



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid To: July 31, 2016

Certificate Number: 2450.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Electrical – DC / Low Frequency

Table with 4 columns: Parameter/Equipment, Range, CMC^{2,5} (±), and Comments. It lists calibration ranges and measurement capabilities for DC Voltage generation and measurement using Fluke and Agilent equipment.

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
DC Voltage ³ – Measure	100 V to 15 kV	3.9 %	Tektronix P6015A with 1 MΩ impedance oscilloscope
DC Current ³ – Generate	(0 to 330) μA 330 μA to 3.3 mA (3.3 to 33) mA (33 to 330) mA 330 mA to 1.1 A (1.1 to 3) A (3 to 11) A (11 to 20.5) A (>20 to 50) A (50 to 100) A (100 to 500) A (500 to 1000) A	0.12 μA/A + 16 nA 78 μA/A + 52 nA 78 μA/A + 0.37 μA 78 μA/A + 7.0 μA 0.016 % + 52 μA 0.029 % + 0.19 mA 0.039 % + 0.74 mA 0.078 % + 2.4 mA 0.19 % + 0.20 A 0.20 % + 0.40 A 0.20 % + 1.0 A 0.21 % + 1.8 A	Fluke 5520A Fluke 5520A + Fluke 5500A/COIL
DC Current ³ – Generate	(0 to 220) μA 220 μA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	50 μA/A + 10 nA 50 μA/A + 22 nA 50 μA/A + 0.25 μA 60 μA/A + 1.8 μA 80 μA/A + 59 μA	Fluke 5700A
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 pA/A + 2.1 nA 25 nA/A + 17 nA 25 nA/A + 0.17 μA 40 nA/A + 2.4 μA 0.12 mA/A + 50 μA	Agilent 3458A

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
Resistance ³ – Generate	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω 330 Ω to 1.1 kΩ (1.1 to 3.3) kΩ (3.3 to 11) kΩ (11 to 33) kΩ (33 to 110) kΩ (110 to 330) kΩ 330 kΩ to 1.1 MΩ (1.1 to 3.3) MΩ (3.3 to 11) MΩ (11 to 33) MΩ (33 to 110) MΩ (110 to 330) MΩ 330 MΩ to 1.1 GΩ	31 μΩ/Ω + 0.033 Ω 23 μΩ/Ω + 0.17 Ω 22 μΩ/Ω + 0.81 Ω 22 μΩ/Ω + 0.024 Ω 22 μΩ/Ω + 0.0059 Ω 22 μΩ/Ω + 0.030 Ω 22 μΩ/Ω + 0.083 Ω 22 μΩ/Ω + 0.30 Ω 22 μΩ/Ω + 0.90 Ω 25 μΩ/Ω + 2.7 Ω 25 μΩ/Ω + 7.1 Ω 47 μΩ/Ω + 48 Ω 0.010 % + 200 Ω 0.019 % + 2.7 kΩ 0.039 % + 9.4 kΩ 0.23 % + 110 kΩ 1.2 % + 1.3 MΩ	Fluke 5520A
Resistance – Generate, Fixed Points	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	56 μΩ 120 μΩ 220 μΩ 370 μΩ 720 μΩ 2 mΩ 3 mΩ 16 mΩ 32 mΩ 120 mΩ 290 mΩ 1.7 Ω 2.7 Ω 25 Ω 51 Ω 490 Ω 1.7 kΩ 16 kΩ	Fluke 5700A
Resistance ³ – Measure (2-wire and 4-wire)	(0 to 10) Ω (10 to 100) Ω 100 Ω to 1 kΩ (1 to 10) kΩ (10 to 100) kΩ 100 kΩ to 1 MΩ (1 to 10) MΩ (10 to 100) MΩ 100 MΩ to 1 GΩ	18 μΩ/Ω + 0.11 mΩ 15 μΩ/Ω + 1.0 mΩ 13 mΩ/Ω + 7.5 mΩ 13 mΩ/Ω + 75 mΩ 13 mΩ/Ω + 0.75 Ω 18 Ω/Ω + 8.3 Ω 53 Ω/Ω + 0.20 kΩ 0.050 % + 0.24 kΩ 0.50 % + 0.24 MΩ	Agilent 3458A

