



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: February 28, 2025

Certificate Number: 7463.01

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, 7}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Micrometers ^{3, 9}	Up to 12 in	(76 + 5L) μin	Mitutoyo BE1-81-1F, Mitutoyo BE6-81-2F, gage block sets
Calipers (Outside Reading Only) ^{3, 9}	Up to 24 in	(20 + 5L) μin	Mitutoyo BE1-81-1F, Mitutoyo BE6-81-2F, gage block sets
Cylindrical Ring Gages	Up to 4 in	(48 + 5L) μin	Mitutoyo BE1-81-1F, gage block set, Federal ID comparator
Cylindrical Pins	(0.05 to 1) in	61 μin	Mitutoyo BE1-81-1F gage block set, SMM-1 bench micrometer
Feeler Gages, Shims	(0.001 to 0.05) in	61 μin	Mitutoyo BE1-81-1F gage block set, SMM-1 bench micrometer

Parameter/Equipment	Range	CMC ² (±)	Comments
Inclinometer	Up to 90°	0.0071°	5 in sine bar, gage blocks, master square, surface plate
Thread Plugs			
Major Diameter	(0.05 to 2) in	60 µin	ULM, gage Block set, thread wires, SMM-1 bench micrometer
Pitch Diameter	(4 to 80) TPI	69 µin	

II. Electrical – DC Low/Frequency

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
DC Voltage – Generate ³	Up 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	7.5 µV/V + 0.4 µV 5 µV/V + 0.7 µV 3.5 µV/V + 2.5 µV 3.5 µV/V + 4 µV 5 µV/V + 40 µV 6.5 µV/V + 0.4 mV	Fluke 5720A multiproduct calibrator
DC Voltage – Generate	Up 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	7.5 µV/V + 0.4 µV 5 µV/V + 0.7 µV 3.5 µV/V + 2.5 µV 3.5 µV/V + 4 µV 5 µV/V + 40 µV 6.5 µV/V + 0.4 mV	Fluke 5730A multiproduct calibrator
DC Voltage – Generate, Fixed Point	10 V	2.4 µV/V	Fluke 732B, DC reference standard

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
DC Voltage – Generate ³	Up to 330 mV 330 mV to 3.3 V (3.3 to 33) V (30 to 330) V (330 to 1000) V	66 μ V/V + 1 μ V 33 μ V/V + 2 μ V 36 μ V/V + 20 μ V 54 μ V/V + 0.15 mV 54 μ V/V + 1.5 mV	Fluke 5520A multiproduct calibrator
DC Voltage – Measure	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	17 μ V/V + 3 μ V 8.6 μ V/V + 0.3 μ V 11 μ V/V + 0.5 μ V 11 μ V/V + 36 μ V 15 μ V/V + 1.1 mV	Agilent/HP 3458A Opt 002, 8.5-digit multimeter
DC High Voltage – Measure	(1 to 10) kV (10 to 20) kV (20 to 30) kV (30 to 40) kV	8.2 mV/V 8.9 mV/V 8.9 mV/V 8.9 mV/V	North Star PVM-1 High voltage probe, HP 34401A, 6.5-digit multimeter
DC Voltage – Measure ³	Up to 100 mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	51 μ V/V + 10 μ V 27 μ V/V + 1 μ V 24 μ V/V + 2 μ V 33 μ V/V + 30 μ V 45 μ V/V + 0.1 mV	Agilent/HP 3458A Opt 002, 8.5-digit multimeter
DC High Voltage – Measure ³	(1 to 10) kV (10 to 20) kV (20 to 30) kV (30 to 40) kV	25 mV/V 28 mV/V 28 mV/V 28 mV/V	North Star PVM-1 High voltage probe, HP 34401A, 6.5-digit multimeter

