



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NC SL Z540-1-1994 & ANSI/NC SL Z540.3-2006

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CALIBRATION

Valid To: April 30, 2021

Certificate Number: 2737.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,7}:

I. Dimensional

Parameter/Equipment	Range	CMC ² (±)	Comments
Hand Tools ³ – Calipers	Up to 72 in	2.2 μin/in + 12 μin	Gage blocks
Micrometers	Up to 48 in	2.2 μin/in + 12 μin	
Height Gages	Up to 48 in	2.2 μin/in + 12 μin	
Indicators: Dial or Digital	Up to 2 in	2.2 μin/in + 12 μin	
Depth Micrometers	Up to 12 in	2.2 μin/in + 12 μin	
Diameter, External (Cylindrical Plug Gages, Thread Wires, Pins)	Up to 3.0 in	9.5 μin/in + 11 μin	
Length/Diameter	Up to 12.1 in	3.7 μin/in + 30 μin	GageMaker MicTrac w/ master gage block set

Parameter/Equipment	Range	CMC ² (±)	Comments
Tape Measure and Steel Ruler ³	(1 to 12) in (12 to 36) in (3 to 100) ft	0.008 in + 0.2 in/in 0.0034 in + 0.002 in/in 0.0002 in + 0.0043 in/ft	Rigid ruler and gage blocks; no tension applied

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV (0.22 to 2.2) V (2.2 to 11) V (11 to 22) V (22 to 220) V (220 to 1100) V	9.2 μV/V + 0.4 μV 5.0 μV/V + 0.7 μV 3.5 μV/V + 2.5 μV 3.5 μV/V + 4.0 μV 5.0 μV/V + 40 μV 6.5 μV/V + 400 μV	Fluke 5720A
DC Voltage ³ – Measure	(0 to 200) mV (0.2 to 2) V (2 to 20) V (20 to 200) V (200 to 1000) V	9.4 μV/V + 0.1 μV 4.2 μV/V + 0.4 μV 4.7 μV/V + 4.0 μV 6.4 μV/V + 40 μV 6.4 μV/V + 0.5 mV	Fluke 8508A
DC High Voltage ³ – Measure/Generate	Up to 1400 V (>1.4 to 35) kV (>35 to 70) kV	0.035 % + 13 mV 0.047 % + 130 mV 0.039 % + 1.3 V	Vitrek 4700 w/ HVL-70
DC Current ³ – Generate	(0 to 220) μA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.2 to 11) A (11 to 20.5) A (20 to 100) A	42 μA/A + 6.0 nA 37 μA/A + 7.0 nA 36 μA/A + 40 nA 55 μA/A + 0.7 μA 0.013 % + 12 μA 0.060 % + 0.33 mA 0.1 % + 58 μA 33 μA/A	Fluke 5720A Fluke 5522A Power Supply, L&N shunt & 3458A
Clamp-On Only	(10 to 300) A (300 to 1000) A	0.30 % + 0.002 A 0.34 % + 0.05 A	Fluke 5522A w/ 5500A/coil

