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

NATIONAL CALIBRATION INC.
1395 N Hayden Rd
Scottsdale, AZ 85257
Bruce Demaree Phone: 602 437 0114

CALIBRATION

Valid To: August 31, 2028 Certificate Number: 1892.01

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, 8]:

I. Dimensional

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Calipers[3] –			
OD Resolution 0.0005 in	Up to 8 in (8 to 60) in (60 to 80) in	(29 + 0.96*L*) µin (290 + 0.83*L*) µin 6.1*L* µin	Gage blocks, gage block accessories
ID Resolution 0.0005 in	Up to 2 in	(37 + 0.51) µin	
Step Resolution 0.0005 in	Up to 2 in	(29 + 0.42) µin	
Depth Resolution 0.0005 in	Up to 2 in	(29 + 0.42) µin	
Gage Blocks	Up to 2 in (2 to 4) in (4 to 6) in (6 to 8) in (8 to 12) in	(3.4 + 1.2*L*) µin (4.0 + 1.4*L*) µin (3.0 + 1.9*L*) µin (2.7 + 2.0*L*) µin (2.5 + 2.1*L*) µin	LabMaster™, standard gage blocks
Height Gage[3]	Up to 40 in	(9 + 3.2*L*) µin	Gage blocks

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Height Master	Up to 36 in	(76 + 1.7*L*) µin	Gage blocks
Indicators[3]	Up to 6 in	(29 + 0.8*L*) µin	Labmaster™, gage blocks, Supermicrometer™
Length Standards	Up to 12 in	(4 + 1.9*L*) µin	Labmaster™, gage blocks,
	(12 to 40) in	(23 + 2.8*L*) µin	Electronic height gage, surface plate, gage blocks (standardization)
Micrometers[3] –			
ID Mics	Up to 8 in	(58 + 0.72*L*) µin	Gage blocks
	(8 to 16) in	(49 + 2.3*L*) µin	
	(16 to 24) in	(48 + 2.3*L*) µin	
	(24 to 32) in	(43 + 2.6*L*) µin	
	(32 to 40) in	(32 + 2.9*L*) µin	
OD Mics	Up to 8 in	(28 + 1.3*L*) µin	Gage blocks
	(8 to 16) in	(19 + 3.1*L*) µin	
	(16 to 24) in	(24 + 2.8*L*) µin	
	(24 to 32) in	(22 + 2.9*L*) µin	
	(32 to 40) in	(14 + 3.1*L*) µin	
	(40 to 48) in	(33 + 2.6*L*) µin	
	(48 to 56) in	(20 + 2.9*L*) µin	
Depth Mics	Up to 6 in	(29 + 1.1*L*) µin	Gage blocks, triangle base
	(6 to 12) in	(8.8 + 4.4*L*) µin	
Tri-Mics	(0.01 to 0.018) in	(37 + 0.025*D*) µin	Ring gages
	(0.15 to 6) in	(120 + 4.0*D*) µin	
V-Anvil Mics	Up to 2 in	(61 + 7.6*L*) µin	Plug gages
Pin Gauges/Plug Gages	(0.011 to 0.060) in	(8.1 + 32*D*) µin	LabMaster™
	(0.061 to 0.250) in	(8.7 + 1.4*D*) µin	
	(0.251 to 0.500) in	(7.6 + 5.6*D*) µin	
	(0.501 to 0.625) in	(8.6 + 3.7*D*) µin	
	(0.626 to 1.000) in	(4.1 + 8.1*D*) µin	
	(1.000 to 4.000) in	(8.6 + 6.4*D*) µin	

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Digital Protractors	Up to 45°	0.005°	Sine plate & gage blocks
Plain Ring Gage	(0.04 to 0.125) in (0.125 to 0.25) in (0.25 to 1) in (1 to 10) in	(6.6 + 15*D*) µin (8.4 + 24*D*) µin (17 + 9.5*D*) µin (2 + 8.4*D*) µin	LabMaster™
Ruler Calibrator[3]	Up to 40 in	0.0005 in	Gage blocks
Rules[3]	Up to 40 in	0.002 in	Rule calibrator
Thread Plug Gages – (Pitch & Major Diameter)	Up to 6 in Pitch Diameter Major Diameter	 (120 + 1.9*D*) µin (21 + 1.3*D*) µin	Supermicrometer™
Supermicrometer™ [3] Up to 10 in total length	Up to 1 in travel from reference	(6.8 + 6.7*L*) µin	Gage blocks, force gage
LabMaster™ [3] Up to 12 in total length	Up to 2 in travel from reference Ratiometric / Repeatability 2 in 3 in 4 in	3.0 µin + 3.9 µin/in from Datum 6.2 µin 8.2 µin 10 µin	Gage blocks, force gage

