



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

TRADEPORT ELECTRONICS CALIBRATION LABORATORY

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CALIBRATION

Valid To: July 31, 2028

Certificate Number: 2450.01

In recognition of the successful completion of the A2LA evaluation process (including an assessment of the organization's compliance with R205 – A2LA's Calibration Program Requirements), accreditation is granted to this laboratory to perform the following calibrations^{1, 6}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Length / Displayment ³ – Generation			
Plunger Type, Lever Type, Cylindrical Bore Gauges	(0 to 25.4) mm	1.1 µm	Hypso I_CAL 25 & optical flat
Height Gauges, Caliper (Outside / Inside)	Fixed Length (20, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600) mm	7.4 µm	AMAC AMC/2425/10/1 & optical flat

II. Electrical – DC / Low Frequency

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
DC Voltage ³ – Generate	(0 to 120) mV 120 mV to 1.2 V (1.2 to 12) V (12 to 120) V (120 to 330) V (330 to 1020) V	12μV/V + 5.8μV 8.5μV/V + 2.1μV 7.8μV/V + 16μV 11μV/V + 0.24 mV 11 μV/V + 1.8 mV 11μV/V + 2.4 mV	Fluke 5560A
	(0 to 220) mV 220 mV to 2.2 V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	8.0μV/V + 0.68 μV 7.0μV/V + 1.4μV 7.0μV/V + 6.5μV 7.0μV/V + 12μV 8.0μV/V + 140 μV 9.0μV/V + 1.5 mV	Fluke 5700A
	(0 to 0.202) V (0.202 to 2.02) V (2.02 to 20.2) V (20.2 to 220) V (200 to 1025) V	15 μV/V + 2.7 μV 9.0 μV/V + 2.6 μV 8.0 μV/V + 0.16 mV 12 μV/V + 0.31 mV 12 μV/V + 9.0 mV	Transmille 4010
	(> 1 to 10) kV (10 to 20) kV (20 to 30) kV (30 to 40) kV	0.58 % + 25 V 0.58 % + 26 V 0.58 % + 27 V 0.58 % + 30 V	Pintek HVC-801
DC Voltage ³ – Measure	(0 to 100) mV (0 to 1) V (0 to 10) V (0 to 100) V (0 to 1000) V	11 μV /V + 1.0μV 10μV/V + 1.0μV 10μV/V + 2.1μV 12μV/V + 34μV 24 μV/V + 0.13 mV	Agilent3458A
	100 V to 15 kV	3.9 %	Tektronix P6015A with 1 MΩ impedance oscilloscope
	(0.5 to 6) kV (> 6 to 10) kV	0.035 % + 0.58 V 0.035 % + 5.8 V	Vitretek 4700
	(> 10 to 40) kV (40 to 70) kV (70 to 100) kV	0.058 % + 5.8 V 0.058 % + 58 V 0.058 % + 0.12 kV	Vitretek 4700 & Vitrek HVL-100 probe

Parameter/Equipment	Range	CMC ^{2, 4, 5} (±)	Comments
DC Current ³ – Generate	(0 to 120) µA	120 µA/A + 6.2 nA	Fluke 5560A
	120 µA to 1.2 mA	100 µA/A + 20nA	
	(1.2 to 12) mA	100 µA/A + 0.14 µA	
	(12 to 120) mA	100 µA/A + 1.4µA	
	120 mA to 1.2 A	0.016 % + 23µA	
	(1.2 to 3.1) A	0.030 % + 0.40 mA	
	(3.1 to 10) A	0.030 % + 0.62 mA	
	(10 to 12) A	0.030 % + 0.77 mA	
	(12 to 20) A	0.10 % + 1.3 mA	
	(20 to 30.2) A	0.10 % + 2.6mA	
	(> 20 to 50) A	0.25 % + 0.20 A	Fluke 5560A & Fluke 5500A/COIL
	(50 to 100) A	0.25 % + 0.68 A	
	(100 to 500) A	0.25 % + 1.1 A	
	(500 to 1000) A	0.27 % + 1.9 A	
	(1000 to 1500) A	0.27 % + 2.8 A	1000A/100mV current shunt, Agilent 3458A
	(> 20 to 120) A	0.025 % + 0.0030A	
	(50 to 350)A	0.025 % + 0.0021A	1000A/100mV current shunt, Agilent 3458A
	(0 to 220) µA	50 µA/A + 10 nA	Fluke 5700A
	220 µA to 2.2 mA	50 µA/A + 22nA	
	(2.2 to 22) mA	50 µA/A + 0.25µA	
	(22 to 220) mA	60 µA/A + 1.8µA	
	220 mA to 2.2 A	80 µA/A + 59 µA	
	(0 to 202) µA	0.01 % + 12 nA	Transmille 4010
	(0.2 to 2.02) mA	0.050 % + 79 nA	
	(2 to 20.2) mA	0.050 % + 0.37 µA	
	(20 to 202) mA	0.05 % + 3.7 µA	
	(0.2 to 2.02) A	0.013 % + 60 µA	Transmille 4010 & Fluke 5500A/COIL
	(2 to 20.2) A	0.030 % + 1.4 mA	
	(20.2 to 30) A	0.050 % + 1.5 mA	
	(> 20 to 50) A	0.25 % + 0.20 A	
	(50 to 100) A	0.25 % + 0.40 A	
	(100 to 500) A	0.25 % + 1.0 A	
	(500 to 1000) A	0.25 % + 1.8 A	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
DC Current ³ – Measure	(0 to 100)µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	25 µA/A + 2.1nA 25µA/A + 17 nA 25µA/A + 0.17µA 40 µA/A + 2.4µA 120 µA/A + 50µA	Agilent3458A
	(1 to 3) A (3 to 10) A	0.016 % + 4.4 mA 0.039 % + 4.4 mA	Fluke 8846A
	(10 to 20) A	0.21 % + 9.7 mA	Agilent 3458A & 50A/50mV current shunt
Resistance ³ – Generate	(0 to 12) Ω (12 to 120) Ω 120 Ω to 1.2 kΩ (1.2 to 12) kΩ (12 to 120) kΩ 120 kΩ to 1.2 MΩ (1.2 to 12) MΩ (12 to 120) MΩ 120 MΩ to 1.2 GΩ	23 µΩ/Ω + 1.0 mΩ 23 µΩ/Ω + 1.4 mΩ 23 µΩ/Ω + 11 mΩ 23 µΩ/Ω + 0.13 Ω 23 µΩ/Ω + 5.9Ω 23 µΩ/Ω + 10Ω 34 µΩ/Ω + 0.11 kΩ 0.039 % + 16 kΩ 0.33 % + 1.1 MΩ	Fluke 5560A
	(0 to 100) Ω (100 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 10) kΩ (10 to 33) kΩ (33 to 100) kΩ (100 to 330) kΩ 330 kΩ to 1 MΩ (1 to 3.3) MΩ (3.3 to 10) MΩ (10 to 33) MΩ (33 to 100) MΩ (100 to 330) MΩ 330 MΩ to 1.0 GΩ	0.010 % + 50 mΩ 0.010 % + 50 mΩ 0.010 % + 51 mΩ 0.010 % + 94 mΩ 0.010 % + 0.14 Ω 0.010 % + 0.82 Ω 0.010 % + 1.4 Ω 0.010 % + 43 Ω 0.010 % + 53Ω 0.010 % + 0.17 kΩ 0.010 % + 0.30 kΩ 0.010 % + 9.3 kΩ 0.050 % + 0.10 MΩ 1.0 % + 0.21 MΩ 2.0 % + 0.70 MΩ	Transmille 4010