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	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	0.24 mV/V + 4 μ V 91 μ V/V + 4 μ V 81 μ V/V + 4 μ V 0.2 mV/V + 4 μ V 0.5 mV/V + 5 μ V 1.1 mV/V + 10 μ V 1.4 mV/V + 20 μ V 2.7 mV/V + 20 μ V	Fluke 5720A multiproduct calibrator
(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	2.4 mV/V + 4 μ V 90 μ V/V + 4 μ V 80 μ V/V + 4 μ V 0.2 mV/V + 4 μ V 0.5 mV/V + 5 μ V 1.1 mV/V + 10 μ V 1.4 mV/V + 20 μ V 2.7 mV/V + 20 μ V	
(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	0.55 mV/V + 5 μ V 0.21 mV/V + 5 μ V 0.11 mV/V + 5 μ V 0.37 mV/V + 5 μ V 0.85 mV/V + 7 μ V 1.1 mV/V + 12 μ V 1.7 mV/V + 25 μ V 3.4 mV/V + 25 μ V	
220 mV 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	0.24 mV/V + 40 μ V 90 μ V/V + 15 μ V 45 μ V/V + 8 μ V 75 μ V/V + 10 μ V 1.1 mV/V + 30 μ V 0.42 mV/V + 80 μ V 1 mV/V + 0.2 mV 1.7 mV/V + 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	0.24 mV/V + 0.4 mV 90 μ V/V + 0.15 mV 80 μ V/V + 50 μ V 0.2 mV/V + 0.1 mV 0.5 mV/V + 0.2 mV 1.1 mV/V + 0.6 mV 1.4 mV/V + 2 mV 2.7 mV/V + 3.2 mV	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Generate ³ (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	0.24 mV/V + 0.4 mV 90 μ V/V + 0.15 mV 45 μ V/V + 50 μ V 75 μ V/V + 0.1 mV 0.1 mV/V + 0.2 mV 0.28 mV/V + 0.6 mV 1 mV/V + 2 mV 1.5 mV/V + 3.2 mV	Fluke 5720A multiproduct calibrator
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.3 mV/V + 16 mV 70 μ V/V + 3.5 mV	
AC Voltage – 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 500 kHz to 1 MHz	0.24 mV/V + 4 μ V 91 μ V/V + 4 μ V 81 μ V/V + 4 μ V 0.2 mV/V + 4 μ V 0.5 mV/V + 5 μ V 1.1 mV/V + 10 μ V 1.4 mV/V + 20 μ V 2.7 mV/V + 20 μ V	Fluke 5730A multiproduct calibrator
(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	2.4 mV/V + 4 μ V 90 μ V/V + 4 μ V 80 μ V/V + 4 μ V 0.2 mV/V + 4 μ V 0.5 mV/V + 5 μ V 1.1 mV/V + 10 μ V 1.4 mV/V + 20 μ V 2.7 mV/V + 20 μ V	
(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	0.24 mV/V + 12 μ V 0.9 mV/V + 7 μ V 0.57 mV/V + 7 μ V 0.12 mV/V + 7 μ V 0.31 mV/V + 17 μ V 0.66 mV/V + 20 μ V 0.14 mV/V + 25 μ V 0.27 mV/V + 45 μ V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Generate (cont)			
220 mV 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	0.24 mV/V + 40 μ V 90 μ V/V + 15 μ V 45 μ V/V + 8 μ V 75 μ V/V + 10 μ V 1.1 mV/V + 30 μ V 0.42 mV/V + 80 μ V 1 mV/V + 0.2 mV 1.7 mV/V + 0.3 mV	Fluke 5730A multiproduct calibrator
(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	0.24 mV/V + 0.4 mV 90 μ V/V + 0.15 mV 80 μ V/V + 50 μ V 0.2 mV/V + 0.1 mV 0.5 mV/V + 0.2 mV 1.1 mV/V + 0.6 mV 1.4 mV/V + 2 mV 2.7 mV/V + 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 (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.24 mV/V + 0.4 mV 90 μ V/V + 0.15 mV 45 μ V/V + 50 μ V 75 μ V/V + 0.1 mV 0.1 mV/V + 0.2 V 0.28 mV/V + 0.6 mV 1 mV/V + 2 mV 1.5 mV/V + 3.2 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.3 mV/V + 16 mV 70 μ V/V + 3.5 mV	
AC Voltage – Generate ³			
(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	0.8 mV/V + 6 μ V 0.15 mV/V + 6 μ V 0.2 mV/V + 6 μ V 1 mV/V + 6 μ V 3.5 mV/V + 12 μ V 8 mV/V + 50 μ V	Fluke 5520A multiproduct calibrator
(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	0.3 mV/V + 8 μ V 0.15 mV/V + 8 μ V 0.16 mV/V + 8 μ V 0.35 mV/V + 8 μ V 0.8 mV/V + 32 μ V 2 mV/V + 70 μ V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Generate ³ (cont)			
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	0.3 mV/V + 50 μ V 0.15 mV/V + 60 μ V 0.19 mV/V + 60 μ V 0.3 mV/V + 50 μ V 0.7 mV/V + 0.13 mV 2.4 mV/V + 0.6 mV	Fluke 5520A multiproduct calibrator
(3.3 to 33) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.3 mV/V + 0.65 mV 0.15 mV/V + 0.6 mV 0.24 mV/V + 0.6 mV 0.35 mV/V + 0.6 mV 0.9 mV/V + 1.6 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	0.19 mV/V + 2 mV 0.2 mV/V + 6 mV 0.25 mV/V + 6 mV 0.3 mV/V + 6 mV 2 mV/V + 50 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 mV/V + 10 mV 0.25 mV/V + 10 mV 0.3 mV/V + 10 mV	
AC Voltage – 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	0.4 mV/V + 3 μ V 0.24 mV/V + 1 μ V 0.4 mV/V + 1 μ V 1.2 mV/V + 1 μ V 5.8 mV/V + 1 μ V 46 mV/V + 2 μ V	Agilent/HP 3458A Opt 002, 8.5 digit multimeter (synchronous AC mode)
(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	12 μ V/V + 0.4 μ V 9.2 μ V/V + 0.2 μ V 16 μ V/V + 0.2 μ V 35 μ V/V + 0.2 μ V 93 μ V/V + 0.2 μ V 0.35 mV/V + 1 μ V 1.2 mV/V + 1 μ V 1.7 mV/V + 1 μ V	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Measure (cont)			
(0.1 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	12 μ V/V + 0.4 μ V 9.2 μ V/V + 0.2 μ V 16 μ V/V + 0.2 μ V 35 μ V/V + 0.2 μ V 93 μ V/V + 0.2 μ V 0.35 mV/V + 1 μ V 1.2 mV/V + 1 μ V 1.7 mV/V + 1 μ V	Agilent/HP 3458A Opt 002, 8.5 digit multimeter (synchronous AC mode)
(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	12 μ V/V + 0.4 μ V 9.2 μ V/V + 0.2 μ V 16 μ V/V + 0.2 μ V 35 μ V/V + 0.2 μ V 93 μ V/V + 0.2 μ V 0.35 mV/V + 1 μ V 1.2 mV/V + 1 μ V 1.7 mV/V + 1 μ V	
(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	25 mV/V + 4 mV 24 mV/V + 2 mV 24 mV/V + 2 mV 41 mV/V + 2 mV 0.14 V/V + 10 mV 0.46 V/V + 10 mV 1.7 V/V + 10 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	55 mV/V + 40 mV 46 mV/V + 20 mV 75 mV/V + 20 mV 0.14 V/V + 20 mV 0.35 V/V + 20 mV	
AC High Voltage – Measure			
(1 to 7) kV (7 to 14) kV (14 to 21) kV (21 to 28) kV	60 Hz	0.12 % of reading 0.12 % of reading 0.12 % of reading 0.12 % of reading	North Star PVM-1 high voltage probe, HP 34401A, 6.5-digit multimeter