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Optical Measuring Machine, Vision Machine, & Optical Comparators[3] –			
X Axis	Up to 178 mm	0.9 µm + 34 nm/mm	Glass scale, gage blocks, ball gages, angle blocks, & ring gages
Y Axis	Up to 75 mm	0.16 µm + 3 nm/mm	
Z Axis	Up to 75 mm	0.2 µm + 0.3 µm/mm	
Radius	Up to 25.4 mm	5 µm + 2.2 nm/mm	
Angle	Up to 45 °	3.1 arc sec + 0.008 arc sec/ arc sec	
Surface Flatness	Up to 4 in length	73 µin	Height gage, triangle base
	(4 to 40) in length	290 µin	Height gage, surface plate
Feeler Gages	Up to 0.25 in	(14 + 0.1*L*) µin	Supermicrometer™, Labmaster™

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Oscilloscopes[3] –			
Level Sine Wave Flatness			
50 kHz Ref	Up to 10 mV (10 to 40) mV (40 to 400) mV (0.4 to 1.3) V (1.3 to 5.5) V	0.7 mV 0.5 mV 4.3 mV 0.02 V 0.1 V	Fluke 5522A-SC1100
50 kHz to 100 MHz	Up to 10 mV (10 to 40) mV (40 to 400) mV (0.4 to 1.3) V (1.3 to 5.5) V	0.25 mV 0.55 mV 4.6 mV 0.015 V 0.075 V	
(100 to 300) MHz	Up to 10 mV 10 to 40 mV 40 to 400 mV 0.4 to 1.3 V 1.3 to 5.5V	0.3 mV 0.7 mV 6.1 mV 0.021 V 0.1 V	
(300 to 600) MHz	Up to 10 mV (10 to 40) mV (40 to 400) mV (0.4 to 1.3) V (1.3 to 5.5) V	0.5 mV 1.3 mV 4.3 mV 0.041 V 0.2 V	
600 MHz to 1.1 GHz	Up to 10 mV (10 to 40) mV (40 to 400) mV (0.4 to 1.3) V	0.6 mV 1.6 mV 15 mV 0.05 V	

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Oscilloscopes[3] – (cont)			
Amplitude Time Markers (5-2-1 Sequence) into a 50 Ω Load	(1 to 2) ns (5 to 100) ns (0.1 to 20) ms 50 ms to 5 s	0.0009 ns 0.0041 ns + 0.0006 ns/ns 0.0029 ms 0.0041 ms + 0.007 s/s	Fluke 5522A-SC1100
Rise Time, 10 mV to 2.5 V	1 ns to 1 ms	350 ps	
DC Voltage[3] – Generate	(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	9.5 µV/V + 0.4 µV 5.9 µV/V + 0.7 µV 4.1 µV/V + 2.5 µV 4.1 µV/V + 4 µV 5.9 µV/V + 40 µV 7.6 µV/V + 0.4 mV	Fluke 5730A
DC Voltage[3] – Measure	(0 to 200) mV 200 mV to 2 V (2 to 20) V (20 to 200) V (200 to 1000) V	4.3 µV/V + 0.48 µV 4.6 µV/V + 1.0 µV 3.5 µV/V + 4 µV 6.4 µV/V + 47 µV 6.4 µV/V + 0.62 mV	Fluke 8508A
DC High Voltage – Measure	(1 to 10) kV (10 to 35) kV (35 to 100) kV	0.13 V + 0.35 mV/V 0.75 mV/V 7.2 V + 0.52 mV/V	Vitrek 4700 with HVL100
DC Current[3] – Generate	(0 to 220) µA 220 µV to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A (2.2 to 11) A (11 to 20) A	48 µA/A + 6 nA 42 µA/A + 7 nA 42 µA/A + 40 nA 53 µA/A + 0.7 µA 0.12 mA/A + 12 µA 0.42 mA/A + 0.48 mA 0.82 mA/A + 0.75 mA	Fluke 5730A Fluke 5522A
Clamp-On Only[3]	(16.5 to 149.999) A (150 to 1025) A	4 mA/A + 3.4 mA 6.1 mA/A + 0.56 A	Fluke 5522A w/ 5500A coil

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
DC Current[3] – Measure	(0 to 200) µA 200 µA to 2 mA (2 to 20) mA (20 to 200) mA 200 mA to 2 A (2 to 20) A (20 to 1000) A	14 µA/A + 0.4 nA 14 µA/A + 4 nA 15 µA/A + 40 nA 43 µA/A + 0.8 µA 0.2 mA/A + 1.6 µA 0.44 mA/A + 200 µA 0.24 A/A + 0.64 A	Fluke 8508A Clamp-on ammeter
Resistance[3] – Generate, Fixed Points	0 Ω 1 Ω 1.9 Ω 10.0 Ω 19.0 Ω 100 Ω 190 Ω 1.0 kΩ 1.9 kΩ 10 kΩ 19 kΩ 100 kΩ 190 kΩ 1.0 MΩ 1.9 MΩ 10 MΩ 19 MΩ 100 MΩ	46 µΩ 0.11 mΩ 0.22 mΩ 0.27 mΩ 0.51 mΩ 1.2 mΩ 2.3 mΩ 7.9 mΩ 15 mΩ 79 mΩ 0.15 Ω 1.0 Ω 2.0 Ω 15 Ω 41 Ω 0.51 kΩ 1.1 kΩ 13 kΩ	Fluke 5730A
Resistance[3] – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω 330 Ω to 1.099 999 kΩ (1.1 to 3.299 999) kΩ (3.3 to 10.999 99) kΩ (11 to 32.999 99) kΩ (33 to 109.9999) kΩ (110 to 329.9999) kΩ 330 kΩ to 1.099 999 MΩ (1.1 to 3.299 999) MΩ (3.3 to 10.999 99) MΩ (11 to 32.999 99) MΩ (33 to 109.9999) MΩ (110 to 329.9999) MΩ (330 to 1100) MΩ	0.0046 % + 0.78 mΩ 0.0017 % + 1.4 mΩ 0.0022 % + 1.1 mΩ 0.0022 % + 1.6 mΩ 0.0022 % + 1.6 mΩ 0.0022 % + 16 mΩ 0.0022 % + 16 mΩ 0.0022 % + 0.16 Ω 0.0022 % + 0.16 Ω 0.0025 % + 1.6 Ω 0.0025 % + 1.6 Ω 0.0047 % + 23 Ω 0.01 % + 39 Ω 0.019 % + 1.9 kΩ 0.039 % + 2.3 kΩ 0.23 % + 78 kΩ 1.2 % + 0.39 MΩ	Fluke 5522A