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Resistance ³ – Generate (cont)			
Resistance – Generate, (2-wire & 4-wire)	0 Ω	56 μΩ	Fluke 5700A
Fixed Points	1 Ω	120 μΩ	
	1.9 Ω	220 μΩ	
	10 Ω	370 μΩ	
	19 Ω	720 μΩ	
	100 Ω	2.0 mΩ	
	190 Ω	3.0 mΩ	
	1 kΩ	16 mΩ	
	1.9 kΩ	32 mΩ	
	10 kΩ	120 mΩ	
	19 kΩ	290 mΩ	
	100 kΩ	1.7 Ω	
	190 kΩ	2.7 Ω	
	1 MΩ	25 Ω	
	1.9 MΩ	51 Ω	
	10 MΩ	490 Ω	
	19 MΩ	1.7 kΩ	
	100 MΩ	16 kΩ	
	0.001 Ω	0.15 μΩ	KAENAHOB CCCP fixed value resistor
	0.01 Ω	0.94 μΩ	
	0.1 Ω	16 μΩ	
	1 Ω	0.16 mΩ	
	10 Ω	0.73 mΩ	
	100 Ω	14 mΩ	
	1 kΩ	87 mΩ	
	10 kΩ	1.0 Ω	
	100 kΩ	23 Ω	
Resistance ³ – Measure (2-Wire & 4-Wire)	(0 to 10) Ω	18 μΩ/Ω + 0.11 mΩ	Agilent3458A
	(10 to 100) Ω	15 μΩ/Ω + 1.0 mΩ	
	100 Ω to 1 kΩ	13 μΩ/Ω + 7.5 mΩ	
	(1 to 10) kΩ	13 μΩ/Ω + 75 mΩ	
	(10 to 100) kΩ	13 μΩ/Ω + 0.75 Ω	
	100 kΩ to 1 MΩ	18 μΩ/Ω + 8.3 Ω	
	(1 to 10) MΩ	53 μΩ/Ω + 0.20 kΩ	
	(10 to 100) MΩ	0.050 % + 0.24 kΩ	
	100 MΩ to 1 GΩ	0.50 % + 0.24 MΩ	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage ³ – Generate			Fluke 5560A
(1 to 12) mV	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.25 % + 7.1µV 0.085 % + 7.1µV 0.015 % + 6.2µV 0.037 % + 6.2 µV 0.15 % + 15 µV 0.78 % + 30µV 0.78 % + 32 µV	
(12 to 120) mV	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.25 % + 8.6µV 0.085 % + 8.6µV 0.013 % + 7.1µV 0.034 % + 12 µV 0.078 % + 50µV 0.19 % + 39µV 0.19 % + 63 µV	
120 mV to 1.2 V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.25 % + 90 µV 0.085 % + 79µV 0.013 % + 16µV 0.013 % + 16µV 0.030 % + 29µV 0.069 % + 73µV 0.19 % + 0.15 mV 0.19 % + 0.36 mV	
(1.2 to 12) V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.25 % + 0.90 mV 0.085 % + 0.84 mV 0.013 % + 0.43 mV 0.013 % + 0.43 mV 0.030 % + 0.74 mV 0.069 % + 0.73 mV 0.19 % + 1.3 mV 0.19 % + 3.8 mV	
(12 to 120) V	(3 to 5) Hz (5 to 10) Hz (10 to 40) Hz 40.01 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.25 % + 9.7 mV 0.085 % + 8.5 mV 0.013 % + 3.2 mV 0.013 % + 3.2 mV 0.030 % + 6.7 mV 0.069 % + 8.8 mV 0.19 % + 22 mV	
(120 to 330) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.25 % + 78 mV 0.085 % + 76 mV 0.013 % + 16 mV 0.030 % + 32 mV 0.15 % + 65 mV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage ³ – Generate (cont)			
(330 to 1020) V	(3 to 5) Hz (5 to 10) Hz 10 Hz to 10 kHz	0.13 % + 95 mV 0.13 % + 85 mV 0.13 % + 85 mV	Fluke 5560A
(1 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	0.055 % + 4.5 µV 0.021 % + 4.5 µV 0.011 % + 4.5 µV 0.037 % + 4.5 µV 0.085 % + 7.0 µV 0.11 % + 13 µV 0.17 % + 25 µV 0.34 % + 25 µV	Fluke 5700A
(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	0.055 % + 5.1 µV 0.021 % + 5.2 µV 0.011 % + 4.2 µV 0.037 % + 5.1 µV 0.085 % + 7.0 µV 0.11 % + 12 µV 0.17 % + 25 µV 0.34 % + 25 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	0.055 % + 13 µV 0.021 % + 8.0 µV 0.011 % + 8.0 µV 0.037 % + 8.0 µV 0.085 % + 25 µV 0.11 % + 25 µV 0.17 % + 35 µV 0.34 % + 80 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 500 kHz to 1 MHz	0.050 % + 130 µV 0.016 % + 55 µV 0.0080 % + 41 µV 0.012 % + 83 µV 0.025 % + 140 µV 0.043 % + 280 µV 0.11 % + 530 µV 0.22 % + 1.6 mV	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage ³ – Generate (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 500 kHz to 1 MHz	0.050 % + 1.3 mV 0.016 % + 560 μ V 0.008 % + 440 μ V 0.012 % + 860 μ V 0.025 % + 1.3 mV 0.050 % + 3.3 mV 0.13 % + 7.5 mV 0.27 % + 20 mV	Fluke 5700A
(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	0.050 % + 13 mV 0.016 % + 5.8 mV 0.0080 % + 5.1 mV 0.022 % + 12 mV 0.050 % + 17 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.040 % + 95 mV 0.0080 % + 94 mV	
(0 to 202) mV	(10 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz (100 to 500) kHz	0.080 % + 31 μ V 0.016 % + 31 μ V 0.020 % + 44 μ V 0.10 % + 0.15 mV 0.40 % + 0.17 mV	Transmille 4010
(0.2 to 2.02) V	(10 to 45) Hz 45 Hz to 1 kHz (1 to 20) kHz (20 to 100) kHz 100 kHz to 1 MHz	0.050 % + 0.28 mV 0.016 % + 0.25 mV 0.021 % + 0.45 mV 0.065 % + 1.3 mV 0.30 % + 3.3 mV	
(2 to 20.2) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 100) kHz	0.050 % + 2.6 mV 0.016 % + 2.2 mV 0.021 % + 2.2 mV 0.060 % + 7.2 mV	
(20 to 202) V	(30 Hz to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 40) kHz (40 to 100) kHz	0.050 % + 28 mV 0.015 % + 23 mV 0.020 % + 80 mV 0.030 % + 0.14 V 0.20 % + 0.15 V	
(200 to 1020) V	(30 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz	0.055 % + 0.23 V 0.020 % + 0.13 V 0.025 % + 0.17 V 0.030 % + 0.25 V	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage ³ – Measure			
(1 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 300 kHz to 1 MHz	0.30 $\mu\text{V/V}$ + 4.1 μV 0.20 $\mu\text{V/V}$ + 3.0 μV 0.30 $\mu\text{V/V}$ + 3.1 μV 1.0 $\mu\text{V/V}$ + 3.1 μV 5.0 $\mu\text{V/V}$ + 9.1 μV 40 $\mu\text{V/V}$ + 66 μV 40 $\mu\text{V/V}$ + 66 μV	Agilent3458A
(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 (2 to 4) MHz (4 to 6) MHz (6 to 8) MHz (8 to 10) MHz	72 nV/V + 7.0 μV 72 nV/V + 6.1 μV 0.14 $\mu\text{V/V}$ + 8.1 μV 0.30 $\mu\text{V/V}$ + 8.1 μV 0.80 $\mu\text{V/V}$ + 37 μV 3.0 $\mu\text{V/V}$ + 70 μV 10 $\mu\text{V/V}$ + 70 μV 15 $\mu\text{V/V}$ + 91 μV 40 $\mu\text{V/V}$ + 0.72 mV 40 $\mu\text{V/V}$ + 0.77 mV 40 $\mu\text{V/V}$ + 0.77 mV 0.015 % + 2.3 mV	
100 mV to 1V	(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 (2 to 4) MHz (4 to 6) MHz (6 to 8) MHz (8 to 10) MHz	72 nV/V + 64 μV 72 nV/V + 54 μV 0.014 % + 72 μV 0.030 % + 0.13 mV 0.080 % + 0.21 mV 0.30 % + 0.61 mV 1.0 % + 1.7 mV 1.5 % + 1.8 mV 4.0 % + 7.2 mV 4.0 % + 7.7 mV 4.0 % + 7.7 mV 15 % + 25 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	72 $\mu\text{V/V}$ + 0.71 mV 72 $\mu\text{V/V}$ + 0.54 mV 0.014 % + 0.71 mV 0.030 % + 1.3 mV 0.080 % + 1.6 mV 0.30 % + 5.2 mV 1.0 % + 16 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	0.020 % + 9.3 mV 0.020 % + 8.6 mV 0.020 % + 12 mV 0.035 % + 14 mV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Voltage ³ – Measure (cont)			
(10 to 100) V	(50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.12 % + 34 mV 0.40 % + 35 mV 1.5 % + 35 mV	Agilent3458A
(100 to 700) V	(1 to 50) Hz 50 Hz to 1 kHz (1 to 10) kHz	0.040 % + 87 mV 0.040 % + 80 mV 0.060 % + 80 mV	
100 V to 15 kV	60 Hz	3.9 %	Tektronix P6015A with 1MΩ impedance oscilloscope
(0.5 to 5) kV (> 5 to 10) kV	60 Hz	0.14 % + 0.60 V 0.14 % + 29 V	Vitretek 4700
(> 10 to 20) kV (20 to 50) kV (50 to 70) kV	60 Hz	0.14 % + 29 V 0.14 % + 58 V 0.14 % + 0.12 kV	Vitretek 4700 + Vitrek HVL-100 Probe
100 V to 1 kV	400 Hz	0.46 % + 0.13 V	Vitretek 4700

