SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

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CALIBRATION

Valid To: September 30, 2018 Certificate Number: 3630.01

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, 4] (±)	Comments
Hand Tools[3] –			
Calipers (OD/ID/Depth)	Up to 24 in (600 mm)	300 µin (7.7 µm)	Gage blocks, optical flats/parallels, ULM
Depth Gages	Up to 6 in (150 mm)	300 µm (7.7 µm)	
Height Gages	Up to 24 in (600 mm)	600 µm (15 µm)	
Indicators	Up to 1 in (25.4 mm)	11 µin (0.30 µm)	
Micrometers (ID/OD/Depth)	Up to 12 in (300 mm)	(32 + 4.2*L*) µin (0.82 + 0.0042*L*) µm	
Length – 1D	Up to 12 in	20 µin	Universal length machine

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
DC Voltage – Measure & Generate, Fixed Point	10 V	0.4 µV/V	Fluke 732B & Agilent 3458A
DC Voltage[3] – Measure	(0 to 100) mV (0.1 to 1) V (1 to 10) V (10 to 100) V (100 to 1000) V (1 to 10) kV	11 µV/V + 0.35 µV 9.6 µV/V + 0.34 µV 9.6 µV/V + 0.57 µV 12 µV/V + 35 µV $(12 + (14*V/1000)^2)$ µV/V + 120 µV 0.05 %	Agilent 3458A *V* = voltage Vitrek 4700
DC Voltage[3] – Generate	220 mV 2.2 V 11 V 22 V 220 V 1100 V (0 to 329.9999) mV (0.33 to 3.299999) V (3.3 to 32.99999) V (33 to 329.9999) V (330 to 1000.000) V	7 µV/V + 0.39 µV 4.7 µV/V + 0.63 µV 3.1 µV/V + 2.4 µV 3.2 µV/V + 3.9 µV 4.7 µV/V + 39 µV 6.3 µV/V + 390 µV 16 µV/V + 0.78 µV 8.6 µV/V + 1.6 µV 9.4 µV/V + 16 µV 14 µV/V + 120 µV 14 µV/V + 1200 µV	Fluke 5720A Fluke 5500 series calibrator
DC Current[3] – Measure	(10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A 100 µA to 100 mA (1 to 10) A (10 to 100) A	24 µA/A + 0.93 nA 24 µA/A + 5.8 nA 24 µA/A + 58 nA 41 µA/A + 0.58 µA 0.013 % + 12 µA 20 µA/A 56 µA/A 36 µA/A	Agilent 3458A Agilent 3458A w/ Fluke 742A (1 Ω,10 Ω,100 Ω & 10 kΩ) Agilent 3458A w/ Guildline 9230

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
DC Current[3] – Generate	220 µA 2.2 mA 22 mA 220 mA 2.2 A 11 A	39 µA/A + 5.5 nA 32 µA/A + 6.3 nA 32 µA/A + 39 nA 39 µA/A + 0.63 µA 70 µA/A + 12 µA 0.028 % + 380 µA	Fluke 5720A w/ 5725A
DC Current[3] – Generate	(0 to 329.999) µA (0.330 to 3.29999) mA (3.3 to 32.9999) mA (33 to 329.999) mA (0.33 to 1.09999) A (1.1 to 2.99999) A (3 to 10.9999) A (11 to 20.5) A	0.012 % + 0.016 µA 78 µA/A + 0.039 µA 78 µA/A + 0.20 µA 78 µA/A + 2.0 µA 0.016 % + 32 µA 0.03 % + 32 µA 0.039 % + 390 µA 0.078 % + 580 µA	Fluke 5500 series calibrator
Clamp-On Meters	(20 to 149.999) A (150 to 549.999) A (550 to 1025) A	0.58 % + 0.17 A 0.58 % + 0.58 A 0.59 % + 0.58 A	Fluke 5500 series w/ Fluke 5500A/coil
Resistance[3] – Measure	(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 + 58 µΩ 15 µΩ/Ω + 0.58 mΩ 13 µΩ/Ω + 0.57 mΩ 13 µΩ/Ω + 5.7 mΩ 13 µΩ/Ω + 56 mΩ 18 µΩ/Ω + 2.3 Ω 58 µΩ/Ω + 120 Ω 0.058 % + 1200 Ω 0.58 % + 12 kΩ	Agilent 3458A
Resistance[3] – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (330 to 1.099999) kΩ (1.1 to 3.299999) kΩ (3.3 to 10.99999) kΩ (11 to 32.99999) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ 330 kΩ to 1.099999 MΩ	32 µΩ/Ω + 0.78 mΩ 24 µΩ/Ω + 1.2 mΩ 22 µΩ/Ω + 1.1 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 1.6 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 16 mΩ 22 µΩ/Ω + 0.16 Ω 22 µΩ/Ω + 0.16 Ω 25 µΩ/Ω + 1.6 Ω 25 µΩ/Ω + 1.6 Ω	Fluke 5500 series calibrator