Parameter/Equipment	Range	CMC[2, 6] (±)	Comments
Resistance[3] – Measure	(0 to 2) Ω (2 to 20) Ω (20 to 200) Ω 200 Ω to 2 kΩ (2 to 20) kΩ (20 to 200) kΩ 200 kΩ to 2 MΩ (2 to 20) MΩ (20 to 200) MΩ 200 MΩ to 2 GΩ (2 to 20) GΩ	17 µΩ/Ω + 4 µΩ 11 µΩ/Ω + 14 µΩ 9.8 µΩ/Ω + 50 µΩ 13 µΩ/Ω + 0.5 mΩ 10 µΩ/Ω + 5 mΩ 8.8 µΩ/Ω + 50 mΩ 11 µΩ/Ω + 1 Ω 18 µΩ/Ω + 100 Ω 58 µΩ/Ω + 10 kΩ 1.0 mΩ/Ω + 1 MΩ 0.14 % + 10 MΩ	Fluke 8508A

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Voltage[3] – Generate			
(0.22 to 2.2) mV	(10 to 20) Hz	0.2 mV/V + 4.8 µV	Fluke 5730A
	(20 to 40) Hz	60 µV/V + 4.8 µV	
	40 Hz to 20 kHz	62 µV/V + 4.8 µV	
	(20 to 50) kHz	0.17 mV/V + 4.8 µV	
	(50 to 100) kHz	0.54 mV/V + 5.9 µV	
	(100 to 300) kHz	1.2 mV/V + 12 µV	
	(300 to 500) kHz	1.7 mV/V + 23 µV	
(2.2 to 22) mV	500 kHz to 1 MHz	3.3 mV/V + 23 µV	
	(10 to 20) Hz	0.27 mV/V + 4.8 µV	
	(20 to 40) Hz	0.10 mV/V + 4.7 µV	
	40 Hz to 20 kHz	90 µV/V + 4.7 µV	
	(20 to 50) kHz	0.23 mV/V + 4.7 µV	
	(50 to 100) kHz	0.58 mV/V + 5.8 µV	
	(100 to 300) kHz	1.2 mV/V + 12 µV	
	(300 to 500) kHz	1.6 mV/V + 23 µV	
	500 kHz to 1 MHz	3.3 mV/V + 23 µV	
(22 to 220) mV	(10 to 20) Hz	0.28 mV/V + 14 µV	
	(20 to 40) Hz	0.10 mV/V + 8.4 µV	
	40 Hz to 20 kHz	63 µV/V + 8.8 µV	
	(20 to 50) kHz	0.13 mV/V + 8.8 µV	
	(50 to 100) kHz	0.36 mV/V + 20 µV	
	(100 to 300) kHz	0.4 mV/V + 95 µV	
	(300 to 500) kHz	1.2 mV/V + 0.24 mV	
	500 kHz to 1 MHz	2.1 mV/V + 0.36 mV	
220 mV to 2.2 V	(10 to 20) Hz	0.28 mV/V + 66 µV	
	(20 to 40) Hz	0.11 mV/V + 22 µV	
	40 Hz to 20 kHz	48 µV/V + 12 µV	
	(20 to 50) kHz	77 µV/V + 13 µV	
	(50 to 100) kHz	98 µV/V + 37 µV	
	(100 to 300) kHz	0.4 mV/V + 95 µV	
	(300 to 500) kHz	1.2 mV/V + 0.24 mV	
	500 kHz to 1 MHz	2 mV/V + 0.36 mV	
(2.2 to 22) V	(10 to 20) Hz	0.28 mV/V + 0.54 mV	
	(20 to 40) Hz	0.1 mV/V + 0.3 mV	
	40 Hz to 20 kHz	47 µV/V + 0.61 mV	
	(20 to 50) kHz	78 µV/V + 0.14 mV	
	(50 to 100) kHz	98 µV/V + 0.26 mV	
	(100 to 300) kHz	0.31 mV/V + 0.72 mV	
	(300 to 500) kHz	1.2 mV/V + 2.4 mV	
	500 kHz to 1 MHz	1.8 mV/V + 3.7 mV	