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Generate			
(10 to 120) µA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 13 nA 0.025 % + 13 nA 0.025 % + 13 nA 0.15 % + 44 nA 0.49 % + 1.0 µA	Fluke 5560A
120 µA to 1.2 mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 0.12µA 0.025 % + 0.12µA 0.025 % + 0.13 µA 0.15 % + 0.22 µA 0.49 % + 5.1 µA	
(1.2 to 12) mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 1.2µA 0.025 % + 1.2µA 0.025 % + 1.2 µA 0.15 % + 1.6 µA 0.49 % + 10 µA	
(12 to 120) mA	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 11 µA 0.025 % + 6.7µA 0.025 % + 9.7 µA 0.15 % + 16 µA 0.49 % + 0.11 mA	
120 mA to 1.2 A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.025 % + 0.11 mA 0.025 % + 70µA 0.025 % + 0.10 mA 0.25 % + 0.33 mA 0.49 % + 0.38 mA	
(1.2 to 3.1) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.037 % + 0.54 mA 0.030 % + 0.37 mA 0.037 % + 0.38 mA 0.25 % + 0.78 mA	
(3.1 to 12) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.037 % + 1.2 mA 0.030 % + 0.89 mA 0.037 % + 1.3 mA 0.25 % + 2.0 mA	
(12 to 20) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.1 % + 10 mA 0.069 % + 8.4 mA 0.49 % + 49 mA	

