



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017
& ANSI/NCSL Z540-1-1994

SIMCO ELECTRONICS
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CALIBRATION

Valid To: September 30, 2024

Certificate Number: 1395.13

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations^{1,6}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,5} (±)	Comments
Micrometers ³ – Flatness Parallelism Linearity	Up to 0.001 in Up to 0.001 in Up to 0.2 in (0.2 to 1.0) in (1.0 to 6.0) in	11 µin 16 µin 52 µin 66 µin 92 µin	Grade 2 gage blocks, optical flat
Calipers ³	Up to 12 in	(280 + 40L) µin	Grade 2 gage blocks, master ring
Indicators ³	Up to 1 in	(17 + 11L) µin	Grade 2 gage blocks
Linear Scales	Increments Up to 12 in	0.000 87 in	MicroVu

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
DC Voltage – Generate ³	(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	8.7 μV/V + 0.4 μV 5.9 μV/V + 0.7 μV 4.2 μV/V + 2.8 μV 4.2 μV/V + 4.2 μV 5.9 μV/V + 42 μV 7.7 μV/V + 420 μV	Fluke 5720A
DC Voltage – Measure ³	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100 V (100 to 1000) V*	7.3 μV/V + 0.3 μV 4.6 μV/V + 0.3 μV 4.6 μV/V + 0.5 μV 6.9 μV/V + 30 μV 7.0 μV/V + 0.1 mV*	HP 3458A OPT-002 *add 12 μV/V x (V _{in} /1000) ² to all V _{in} >100 V
DC Current – Generate ³	0.1 nA 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 149.999) A (150 to 1025) A	48 μA/A + 6 nA 43 μA/A + 7 nA 43 μA/A + 40 nA 54 μA/A + 0.7 μA 93 μA/A + 12 μA 0.46 mA/A + 0.48 mA 1.7 mA/A + 0.76 mA 0.36 % 0.35 %	Fluke 5720A w/5725A Fluke 5520A/SC1100 [2] Floor specification doubled after 30 seconds Fluke 55XXA, Fluke 5500A/COIL
DC Current – Measure ³	(10 to 100) μA (0.1 to 1) mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A (1 to 40) A (40 to 60) A (60 to 100) A (100 to 500) A	29 μA/A + 0.8 nA 26 μA/A + 5 nA 26 μA/A + 50 nA 42 μA/A + 0.5 μA 130 μA/A + 10 μA 0.038 % + 0.12 mA 0.065 % + 0.12 mA 0.058 % + 0.12 mA 0.46 % + 0.12 mA	HP 3458A OPT-002 HP 3458A OPT-2 standard shunts

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Resistance – Measure ³	(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 to 1000) MΩ	19 μΩ/Ω + 50 μΩ 16 μΩ/Ω + 0.5 mΩ 14 μΩ/Ω + 0.5 mΩ 14 μΩ/Ω + 5 mΩ 14 μΩ/Ω + 50 mΩ 19 μΩ/Ω + 210 mΩ 60 μΩ/Ω + 100 Ω 0.058 % + 0.1 kΩ 0.58 % + 1 kΩ	HP 3458A OPT-002
Resistance – Generate ³	(0 to 11) Ω (11 to 33) Ω (33 to 110) Ω (110 to 330) Ω (0.33 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 (0.33 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 (0.11 to 1.1) GΩ	76 μΩ/Ω + 1 mΩ 44 μΩ/Ω + 1.3 mΩ 25 μΩ/Ω + 2.5 mΩ 27 μΩ/Ω + 8 mΩ 30 μΩ/Ω + 30 mΩ 25 μΩ/Ω + 74 mΩ 30 μΩ/Ω + 0.30 Ω 26 μΩ/Ω + 0.79 Ω 25 μΩ/Ω + 2.5 Ω 25 μΩ/Ω + 7.5 Ω 30 μΩ/Ω + 30 Ω 49 μΩ/Ω + 150 Ω 0.012 % + 1.2 kΩ 0.020 % + 6.1 kΩ 0.040 % + 40 kΩ 0.37 % + 0.1 MΩ 1.2 % + 0.5 MΩ	Fluke 5520A
Resistance – Generate, Fixed Points ³	0 Ω 1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω	0.1 mΩ 95 μΩ/Ω + 11 μΩ 50 μΩ/Ω + 11 μΩ 2.3 μΩ/Ω + 11 μΩ 1.2 μΩ/Ω + 11 μΩ 0.1 μΩ/Ω + 11 μΩ 0.053 μΩ/Ω + 82 μΩ	Fluke 5720A