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Voltage ³ – Generate			
(1 to 33) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.062 % + 5.0 μV 0.012 % + 5.0 μV 0.016 % + 5.6 μV 0.078 % + 7.7 μV 0.27 % + 12 μV 0.62 % + 45 μV	Fluke 5520A
(33 to 330) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 25 μV 0.011 % + 11 μV 0.012 % + 11 μV 0.027 % + 33 μV 0.062 % + 35 μV 0.16 % + 93 μV	
330 mV to 3.3 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.023 % + 150 μV 0.012 % + 100 μV 0.015 % + 100 μV 0.023 % + 120 μV 0.054 % + 220 μV 0.19 % + 1.0 mV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.023 % + 3.4 mV 0.012 % + 1.0 mV 0.019 % + 1.1 mV 0.027 % + 1.5 mV 0.070 % + 2.6 mV	
(33 to 330) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 12 mV 0.016 % + 13 mV 0.019 % + 14 mV 0.023 % + 31 mV 0.16 % + 49 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 54 mV 0.019 % + 32 mV 0.023 % + 35 mV	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Voltage ³ – Generate			
(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 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 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 μV 0.011 % + 8 μV 0.037 % + 8 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 0.008 % + 41 μV 0.012 % + 83 μV 0.025 % + 140 μV 0.043 % + 280 μV 0.11 % + 530 μV 0.22 % + 1.6 mV	
(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 μV 0.008 % + 440 μV 0.012 % + 860 μV 0.025 % + 1.3 mV 0.050 % + 3.3 mV 0.13 % + 7.5 mV 0.27 % + 20 mV	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Voltage ³ – Generate (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	0.050 % + 13 mV 0.016 % + 5.8 mV 0.008 % + 5.1 mV 0.022 % + 12 mV 0.050 % + 17 mV	Fluke 5700A
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.040 % + 95 mV 0.008 % + 94 mV	
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	0.3 μV/V + 4.1 μV 0.2 μV/V + 3.0 μV 0.3 μV/V + 3.1 μV 1 μV/V + 3.1 μV 5 μV/V + 9.1 μV 40 μV/V + 66 μV 40 μV/V + 66 μV	Agilent 3458A
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz (2 to 4) MHz (4 to 6) MHz (6 to 8) MHz (8 to 10) MHz	72 nV/V + 7 μV 72 nV/V + 6.1 μV 0.14 μV/V + 8.1 μV 0.3 μV/V + 8.1 μV 0.8 μV/V + 37 μV 3 μV/V + 70 μV 10 μV/V + 70 μV 15 μV/V + 91 μV 40 μV/V + 0.72 mV 40 μV/V + 0.77 mV 40 μV/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 0.03 % + 0.13 mV 0.08 % + 0.21 mV 0.3 % + 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	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Voltage ³ – Measure (cont)			
(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 μV/V + 0.71 mV 72 μV/V + 0.54 mV 0.014 % + 0.71 mV 0.03 % + 1.3 mV 0.08 % + 1.6 mV 0.3 % + 5.2 mV 1.0 % + 16 mV	Agilent 3458A
(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	0.02 % + 9.3 mV 0.02 % + 8.6 mV 0.02 % + 12 mV 0.035 % + 14 mV 0.12 % + 34 mV 0.4 % + 35 mV 1.5 % + 35 mV	
(100 to 700) V	(1 to 50) Hz 50 Hz to 1 kHz (1 to 10) kHz	0.04 % + 87 mV 0.04 % + 80 mV 0.06 % + 80 mV	
100 V to 15 kV	60 Hz	3.9 %	Tektronix P6015A with 1 MΩ impedance oscilloscope