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
AC Current ³ – Generate (cont)			
(20 to 30.2) A	(3 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz	0.1 % + 11 mA 0.069 % + 9.2 mA 0.49 % + 72 mA	Fluke 5560A
(> 20 to 50) A	(50 to 100) Hz (100 to 400) Hz	0.29 % + 0.11 A 0.79 % + 0.12 A	Fluke 5560A & Fluke 5500A/coil
(50 to 100) A	(50 to 100) Hz (100 to 400) Hz	0.29 % + 0.21 A 0.79 % + 0.21 A	
(100 to 500) A	(50 to 100) Hz (100 to 400) Hz	0.29 % + 0.91 A 0.79 % + 0.91 A	
(500 to 1000) A	(50 to 100) Hz (100 to 400) Hz	0.30 % + 1.9 A 0.80 % + 1.9 A	
(1000 to 1500) A	(50 to 100) Hz (100 to 400) Hz	0.31 % + 2.7 A 0.80 % + 2.7 A	
(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	0.070 % + 28 nA 0.035 % + 24 nA 0.014 % + 21 nA 0.060 % + 42 nA 0.16 % + 82 nA	Fluke 5700A
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	0.070 % + 140 nA 0.035 % + 170 nA 0.014 % + 140 nA 0.060 % + 420 nA 0.16 % + 810 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	0.070 % + 1.5 µA 0.035 % + 1.4 µA 0.014 % + 1.4 µA 0.060 % + 4.3 µA 0.16 % + 8.1 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	0.070 % + 1.4 µA 0.035 % + 1.4 µA 0.014 % + 1.4 µA 0.060 % + 42 µA 0.16 % + 81 µA	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Generate (cont)			
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.065 % + 140 µA 0.075 % + 160 µA 0.85 % + 210 µA	Fluke 5700A
(20 to 202) µA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.20 % + 0.30 µA 0.070 % + 0.23 µA 0.80 % + 0.77 µA 1.6 % + 0.83 µA	Transmille 4010
(0.2 to 2.02) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.20 % + 0.63 µA 0.060 % + 0.62 µA 0.50 % + 3.3 µA 1.0 % + 6.6 µA	
(2 to 20.2) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.20 % + 4.0 µA 0.040 % + 3.4 µA 0.25 % + 4.2 µA 0.50 % + 5.0 µA	
(20 to 202) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 10) kHz (10 to 30) kHz	0.20 % + 58 µA 0.040 % + 54 µA 0.50 % + 70 µA 0.70 % + 0.22 mA	
(0.2 to 2.02) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 30) kHz	0.20 % + 0.41 mA 0.060 % + 0.49 mA 0.50 % + 0.60 mA 0.60 % + 1.1 mA	
(2 to 30.0) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.080 % + 5.6 mA 0.30 % + 6.6 mA 0.60 % + 6.6 mA 3.0 % + 6.8 mA	
(> 20 to 50) A	(50 to 100) Hz (100 to 400) Hz	0.29 % + 0.11 A 0.79 % + 0.11 A	Transmille 4010 & Fluke 5500A/coil
(50 to 100) A	(50 to 100) Hz (100 to 400) Hz	0.29 % + 0.20 A 0.79 % + 0.20 A	
(100 to 500) A	(50 to 100) Hz (100 to 400) Hz	0.30 % + 1.0 A 0.80 % + 1.0 A	
(500 to 1000) A	(50 to 100) Hz (100 to 400) Hz	0.41 % + 2.0 A 0.85 % + 1.8 A	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Generate (cont)			
(> 30 to 50) A	60 Hz	0.025 % + 3.0 mA	5kVA Transformer, HP 3458A & OHM-LABS CS- 1000
(50 to 100) A		0.025 % + 37 mA	
(100 to 200) A		0.025 % + 0.61 A	
(200 to 400) A		0.025 % + 0.71 A	
(400 to 600) A		0.025 % + 2.5 A	
(600 to 800) A		0.025 % + 2.9 A	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Measure			
(10 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	0.40 % + 44 nA 0.15 % + 44 nA 0.061 % + 44 nA 0.061 % + 44 nA 0.061 % + 44 nA	Agilent3458A
100 µA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	0.40 % + 0.23 µA 0.15 % + 0.23 µA 0.061 % + 0.23 µA 0.031 % + 0.23 µA 0.061 % + 0.23 µA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	0.40 % + 2.8 µA 0.15 % + 2.8 µA 0.061 % + 2.8 µA 0.031 % + 2.8 µA 0.061 % + 2.8 µA	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current ³ – Measure cont.			
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	0.40 % + 28 µA 0.15 % + 28 µA 0.061 % + 28 µA 0.031 % + 28 µA 0.061 % + 28 µA	Agilent3458A
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 10) kHz	0.40 % + 0.29 mA 0.18 % + 0.29 mA 0.081 % + 0.29 mA 0.11 % + 0.29 mA 0.31 % + 0.29 mA	
(1 to 3) A	10 Hz to 1 kHz (1 to 5) kHz	0.14 % + 3.8 mA 2.3 % + 4.5 mA	Fluke 8846A
(3 to 10) A	10 Hz to 1 kHz (1 to 5) kHz	0.14 % + 9.4 mA 2.3 % + 9.7 mA	
(10 to 20) A	10 Hz to 400 Hz 400 Hz to 1 kHz	0.23 % + 18 mA 0.23 % + 38 mA	Agilent 3458A & 50A/50mV current shunt