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Voltage – Measure ³			
(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	1.2 mV/V + 3 μ V 0.72 mV/V + 1 μ V 1.2 mV/V + 1 μ V 3.6 mV/V + 1 μ V 18 mV/V + 1 μ V 0.14 V/V + 2 μ V	Agilent/HP 3458A Opt 002, 8.5-digit multimeter (synchronous AC mode)
(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	36 μ V/V + 0.4 μ V 28 μ V/V + 0.2 μ V 48 μ V/V + 0.2 μ V 0.11 mV/V + 0.2 μ V 0.28 mV/V + 0.2 μ V 1.1 mV/V + 1 μ V 3.6 mV/V + 1 μ V 5.1 mV/V + 1 μ V	
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	36 μ V/V + 0.4 μ V 28 μ V/V 0.2 μ V 48 μ V/V + 0.2 μ V 0.11 mV/V + 0.2 μ V 0.28 mV/V + 0.2 μ V 1.1 mV/V + 1 μ V 3.6 mV/V + 1 μ V 5.1 mV/V + 1 μ V	
(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	36 μ V/V + 0.4 μ V 28 μ V/V + 0.2 μ V 48 μ V/V + 0.2 μ V 0.11 mV/V + 0.2 μ V 0.28 mV/V + 0.2 μ V 1.1 mV/V + 1 μ V 3.6 mV/V + 1 μ V 5.1 mV/V + 1 μ V	
(10 to 100) V	(1 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	24 mV/V 2 mV 24 mV/V + 2 mV 41 mV/V + 2 mV 0.14 V/V + 10 mV 0.46 V/V + 10 mV 1.7 V/V + 10 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	0.6 mV/V + 40 mV 0.5 mV/V + 20 mV 0.8 mV/V + 20 mV 1.4 mV/V + 20 mV 3.5 mV/V + 20 mV	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC High Voltage – Measure ³ (1 to 7) kV (7 to 14) kV (14 to 21) kV (21 to 28) kV	60 Hz	0.36 % of reading 0.36 % of reading 0.36 % of reading 0.36 % of reading	North Star PVM-1 high voltage probe, HP 34401A 6.5-digit multimeter

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
DC Current – Generate ³	(10 to 220) µA (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A	42 µA/A + 6 nA 36 µA/A + 7 nA 37 µA/A + 40 nA 46 µA/A + 0.7 µA 82 µA/A + 12 µA	Fluke 5720A multiproduct calibrator
DC Current – Generate	Up to 220 µA 220 µA to 2.2 mA (2.2 to 22) mA (22 to 220) mA 220 mA to 2.2 A	40 µA/A + 6 nA 35 µA/A + 7 nA 35 µA/A + 40 nA 45 µA/A + 0.7 µA 80 µA/A + 12 µA	Fluke 5730A multiproduct calibrator
DC Current – Generate ³	Up 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) A	0.015 % of reading + 20 nA 0.01 % of reading + 50 nA 0.01 % of reading + 0.25 µA 0.01 % of reading + 2.5 µA 0.02 % of reading + 40 µA 1.2 mA/A + 40 µA 1.5 mA/A + 0.5 mA 3 mA/A + 0.75 mA	Fluke 5520A multiproduct calibrator
DC Clamp-On Meters ³ – (Current Generate)	(20.5 to 30) A (30 to 100) A (100 to 500) A (500 to 1000) A	0.12 % of reading 0.11 % of reading 0.11 % of reading 0.11 % of reading	Fluke 5520A multiproduct calibrator, Fluke 9100-200, current coil