Parameter/Range	Frequency	CMC[2, 6] (±)	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 (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.28 mV/V + 5.8 mV 0.10 mV/V + 3.1 mV 61 µV/V + 0.81 mV 94 µV/V + 1.2 mV 0.18 mV/V + 2.9 mV 1.1 mV/V + 18 mV 5.1 mV/V + 46 mV 9.0 mV/V + 0.1 V	Fluke 5730A
(220 to 250) V	(15 to 50) Hz	0.29 mV/V + 16 µV	
(220 to 1100) V	50 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz	67 µV/V + 3.5 µV 98 µV/V + 6 mV 0.7 mV/V + 12 mV	
AC Voltage[3] – Measure			
Up 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	0.31 µV/V + 5.2 µV 1 µV/V + 2.5 µV 0.31 µV/V + 3.3 µV 1.1 µV/V + 3 µV 5.7 µV/V + 3.3 µV 45 µV/V + 14 µV	Keysight 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	0.1 µV/V + 7 µV 0.09 µV/V + 3.2 µV 0.16 µV/V + 3.2 µV 0.35 µV/V + 3 µV 0.85 µV/V + 12 µV 3.3 µV/V + 38 µV 12 µV/V + 25 µV 17 µV/V + 22 µV	
100 mV to 1 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	0.11 mV/V + 54 µV 0.089 mV/V + 29 µV 0.16 mV/V + 29 µV 0.35 mV/V + 30 µV 0.92 mV/V + 37 µV 3.5 mV/V + 150 µV 12 mV/V + 160 µV 17 mV/V + 270 µV	

Parameter/Range	Frequency	CMC[2, 6] (±)	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 (1 to 2) MHz	0.081 mV/V + 0.57 mV 0.079 mV/V + 0.32 mV 0.16 mV/V + 0.29 mV 0.34 mV/V + 0.32 mV 0.92 mV/V + 0.3 mV 3.5 mV/V + 1.4 mV 12 mV/V + 1.5 mV 17 mV/V + 2.2 mV	Keysight 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	0.27 mV/V + 1.9 mV 0.23 mV/V + 3.4 mV 0.23 mV/V + 3.3 mV 0.4 mV/V + 3.8 mV 1.4 mV/V + 3.5 mV 4.6 mV/V + 14 mV 1.7 mV/V + 14 mV	
(100 to 700) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.45 mV/V + 59 mV 0.45 mV/V + 39 mV 0.68 mV/V + 36 mV 1.4 mV/V + 31 mV 3.5 mV/V + 27 mV	
AC High Voltage – Measure (50 to 60) Hz	(1 to 10) kV (10 to 35) kV (35 to 100) kV	0.25 V + 4.6 mV/V 0.25 V + 4.8 mV/V 4.9 V + 4.9 mV/V	Vitrek 4700 with HVL100

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Current[3] – Generate			
Up to 220 µA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.36 mA/A + 16 nA 0.21 mA/A + 10 nA 0.14 mA/A + 8 nA 0.33 mA/A + 12 nA 1.3 mA/A + 65 nA	Fluke 5730A
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.36 mA/A + 40 nA 0.20 mA/A + 35 nA 0.14 mA/A + 35 nA 0.23 mA/A + 0.11 µA 1.3 mA/A + 0.65 µA	
(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	0.35 mA/A + 0.40 µA 0.21 mA/A + 0.35µA 0.14 mA/A + 0.35 µA 0.23 mA/A + 0.55 µA 1.3 mA/A + 5.0 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.37 mA/A + 4.0 µA 0.72 mA/A + 3.5 µA 0.14 mA/A + 3.5 µA 0.23 mA/A + 3.5 µA 1.3 mA/A + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.30 mA/A + 35 µA 0.53 mA/A + 80 µA 8.1 mA/A + 0.16 mA	

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
AC Current[3] – Generate (cont)			
(2.2 to 10) Amps	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.48 mA/A + 0.95 mA 1.1 mA/A + 0.76 mA 4.2 mA/A + 1.1 mA	5730A w/5725A
(10 to 20) Amps	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.4 mA/A + 5.9 mA 1.7 mA/A + 6 mA 35 mA/A + 5.8 mA	5522A
Clamp-on Meters[3]			
Toroidal (16.5 to 149.999) A (150 to 1025) A	 (45 to 65) Hz (65 to 440) Hz	 0.58 A + 3 mA/A 0.57 A + 3 mA/A	 Fluke 5522A w/ 5500A coil
Non-Toroidal (16.5 to 1025) A	 (45 to 440) Hz	 0.58 A + 5.8 mA/A	
AC Current[3] – Measure			
(0 to 200) µA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.6 mA/A + 23 nA 0.24 mA/A + 34 nA 0.7 mA/A + 23 nA	Fluke 8508A
200 µA to 2 mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.32 mA/A + 0.23 µA 0.33 mA/A + 0.20 µA 0.75 mA/A + 0.20 µA	
(2 to 20) mA	(1 to 10) Hz 10 Hz to 10 kHz (10 to 30) kHz	0.31 mA/A + 2.3 µA 0.32 mA/A + 2.0 µA 0.75 mA/A + 2.0 µA	
(20 to 200) mA	10 Hz to 10 kHz	0.29 mA/A + 20 µA	
200 mA to 2 A	10 Hz to 2 kHz (2 to 10) kHz (10 to 30) kHz	0.69 mA/A + 0.20 mA 0.82 mA/A + 0.20 mA 3.5 mA/A + 0.20 mA	
(2 to 20) A	10 Hz to 2 kHz (2 to 10) kHz	0.93 mA/A + 2.0 mA 2.9 mA/A + 2.0 mA	
(20 to 1000) A	(10 to 100) Hz (100 to 500) Hz	0.65 A + 23 mA/A 0.69 A + 29 mA/A	Clamp on ammeter