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Current ³ – Measure	(0 to 100) nA 100 nA to 1 μA (1 to 10) μA (10 to 100) μA 100 μA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	30 μA/A + 8.0 nA 15 μA/A + 1 nA 15 μA/A + 0.16 nA 15 μA/A + 0.83 nA 15 μA/A + 9.2 nA 15 μA/A + 90 nA 30 μA/A + 0.92 μA 100 μA/A + 13 μA	Agilent 3458A
	(20 to 100) A	33 μA/A	3458A & L&N shunt
DC Resistance ³ – Generate	1 Ω	0.1 mΩ/Ω + 40 μΩ	Fluke 5720A
	1.9 Ω	0.1 mΩ/Ω + 40 μΩ	
	10 Ω	9.1 μΩ/Ω + 40 μΩ	
	19 Ω	15 μΩ/Ω + 40 μΩ	
	100 Ω	2.5 μΩ/Ω + 40 μΩ	
	190 Ω	7.1 μΩ/Ω + 40 μΩ	
	1 kΩ	2.1 Ω/Ω + 40 μΩ	
	1.9 kΩ	6.7 Ω/Ω + 40 μΩ	
	10 kΩ	6.1 Ω/Ω + 40 μΩ	
	19 kΩ	3.9 Ω/Ω + 40 μΩ	
	100 kΩ	6.2 Ω/Ω + 40 μΩ	
	190 kΩ	5.8 Ω/Ω + 40 μΩ	
	1 MΩ	7.1 Ω/Ω + 40 μΩ	
1.9 MΩ	7.3 Ω/Ω + 40 μΩ		
10 MΩ	13 Ω/Ω + 40 μΩ	Fluke 5522A, 4-wire	
19 MΩ	30 Ω/Ω + 40 μΩ		
100 MΩ	96 Ω/Ω + 40 μΩ		
(0 to 10.9999) Ω	40 μΩ/Ω + 1.0 mΩ		
(11 to 32.9999) Ω	30 μΩ /Ω + 1.5 mΩ		
(33 to 109.9999) Ω	28 μΩ /Ω + 1.4 mΩ		
(110 to 329.9999) Ω	28 μΩ /Ω + 2.0 mΩ		
330 Ω to 1.09999 kΩ	28 μΩ /Ω + 6.8 mΩ		
(1.1 to 3.299 999) kΩ	28 μΩ /Ω + 21 mΩ		
(3.3 to 10.99 999) kΩ	28 μΩ /Ω + 25 mΩ		
(11 to 32.99 999) kΩ	28 μΩ /Ω + 0.2 Ω		
(33 to 109.9999) kΩ	28 μΩ /Ω + 0.22 Ω		
(110 to 329.9999) kΩ	32 μΩ /Ω + 2.0 Ω		Fluke 5522A, 2-wire
330 kΩ to 1.099 999 MΩ	32 μΩ /Ω + 2.6 Ω		
(1.1 to 3.299 999) MΩ	60 μΩ /Ω + 42 Ω		
(3.3 to 10.99 999) MΩ	0.013 % + 61 Ω		
(11 to 32.99 999) MΩ	0.025 % + 2.7 kΩ		

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Resistance ³ – Generate (cont)	(33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	0.05 % + 5.4 kΩ 0.3 % + 0.12 MΩ 1.5 % + 0.56 MΩ	Fluke 5522A, 2-wire
DC Resistance ³ – Measure	(0 to 10) Ω (10 to 100) Ω (0.1 to 1) kΩ (1 to 10) kΩ (10 to 100) kΩ (0.1 to 1) MΩ (1 to 10) MΩ (10 to 100) MΩ (0.1 to 1) GΩ	49 μΩ/Ω + 50 μΩ 17 μΩ/Ω + 500 μΩ 15 μΩ/Ω + 500 μΩ 14 μΩ/Ω + 500 μΩ 14 μΩ/Ω + 5.0 μΩ 20 μΩ/Ω + 50 μΩ 66 μΩ/Ω + 1.0 Ω 3.4 mΩ/Ω + 100 Ω 6.5 mΩ/Ω + 10 kΩ	HP 3458A
Electrical Calibration of Thermocouples and Indicators ³ –			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.35 °C 0.27 °C 0.24 °C 0.26 °C	Fluke 5520A
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.24 °C 0.21 °C 0.25 °C 0.39 °C 0.65 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.53 °C 0.14 °C 0.12 °C 0.14 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.22 °C 0.14 °C 0.12 °C 0.14 °C 0.19 °C	
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 0.15 °C 0.13 °C 0.21 °C 0.33 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouples and Indicators ³ – (cont)			
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.31 °C 0.18 °C 0.16 °C 0.15 °C 0.22 °C	Fluke 5520A
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.45 °C 0.28 °C 0.26 °C 0.31 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.37 °C 0.28 °C 0.29 °C 0.36 °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 0.14 °C 0.15 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.44 °C 0.22 °C	
Electrical Calibration of RTD Indicators ³ –			
Pt 385, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.068 °C 0.055 °C 0.07 °C 0.098 °C 0.11 °C 0.18 °C	Fluke 5520A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.039 °C 0.055 °C 0.07 °C 0.078 °C 0.093 °C	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Electrical Calibration of RTD Indicators ³ – (cont)			
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	0.2 °C 0.032 °C 0.039 °C 0.076 °C 0.073 °C 0.084 °C 0.09 °C 0.096 °C 0.18 °C	Fluke 5520A
Pt 385, 200 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.032 °C 0.032 °C 0.039 °C 0.093 °C 0.11 °C 0.11 °C 0.12 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.032 °C 0.039 °C 0.047 °C 0.062 °C 0.07 °C 0.086 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C	0.024 °C 0.032 °C 0.039 °C	
PtNi 385, 120 Ω	(-80 to 0) °C (0 to 100) °C (100 to 260) °C	0.062 °C 0.062 °C 0.11 °C	
Cu 427. 10 Ω	(-100 to 260) °C	0.23 °C	
Oscilloscope ³ –			
50 Ω Load	(-6.6 to 6.6) V	0.25 % of output + 40 μV	Fluke 5520A- SC1100
1 MΩ Load	(-130 to 130) V	0.12 % of output + 40 μV	
Rise Time	Single Sided	< 300 ps ± 120 ps	