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
DC Current – Measure	(10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	48 μ A/A + 0.8 nA 47 μ A/A + 5 pA 45 μ A/A + 50 pA 63 μ A/A + 0.5 μ A 0.15 mA/A + 10 μ A	Agilent/HP 3458 ^a , Opt 002, 8.5-digit multimeter
DC Current – Measure ³	(10 to 100) μ A 100 μ A to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.15 μ A/A + 0.8 μ A 0.15 μ A/A + 5 nA 0.15 μ A/A + 50 nA 0.19 μ A/A + 0.5 μ A 0.45 μ A/A + 10 μ A	Agilent/HP 3458 ^a , Opt 002, 8.5-digit multimeter
DC Current – Measure ³	(1 to 100) A	5 mA/A	Agilent/HP 3458A Opt 002, 8.5-digit multimeter, Empro 200-50 shunt
DC Current – Measure ³	(100 to 500) A	5 mA/A	Agilent/HP 3458A, Opt 002, 8.5-digit multimeter, Empro 1000-1000 shunt

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Current – Generate ³			
Up to 220 μ A	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.3 μ A/A + 20 nA 0.2 μ A/A + 12 nA 0.14 μ A/A + 10 nA 0.35 μ A/A + 15 nA 1.3 μ A/A + 80 nA	Fluke 5720A multiproduct calibrator
220 μ A 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	0.25 mA/A + 40 nA 0.16 mA/A + 35 nA 0.12 mA/A + 35 nA 0.2 mA/A + 0.11 μ A 1.1 mA/A + 0.65 μ A	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Current – Generate ³ (cont)			
(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	0.25 mA/A + 0.4 µA 0.16 mA/A + 0.35 µA 0.12 mA/A + 0.35 µA 0.2 mA/A + 0.55 µA 1.1 mA/A + 5 µA	Fluke 5720A multiproduct calibrator
(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	0.25 mA/A + 4 µA 0.16 mA/A + 3.5 µA 0.12 mA/A + 2.5 µA 0.28 mA/A + 3.5 µA 1.1 mA/A + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.26 mA/A + 35 µA 0.45 mA/A + 80 µA 7 mA/A + 0.16 mA	
AC Current – 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	0.25 mA/A + 16 nA 0.16 mA/A + 10 nA 0.1 mA/A + 8 nA 0.28 mA/A + 12 nA 0.1 mA/A + 65 nA	Fluke 5730A multiproduct calibrator
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	0.25 mA/A + 40 nA 0.16 mA/A + 35 nA 0.1 mA/A + 35 nA 0.2 mA/A + 0.11 µA 0.1 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	0.25 mA/A + 0.4 µA 0.16 mA/A + 0.35 µA 0.1 mA/A + 0.35 µA 0.2 mA/A + 0.55 µA 1.1 mA/A + 5 µA	
(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	0.25 mA/A + 4 µA 0.16 mA/A + 3.5 µA 0.1 mA/A + 2.5 µA 0.2 mA/A + 3.5 µA 0.1 mA/A + 10 µA	
220 mA to 2.2 A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.24 mA/A + 35 µA 0.45 mA/A + 80 µA 7 mA/A + 0.16 mA	

Parameter/Range	Frequency	CMC ^{2, 5} ($\pm$)	Comments
AC Current – Generate ³			
(29 to 330) μ A	(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	0.2 μ A/A + 0.15 μ A 0.15 μ A/A + 0.15 μ A 0.13 μ A/A + 0.15 μ A 0.3 μ A/A + 1.6 μ A 0.8 μ A/A + 1.7 μ A 1.6 μ A/A + 10 μ A	Fluke 5520A multiproduct calibrator
330 μ A 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	0.2 μ A/A + 0.2 μ A 0.13 μ A/A + 0.2 μ A 0.1 μ A/A + 0.2 μ A 0.2 μ A/A + 1.7 μ A 0.5 μ A/A + 1.8 μ A 1 μ A/A + 11 μ A	
(3.3 to 33) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	5.4 mA/A + 2 μ A 2.7 mA/A + 2 μ A 1.2 mA/A + 2 μ A 2.4 mA/A + 2 μ A 6 mA/A + 3 μ A 12 mA/A + 4 μ A	
(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	5.4 mA/A + 20 μ A 2.7 mA/A + 20 μ A 1.2 mA/A + 20 μ A 3 mA/A + 50 μ A 6 mA/A + 0.1 mA 12 mA/A + 0.2 mA	
330 mA to 3 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	5.4 mA/A + 0.1 mA 1.8 mA/A + 0.1 mA 18 mA/A + 1 mA 75 mA/A + 5 mA	
(3 to 11) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	1.8 mA/A + 2 mA 3 mA/A + 2 mA 90 mA/A + 2 mA	
(11 to 20.5) A	(45 to 100) Hz 100 Hz to 1 kHz (1 to 5) kHz	3.6 mA/A + 5 mA 4.5 mA/A + 5 mA 90 mA/A + 5 mA	