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
AC Flatness – Measure			
(220 to 700) mV	(10 to 30) Hz (30 to 120) Hz (0.12 to 1.2) kHz (1.2 to 120) kHz (120 to 500) kHz (0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.1 % 0.03 % 0.03 % 0.04 % 0.04 % 0.06 % 0.06 % 0.14 % 0.27 % 0.35 %	Fluke 5790A
700 mV to 2.2 V	(10 to 30) Hz (30 to 120) Hz (0.12 to 1.2) kHz (1.2 to 120) kHz (120 to 500) kHz (0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.1 % 0.04 % 0.04 % 0.03 % 0.03 % 0.06 % 0.07 % 0.1 % 0.2 % 0.35 %	
(2.2 to 7) V	(10 to 30) Hz (30 to 120) Hz (0.12 to 1.2) kHz (1.2 to 120) kHz (120 to 500) kHz (0.5 to 1.2) MHz (1.2 to 2) MHz (2 to 10) MHz (10 to 20) MHz (20 to 30) MHz	0.1 % 0.04 % 0.04 % 0.04 % 0.04 % 0.05 % 0.06 % 0.1 % 0.2 % 0.35 %	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouple Indicators[3] – Generate & Measure			
Type E	(-270 to 0) °C (0 to 600) °C (600 to 1000) °C	0.032 °C 0.035 °C 0.039 °C	Fluke 5730A. Fluke Ice Point 9101, Fluke 8508A
Type J	(-210 to -0) °C (0 to 600) °C (600 to 1200) °C	0.069 °C 0.038 °C 0.044 °C	
Type K	(-200 to 0) °C (0 to 600) °C (600 to 1372) °C	0.091 °C 0.045 °C 0.063 °C	
Type R	(0 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.27 °C 0.14 °C 0.13 °C	
Type S	(0 to 500) °C (500 to 1000) °C (1000 to 1767) °C	0.27 °C 0.18 °C 0.13 °C	
Type T	(-250 to 0) °C (0 to 120) °C (120 to 400) °C	0.21 °C 0.042 °C 0.038 °C	
Type N	(-200 to 0) °C (0 to 600) °C (600 to 1300) °C	0.15 °C 0.057 °C 0.057 °C	5522A thermocouple output

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators[3] – Generate & Measure			
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	0.05 °C 0.07 °C 0.09 °C 0.10 °C 0.12 °C 0.23 °C	Fluke 5522A, Fluke 8508A
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.05 °C 0.07 °C 0.09 °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 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °C 0.10 °C 0.23 °C	
Pt 385, 200 Ω	(-200 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.04 °C 0.05 °C 0.12 °C 0.13 °C 0.14 °C 0.16 °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	0.04 °C 0.05 °C 0.06 °C 0.08 °C 0.09 °C 0.11 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 600) °C (600 to 630) °C	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.23 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators[3] (cont) – Generate & Measure			
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.08 °C 0.14 °C	Fluke 5522A, Fluke 8508A
Cu 427, 10 Ω	(-100 to 260) °C	0.3 °C	

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Distortion – Measure			
(-75 to 0) dB Dist	10 Hz to 500 kHz	0.74 dB	U8903A
(-99.99 to 0) dB Dist	9 kHz to 30 MHz	1.2 dB	E4440A
Capacitance – Generate[3]			
(220 to 399.9) pF	10 Hz to 10 kHz	12 pF	Fluke 5522A
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.015 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.015 nF	
(3.3 to 10.999) nF	10 Hz to 1 kHz	0.035 nF	
(11 to 32.999) nF	10 Hz to 1 kHz	0.085 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.26 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.78 nF	
(0.33 to 1.1) µF	(10 to 600) Hz	0.0035 µF	
(1.1 to 3.3) µF	(10 to 300) Hz	0.011 µF	
(3.3 to 11) µF	(10 to 150) Hz	0.035 µF	
(11 to 33) µF	(10 to 120) Hz	0.15 µF	
(33 to 110) µF	(10 to 80) Hz	0.55 µF	
(110 to 330) µF	DC to 50 Hz	1.7 µF	
(0.33 to 1.1) mF	DC to 20 Hz	0.0055 mF	
(1.1 to 3.3) mF	DC to 6 Hz	0.017 mF	
(3.3 to 11) mF	DC to 2 Hz	0.055 mF	
(11 to 33) mF	DC to 0.6 Hz	0.26 mF	
(33 to 110) mF	DC to 0.2 Hz	1.2 mF	