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Resistance – Generate, Fixed Points ³	1 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	8.5 μΩ/Ω + 82 μΩ 4.5 μΩ/Ω + 0.82 mΩ 0.85 μΩ/Ω + 0.82 mΩ 0.45 μΩ/Ω + 8.2 mΩ 0.11 μΩ/Ω + 8.2 mΩ 0.058 μΩ/Ω + 82 mΩ 20 μΩ/Ω + 82 mΩ 11 μΩ/Ω + 0.82 Ω 4 μΩ/Ω + 0.82 Ω 2.5 μΩ/Ω + 8.2 Ω 1.0 μΩ/Ω + 8.2 Ω	Fluke 5720A
Capacitance – Generate ³	(0.19 to 0.3999) nF (0.4 to 1.0999) nF (1.1 to 3.2999) nF (3.3 to 10.999) nF (11 to 32.999) nF (33 to 109.99) nF (110 to 329.99) nF (0.33 to 1.0999) μF (1.1 to 3.2999) μF (3.3 to 10.999) μF (11 to 32.999) μF (33 to 109.99) μF (110 to 329.99) μF (0.33 to 1.0999) mF	0.013 % + 0.0019 nF 0.013 % + 0.0045 nF 0.013 % + 0.013 nF 0.017 % + 0.025 nF 0.12 % + 0.064 nF 0.12 % + 0.23 nF 0.35 % + 0.65 nF 0.0059 % + 0.0022 μF 0.0067 % + 0.0065 μF 0.013 % + 0.022 μF 0.035 % + 0.11 μF 0.12 % + 0.46 μF 0.35 % + 1.2 μF 0.0059 % + 0.0038 mF	Fluke 55XXA

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ 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 500 kHz to 1 MHz	0.087 % + 4 μV 0.081 % + 4 μV 0.088 % + 4 μV 0.063 % + 4 μV 0.2 % + 5 μV 0.28 % + 10 μV 1.2 % + 20 μV 1.3 % + 20 μV	Fluke 5720A