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
AC Clamp-On Meters – (Current Generate) ³ (20.5 to 30) A (30 to 100) A (100 to 500) A (500 to 1000) A	(50 to 400) Hz	1.2 % of reading 1.2 % of reading 1.2 % of reading 1.2 % of reading	Fluke 5520A, multiproduct calibrator, Fluke 9100- 200, current coil
AC Current – Measure (10 to 100) µA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	0.46 µA/A + 36 nA 0.17 µA/A + 36 nA 0.75 µA/A + 36 nA	Agilent/HP 3458A, Opt 002, 8.5-digit multimeter
100 µA to 1 mA	(10 to 20) Hz (20 to 45) Hz 45 Hz to 5 kHz	70 nA/A + 36 nA 0.17 µA/A + 36 nA 0.74 µA/A + 36 nA	
(1 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 mA/A + 0.24 µA 0.17 mA/A + 0.24 µA 70 µA/A + 0.24 µA 40 µA/A + 0.24 µA	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 mA/A + 0.2 mA 0.17 mA/A + 0.2 mA 70 µA/A + 0.2 mA 40 µA/A + 0.2 mA	

Parameter/Equipment	Range	CMC ^{2, 5} (±)	Comments
Resistance – Generate ³ (Simulated, Fixed Point)	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	5 µΩ/Ω + 40 µΩ 5 µΩ/Ω + 40 µΩ 23 µΩ/Ω + 40 µΩ 23 µΩ/Ω + 40 µΩ 10 µΩ/Ω + 40 µΩ 10 µΩ/Ω + 40 µΩ 8.5 µΩ/Ω + 40 µΩ 8.5 µΩ/Ω + 40 µΩ 6.5 µΩ/Ω + 40 µΩ 7.5 µΩ/Ω + 40 µΩ 11 µΩ/Ω + 40 µΩ 11 µΩ/Ω + 40 µΩ 20 µΩ/Ω + 40 µΩ 21 µΩ/Ω + 40 µΩ 40 µΩ/Ω + 40 µΩ 47 µΩ/Ω + 40 µΩ 0.1 mΩ/Ω + 40 µΩ	Fluke 5720A multiproduct calibrator

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Resistance – Generate (Simulated, Fixed Point)	1 Ω 1.9 Ω 10 Ω 19 Ω 100 Ω 190 Ω 1 k Ω 1.9 k Ω 10 k Ω 19 k Ω 100 k Ω 190 k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	95 $\mu\Omega/\Omega + 40 \mu\Omega$ 95 $\mu\Omega/\Omega + 40 \mu\Omega$ 23 $\mu\Omega/\Omega + 40 \mu\Omega$ 23 $\mu\Omega/\Omega + 40 \mu\Omega$ 10 $\mu\Omega/\Omega + 40 \mu\Omega$ 10 $\mu\Omega/\Omega + 40 \mu\Omega$ 6.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 6.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 6.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 6.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 8.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 8.5 $\mu\Omega/\Omega + 40 \mu\Omega$ 13 $\mu\Omega/\Omega + 40 \mu\Omega$ 18 $\mu\Omega/\Omega + 40 \mu\Omega$ 40 $\mu\Omega/\Omega + 40 \mu\Omega$ 47 $\mu\Omega/\Omega + 40 \mu\Omega$ 100 $\mu\Omega/\Omega + 40 \mu\Omega$	Fluke 5730A multiproduct calibrator
Resistance – Generate ³ (Simulation)	Up to 11 Ω (11 to 33) Ω (33 to 110) Ω 110 Ω to 1.1 k Ω (1.1 to 11) k Ω (11 to 110) k Ω 110 k Ω to 1.1 M Ω (1.1 to 3.3) M Ω (3.3 to 11) M Ω (11 to 33) M Ω (33 to 110) M Ω (110 to 330) M Ω 330 M Ω to 1.1 G Ω	40 $\mu\Omega/\Omega + 1.4 \text{ m}\Omega$ 84 $\mu\Omega/\Omega + 1.5 \text{ m}\Omega$ 84 $\mu\Omega/\Omega + 1.4 \text{ m}\Omega$ 84 $\mu\Omega/\Omega + 2 \text{ m}\Omega$ 84 $\mu\Omega/\Omega + 2 \text{ m}\Omega$ 87 $\mu\Omega/\Omega + 0.2 \Omega$ 0.11 $\text{m}\Omega/\Omega + 2 \Omega$ 0.18 $\text{m}\Omega/\Omega + 30 \Omega$ 0.39 $\text{m}\Omega/\Omega + 50 \Omega$ 0.76 $\text{m}\Omega/\Omega + 2.5 \text{ k}\Omega$ 1.5 $\text{m}\Omega/\Omega + 3 \text{ k}\Omega$ 9 $\text{m}\Omega/\Omega + 0.1 \text{ M}\Omega$ 45 $\text{m}\Omega/\Omega + 0.5 \text{ M}\Omega$	Fluke 5520A multiproduct calibrator
Resistance – Measure	Up to 10 Ω (10 to 100) Ω 100 Ω to 10 k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	30 $\mu\Omega/\Omega + 50 \mu\Omega$ 18 $\mu\Omega/\Omega + 0.5 \text{ m}\Omega$ 15 $\mu\Omega/\Omega + 5 \text{ m}\Omega$ 20 $\mu\Omega/\Omega + 50 \text{ m}\Omega$ 32 $\mu\Omega/\Omega + 2 \Omega$ 73 $\mu\Omega/\Omega + 0.1 \text{ k}\Omega$ 0.59 $\text{m}\Omega/\Omega + 1 \text{ k}\Omega$ 5.8 $\text{m}\Omega/\Omega + 10 \text{ k}\Omega$	Agilent/HP 3458A, Opt 002, 8.5-digit multimeter