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Capacitance ³ – Generate			
(0 to 1.2) nF	100 Hz to 10 kHz	0.11 % + 2.5 pF	Fluke 5560A
(1.2 to 12) nF	150 Hz to 5 kHz	0.11 % + 10 pF	
(12 to 120) nF	200 Hz to 1.3 kHz	0.12 % + 78 pF	
120 pF to 1.2 µF	(2 to 310) Hz	0.12 % + 0.83 nF	
(1.2 to 12) µF	(0.5 to 250) Hz	0.12 % + 7.7 nF	
(12 to 120) µF	(0.5 to 40) Hz	0.14 % + 72nF	
120 µF to 1.2 mF	(0.1 to 11) Hz	0.23 % + 1.4 µF	
(1.2 to 12) mF	(0.03 to 4) Hz	0.23 % + 11 µF	
(12 to 120) mF	(0.01 to 1.3) Hz	0.47 % + 0.10 mF	
(0.95 to 9.5) µF	1 kHz	0.70 % + 1.0 nF	Transmille 4010
(9.5 to 95) µF		0.70 % + 6.0nF	
95µF to 0.95mF		0.70 % + 5.3 nF	
(0.95 to 9.5) mF		0.70 % + 6.0 µF	
(9.5 to 100) mF		0.70 % + 24µF	
Fixed Points Capacitance			
1 nF	1 kHz	0.25 % + 0.61 pF	Fluke 5560A
2 nF		0.25 % + 42 pF	
5 nF		0.25 % + 32 pF	
10 nF		0.25 % + 6.0 pF	
100nF		0.25 % + 60 pF	
1 µF		0.40 % + 0.60µF	
10 µF		0.60 % + 0.60µF	
Inductance ³ – Generate			
(13 to 120) µH	1 kHz 550 Hz to 13 kHz 490 Hz to 17 kHz	0.19 % + 0.82 µH Add 0.25 % Add 1 %	Fluke 5560A
120 µH to 1.2 mH	1 kHz 330 Hz to 1.6 kHz 260 Hz to 2.5 kHz	0.11 % + 5.9 µH Add 0.25 % Add 1 %	
(1.2 to 12) mH	110 Hz	0.11 % + 59 µH	
(1.2001 to 3.3) mH	(0.5 to 800) Hz (0.5 to 980) Hz	Add 0.25 % Add 1 %	
(3.3 to 12) mH	(0.5 to 1000) Hz (0.5 to 1400) Hz	Add 0.25 % Add 1 %	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Inductance ³ – Generate (cont)			
(12 to 120) mH (12.001 to 83) mH	100 Hz (0.1 to 180) Hz (0.1 to 230) Hz	0.11 % + 0.12 mH Add 0.25 % Add 1 %	Fluke 5560A
(83 to 120) mH	(0.1 to 320) Hz (0.1 to 1000) Hz	Add 0.25 % Add 1 %	
120 mH to 1.2 H (0.120 01 to 0.65) H	10 Hz (0.05 to 30) Hz (0.05 to 55) Hz	0.14 % + 1.0 mH Add 0.25 % Add 1 %	
(0.65 to 1.2) H	(0.05 to 30) Hz (0.05 to 170) Hz	Add 0.25 % Add 1 %	
(1.2 to 12) H (1.2001 to 5.5) H	3 Hz (0.01 to 8) Hz (0.01 to 16) Hz	0.19 % + 10 mH Add 0.25 % Add 1 %	
(5.5 to 12) H	(0.01 to 19) Hz (0.01 to 37) Hz	Add 0.25 % Add 1 %	
(12 to 120) H (12.001 to 30) H	2 Hz (0.005 to 4) Hz (0.002 to 9) Hz	0.23 % + 0.10 H Add 0.25 % Add 1 %	
(30 to 120) H	(0.005 to 7) Hz (0.002 to 14) Hz	Add 0.25 % Add 1 %	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
Electrical Simulation of Thermocouple Indicating Systems ³ –			
Type B	(600 to 800) °C (800to 1000)°C (1000 to 1550)°C (1550 to 1820)°C	0.43°C 0.33°C 0.30°C 0.33°C	Fluke 5560A
Type C	(0 to 150) °C (150to 650)°C (650 to 1000)°C (1000 to 1800)°C (1800 to 2316)°C	0.25°C 0.20°C 0.26°C 0.44°C 0.78°C	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
Electrical Simulation of Thermocouple Indicating Systems ³ – (cont)			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °C 0.15 °C 0.11 °C 0.16 °C 0.22 °C	Fluke 5560A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.28 °C 0.13 °C 0.11 °C 0.20 °C 0.34 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.28 °C 0.13 °C 0.11 °C 0.20 °C 0.34 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.30 °C 0.19 °C 0.11 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.40 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.41 °C 0.30 °C 0.31 °C 0.40 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.41 °C 0.30 °C 0.31 °C 0.40 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.59 °C 0.20 °C 0.13 °C 0.11 °C	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
Electrical Simulation of Thermocouple Indicating Systems ³ – (cont)			
Type U	(-200 to 0) °C (0 to 600) °C	0.40 °C 0.11 °C	Transmille 4010
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.44 °C 0.34 °C 0.30 °C 0.33 °C	
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.30 °C 0.26 °C 0.31 °C 0.50 °C 0.84 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.50 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.17 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1370) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.40 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.37 °C 0.26 °C 0.17 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.40 °C 0.22 °C 0.19 °C 0.18 °C 0.27 °C	