Parameter/Equipment	Range	CMC ^{2, 4, 5} (\pm)	Comments
Oscilloscope ³ – (cont)			
Bandwidth	50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.6 % + 0.3 mV 2.8 % + 0.3 mV 3.2 % + 0.3 mV 4.7 % + 0.3 mV 5.7 % + 0.3 mV	Fluke 5520A- SC1100
Flatness (50 kHz Reference)	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.4 % + 0.1 mV 1.6 % + 0.1 mV 3.2 % + 0.1 mV 3.9 % + 0.1 mV	
Time Markers: Source and Period into a 50 Ω load	5 s to 50 ms 20 ms to 1 ns	160 μ s + t parts in 10 ⁶ s 64 μ s + t parts in 10 ⁶ s	t = time in seconds
Amplitude: 1 M Ω 50 Ω	1.0 mV to 130 V _(pk-pk) 1.0 mV to 5.0 V _(pk-pk)	2.4 % + 0.1 mV 2.4 % + 0.1 mV	
Frequency	10 Hz to 50 GHz	34 parts in 10 ⁻¹¹ Hz +15 mHz	
AC Power ³ @ (45 to 65) Hz – (PF =1)			
(3.3 to 9) mA	(33 to 330) mV (0.33 to 1020) V	0.11 % 0.1 %	Fluke 5520A
(9 to 33) mA	(33 to 330) mV (0.33 to 1020) V	0.08 % 0.06 %	
(33 to 90) mA	(33 to 330) mV (0.33 to 1020) V	0.11 % 0.09 %	
(90 to 330) mA	(33 to 330) mV (0.33 to 1020) V	0.08 % 0.06 %	
(0.33 to 0.9) A	(33 to 330) mV (0.33 to 1020) V	0.1 % 0.1 %	
(0.9 to 2.2) A	(33 to 330) mV (0.33 to 1020) V	0.09 % 0.07 %	
(2.2 to 4.5) A	(33 to 330) mV (0.33 to 1020) V	0.1 % 0.1 %	