Parameter/Equipment	Range	CMC ^{2, 5} ($\pm$)	Comments
Resistance – Measure ³	Up to 10 Ω (10 to 100) Ω 100 Ω to 10 k Ω (10 to 100) k Ω 100 k Ω to 1 M Ω (1 to 10) M Ω (10 to 100) M Ω 100 M Ω to 1 G Ω	87 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 51 $\mu\Omega/\Omega$ + 0.5 m Ω 45 $\mu\Omega/\Omega$ + 5 m Ω 55 $\mu\Omega/\Omega$ + 50 m Ω 87 $\mu\Omega/\Omega$ + 2 Ω 0.21 m Ω/Ω + 0.1 k Ω 1.8 m Ω/Ω + 1 k Ω 15 m Ω/Ω + 10 k Ω	Agilent/HP 3458A, Opt 002, 8.5-digit multimeter
Electrical Simulation of RTD Indicating Devices – Generate ³			
Pt 385, 100 Ω	(-200 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 630) $^{\circ}\text{C}$ (630 to 800) $^{\circ}\text{C}$	0.06 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.11 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.15 $^{\circ}\text{C}$ 0.27 $^{\circ}\text{C}$	Fluke 5520A multiproduct calibrator
Pt 385, 200 Ω	(-200 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$ (260 to 300) $^{\circ}\text{C}$ (300 to 400) $^{\circ}\text{C}$ (400 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.06 $^{\circ}\text{C}$ 0.15 $^{\circ}\text{C}$ 0.16 $^{\circ}\text{C}$ 0.18 $^{\circ}\text{C}$ 0.2 $^{\circ}\text{C}$ 0.2 $^{\circ}\text{C}$	
Pt 385, 500 Ω	(-200 to -80) $^{\circ}\text{C}$ (-80 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$ (260 to 400) $^{\circ}\text{C}$ (400 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.05 $^{\circ}\text{C}$ 0.06 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.1 $^{\circ}\text{C}$ 0.12 $^{\circ}\text{C}$ 0.14 $^{\circ}\text{C}$	
Pt 385, 1000 Ω	(-200 to 0) $^{\circ}\text{C}$ (0 to 100) $^{\circ}\text{C}$ (100 to 260) $^{\circ}\text{C}$ (260 to 300) $^{\circ}\text{C}$ (300 to 600) $^{\circ}\text{C}$ (600 to 630) $^{\circ}\text{C}$	0.04 $^{\circ}\text{C}$ 0.05 $^{\circ}\text{C}$ 0.07 $^{\circ}\text{C}$ 0.08 $^{\circ}\text{C}$ 0.1 $^{\circ}\text{C}$ 0.3 $^{\circ}\text{C}$	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicating Devices – Generate 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	0.29 °C 0.05 °C 0.06 °C 0.07 °C 0.09 °C 0.1 °C 0.13 °C 0.11 °C 0.27 °C	Fluke 5520A multiproduct calibrator
Pt 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.08 °C 0.08 °C 0.11 °C 0.12 °C 0.15 °C	
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.09 °C 0.46 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.36 °C	
Electrical Simulation of Thermocouple Indicating Devices – Generate/Measure ³			
Type B	(600 to 800) °C (800 to 1000) °C (1000 to 1550) °C (1550 to 1820) °C	0.51 °C 0.56 °C 0.49 °C 0.54 °C	Fluke 5520A multiproduct calibrator
Type C	(0 to 150) °C (150 to 650) °C (650 to 1000) °C (1000 to 1800) °C (1800 to 2316) °C	0.49 °C 0.42 °C 0.51 °C 0.82 °C 1.4 °C	
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.82 °C 0.26 °C 0.23 °C 0.26 °C 0.34 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of Thermocouple Indicating Devices – Generate/Measure ³			
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.44 °C 0.26 °C 0.23 °C 0.28 °C 0.38 °C	Fluke 5520A multiproduct calibrator
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.38 °C 0.29 °C 0.26 °C 0.42 °C 0.65 °C	
Type L	(-200 to -100) °C (-100 to 800) °C (800 to 900) °C	0.6 °C 0.42 °C 0.28 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.65 °C 0.36 °C 0.31 °C 0.29 °C 0.44 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.93 °C 0.57 °C 0.54 °C 0.65 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.77 °C 0.59 °C 0.60 °C 0.75 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	1.1 °C 0.42 °C 0.26 °C 0.23 °C	
Type U	(-200 to 0) °C (0 to 600) °C	0.91 °C 0.44 °C	