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Current ³ – Generate			
(29 to 330) μA	(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	0.16 % + 0.11 μA 0.12 % + 0.1 μA 0.097 % + 0.11 μA 0.23 % + 0.16 μA 0.62 % + 0.22 μA 1.2 % + 0.41 μA	Fluke 5520A
(0.33 to 3.3) 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	0.16 % + 0.49 μA 0.097 % + 0.42 μA 0.078 % + 0.41 μA 0.16 % + 0.51 μA 0.39 % + 0.93 μA 0.78 % + 2.8 μA	
(3.3 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	0.14 % + 4.5 μA 0.070 % + 4.3 μA 0.031 % + 4.1 μA 0.062 % + 5.0 μA 0.16 % + 9.0 μA 0.31 % + 21 μA	
(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	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
AC Current ³ – Generate (cont)			
(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	Fluke 5700A
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	
(33 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	0.14 % + 47 µA 0.070 % + 45 µA 0.031 % + 42 µA 0.078 % + 62 µA 0.16 % + 120 µA 0.31 % + 310 µA	Fluke 5520A
(0.33 to 1.1) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 0.14 mA 0.039 % + 0.13 mA 0.47 % + 0.8 mA 2.0 % + 3.9 mA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 1.1 mA 0.039 % + 1.0 mA 0.47 % + 1.5 mA 2.0 % + 4.4 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.047 % + 3.1 mA 0.078 % + 3.1 mA 0.23 % + 4.0 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.093 % + 6.3 mA 0.12 % + 6.1 mA 0.23 % + 7.5 mA	
(>20 to 50) A	(50 to 100) Hz (100 to 400) Hz	0.23 % + 0.12 A 0.62 % + 0.12 A	Fluke 5520A + Fluke 5500A/Coil
(50 to 100) A	(50 to 100) Hz (100 to 400) Hz	0.23 % + 0.21 A 0.62 % + 0.21 A	
(100 to 500) A	(50 to 100) Hz (100 to 400) Hz	0.23 % + 1.1 A 0.62 % + 1.1 A	
(500 to 1000) A	(50 to 100) Hz (100 to 400) Hz	0.24 % + 2.1 A 0.63 % + 1.9 A	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	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	Agilent 3458A
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	
(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	
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 0.15 % + 0.29 mA 0.061 % + 0.29 mA 0.031 % + 0.29 mA 0.061 % + 0.29 mA	
Capacitance ³ – Generate			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.39 % + 0.0079 nF	Fluke 5520A
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.39 % + 0.008 nF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.39 % + 0.0085 nF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.19 % + 0.012 nF	
(11 to 33) nF	10 Hz to 1 kHz	0.19 % + 0.08 nF	
(33 to 110) nF	10 Hz to 1 kHz	0.19 % + 0.1 nF	
(110 to 330) nF	10 Hz to 1 kHz	0.19 % + 0.32 nF	
(0.33 to 1.1) µF	(10 to 600) Hz	0.19 % + 1.1 nF	
(1.1 to 3.3) µF	(10 to 300) Hz	0.19 % + 3.0 nF	
(3.3 to 11) µF	(10 to 150) Hz	0.19 % + 12 nF	
(11 to 33) µF	(10 to 120) Hz	0.31 % + 23 nF	
(33 to 110) µF	(10 to 80) Hz	0.35 % + 150 n	

Parameter/Range	Frequency	CMC ^{2,4,5} (±)	Comments
Capacitance ³ – Generate (cont)			
(110 to 330) μF	Up to 50 Hz	0.35 % + 420 nF	Fluke 5520A
(0.33 to 1.1) mF	Up to 20 Hz	0.35 % + 1.1 μF	
(1.1 to 3.3) mF	Up to 6 Hz	0.35 % + 2.5 μF	
(3.3 to 11) mF	Up to 2 Hz	0.35 % + 9.5 μF	
(11 to 33) mF	Up to 0.6 Hz	0.58 % + 25 μF	
(33 to 110) mF	Up to 0.2 Hz	0.85 % + 81 μF	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple Indicating Systems ³ –			
Type B	600 °C to 800 °C	0.34 °C	Fluke 5520A
	800 °C to 1000 °C	0.27 °C	
	1000 °C to 1550 °C	0.24 °C	
	1550 °C to 1820 °C	0.26 °C	
Type C	0 °C to 150 °C	0.23 °C	
	150 °C to 650 °C	0.20 °C	
	650 °C to 1000 °C	0.24 °C	
	1000 °C to 1800 °C	0.39 °C	
	1800 °C to 2316 °C	0.65 °C	
Type E	-250 °C to -100 °C	0.39 °C	
	-100 °C to -25 °C	0.13 °C	
	-25 °C to 350 °C	0.11 °C	
	350 °C to 650 °C	0.14 °C	
	650 °C to 1000 °C	0.17 °C	
Type J	-210 °C to -100 °C	0.21 °C	
	-100 °C to -30 °C	0.13 °C	
	-30 °C to 150 °C	0.11 °C	
	150 °C to 760 °C	0.13 °C	
	760 °C to 1200 °C	0.18 °C	
Type K	-200 °C to -100 °C	0.26 °C	
	-100 °C to -25 °C	0.14 °C	
	-25 °C to 120 °C	0.13 °C	
	120 °C to 1000 °C	0.20 °C	
	1000 °C to 1372 °C	0.31 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple Indicating Systems ³ – (cont)			
Type L	-200 °C to -100 °C -100 °C to -800 °C -800 °C to 900 °C	0.29 °C 0.20 °C 0.14 °C	Fluke 5520A
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.31 °C 0.17 °C 0.15 °C 0.14 °C 0.21 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.44 °C 0.27 °C 0.26 °C 0.31 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.36 °C 0.28 °C 0.29 °C 0.36 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.49 °C 0.19 °C 0.13 °C 0.11 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.43 °C 0.21 °C	
Electrical Simulation of RTD Indicators and Indicating Systems ³ –			
Pt 385, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C 630 °C to 800 °C	0.04 °C 0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.09 °C 0.18 °C	Fluke 5520A