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(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	0.022 % + 4 μV 0.013 % + 4 μV 0.01 % + 4 μV 0.021 % + 4 μV 0.047 % + 5 μV 0.093 % + 10 μV 0.16 % + 20 μV 0.27 % + 20 μV	Fluke 5720A
(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	0.011 % + 13 μV 61 μV/V + 8 μV 60 μV/V + 7 μV 0.011 % + 7 μV 0.023 % + 17 μV 0.047 % + 27 μV 0.13 % + 25 μV 0.18 % + 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 500 kHz to 1 MHz	96 μV/V + 40 μV 42 μV/V + 15 μV 31 μV/V + 8 μV 44 μV/V + 10 μV 53 μV/V + 30 μV 0.022 % + 80 μV 0.049 % + 0.2 mV 0.08 % + 0.3 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	96 μV/V + 0.4 mV 42 μV/V + 0.15 mV 32 μV/V + 50 μV 30 μV/V + 0.1 mV 53 μV/V + 0.2 mV 0.011 % + 0.6 mV 0.044 % + 2 mV 0.1 % + 3.2 mV	
(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	96 μV/V + 4 mV 47 μV/V + 1.5 mV 33 μV/V + 0.6 mV 43 μV/V + 1 mV 73 μV/V + 2.5 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Generate ³ (cont)			
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	0.28 mV/V + 16 mV 0.075 mV/V + 3.5 mV 0.14 mV/V + 6 mV 0.48 mV/V + 11 mV	Fluke 5720A
(220 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.47 mV/V + 11 mV 1.8 mV/V + 45 mV	Fluke 5720A w/ Fluke 5725A
AC Voltage – Measure ³			
Up to 10 mV	(1 to 40) Hz (0.04 to 1) kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.03 % + 0.03 % of range 0.02 % + 0.011 % of range 0.031 % + 0.011 % of range 0.1 % + 0.011 % of range 0.5 % + 0.011 % of range 4 % + 0.02 % of range	HP 3458A OPT-002
(10 to 100) mV	(1 to 40) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 500 kHz to 1 MHz	18 µV 11 µV 19 µV 37 µV 95 µV 0.36 mV 1.2 mV 1.2 m	
100 mV to 1 V	(10 to 20) Hz (20 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 to 500) kHz 500 kHz to 1 MHz	0.21 mV 0.21 mV 0.20 mV 0.25 mV 0.42 mV 0.97 mV 0.61 mV 12 mV 12 mV	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Voltage – Measure ³ (cont)			
(1 to 10) V	(1 to 20) Hz (20 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 to 500) kHz 500 kHz to 1 MHz	12 mV 12 mV 12 mV 12 mV 12 mV 12 mV 12 mV 20 mV 16 mV	HP 3458A OPT-002
(10 to 100) V	(1 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.12 V 29 mV 26 mV 26 mV 44 mV 23 mV 23 mV	
(100 to 700) V	(15 to 50) Hz 50 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz	0.36 V 0.34 V 0.50 V 0.99 V	
AC Current – Generate ³			
(22 to 220) µA	(1 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.029 % + 0.023 µA 0.019 % + 0.018 µA 0.014 % + 0.017 µA 0.032 % + 0.037 µA 0.13 % + 0.085 µA	Fluke 5720A w/5725A
(0.22 to 2.2) mA	(1 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.029 % + 0.12 µA 0.019 % + 0.097 µA 0.014 % + 0.097 µA 0.023 % + 0.19 µA 0.13 % + 0.68 µA	
(2.2 to 22) mA	(1 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.029 % + 1.4 µA 0.019 % + 0.97 µA 0.014 % + 0.97 µA 0.023 % + 1.5 µA 0.13 % + 5.4 µA	

Parameter/Range	Frequency	CMC ^{2,4} (±)	Comments
AC Current – Generate ³ (cont)			
(22 to 220) mA	(1 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.029 % + 26 μA 0.019 % + 9.7 μA 0.014 % + 13 μA 0.023 % + 16 μA 0.13 % + 38 μA	Fluke 5720A w/5725A
(0.22 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.03 % + 0.14 mA 0.052 % + 0.25 mA 0.81 % + 2.0 mA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.053 % + 0.93 mA 0.11 % + 1.4 mA 0.42 % + 1.5 mA	
(11 to 20.5) A	1 kHz	44 mA	Fluke 55XXA
(20 to 149.999) A	(45 to 65) Hz (65 to 440) Hz	0.45 % 1.4 %	Fluke 55XXA w/ Fluke 5500/COIL
(150 to 1025) A	(45 to 65) Hz (65 to 440) Hz	0.40 % 1.4 %	
AC Current – Measure ³			
(5 to 100) μA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 1 kHz	0.46 % + 0.01 μA 0.17 % + 0.01 μA 0.071 % + 0.01 μA 0.036 % + 0.01 μA	HP 3458A OPT-2
100 mA to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.01 μA 0.20 % + 0.01 μA 0.093 % + 0.01 μA 0.059 % + 0.01 μA	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.012 μA 0.17 % + 0.012 μA 0.07 % + 0.012 μA 0.036 % + 0.012 μA	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.059 μA 0.17 % + 0.059 μA 0.07 % + 0.059 μA 0.036 % + 0.059 μA	