Parameter/Equipment	Range	CMC ^{2, 8} ($\pm$)	Comments
Oscilloscopes ³ Leveled Sine Wave/Bandwidth Into 50 Ω	5 mVp-p to 5 Vp-p 50 kHz 50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz 5 mVp-p to 3.5 Vp-p (600 to 1100) MHz	2.3 % of reading + 0.3 mV 4.1 % of reading + 0.3 mV 4.7 % of reading + 0.3 mV 7 % of reading + 0.3 mV 8.1 % of reading + 0.3 mV	Fluke 5520A/11 multiproduct calibrator
Oscilloscopes ³ Leveled Sine Wave/Bandwidth Into 50 Ω Load	(1.1 to 12.4) GHz (12.4 to 18) GHz (18 to 26.5) GHz (26.5 to 40) GHz	4.5 % of reading + M 4.7 % of reading + M 5.5 % of reading + M 6.2 % of reading + M	Compared to HP E4418B, power meter, HP 8485A power sensor
Oscilloscopes ³ Leveled Sine Wave/Bandwidth Into 50 Ω Load	(40 to 50) GHz	8.1 % of reading + M	Compared to HP E4418B power meter, HP 8487A power sensor
RF Power Meter Reference	1 mW, 50 MHz	1.1 % of reading	HP 432A power meter, HP 8478B power sensor, HP 3458A, 8.5-digit multimeter

III. Electrical RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 5} (±)	Comments
RF Power – Measure ³ (-60 to -50) dBm (-50 to -40) dBm (-40 to -30) dBm (-30 to -10) dBm (-10 to 20) dBm (-20 to -10) dBm (-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm	9 kHz to 6 GHz 10 MHz to 18 GHz	7.4 dB 4.2 dB 0.52 dB 0.34 dB 0.31 dB 0.55 dB 0.16 dB 0.31 dB 0.31 dB	EPM power meter, Keysight E9304A RF power sensor EPM power meter, Keysight 8481A power sensor
RF Power – Measure ³ (-70 to -60) dBm (-60 to -50) dBm (-50 to -40) dBm (-40 to -30) dBm (-30 to -20) dBm (-30 to -20) dBm (-20 to 0) dBm (0 to 20) dBm (-70 to -60) dBm (-60 to -50) dBm (-50 to -40) dBm (-40 to -30) dBm (-30 to -20) dBm (-30 to -20) dBm (-20 to -10) dBm (-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm (-70 to -60) dBm (-60 to -50) dBm (-50 to -40) dBm (-40 to -30) dBm (-30 to -20) dBm	10 MHz to 18 GHz (18 to 26.5) GHz (18 to 26.5) GHz (26.5 to 50) GHz (26.5 to 50) GHz	5.4 dB 2.2 dB 0.27 dB 0.16 dB 0.18 dB 6.1 dB 0.58 dB 0.35 dB 2.2 dB 0.41 dB 0.22 dB 0.28 dB 0.28 dB 4.1 dB 0.54 dB 0.36 dB 0.36 dB 0.37 dB 5.9 dB 2.7 dB 0.77 dB 0.71 dB 0.71 dB	EPM power meter, Keysight 8481D power sensor EPM power meter, Keysight 8485A power sensor EPM power meter, Keysight 8485D power sensor EPM power meter, Keysight N8487A power sensor EPM power meter, Keysight N8487D power sensor

IV. Fluid

Parameter/Range	Range	CMC ² ($\pm$)	Comments
Volumetric Flow	(0.1 to 100) slm	1.5 % of reading	DHI flow system

V. Mechanical

Parameter/Range	Range	CMC ^{2, 10} (±)	Comments
Balances & Scales ³	Up to 1) mg (> 1 to < 100) mg (> 100 to < 500) mg (> 0.50 to < 1) g (> 1 to < 2) g (> 2 to < 30) g (> 30 to < 50) g (> 50 to < 200) g (> 200 to < 1000) g (> 1 to < 2) kg (> 2 to < 4) kg 10 kg 20 kg Up to 1000 lb	10 µg 10 µg 27 µg 35 µg 35 µg 0.12 mg 0.12 mg 0.51 mg 2.5 mg 5.1 mg 10 mg 0.1 g 0.3 g 0.02 lb	ASTM E617 Class 1, Class 3, & Class 4 weights & manufacturer's procedure utilized in the calibration of the weighing system. NIST Class F weights & manufacturer's procedure utilized in the calibration of the weighing system.
Pneumatic Pressure Gages	Up to 300 psi Up to 500 psi Up to 1000 psi Up to 2000 psi Up to 3000 psi	0.61 psi 0.06 psi 0.37 psi 0.71 psi 3.1 psi	Comparison to Crystal pressure gage GE/Druck CM2-B-14G, pressure controller, Additel pressure gages
Hydraulic Pressure Gages	Up to 10 000 psi	3.1 psi	Comparison to Additel pressure gages
Differential Pressure Gages	(-10 to 10) inH ₂ O	0.005 inH ₂ O	Additel automated pressure calibrator