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
Capacitance – Generate[3] (cont) Fixed Points 1 pF 10 pF 100 pF 1000 pF 0.01 µF 0.10 µF 1.0 µF	 1 kHz to 13 MHz 1 kHz to 13 MHz 1 kHz to 13 MHz 1 kHz to 13 MHz (0.1 to 100) kHz (0.1 to 100) kHz (0.1 to 100) kHz	 0.0012 pF 0.012 pF 0.12 pF 1.2 pF 0.000 74 µF 0.000 82 µF 0.0015 µF	 HP 16380A & HP 16380C standard capacitor sets
Capacitance – Measure 10 pF 100 pF 1000 pF 0.1 µF 10 µF	 120 Hz to 300 kHz 120 Hz to 300 kHz 120 Hz to 300 kHz 120 Hz to 100 kHz 120 Hz to 100 kHz	 0.028 pF 0.19 pF 1.2 pF 0.000 61 µF 0.093 µF	 Agilent E4980A

III. Electrical RF/Microwave

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Attenuation – Tuned RF Power Measurement Measure	100 kHz to 10 MHz 10 MHz to 3.05 GHz (3.05 to 6.6) GHz (6.6 to 13.2) GHz (13.2 to 19.2) GHz (19.2 to 26.5) GHz	0.89 dBm 0.2 dBm 0.2 dBm 0.2 dBm 0.2 dBm 0.2 dBm	N5531S MMR system
RF Power – Generate (20 to 24) dBm (14 to 20) dBm	 (0.01 to 100) kHz (0.1 to 125) MHz (0.01 to 100) kHz (0.1 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz	 0.06 dB 0.06 dB 0.04 dB 0.06 dB 0.09 dB 0.23 dB	Fluke 96270A reference source w/ leveling head output

Parameter/Range	Frequency	CMC[2, 6] (±)	Comments
RF Power – Generate (cont)			
(-17 to 14) dBm	(0.01 to 100) kHz (0.1 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz (1.4 to 4.0) GHz	0.04 dB 0.06 dB 0.09 dB 0.23 dB 0.35 dB	Fluke 96270A reference source w/ leveling head output
(-120 to 16) dBm	(2.4 to 8.0) GHz (8.0 to 12.0) GHz (12.0 to 18.0) GHz (18.0 to 22.0) GHz (22.0 to 26.5) GHz	0.8 dB 0.8 dB 0.8 dB 0.8 dB 0.8 dB	Fluke 96270A reference source w/11667B splitter
RF Attenuation - Tuned RF Power Measurement			
(-48 to -17) dBm	(0.01 to 100) kHz (0.1 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz (1.4 to 3.0) GHz (3.0 to 4.0) GHz	0.04 dB 0.06 dB 0.09 dB 0.25 dB 0.40 dB 0.59 dB	N5531S MMR system
(-74 to -48) dBm	(0.1 to 10) MHz (10 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz (1.4 to 4.0) GHz	0.23 dB 0.11 dB 0.11 dB 0.46 dB 0.57 dB	
(-84 to -74) dBm	(0.1 to 10) MHz (10 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz (1.4 to 4.0) GHz	0.60 dB 0.10 dB 0.34 dB 0.57 dB 1.2 dB	
(-94 to -84) dBm	(0.1 to 10) MHz (10 to 125) MHz (125 to 300) MHz (0.3 to 3.0) GHz	0.60 dB 0.40 dB 0.60 dB 1.2 dB	
(-94 to -124) dB	(10 to 125) MHz (125 to 300) MHz (0.3 to 1.4) GHz (1.4 to 3.0) GHz	0.80 dB 1.8 dB 1.8 dB 1.8 dB	

Parameter/Range	Frequency	CMC[2, 5, 6] (±)	Comments
RF Power – Measure			
(+20 to -10) dB	100 kHz to 10 MHz	0.066 dB	Power meter & power sensor
	(10 to 30) MHz 30 MHz to 2.0 GHz (2 to 4.2) GHz (4.2 to 18) GHz (18 to 26.5) GHz	0.13 dB 0.13 dB 0.13 dB 0.14 dB 0.14 dB	NRPZ power senor
Power Reference – Measure	1 mW, 50 MHz	1.2 %	N432A, HP 3458A, HP 478A-H55 thermistor mount

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Amplitude Modulation – Measure			
100 kHz to 10 MHz	Rate: 50 Hz to 10 kHz Depth: (5 to 99) %	0.017 %	N5531S MMR system with N5532B
10 MHz to 3 GHz	Rate: 50 Hz to 100 kHz Depth: (20 to 99) % Depth: (5 to 20) %	0.58 % 2.9 %	
(3 to 26.5) GHz	Rate: 50 Hz to 100kHz Depth: (20 to 99) % Depth: (5 to 20) %	1.7 % 5.2 %	
Frequency Modulation – Measure			
Rate: (0.02 to 10) kHz	$\leq$ 40 kHz $_{peak}$ (0.25 to 10) MHz	1.2 % deviation	N5531S MMR system with N5532B
Rate: (0.05 to 200) kHz	$\leq$ 400 kHz $_{peak}$ (0.01 to 26.5) GHz	1.2 % deviation	