Parameter/Equipment	Range	CMC ^{2,4,5} (±)	Comments
AC Power ³ @ (45 to 65) Hz – (PF =1) (cont) (4.5 to 20.5) A	(33 to 330) mV (0.33 to 1020) V	0.09 % 0.31 %	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage ³ – Generate Up to 2.2 mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.024 % + 4.0 μV 90 μV/V + 4.0 μV 80 μV/V + 4.0 μV 0.020 % + 4.0 μV 0.050 % + 5.0 μV 0.11 % + 13 μV 0.14 % + 20 μV 0.27 % + 20 μV	Fluke 5720A
(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 (0.5 to 1) MHz	0.024 % + 4.0 μV 90 μV/V + 4.0 μV 80 μV/V + 4.0 μV 0.020 % + 4.0 μV 0.050 % + 5.0 μV 0.11 % + 10 μV 0.14 % + 20 μV 0.27 % + 20 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 (0.5 to 1) MHz	0.024 % + 12 μV 90 μV/V + 7.0 μV 80 μV/V + 7.0 μV 0.020 % + 7.0 μV 0.046 % + 17 μV 0.090 % + 20 μV 0.14 % + 25 μV 0.27 % + 45 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 (0.5 to 1) MHz	0.024 % + 40 μV 90 μV/V + 15 μV 50 μV/V + 8.0 μV 80 μV/V + 10 μV 0.011 % + 30 μV 0.042 % + 80 μV 0.10 % + 0.2 mV 0.17 % + 0.30 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	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 (0.5 to 1) MHz	0.024 % + 400 µV 90 µV/V + 150 µV 50 µV/V + 51 µV 80 µV/V + 0.10 mV 0.010 % + 0.2 mV 0.028 % + 0.60 mV 0.10 % + 2.0 mV 0.15 % + 3.2 mV	Fluke 5720A
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz* (300 to 500) kHz* (0.5 to 1) MHz*	0.024 % + 4.0 µV 90 µV/V + 2.0 µV 50 µV/V + 1.0 µV 80 µV/V + 1.0 µV 0.015 % + 3.0 µV 0.090 % + 16 µV 0.44 % + 40 µV 0.80 % + 80 µV	* Limited to 2.2E7 V-Hz
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.030 % + 16 µV 0.0070 % + 4.0 µV	
(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	0.23 % + 2 mV 0.23 % + 6 mV 0.24 % + 6 mV 0.40 % + 6 mV 0.43 % + 6 mV	Fluke 5522A
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.41% + 10 mV 0.41% + 10 mV 0.40 % + 10 mV	
AC Voltage – Measure			
(0 to 10) mV	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.039 % + 3 µV 0.023 % + 1.1 µV 0.034 % + 1.1 µV 0.11 % + 1.1 µV 0.57 % + 1.1 µV 4.5 % + 2 µV	Agilent 3458A-002