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Resistance[3] – Generate (cont)	(1.1 to 3.299999) MΩ (3.3 to 10.99999) MΩ (11 to 32.99999) MΩ (33 to 109.9999) MΩ (110 to 329.9999)MΩ (330 to 1100) MΩ	47 μΩ/Ω + 24 Ω 0.011 % + 36 Ω 0.02 % + 2.0 kΩ 0.039 % + 2.4 kΩ 0.24 % + 78 kΩ 1.2 % + 390 kΩ	Fluke 5500 series calibrator
Resistance[3] – Generate, Fixed Points	0 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	39 μΩ 86 μΩ/Ω 86 μΩ/Ω 21 μΩ/Ω 21 μΩ/Ω 9.4 μΩ/Ω 9.4 μΩ/Ω 7.8 μΩ/Ω 7.8 μΩ/Ω 7.8 μΩ/Ω 7.8 μΩ/Ω 11 μΩ/Ω 11 μΩ/Ω 18 μΩ/Ω 19 μΩ/Ω 36 μΩ/Ω 43 μΩ/Ω 94 μΩ/Ω	Fluke 5720A

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	0.035 % + 3.5 μV 0.024 % + 1.3 μV 0.035 % + 1.3 μV 0.12 % + 1.3 μV 0.58 % + 1.3 μV 4.7 % + 2.4 μV	Agilent 3458A