Parameter/Equipment	Range	CMC[2, 5, 6] (±)	Comments
Phase Modulation – Measure			
100 kHz to 6.6 GHz	> 0.7 Rad > (0.3 to 0.7) Rad	1.6 % deviation 3.7 % deviation	N5531S MMR system with N5532B
(6.6 to 13.2) GHz	> 2.0 Rad > (0.6 to 2.0) Rad	1.3 % deviation 3.5 % deviation	
(13.2 to 26.5) GHz	> 4.0 Rad > (1.2 to 4.0) Rad	1.2 % deviation 3.5 % deviation	
Single Sideband Phase Noise (SSB) – Measure			
CW Frequency: 10 MHz to 26.5 GHz	Offset from CW: 100Hz to 1 MHz	1.9 dB	Keysight E4440A w/ N5532B-526

IV. Mechanical

Parameter/Equipment	Range	CMC[2, 5] (±)	Comments
Acceleration & Vibration Amplitude Response	(5 to 9) Hz (10 to 99) Hz 100 Hz (101 to 920) Hz (921 to 5000) Hz (5 to 10) kHz (10 to 15) kHz (15 to 20) kHz	2.2 % 1.7 % 1.3 % 1.4 % 1.7 % 2.2 % 2.8 % 3.5 %	Modal Shop 9155 system using back-to-back calibration method

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
Pressure – Measure & Measuring Equipment			
Pneumatic	(-2.2 to 2.2) psig (0 to 15) psig	0.000 12 psi 0.0004 psi	Fluke PPC3 pressure calibrator
	(0.01 to 60) psig Up to 200 psig Up to 500 psig Up to 1000 psig	0.0019 psi + 62 µpsi/psig 0.024 psi 0.060 psi 0.13 psi	Mensor CPC 6050
	(0 to 34) inHg	0.012 inHg	Mensor CPC 6050
Hydraulic	(50 to 10 000) psi	0.0093 %	Deadweight tester
	(0 to 30 000) psi	35 PSIG + 3.0 µPSIG/PSIG	Additel ADT672
Pressure – Field[3], Measure & Measuring Equipment			
Hydraulic	(5 to 10 000) psig	0.12 %	Deadweight tester
Pneumatic	-13.6 to 0.01 psig Up to 1 psig Up to 5 psig Up to 30 psig Up to 100 psig Up to 300 psig Up to 1000 psig Up to 5000 psig	0.016 psi 0.0012 psi 0.04 psi 0.018 psi 0.12 psi 0.17 psi 0.59 psi 4.7 psi	Fluke modules

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
Scales & Balances[3] –			
Linearity	0.01 mg to 42 g (42 to 210) g 210 g to 5.1 kg (5.1 to 30) kg	0.000 042 g + 4.9 µg/g 0.000 041 g + 2.8 µg/g 0.0097 g + 2.4 µg/g 0.12 g + 1.7 µg/g	Class 00, Class 0 & Class 1 weights
Repeatability	0.01 mg to 42 g (43 to 210) g 210 g to 5.1 kg (5.1 to 30) kg	0.000 079 g 0.000 16 g 0.022 g 0.000 26 kg	
Scales & Balances[3]	(0 to 1500) lb	0.0058 lbf + 0.0004 lbf/lbf	Class F weights
Mass – Measure	0.01 mg to 42 g (43 to 210) g 210 g to 6 kg (6 to 30) kg	0.000 03 g + 0.36 µg/g 0.000 15 g + 0.08 µg/g 0.018 g + 1.9 µg/g 0.17 g + 0.8 mg/g	Analytical balances Top loading balances
Torque – Measure	0.5 ozf·in to 2000 lbf·ft (500 to 5000) lbf·ft	0.3 % 0.5 %	Torque transducers
Torque[3] – Measure	5 lbf·in to 600 lbf·ft	0.35 %	Torque transducers
Torque Transducers	(0.5 to 400) ozf·in (4 to 150) lbf·in (150 to 400) lbf·in (10 to 2000) lbf·ft	0.05 % 0.05 % 0.05 % 0.05 %	Torque arms Class F weights