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Measure (cont)			
(10 to 100) mV	(10 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.049 % + 4 μV 0.12 % + 2 μV 0.045 % + 2 μV 0.091% + 2 μV 0.12 % + 2 μV 0.35 % + 10 μV	Agilent 3458A-002
(0.1 to 1) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.008 % + 40 μV 0.008 % + 20 μV 0.016 % + 20 μV 0.034 % + 20 μV 0.091 % + 20 μV 0.34 % + 100 μV	
(1 to 10) V	(1 to 40) Hz (40 to 1000) Hz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.043 % + 400 μV 0.027 % + 200 μV 0.023 % + 200 μV 0.041 % + 200 μV 0.094 % + 200 μV 0.34 % + 1 mV	
(10 to 100) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.21 % + 4 mV 0.21 % + 2 mV 0.21 % + 2 mV 0.28 % + 2 mV 0.31 % + 2 mV	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	1.6 % + 40 mV 1.7 % + 20 mV 2.3 % + 20 mV 2.3 % + 20 mV 0.36 % + 20 mV	
AC High Voltage ³ – Measure			
Up to 1.4 kV	Up to 600 Hz	0.12 % + 13 mV	Vitretek 4700 w/ HVL-70
(>1.4 to 35) kV	Up to 30 Hz (30 to 200) Hz (200 to 450) Hz (450 to 600) Hz	0.59 % + 0.13 V 0.12 % + 0.13 V 0.71 % + 0.13 V 1.5 % + 0.13 V	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC High Voltage ³ – Measure (cont) (>35 to 50) kV	Up to 30 Hz (30 to 70) Hz (70 to 200) Hz (200 to 450) Hz	0.35 % + 1.3 V 0.14 % + 1.3 V 1.2 % + 1.3 V 18 % + 1.3 V	Vitrek 4700 w/ HVL-70
Capacitance ³ – Generate (0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.9999) nF (11 to 32.9999) nF (33 to 109.999) nF (110 to 329.999) nF (0.33 to 1.0999) μF (1.1 to 3.29999) μF (3.3 to 10.9999) μF (11 to 32.9999) μF (33 to 109.999) μF (110 to 329.999) μF (0.33 to 1.09999) mF (1.1 to 3.2999) mF (3.3 to 10.9999) mF (11 to 32.9999) mF (33 to 110) mF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 600) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (10 to 50) Hz (10 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	0.55 % + 0.01 nF 0.42 % + 0.01 nF 0.43 % + 0.01 nF 0.19 % + 0.01 nF 0.19 % + 0.1 nF 0.19 % + 0.1 nF 0.19 % + 0.3 nF 0.19 % + 1 nF 0.19 % + 3 nF 0.19 % + 10 nF 0.31 % + 30 nF 0.36 % + 100 nF 0.35 % + 300 nF 0.35 % + 1 μF 0.35 % + 3 μF 0.35 % + 10 μF 0.58 % + 30 μF 0.85 % + 100 μF	Fluke 5520A
AC Current ³ – Generate (29 to 329.99) μA (0.33 to 3.2999) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz (10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 100 nA 0.097 % + 100 nA 0.23 % + 150 nA 0.62 % + 200 nA 1.2 % + 400 nA 0.16 % + 150 nA 0.078 % + 150 nA 0.16 % + 200 nA 0.39 % + 300 nA 0.78 % + 600 nA	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current ³ – Generate (cont)			
(3.3 to 32.999) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 2 µA 0.10 % + 2 µA 0.062 % + 2 µA 0.16 % + 3 µA 1.1 % + 4 µA	Fluke 5520A
(33 to 329.99) mA	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 20 µA 0.032 % + 20 µA 0.078 % + 50 µA 0.16 % + 100 µA 0.31 % + 200 µA	
(0.33 to 1.09999) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 100 µA 0.04 % + 100 µA 0.47 % + 1 mA 1.9 % + 5 mA	
(1.1 to 2.99999) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.21 % + 100 µA 0.13 % + 100 µA 0.14 % + 1 mA 2 % + 5 mA	5520A w/ 5500A/coil
(3 to 10.9999) A	(45 to 100) Hz (0.100 to 1) kHz (1 to 5) kHz	0.31 % + 2 mA 0.31 % + 2 mA 2.4 % + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	0.12 % + 5 mA 0.15 % + 5 mA 3 % + 5 mA	
(16.5 to 150) A (16.5 to 150) A (150 to 1025) A (150 to 1025) A	(45 to 65) Hz (65 to 440) Hz (45 to 65) Hz (65 to 440) Hz	0.38 % + 0.029 A 1.0 % + 0.031 A 0.54 % + 0.10 A 1.0 % + 0.12 A	
AC Current ³ – Measure			
Up to 100 µA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA (0.1 to 1) A	40 Hz to 5 kHz	0.071 % + 31 nA 0.036 % + 0.21 µA 0.036 % + 2.1 µA 0.036 % + 21 µA 0.12 % + 0.21 ma	3458A-002

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 6} (±)	Comments
<p>RF Microwave – Absolute Power – Measure³</p> <p>(-70 to 20) dBm</p> <p>(-30 to 20) dBm</p>	<p>9 kHz to 6 GHz 10 MHz to 18 GHz 50 MHz to 26.5 GHz</p> <p>100 kHz to 4.2 GHz (4.2 to 18 GHz) (18 to 30) GHz (30 to 40) GHz (40 to 50) GHz</p>	<p>0.18 dBm 0.24 dBm 0.23 dBm</p> <p>0.21 dBm 0.26 dBm 0.23 dBm 0.29 dBm 0.31 dBm</p>	<p>Power meter w/ power sensors</p>
<p>Amplitude Modulation – Measure</p> <p>Rate: 50 Hz to 10 kHz Depths: 5 % to 99 %</p> <p>Rate: 20 Hz to 10 kHz Depths: to 99 %</p> <p>Rate: 50 Hz to 50 kHz Depths: 5 % to 99 %</p> <p>Rate: 20 Hz to 100 kHz Depths: to 99 %</p>	<p>150 kHz to 10 MHz</p> <p>150 kHz to 10 MHz</p> <p>(0.01 to 26.5) GHz</p> <p>(0.01 to 26.5) GHz</p>	<p>0.14 % + 0.023 %/°</p> <p>0.13 % + 0.034 %/°</p> <p>0.18 % + 0.012 %/°</p> <p>0.15 % + 0.035 %/°</p>	<p>8902A w/ 11793A</p>
<p>Frequency Modulation – Measure</p> <p>Rate: 20 Hz to 10 kHz Dev.: ≤ 40 kHz Peak</p> <p>Rate: 50 Hz to 100 kHz Dev.: ≤ 400 kHz Peak</p> <p>Rate: 20 Hz to 200 kHz Dev.: ≤ 400 kHz Peak</p>	<p>250 kHz to 10 MHz</p> <p>(0.01 to 26.5) GHz</p> <p>(0.01 to 26.5) GHz</p>	<p>0.018 kHz + 0.023 kHz/kHz</p> <p>0.37 kHz + 0.011 kHz/kHz</p> <p>0.33 kHz + 0.057 kHz/kHz</p>	<p>8902A w/ 11793A</p>