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators and Indicating Systems ³ (cont)–			
Pt 3926, 100 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 400 °C 400 °C to 630 °C	0.04 °C 0.04 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C	Fluke 5520A
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.19 °C 0.03 °C 0.04 °C 0.05 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.18 °C	
Pt 385, 200 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.03 °C 0.03 °C 0.03 °C 0.04 °C 0.09 °C 0.10 °C 0.11 °C 0.12 °C	
Pt 385, 500 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.03 °C 0.04 °C 0.04 °C 0.05 °C 0.06 °C 0.06 °C 0.07 °C 0.09 °C	
Pt 385, 1000 Ω	-200 °C to -80 °C -80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.02 °C 0.02 °C 0.03 °C 0.04 °C 0.05 °C 0.05 °C 0.05 °C 0.18 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators and Indicating Systems ³ –			
PtNi 385, 120 Ω	-80 °C to 0 °C 0 °C to 100 °C 100 °C to 260 °C	0.06 °C 0.06 °C 0.11 °C	Fluke 5520A
Cu 427, 10 Ω	-100 °C to 260 °C	0.23 °C	
Oscilloscope ³ –			
Square Wave Amplitude 50 Ω Load 1 MΩ Load	V _{p-p} 1 mV to 6.6 V V _{p-p} 1 mV to 130 V ≤ 1 kHz > 1 kHz	0.19 % of output + 7.1 μV 0.08 % of output + 39 μV 0.08 % of output + 39 μV	Fluke 5520A with SC-1100 option
DC Signal Output 50 Ω Load 1 MΩ Load	V _{dc} (0 to 6.6) V V _{dc} (0 to 130) V	0.19 % of output + 5.9 μV 0.04 % of output + 8.0 μV	
Leveled Sine Wave Amplitude 5 mV _{p-p} to 5.5 V _{p-p}	50 kHz reference 50 KHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.6 % of output + 250 μV 2.8 % of output + 400 μV 3.1 % of output + 660 μV 4.7 % of output + 660 μV 5.5 % of output + 250 μV	
Flatness Relative to 50kHz 5 mV _{p-p} to 5.5 V _{p-p}	50 kHz reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.5 % of output + 240 μV 2 % of output + 240 μV 4 % of output + 240 μV 5 % of output + 240 μV	
Time Marker 50 Ω Load	5 s to 50 ms (20 to 1.0) ms (50 to 20) ns 10 ns (5 to 1) ns	8.1 μs/s 8.1 μs/s 8.1 μs/s 5.8 μs/s 5.8 μs/s	
Edge-Rise Time	1 kHz to 10 MHz	≤ 300 ps	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Power ³ – (cont)			
(> 3 to 9) mA	(1 to 5) kHz	0.10 %	Fluke 5520A
(> 9 to 33) mA	33 mV to 1020 V	0.068 %	
(> 33 to 90) mA		0.10 %	
(> 90 to 330) mA		0.084 %	
> 330 mA to 0.9 A		0.47 %	
(> 0.9 to 2.2) A		0.47 %	
(> 3 to 9) mA	(5 to 10) kHz	0.18 %	
(> 9 to 33) mA	33 mV to 1020 V	0.16 %	
(> 33 to 90) mA		0.18 %	
(> 90 to 330) mA		0.16 %	
> 330 mA to 0.9 A		2.0 %	
(> 0.9 to 2.2) A		2.2 %	

II. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ² (±)	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	0.11 dB	HP437B+HP8481D
	(> 8 to 10) GHz	0.13 dB	HP437B+HP8481D
	(> 10 to 14) GHz	0.14 dB	HP437B+HP8481D
	(> 14 to 18) GHz	0.16 dB	HP437B+HP8481D
(10 to -10) dBm	10 MHz to 8 GHz	0.13 dB	HP437B+HP8481A
	(> 8 to 10) GHz	0.17 dB	HP437B+HP8481A
	(> 10 to 14) GHz	0.17 dB	HP437B+HP8481A
	(> 14 to 18) GHz	0.21 dB	HP437B+HP8481A

III. Time & Frequency

Parameter	Range	CMC ² (±)	Comments
Frequency and Period – Measure and 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 5520A
	(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		

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 and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. 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 of the reading plus a fixed floor specification.



American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

TRADEPORT ELECTRONICS CALIBRATION LABORATORY

Concord, Ontario, Canada

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets any additional program requirements in the field of calibration. 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 8 January 2009).

Presented this 22nd day of August 2014.



A handwritten signature in black ink, appearing to read "Peter Abney", written over a horizontal line.

President & CEO
For the Accreditation Council
Certificate Number 2450.01
Valid to July 31, 2016

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