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Measure (cont)			
(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	0.0081 % + 4.7 µV 0.0081 % + 2.4 µV 0.017 % + 2.4 µV 0.035 % + 2.4 µV 0.093 % + 2.4 µV 0.35 % + 12 µV 1.2 % + 12 µV 1.8 % + 12 µV	Agilent 3458A
(0.1 to 1.0) 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	0.0081 % + 47 µV 0.0081 % + 24 µV 0.017 % + 24 µV 0.035 % + 24 µV 0.093 % + 24 µV 0.35 % + 120 µV 1.2 % + 120 µV 1.8 % + 120 µV	
(1.0 to 10.0) 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	0.0081 % + 0.47 mV 0.0081 % + 0.24 mV 0.017 % + 0.24 mV 0.035 % + 0.24 mV 0.093 % + 0.24 mV 0.35 % + 1.2 mV 1.2 % + 1.2 mV 1.8 % + 1.2 mV	
(10.0 to 100.0) 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	0.024 % + 4.7 mV 0.024 % + 2.4 mV 0.024 % + 2.4 mV 0.041 % + 2.4 mV 0.14 % + 2.4 mV 0.47 % + 12 mV 1.8 % + 12 mV	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Voltage[3] – Measure (cont)			
(100.0 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.047 % + 47 mV 0.047 % + 24 mV 0.07 % + 24 mV 0.14 % + 24 mV 0.35 % + 24 mV	Agilent 3458A
(1 to 5) kV	60 Hz	0.15 %	Vitrek 4700
AC Voltage[3] – Generate			
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	0.024 % + 3.9 µV 90 µV/V + 3.9 µV 78 µV/V + 3.9 µV 0.02 % + 3.9 µV 0.047 % + 4.7 µV 0.11 % + 9.4 µV 0.14 % + 20 µV 0.27 % + 20 µV	Fluke 5720A w/ 5725A
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	0.024 % + 3.9 µV 90 µV/V + 3.9 µV 78 µV/V + 3.9 µV 0.02 % + 3.9 µV 0.047 % + 4.7 µV 0.11 % + 9.4 µV 0.14 % + 20 µV 0.27 % + 20 µV	
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	0.024 % + 12 µV 90 µV/V + 6.2 µV 78 µV/V + 6.2 µV 0.02 % + 6.2 µV 0.047 % + 16 µV 0.086 % + 20 µV 0.14 % + 24 µV 0.26 % + 47 µV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate (cont)			
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	0.024 % + 39 µV 86 µV/V + 16 µV 41 µV/V + 7.8 µV 70 µV/V + 9.3 µV 0.011 % + 32 µV 0.039 % + 78 µV 0.094 % + 200 µV 0.16 % + 320 µV	Fluke 5720A w/ 5725A
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	0.024 % + 390 µV 86 µV/V + 160 µV 41 µV/V + 55 µV 70 µV/V + 93 µV 94 µV/V + 200 µV 0.026 % + 630 µV 0.094 % + 2000 µV 0.14 % + 3200 µV	
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	0.024 % + 3.9 mV 86 µV/V + 1.6 mV 51 µV/V + 0.55 mV 78 µV/V + 0.94 mV 0.014 % + 2.4 mV 0.086 % + 16 mV 0.42 % + 39 mV 0.78 % + 78 mV	
1100 V	(15 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz (30 to 50) kHz (50 to 100) kHz	0.028 % + 16 mV 70 µV/V + 3.2 mV 0.013 % + 4.7 mV 0.047 % + 8.6 mV 0.047 % + 8.6 mV 0.18 % + 36 mV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate (cont)			
Wideband AC Voltage Flatness:			
1.1 mV	(10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.24 % 0.078 % 0.16 % + 2.4 µV 0.32 % + 2.4 µV 0.47 % + 2.4 µV 1.2 % + 12 µV	Fluke 5720A w/ 5725A
3 mV	(10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.24 % 0.078 % 0.078 % + 2.4 µV 0.24 % + 2.4 µV 0.39 % + 2.4 µV 1.2 % + 2.4 µV	
11 mV to 3.5 V	(10 to 30) Hz 30 Hz to 120 kHz 120 kHz to 2 MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.24 % 0.078 % 0.078 % + 2.4 µV 0.16 % + 2.4 µV 0.32 % + 2.4 µV 0.78 % + 2.4 µV	
(1 to 32.999) 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	0.063 % + 4.7 µV 0.012 % + 4.7 µV 0.016 % + 4.7 µV 0.078 % + 4.7 µV 0.28 % + 9.4 µV 0.63 % + 39 µV	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Voltage[3] – Generate (cont)			
Wideband AC Voltage Flatness:			
(33 to 329.999) 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	0.024 % + 6.3 µV 0.012 % + 6.3 µV 0.013 % + 6.3 µV 0.028 % + 6.3 µV 0.063 % + 25 µV 0.16 % + 55 µV	Fluke 5720A w/ 5725A
(0.33 to 3.29999) 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	0.024 % + 39 µV 0.012 % + 47 µV 0.015 % + 47 µV 0.024 % + 39 µV 0.055 % + 97 µV 0.19 % + 470 µV	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % + 510 µV 0.012 % + 470 µV 0.019 % + 470 µV 0.028 % + 470 µV 0.07 % + 1300 µV	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 1600 µV 0.016 % + 4700 µV 0.02 % + 4700 µV 0.024 % + 4700 µV 0.16 % + 39 000 µV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 7800 µV 0.02 % + 7800 µV 0.024 % + 7800 µV	Fluke 5500 series calibrator

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Measure			
(5 to 100) µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 0.035 µA 0.18 % + 0.035 µA 0.07 % + 0.035 µA 0.07 % + 0.035 µA	Agilent 3458A
(0.05 to 1) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 0.24 µA 0.18 % + 0.24 µA 0.07 % + 0.24 µA 0.035 % + 0.24 µA	
(0.5 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 2.4 µA 0.18 % + 2.4 µA 0.07 % + 2.4 µA 0.035 % + 2.4 µA	
(5 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 24 µA 0.18 % + 24 µA 0.07 % + 24 µA 0.035 % + 24 µA	
(0.05 to 1) A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.47 % + 240 µA 0.19 % + 240 µA 0.093 % + 240 µA 0.12 % + 240 µA	
(1 to 10) A	60 Hz	0.029 %	Agilent 3458A, Guildline 9230, Holt HCS-1
(10 to 100) A	60 Hz	0.053 %	Agilent 3458A w/ L&N 4361