Parameter/Range	Range	CMC ² (±)	Comments
Vacuum Gages	(-14 to 0) psi	0.003 psi	Druck pressure calibrator
Barometric Pressure Devices	(800 to 1030) mbar	0.12 mbar	Druck pressure calibrator
Force Gages (Tension & Compression)	(0.1 to 500) lbf	0.087 lbf	Morehouse HADI indicator, master load cell
Pipettes	(0.1 to 2) µL (2.1 to 5) µL (5.1 to 10) µL (10.1 to 20) µL	29 nL 39 nL 58 nL 0.1 µL	Gravimetric method utilizing electronic balances & weights
Pipettes ³	(20 to 50) µL (50 to 100) µL (100 to 200) µL (200 to 500) µL (500 to 1000) µL (1 to 2.5) mL (2.5 to 5) mL (5 to 10) mL	0.83 µL 0.96 µL 1.2 µL 1.9 µL 3.1 µL 6.9 µL 13 µL 39 µL	Gravimetric method utilizing electronic balances & weights
Torque Devices	(0.5 to 215) ozf-in 10 lbf-in to 100 lbf-ft (100 to 1000) lbf-ft	1.5 % of reading 1.5 % of reading 1.5 % of reading	Torque testers, torque transducers

VI. Thermodynamics

Parameter/Range	Range	CMC ^{2, 6} ($\pm$)	Comments
Temperature Measuring Equipment/Measure	(-95 to -40) °C (-40 to 0) °C (0 to 150) °C (150 to 420) °C (420 to 660) °C	0.04 °C 0.04 °C 0.56 °C 0.57 °C 0.12 °C	Hart 1502 indicator, Hart 5628 PRT, Fluke 9190A well, Hart 9173 dry-block
Temperature Measuring Equipment/Measure ³	(-200 to 400) °C	0.1 °C	Hart 1521 thermometer, Hart 5627-9 PRT, Hart 5623-6 PRT
IR Thermometers	(50 to 100) °C (100 to 200) °C (200 to 300) °C (300 to 400) °C (400 to 500) °C	1.6 % of reading + 2.8 °C 1.6 % of reading + 5.5 °C 1.6 % of reading + 8.3 °C 1.6 % of reading + 11 °C 1.6 % of reading + 14 °C	Hart 9132 Blackbody source (flat plate), Hart 1502A indicator, Hart 5628B PRT $\epsilon = 0.95$, $\lambda = (8 \text{ to } 14) \mu\text{m}$
Relative Humidity – Measuring Equipment	(10 to 20) % RH (20 to 40) % RH (40 to 70) % RH (70 to 80) % RH (80 to 95) % RH	0.63 % RH 0.65 % RH 0.67 % RH 0.67 % RH 1.1 % RH	Thunder Scientific 2500 two-pressure humidity generator
Relative Humidity – Measure ³	(10 to 95) %RH	1.5 % RH	Rotronic HP23-A HygroPalm/HC2-HK25 temperature/humidity indicator

VII. Time & Frequency

Parameter/Range	Range	CMC ^{2, 6} ($\pm$)	Comments
Frequency – Measuring Equipment ³	10 mHz to 2 MHz	0.000 25 % of reading + 5 μHz	Fluke 5520A multiproduct calibrator

Parameter/Range	Range	CMC ² ($\pm$)	Comments
Frequency Oscillator Characterization	10 MHz	3 pHz/Hz	Stanford Research FS740 GPS time & frequency system
Digital Stopwatches/Timers ³	Up to 19.99 s/d	85 ms/d	Helmut-Klein 4500 timometer per NIST SP 960-12

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. 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 In the statement of CMC, L is the numerical value of the nominal length of the device measured in inches; R is the numerical value of the resolution of the device.

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. CMCs 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 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.

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

⁸ In the statement of CMC, M is the mismatch uncertainty. The power meter and power sensor do not include mismatch uncertainty, 0 dBm referenced at 1 mW.

⁹ The scope uncertainty presented here does not include resolution. It is included in the measurement uncertainty at the time of calibration at a value of $0.6R$.

¹⁰ The CMC for scales and balances is highly dependent on the resolution of the unit under test. The CMC presented here does not include the resolution of the unit under test. The resolution of the unit will be included in the reported measurement uncertainty at the time of calibration.



Accredited Laboratory

A2LA has accredited

TRESCAL, INC.

San Jose, CA

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 the requirements of ANSI/NCSL 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 15th day of January 2025.

A blue ink signature of Mr. Trace McInturff.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 7463.01
Valid to February 28, 2025
Revised January 31, 2025

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