Parameter/Range	Frequency	CMC ^{2,5} (±)	Comments
Phase Modulation – Measure Rate: 200 Hz to 10 kHz (0 to 100) rad	Carrier: 150 kHz ≤ <i>f</i> < 10MHz	0.12 <i>R</i> + 0.047 <i>R</i> / <i>R</i>	8902A w/ 11793A
Rate: 200 Hz to 20 kHz (0 to 100) rad	10 MHz ≤ <i>f</i> < 26.5GHz	0.12 <i>R</i> + 0.035 <i>R</i> / <i>R</i>	

IV. Mechanical

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Torque Equipment	(4 to 50) in·lbf (40 to 400) in·lbf (100 to 1000) in·lbf (25 to 250) ft·lbf (60 to 600) ft·lbf	0.29 % 0.29 % 0.29 % 0.29 % 0.29 %	CDI Suretest system
Scales and Balances ³	Up to 20 g (20 to 100) g 2 oz to 1 lb (1 to 50) lb (50 to 300) lb (300 to 1000) lb	320 µg/g + 0.6 <i>R</i> 67 µg/g + 0.6 <i>R</i> 180 µg/g + 0.6 <i>R</i> 120 µg/g + 0.6 <i>R</i> 0.06 µg/g + 0.6 <i>R</i> 0.012 % + 0.6 <i>R</i>	Class 1 weights Class F weights
Pressure Gages, Transducers & Calibrators – Measure and Measuring Equipment ³	(1 to 15) psia (0 to 100) psig (0 to 500) psig (0 to 1000) psig (0 to 10 000) psig	0.024 psia 0.08 psi 0.06 psi 0.61 psi 9.3 psi	Fluke 700PA4 Fluke 700P06 Fluke 700P07 Fluke 700P08 Fluke 700P31

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 8} (±)	Comments
Time Interval	Up to 86 400 s	30 ms	Counter phase locked to GPS
Frequency – Measure	1 mHz to 40 GHz	$1.2 \times 10^{-11} \times f + 5 \mu\text{Hz}$	Counter phase locked to GPS (f is the frequency)
Frequency – Measuring Equipment	10 MHz 1 mHz to 50 GHz	$1.2 \times 10^{-11} \times f$ $1.2 \times 10^{-11} \times f + 5 \mu\text{Hz}$	Datum GPS receiver Signal generators, Phase locked to GPS (f is the frequency)

¹ This laboratory offers commercial calibration and field calibration service.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards or nearly ideal measuring equipment. CMCs represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The actual measurement uncertainty of a specific calibration performed by the laboratory may be greater than the CMC due to the behavior of the customer's device and to influences from the circumstances of the specific calibration.

³ Field calibration service is available for this calibration 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 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.

⁵ In the statement of CMC uncertainty, the value is defined as the percentage of reading unless otherwise indicated; L represents the length of displacement in inches. R represents the resolution of the unit under test.

⁷ This scope meets A2LA's P112 Flexible Scope Policy.

⁸ 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

ACUCAL, INC.

Elizabeth City, NC

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and the requirements of ANSI/NCSLI Z540.3-2006 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).



Presented this 25th day of June 2019.

A blue ink signature of the Vice President of Accreditation Services.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 2737.02
Valid to April 30, 2021

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