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments	
Electrical Simulation of Thermocouple Indicating Systems ³ – (cont)				
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.40 °C	Transmille 4010	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C		
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C		
Type U	(-200 to 0) °C (0 to 600) °C	0.56 °C 0.27 °C		

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators & Indicating Systems 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	0.050°C 0.050°C 0.070°C 0.090°C 0.10°C 0.12 °C 0.23 °C	Fluke 5560A
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	0.050°C 0.050 °C 0.080 °C 0.090 °C 0.10 °C 0.12 °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	0.25°C 0.040°C 0.050°C 0.060 °C 0.070°C 0.080°C 0.090°C 0.10°C 0.23°C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators & Indicating Systems ³ – (cont)			
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	0.040 °C 0.040 °C 0.040 °C 0.050 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °C	Fluke 5560A
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	0.040 °C 0.050 °C 0.050 °C 0.060 °C 0.080 °C 0.080 °C 0.090 °C 0.11 °C	
Pt 385, 1000Ω	(-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	0.030°C 0.030°C 0.040 °C 0.050°C 0.060 °C 0.070°C 0.070°C 0.23°C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.080 °C 0.080 °C 0.14 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.30 °C	
Pt 25, 25 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	0.50°C 0.50°C 0.60°C 0.60 °C 0.60°C 0.60°C 0.60°C	Transmille 4010

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators & Indicating Systems ³ – (cont)			
Pt 100, 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	0.13 °C 0.13 °C 0.55 °C 0.55 °C 0.55 °C 0.55 °C 0.55 °C	Transmille 4010
Pt 250, 250 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 800) °C	0.25 °C 0.25 °C 0.30 °C 0.30 °C 0.30 °C 0.30 °C 0.30 °C	
Pt 25, 500 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	0.10 °C 0.10 °C 0.90 °C 0.90 °C 0.90 °C 0.90 °C 0.90 °C	
Pt 100, 1000 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 800) °C	0.080 °C 0.080 °C 0.45 °C 0.45 °C 0.45 °C 0.45 °C 0.45 °C	
Fixed Point Temperature (4 Wire)	-100 °C 0 °C 30 °C 60 °C 100 °C 200 °C 400 °C 800 °C	0.011°C 0.002°C 0.004°C 0.008 °C 0.011°C 0.022°C 0.041°C 0.08 °C	
(-100 to 800) °C			

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Oscilloscope ³ —			
Square Wave Amplitude: 50 Ω Load	V _{p-p} 1 mV to 6.5 V ≤ 1 kHz > 1 kHz	0.23 % + 41 μV 0.23 % + 41 μV	Fluke 5560A
1 MΩ Load	V _{p-p} 1 mV to 120 V ≤ 1 kHz > 1 kHz	0.090 % + 41 μV 0.090 % + 41 μV	
DC Signal Output: 50 Ω Load 1 MΩ Load	V _{dc} (0 to 6.5) V V _{dc} (0 to 120) V	0.23 % + 41 μV 0.050 % + 41 μV	
Leveled Sine Wave Amplitude: 5 mV _{p-p} to 5.5 V _{p-p}	50 kHz (reference)	1.9 % + 0.31 mV	
Flatness: Relative to 50 kHz 5 mV _{p-p} to 5.5 V _{p-p}	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.4 % + 0.10 mV 2.8 % + 0.12 mV 2.8 % + 0.12 mV 3.7 % + 0.12 mV	
5 mV _{p-p} to 3.5 V _{p-p}	(600 to 1100) MHz	3.7 % + 0.12 mV	
Time Marker: 50 Ω Load	(5 to 1) s (500 to 1) ms (500 to 1) μs (500 to 1) ns	1.3 ms/s 8.2 μs/s 0.82 ns/s 0.82 ps/s	
Edge-Rise Time	> 50 mV to 2.5V 990 Hz to 1 MHz > 1 to 5 MHz > 5 to 10 MHz	180 pS 180 pS 180 pS	
Square Wave Amplitude: 1 MΩ Load	V _{p-p} 1 mV to 300 V at 1 kHz	0.25 % + 38 μV	Transmille 4010 with SCP 600 option
DC Signal Output: 1 MΩ Load	V _{dc} (0 to 300) V	0.01 % + 0.84 μV	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Oscilloscope ³ — (cont)			
Leveled Sine Wave Amplitude: 600 mV _p	50 kHz reference (> 5 to 600) MHz	0.26 % + 69µV 0.26 % + 69µV	Transmille 4010 with SCP 600 option
Timebase: 50 Ω Load	(5 to 1) s (500 to 1) ms (500 to 100) µs (50 to 1) µs (500 to 2) ns	0.010 % + 0.58 ms 0.010 % + 58 µs 0.010 % + 5.8µs 0.010 % + 0.58 ns 0.010 % + 0.58ps	
Edge-Rise Time	1 kHz	1.5 nS	
Phase – Measuring Equipment ³	(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 (40 to 60) Hz (60 to 100) Hz (100 to 400) Hz	0.11° 0.26° 0.50° 2.5° 5.0° 10° 0.11° 0.26° 0.50°	Fluke 5560A Transmille 4010
DC Power ³	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW > (1 to 30) kW 40µW to 2 W (> 2 to 200) W > 200W to 30kW	0.012 % 0.016 % 0.031 % 0.10 % 0.030 % 0.014 % 0.031 %	Fluke 5560A Transmille 4010