Parameter/Equipment	Range	CMC[2, 5, 7] (±)	Comments
Force Measurement[3]			
Compression & Tension	(1 to 10) lbf (10 to 100) lbf (100 to 500) lbf (500 to 1000) lbf	0.0058 lbf + 15 µlbf/ lbf 0.0058 lbf + 34 µlbf / lbf 0.053 lbf + 58 µlbf / lbf 0.57 lbf + 20 µlbf / lbf	Load cells, Class F, Class 1 weights
Compression Only	(1000 to 5000) lbf (5000 to 10 000) lbf (10 000 to 50 000) lbf (50 000 to 500 000) lbf	5.8 lbf + 33 µlbf / lbf 12 lbf + 24 µlbf / lbf 57 lbf + 74 µlbf / lbf 210 lbf + 620 µlbf / lbf	Load cells
Force – Measure & Measuring Equipment			
Compression	(1 to 1000) lbf	0.12 %	Class F weights
	(65 to 6500) lbf (6500 to 50 000) lbf	0.98 lbf 7.3 lbf	Proving rings
Tension	(1 to 1000) lbf	0.12 %	Class F weights
	(65 to 6500) lbf (500 to 50 000) lbf	0.98 lbf 7.3 lbf	Proving rings
Nuclear Density Gauges, Fixed Points – Density[3]			
Magnesium Mag/Aluminum Aluminum Granite	110.7 lb/ft^3 139.7 lb/ft^3 168.9 lb/ft^3 161.9 lb/ft^3	0.34 lb/ft^3 0.56 lb/ft^3 0.34 lb/ft^3 1.1 lb/ft^3	Density blocks
Nuclear Density Gauges, Fixed Points – Moisture[3]	Up to 35 lb/ft^3	0.46 lb/ft^3	Moisture blocks

V. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Thermometers[3]	(-80 to < 0) °C 0 °C (> 0 to 200) °C (> 200 to 400) °C (400 to 650) °C	0.084 °C 0.019 °C 0.040 °C 0.053 °C 0.067 °C	Liquid bath dry block/PRT

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Infrared Thermometers – Measuring Equipment	(-15 to 120) °C (100 to 200) °C (200 to 350) °C (350 to 500) °C	0.7 °C 0.73 °C 1.0 °C 1.7 °C	Fluke 4180/4181 Where wavelength (λ) = (8 to 14) µm & emissivity (ε) = 0.95
Furnaces, Ovens, Refrigerators & Freezers[3] – Temperature Only	(0 to 900) °C	1.4 °C	Fluke 1586 RTD thermocouple
Temp/Humidity Indicators –Generate & Measure			
Relative Humidity	(5 to 95) % RH @ 0 °C (5 to 95) % RH @ 25 °C (5 to 95) % RH @ 50 °C (5 to 95) % RH @ 70 °C	0.09 % RH + 0.006 % RH/ % RH 0.09 % RH + 0.005 % RH/ % RH 0.091 % RH + 0.005 % RH/ % RH 0.29 % RH + 0.003 % RH/ % RH	RH Systems CGS-240
Temperature	(0 to 70) °C	0.054 °C + 3 µ°C/°C	
Temperature – Measure[3]	(-80 to -20) °C (-20 to 100) °C (100 to 400) °C (400 to 650) °C	0.012 °C 0.015 °C 0.038 °C 0.040 °C	Fluke 1502A with 5628 PRT

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature Uniformity Survey[3]			
J-Type Thermocouples	(0 to 1200) °F	2.3 °F + 0.0029 °F/°F	AMS2750
K-Type Thermocouples	(0 to 1850) °F	2.2 °F + 0.0035 °F/°F	
T-Type Thermocouples	(0 to 500) °F	0.97 °F + 0.0029 °F/°F	
System Accuracy Test[3]	(0 to 1850) °F	2.2 °F + 0.0035 °F/°F	AMS2750

VI. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Stopwatches/Timers[3]	Up to 30 days	0.037 s/day	Timometer
Tachometer[3] –			
Non-Contact	(0 to 100 000) RPM	0.0029 RPM + 0.000 003 7 RPM/RPM	33250A function generator & LED strobe.
Contact	(0 to 1500) RPM	0.13 RPM + 0.0014 RPM/RPM	Reference tachometer comparison
Frequency – Measure[3]	(0 to 200) MHz 50 MHz to 26.5 GHz	1.2 parts in 10^7 Hz/Hz 1.2 parts in 10^7 Hz/Hz	Agilent 53132A
Frequency – Measuring Equipment[3]	10 MHz	3.4 parts in 10^9 MHz	4410A GPS frequency standard
	DC to 4 GHz (4 to 26.5) GHz	5.8 parts in 10^8 Hz/Hz 5.8 parts in 10^8 Hz/Hz	Frequency counter, MMR

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency – Source Equipment[3] Measure	10 MHz	6 parts in 10^{10} Hz/Hz	Agilent 33250A, 4410A GPS
	DC to 4 GHz	5.8 parts in 10^{8} Hz/Hz	Fluke 96270A w/leveling head & microwave output
	(4 to 26.5) GHz	5.8 parts in 10^{8} Hz/Hz	

---

[1] This laboratory offers commercial calibration service 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 Calibration and Measurement Capability Uncertainty (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 values of the nominal length of the device measured in inches, *R* is the numerical value of the resolution of the device in microinches, and *D* is the diameter of the device in inches

[5] In the statement of CMC, a % denotes a percent of reading unless otherwise noted.

[6] 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's 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.

[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

[8] This scope meets A2LA's *P112 Flexible Scope Policy*.

Accredited Laboratory

A2LA has accredited

NATIONAL CALIBRATION INC.

Scottsdale, AZ

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 31st day of August 2026.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1892.01
Valid to August 31, 2028

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