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate			
220 µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 16 nA 0.016 % + 9.4 nA 0.011 % + 7.8 nA 0.028 % + 12 nA 0.11 % + 63 nA	Fluke 5720A w/ 5725A
2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 39 nA 0.016 % + 32 nA 0.011 % + 32 nA 0.019 % + 110 nA 0.11 % + 630 nA	
22 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 390 nA 0.016 % + 320 nA 0.011 % + 320 nA 0.019 % + 550 nA 0.11 % + 4700 nA	
220 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 3.9 µA 0.016 % + 3.2 µA 0.011 % + 2.4 µA 0.019 % + 3.2 µA 0.11 % + 9.4 µA	
2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.025 % + 32 µA 0.039 % + 78 µA 0.63 % + 160 µA	
11 A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.036 % + 140 µA 0.074 % + 300 µA 0.28 % + 590 µA	
(29 to 329.99) µA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 0.078 µA 0.12 % + 0.078 µA 0.097 % + 0.078 µA 0.24 % + 0.12 µA 0.63 % + 0.16 µA 1.3 % + 0.32 µA	Fluke 5500 series calibrator

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate (cont)			
(0.33 to 3.2999) mA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 0.12 µA 0.097 % + 0.12 µA 0.078 % + 0.12 µA 0.16 % + 0.16 µA 0.39 % + 0.24 µA 0.78 % + 0.47 µA	Fluke 5500 series calibrator
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 1.6 µA 0.07 % + 1.6 µA 0.032 % + 1.6 µA 0.063 % + 1.6 µA 0.16 % + 2.4 µA 0.32 % + 3.2 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 16 µA 0.070 % + 16 µA 0.032 % + 16 µA 0.078 % + 39 µA 0.16 % + 78 µA 0.32 % + 160 µA	
(0.33 to 1.09999) A	(10 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.039 % + 78 µA 0.47 % + 780 µA 2.0 % + 3900 µA	
(1.1 to 2.99999) A	(10 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.047 % + 78 µA 0.47 % + 780 µA 2.0 % + 3900 µA	
(3 to 10.9999) A	(45 to 100) Hz 100 to 1 kHz (1 to 5) kHz	0.047 % + 1600 µA 0.078 % + 1600 µA 2.4 % + 1600 µA	
(11 to 20.5) A	(45 to 100) Hz 100 to 1 kHz (1 to 5) kHz	0.094 % + 3900 µA 0.12 % + 3900 µA 2.4 % + 3900 µA	

Parameter/Range	Frequency	CMC[2, 5] (±)	Comments
AC Current[3] – Generate (cont)			
Clamp-On Meters: (Toroidal Type)			
(20 to 54.999) A	(45 to 65) Hz	0.31 % + 0.054 A	Fluke 5500 series w/ Fluke 5500A/coil
(55 to 149.999) A		0.34 % + 0.042 A	
(150 to 1025) A		0.34 % + 0.13 A	
(20 to 54.999) A	(65 to 440) Hz	0.93 % + 0.054 A	
(55 to 149.999) A		0.94 % + 0.046 A	
(150 to 400) A		1.2 % + 0.22 A	
(Non-Toroidal Type)			
(20 to 149.999) A	(45 to 65) Hz	0.65 % + 0.30 A	
(150 to 549.999) A		0.66 % + 1.1 A	
(550 to 1025) A		0.65 % + 1.1 A	
(20 to 149.999) A	(65 to 440) Hz	1.2 % + 0.30 A	
(150 to 400) A		1.4 % + 1.1 A	
Capacitance[3] – Generate			
(0.19 to 0.39999) nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF	Fluke 5500 series calibrator
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.39 % + 0.0078 nF	
(3.3 to 10.999) nF	10 Hz to 1 kHz	0.20 % + 0.0078 nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.20 % + 0.078 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.20 % + 0.078 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.20 % + 0.24 nF	
(0.33 to 1.09999) µF	(10 to 600) Hz	0.20 % + 0.78 nF	
(1.1 to 3.29999) µF	(10 to 300) Hz	0.20 % + 2.4 nF	
(3.3 to 10.9999) µF	(10 to 150) Hz	0.20 % + 7.8 nF	
(11 to 32.9999) µF	(10 to 120) Hz	0.32 % + 24 nF	
(33 to 109.999) µF	(10 to 80) Hz	0.35 % + 78 nF	
(110 to 329.999) µF	(0 to 50) Hz	0.35 % + 240 nF	
(0.33 to 1.09999) mF	(0 to 20) Hz	0.35 % + 0.78 µF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.35 % + 2.4 µF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.35 % + 7.8 µF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.59 % + 24 µF	
(33 to 110) mF	(0 to 0.2) Hz	0.86 % + 78 µF	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Simulation of Thermocouples & Thermocouple Indicating Devices[3] – Generate			
Type B	(600 to 800) ºC (800 to 1000) ºC (1000 to 1550) ºC (1550 to 1820) ºC	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5500 series calibrator
Type E	(-250 to -100) ºC (-100 to -25) ºC (-25 to 350) ºC (350 to 650) °C (650 to 1000) °C	0.39 °C 0.13 °C 0.11 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) ºC (-100 to -30) ºC (-30 to 150) ºC (150 to 760) ºC (760 to 1200) ºC	0.21 °C 0.13 °C 0.11 °C 0.14 °C 0.18 °C	
Type K	(-200 to -100) ºC (-100 to -25) ºC (-25 to 120) ºC (120 to 1000) ºC (1000 to 1372) ºC	0.26 °C 0.14 °C 0.13 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) ºC (-100 to -25) ºC (-25 to 120) ºC (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.15 °C 0.14 °C 0.21 °C	
Type R	(0 to 250) ºC (250 to 400) ºC (400 to 1000) ºC (1000 to 1767) ºC	0.45 °C 0.28 °C 0.26 °C 0.32 °C	
Type S	(0 to 250) ºC (250 to 1000) ºC (1000 to 1400) ºC (1400 to 1767) ºC	0.37 °C 0.28 °C 0.29 °C 0.36 °C	