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
AC Power ³ –			
PF = 1 (10 to 65) Hz	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW > (1 to 30) kW	0.030 % 0.030 % 0.035 % 0.077 %	Fluke 5560A
(65 to 500) Hz	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW > (1 to 30) kW	0.031 0.030 % 0.035 % 0.077 %	
500 Hz to 1 kHz	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW > (1 to 30) kW	0.030 % 0.030 % 0.035 % 0.077 %	
(> 1 to 5) kHz	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW > (1 to 30) kW	0.031 % 0.031 % 0.036 % 0.25 %	
(> 5 to 10) kHz	10 µW to 100 mW > 100 mW to 100 W > 100 W to 1 kW	0.15 % 0.25 % 0.25 %	
PF = 1 (40 to 60) Hz	40µW to 2 W (> 2 to 200) W > 200W to 30kW	0.21 % 0.21 % 0.20 %	Transmille 4010
(> 60 to 100) Hz	40µW to 2 W (> 2 to 200) W > 200W to 30kW	0.079 % 0.088 % 0.10 %	
(> 100 to 400) Hz	40µW to 2 W (> 2 to 200) W > 200W to 30kW	0.079 % 0.088 % 0.31 %	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
RF Absolute Power – Measure			
(20 to 44) dBm	10 MHz to 4 GHz	0.73 dB	30 dB attenuator with HP8482B
(-30 to 20) dBm	0.1 MHz to 4 GHz	0.16 dB	HP437B&HP 8482A
(-20 to -70) dBm	10 MHz to 8 GHz (> 8 to 10) GHz (> 10 to 14) GHz (> 14 to 18) GHz	0.11 dB 0.13 dB 0.14 dB 0.16 dB	HP437B&HP8481D HP437B&HP8481D HP437B&HP8481D HP437B&HP8481D
(10 to -10) dBm	10 MHz to 8 GHz (> 8 to 10) GHz (> 10 to 14) GHz (> 14 to 18) GHz	0.13 dB 0.17 dB 0.17 dB 0.21 dB	HP437B&HP8481A HP437B&HP8481A HP437B&HP8481A HP437B&HP8481A

IV. Mechanical

Parameter/Equipment	Range	CMC ² (±)	Comments
Pressure ³ – Generate & Measure			
Pneumatic	(-14 to 300) PSI (0 to 2000) PSI	0.076 PSI 0.02 % + 0.34 PSI	Druck DPI610
Hydraulic	(> 2000 to 10,000) PSI	0.1 % + 0.69 PSI	Crystal Pressure 10KPSIXP2I & Additel ADT936

Parameter/Equipment	Range	CMC ² (±)	Comments
Torque ³ – Measure	(10 to 100) in.lbf Clockwise & Counter-Clockwise	0.54 %	Norbar TST10
	(0 to 80) Nm Clockwise & Counter-Clockwise	1 %	WTIM ANJ – M100
	(> 80 to 340) Nm Clockwise & Counter-Clockwise	1 %	WTIM ANJ – M500

V. Thermodynamics

Parameter/Range	Range	CMC ^{2, 4, 5} (±)	Comments
Temperature Generation –			
(5 to 60) °C	(5 to 60) °C	0.36 °C	Sansel HCAL 1102U (Chamber)
(-25 to 140) °C	(-25 to 140) °C	0.26 °C	Kaye LTR-140 (Dry Well)
Relative Humidity Generation –			
(5 to 95) % RH	(5 to 95) % RH	0.90 %	Sansel HCAL 1102U (Chamber)
Temperature Measurement ³ –			
(5 to 60) °C	(5 to 60) °C	0.51 °C	Sansel HTD-200
Relative Humidity Measurement ³ –			
(5 to 95) % RH	(5 to 95) % RH	1.1 %	Sansel HTD-200