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
AC Current – Measure ³ (cont) 100 mA to 1A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 0.58 μA 0.19 % + 0.58 μA 0.095 % + 0.58 μA 0.12 % + 0.58 μA	HP 3458A OPT-2
AC Voltage Flatness – Measure ³ 0.5 V 2 V	10 MHz 20 MHz 30 MHz 50 MHz 10 MHz 20 MHz 30 MHz 50 MHz	0.88 % 0.95 % 0.95 % 1.4 % 0.95 % 1.0 % 1.0 % 1.3 %	Fluke A55 0.5 V thermal converter Fluke A55 2.0 V thermal converter
Oscilloscopes ³ – Level Sine Amp – 50 kHz Reference Level Sine Flatness 5 mV to 5.5 V relative to 50 kHz Reference Square Wave Amplitude DC Signal Level	5 mV to 5.0 V _(p-p) (0.050 to 100) MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz 1.0 mV to 130 V _(p-p) 1.0 mV to 6.6 V _(p-p) Up to 130 V Up to 6.6 V	1.6 % + 300 μV 2.7 % + 300 μV 3.1 % + 300 μV 4.7 % + 300 μV 5.4 % + 300 μV 0.096 % + 40 μV 0.2 % + 40 μV 0.04 % + 40 μV 0.19 % + 40 μV	Fluke 5520A/SC1100 Into 1 MΩ load Into 50 Ω load Into 1 MΩ load Into 50 Ω load

Parameter/Equipment	Range	CMC ² (±)	Comments
Oscilloscopes ³ – (cont)			
Time Marker Output Into 50 Ω	2 ns to 20 ms 50 ms to 5 s	2.5 μs/s (25 + 1000t) parts in 10 ⁶ s	t = time in seconds
Rise Time: 1 kHz to 1 MHz (1 to 10) MHz (1 to 100) kHz	300 ps 350 ps 150 ps	65 ps 60 ps 14 ps	Fluke 5820-5-2.1
Electrical Simulation of Thermocouples – Generate & Measure ³			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.42 °C 0.15 °C 0.14 °C 0.15 °C 0.18 °C	Fluke 5520A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.25 °C 0.17 °C 0.15 °C 0.16 °C 0.20 °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 0.16 °C 0.14 °C 0.24 °C 0.32 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.51 °C 0.21 °C 0.15 °C 0.13 °C	

III. Mechanical

Parameter/Equipment	Range	CMC ^{2,5,7} (\pm)	Comments
Scales and Balances ³	1 mg to 200 g 200 g to 10 kg	0.50 mg + 0.58R 0.014 % + 0.58R	Class 1 weight set
Torque Tools	4 ozf·in to 600 lbf·ft	0.34 %	4:1 transducer load cell (x3) w/ display

IV. Thermodynamic

Parameter/Equipment	Range	CMC ^{2,4,7} (\pm)	Comments
Humidity – Measuring Equipment ³	11 % RH 43 % RH 75 % RH	1.5 % + 0.58R 1.5 % + 0.58R 1.5 % + 0.58R	Vaisala HMP233, humidity chambers w/ salts
Humidity – Measure ³	(15 to 90) % RH	1.5 % + 0.58R	Vaisala HMP233
Temperature – Measuring Equipment	(-20 to 140) °C	0.18 °C	Rosemont 162CE w/ Hart 9105
Temperature – Measure ³	(-40 to 420) °C	0.013 °C	Rosemont 162CE w/ Hart 9105

V. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 7} (\pm)	Comments
Frequency – Generate, Fixed Point	10 MHz	6.6×10^{-12} Hz	Fluke 910
Frequency – Generate, Measuring Equipment	10 mHz to 3 GHz	0.13×10^{-9} Hz	Fluke 910, HP8648C
	10 MHz to 26.5 GHz	0.90×10^{-9} Hz	Fluke 910, HP83650A
Frequency – Measure ³	10 mHz to 225 MHz (0.225 to 3.0) GHz	0.17×10^{-9} Hz 5.8×10^{-9} Hz	HP 53132A OPT-012, 030
	10 Hz to 525 MHz (0.500 to 26.5) GHz	21×10^{-9} Hz 21×10^{-9} Hz	HP5351B

¹ This laboratory offers commercial 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. 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. CMCs are expressed as either a specific value that covers the full range or as a fraction/percentage of the reading plus a fixed floor specification.

⁵ In the statement of CMC, L is the numerical value of the nominal length of the device measured in micro-inches, R is the numerical value of the resolution of the device in micro-inches or grams, percent is percent of reading, unless otherwise defined.

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.



Accredited Laboratory

A2LA has accredited

SIMCO ELECTRONICS

Billerica, MA

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/NCSL Z540-1-1994 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 18th day of November 2022.

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

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1395.13
Valid to September 30, 2024

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