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Electrical Simulation of Thermocouples & Thermocouple Indicating Devices[3] – Generate (cont)			
Type T	(-250 to -150) ºC (-150 to 0) ºC (0 to 120) ºC (120 to 400) °C	0.49 °C 0.19 °C 0.13 °C 0.11 °C	Fluke 5500 series calibrator
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	0.039 °C 0.039 °C 0.055 °C 0.07 °C 0.078 °C 0.094 °C 0.18 °C	Fluke 5500 series calibrator
Oscilloscopes[3] –			
DC & Square Wave	Into 50 Ω	0.20 % + 32 µV	Fluke 5520A/SC600
DC Signal	Into 1 MΩ	0.039 % + 32 µV	
Square Wave	Into 1 MΩ	0.078 % + 32 µV	
Leveled Sine Wave	50 kHz reference	1.6 % + 240 µV	
	Relative to 50 kHz Reference 50 kHz to 100 MHz (100 to 300) MHz (300 to 500) MHz	 1.2 % + 78 µV 1.6 % + 78 µV 3.2 % + 78 µV	
Time Marker	50 ms to 5 s	140 µs/s	
	2 ns to 20 ms	2.0 µs/s	

III. Electrical – RF/Microwave

Parameter/Equipment	Range	CMC[2] (±)	Comments
RF Power – Generate (+23.9 to -36) dBm	<10 MHz (10 to 50) MHz (>50 to 80) MHz	0.11 dB 0.22 dB 0.50 dB	Agilent 33250A used for frequency counter sensitivity test

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Pressure Gauges	(0 to 10 000) psig	0.1 %	Digital pressure standard
Pressure – Measuring Equipment/Standards	(0 to 1500) psig (0 to 15 000) psig	0.0056 % 0.004 %	Ruska 2485 DWT

V. Time & Frequency

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Frequency[3] – Measure	(1 to 40) Hz 40 Hz to 10 MHz 10 Hz to 225 MHz >225 MHz to 3 GHz	0.058 % 0.12 % 120 nHz/Hz 81 nHz/Hz	Agilent 3458A Agilent 53131A & Fluke 910R
Frequency[3] – Measuring Equipment	0.01 Hz to 2 MHz Up to 500 MHz 1 Hz to 80 MHz	2 µHz/Hz + 3.9 µHz 2 µHz/Hz 2.3 µHz/Hz	Fluke 5522A Fluke 5520A/SC600 Agilent 33250A

Parameter/Equipment	Range	CMC[2] (±)	Comments
Frequency – Fixed Point	10 MHz	2.8 pHz/Hz	Fluke 910R

[1] This laboratory offers commercial calibration service and field calibration service where noted.

[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 of 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 uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

[4] In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches for imperial units, or in millimeters for metric units.

[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. CMC's 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] In the statement of CMC, percentages are to be read as percent of reading, unless otherwise noted.

Accredited Laboratory

A2LA has accredited

PYLON ELECTRONICS INC.

Ottawa, 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 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 8 January 2009*).

Presented this 3rd day of October 2016.

Senior Director of Quality and Communications
For the Accreditation Council
Certificate Number 3630.01
Valid to September 30, 2018

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