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 7} ($\pm$)	Comments
Frequency & Period – Measuring Equipment	10 MHz	0.035 mHz	Brandywine Communication GPS time/frequency system
	(0.01 to 119.99) Hz	3.0 pHz/Hz + 5.8 mHz	Fluke 5560A
	(120.0 to 1199.9) Hz	3.0 pHz/Hz + 58 mHz	(With 10 MHz GPS external clock)
	(1.200 to 11.999) kHz	3.0 pHz/Hz + 0.58 Hz	
	(12.00 to 119.99) kHz	3.0 pHz/Hz + 5.8 Hz	
	(120.0 to 1199.9) kHz	3.0 pHz/Hz + 58 Hz	
	(1.200 to 2.000) MHz	3.0 pHz/Hz + 0.58 kHz	
	(0.05 to 100) MHz	3.0 pHz/Hz + 5.8 kHz	
	(100 to 300) MHz	3.0 pHz/Hz + 5.8 kHz	
	(300 to 600) MHz	3.0 pHz/Hz + 5.8 kHz	
	(600 to 1100) MHz	3.0 pHz/Hz + 58 kHz	

VII. EMC

Parameter/Equipment	Range	CMC ^{2, 4} ($\pm$)	Comments
ESD Simulators –			EN 61000-4-2
Contact Voltage (Positive & Negative)	(2 to 8) kV $\pm$ 5 % (10 to 30) kV $\pm$ 5 %	0.35 % 4.4 %	Tektronix DPO7254 with Noiseken Target 06- 00067A, Noiseken Attenuator 00-00010A, Tektronix attenuator 011- 0053-03, Tektronix probe P6015A, Brandenburg HV meter 139D
Rise/Fall Time	(0.6 to 1) ns	1.2 %	
Peak Current	(7.5 to 30) A $\pm$ 15 %	2.3 %	
30 ns Current	(4 to 16) A $\pm$ 30 %	2.2 %	
60 ns Current	(2 to 8) A $\pm$ 30 %	3.0 %	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
EFT/Burst Generator ³ – 50Ω / 1kΩ Load; 100kHz / 5kHz			EN 61000-4-4
Voltage (Positive & Negative)	(0.25 to 4.4) kV	4.3 %	Tektronix DPO7254 with Noiseken attenuators AT- 810 & AT-811
Rise/Fall Time	5 ns ± 30 %	3.6 %	
Burst Duration	50 ns ± 30 %	3.6 %	
Impulse Duration 5kHz	20 ms ± 20 %	3.7 %	
100kHz	1 ms ± 20 %	3.7 %	
Burst Period (5/100) kHz	300 ms ± 20 %	3.7 %	
Repetition Cycle 5kHz	200 μs ± 20 %	3.7 %	
100kHz	10 μs ± 20 %	3.7 %	
Surge Generator ³ –			EN 61000-4-5
Open Circuit– Voltage (Positive & Negative)	(0.5 to 4.4) kV	2.6 %	Tektronix DPO7254 with Pintek DP-100, Pearson 110A, Tektronix 011-0060-02
Rise/Fall Time	1.2 μs	2.7 %	
Duration	50 μs	2.6 %	
Short Circuit– Current (Positive & Negative)	(41.67 to 2200) A	1.3 %	
Front Time	8 μs	1.3 %	
Duration	20 μs	1.3 %	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Ring Wave Generator ³ –			EN 61000-4-12
Open Circuit– Voltage (Positive & Negative)	(0.5 to 4) kV	5.9 %	Tektronix DPO7254 with PinteK DP-100, Pearson 110A, Tektronix 011-0060-02
Rise/Fall Time	1 µs	6.0 %	
Duration	10 µs	6.0 %	
Short Circuit– Current (Positive & Negative)	(200 & 500) A	5.8 %	
Rise/Fall Time	8 µs	6.0 %	
Fast Damped Oscillatory Wave Generator ³ –			EN 61000-4-18, Edition 2.0, 2019
Open Circuit– Voltage (Positive & Negative) (3MHz, 10MHz & 30MHz)	(0.45 to 4) kV	6.3 %	Tektronix DPO7254 with EMC Partner VERI1K & Pearson 110A
Rise/Fall Time	5 ns	6.3 %	
Duration	200 µs	6.3 %	
Short Circuit– Current (Positive & Negative) 3MHz	(9 to 80) A	1.6 %	
Rise/Fall Time	330 ns	1.6 %	
Short Circuit– Current (Positive & Negative) 10MHz	(9 to 80) A	1.6 %	
Rise/Fall Time	100 ns	1.6 %	
Short Circuit– Current (Positive & Negative) 30MHz	(9 to 80) A	1.6 %	
Rise/Fall Time	33 ns	1.6 %	

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Slow Damped Oscillatory Wave Generator ³ – Common Mode & Differential Mode Open Circuit– Voltage (Positive & Negative) (100kHz & 1MHz) Rise/Fall Time Duration Short Circuit – Current (Positive & Negative) (100kHz & 1MHz) Rise/Fall Time	(0.25 to 3) kV 75 ns 25 ms (1.25 to 15) A 8 µs	6.3 % 6.3 % 6.3 % 1.0 % 6.0 %	EN 61000-4-18, Edition 2.0, 2019 Tektronix DPO7254 with EMC Partner VERI1K & Pearson 110A
PQT ³ – Testing Voltage at 220 V With no Loading– Dip Voltage Duration (1 to 100) cycles Phase Angle Rise/Fall Time	 (0 to 70) % 16.6 ms to 1.666 s (0 to 360)° 2 cycles, 30°	 2.7 % 2.6 % 2.7 % 2.7 %	EN 61000-4-11 Tektronix DPO7254 with Pintek DP-100

¹ This laboratory offers commercial and field calibration services.

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 Unless otherwise noted, in the statement of CMC, percent refers to percent of reading.
- ⁵ The measurands stated are generated using the indicated instrument (see Comments). This capability is suitable for the calibration of the devices intended to measure the measurand in the ranges indicated. CMC are expressed as either a specific value that covers the full range or as a fraction/percent of the reading plus a fixed floor specification.
- ⁶ This scope meets A2LA's *P112 Flexible Scope Policy*.
- ⁷ 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.