



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

WESCAN CALIBRATION
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CALIBRATION

Valid To: January 31, 2027

Certificate Number: 1500.02

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^{1,9}:

I. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Angle Blocks	Up to 30°	3.1"	Gauge blocks, sine bar, gauging head & amplifier
Length Standards	(1 to 40) in	(13 + 4.0L) μin	Gauge blocks, gauging head & amplifier
Diameter –			
External	Up to 10 in	(3.8 + 4.3D) μin	Supermicrometer ^{TM6} & gauge blocks
	(10 to 24) in	(13 + 4.0D) μin	Gauge blocks, gauging head & amplifier
Internal	Up to 24 in	(13 + 3.4D) μin	Linear height gage

Parameter/Equipment	Range	CMC ^{2, 4} (±)	Comments
Flatness	Up to 3 in	4.1 μin	Optical flat
Surface Plates ³			
Overall Flatness	12 in × 18 in to 12 ft × 12 ft	35 μin	Electronic leveling system
Repeatability	12 in × 18 in to 12 ft × 12 ft	26 μin	Repeat meter
Height Gauges ^{3, 5}	Up to 24 in (24 to 40) in	(1.0 + 3.7L) μin (13 + 3.5L) μin	Gauge blocks
Calipers ^{3, 5}	Up to 40 in	(5.6 + 4.1L) μin	Gauge blocks
Micrometers ^{3, 5}			
OD	Up to 60 in	(8.2 + 3.8L) μin	Gauge blocks
ID	Up to 24 in	(5.5 + 4.0L) μin	
Depth	Up to 12 in	(2.9 + 3.4L) μin	
Indicators ^{3, 5}	Up to 3 in	(7.0 + 2.8L) μin	Gauge blocks
Indicator Calibrators ⁵	Up to 2 in	12 μin	Gauge blocks
Gauge Head/Amplifier	(0.0001 to 0.2) in	5.4 μin	Gauge blocks
ID Instruments ^{3, 5} – Bore Gages, ID Micrometers, & Similar ³	Up to 24 in	(5.5 + 4.0L) μin	Gauge blocks, rings, gauging head/amplifier
Thickness Gauges ⁵	(0.001 to 0.6) in (> 0.6 to 1) in	4.7 μin 11 μin	Shims & gauge blocks

Parameter/Equipment	Range	CMC ^{2, 4} (\pm)	Comments
Rules/Tapes ⁵	Up to 30 in increments	0.0018 in	Ruler/tape calibrator
Sine Bars – Parallelism Angle (5 in Bar) Angle (10 in Bar)	5 in 10 in (0 to 45)° (0 to 45)°	37 μ in 39 μ in 5.5" 3.0"	Gauging head & amplifier Gauge blocks, Supermicrometer ^{TM6} , gauging head & amplifier
Squares	Up to 18 in	11 μ in/in	Master square, gauge blocks
Precision Levels ⁵	Up to 12 in	15 μ in/in	Sine bar, gauge blocks, surface plate
Protractors ⁵	At 0° & 90° (> 0 to < 90)°	0.000 56° 0.014°	Master square Sine bar, gauge blocks, master square
Thread Plugs – Major & Pitch Diameter	(0.07 to 10) in	98 μ in	Thread wires & Supermicrometer ^{TM6}
Linear Dimension – X-Axis Y-Axis Angle	8 in 4 in Up to 360°	0.000 075 in 0.000 075 in 0.017°	Optical comparator

II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2, 11} (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV (0.2 to 2.2) V (2 to 11) V (11 to 22) V (22 to 220) V (200 to 1100) V	0.000 96 % + 0.0011 mV 0.000 92 % + 0.0015 mV 0.000 91 % + 0.000 005 6 V 0.000 92 % + 0.000 010 V 0.0010 % + 0.000 12 V 0.0013 % + 0.000 82 V	Fluke 5700A
	0 to 329.9999) mV (0.33 to 3.299 999) V (3.3 to 32.999 99) V (33 to 329.9999) V (330 to 1000) V	16 μV/V + 0.78 μV 8.6 μV/V + 1.6 μV 9.4 μV/V + 16 μV 14 μV/V + 120 μV 14 μV/V + 1200 μV	552X series calibrator
DC Voltage – Measure – Generate (Monitor)	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1000) V	5.7 μV/V + 0.34 μV 4.5 μV/V + 0.35 μV 4.5 μV/V + 0.57 μV 6.8 μV/V + 0.035 mV (20 + (12·V / 1000) ²) μV/V + 0.19 mV	HP 3458A opt 002 V is the voltage in V
	(1 to 10) kV	0.035 % + 0.15 V	Vitretek 4700
	(1 to 35) kV	0.030 % + 0.14 V	Vitretek 4700 & HVL-35
	(10 to 140) kV	0.091 % + 0.8 V	Vitretek 4700 & HVL-150
DC Current ³ – Measure – Generate (Monitor)	(0 to 120) nA 100 nA to 1.2 μA (1 to 12) μA (10 to 120) μA 100 μA to 1.2 mA (1 to 12) mA (10 to 120) mA 100 mA to 1.05 A	34 μA/A + 45 pA 23 μA/A + 45 pA 23 μA/A + 0.11 nA 23 μA/A + 0.91 nA 23 μA/A + 5.7 pA 23 μA/A + 57 pA 40 μA/A + 0.57 μA 120 μA/A + 11 μA	HP 3458A opt 002
	(1 to 3) A (3 to 10) A (10 to 20) A	0.016 % + 48 μA 0.017 % + 18 μA 0.022 % - 10 μA	Fluke Y5020 & HP 3458A opt 002

Parameter/Equipment	Range	CMC ^{2, 8, 11} (\pm)	Comments
DC Current ³ – Generate	(0 to 329.999) μ A (0.330 to 3.299 99) mA (3.3 to 32.9999) mA (33 to 329.999) mA (0.33 to 1.099 99) A (1.1 to 2.999 99) A (3 to 10.9999) A (11 to 20.5) A	0.012 % + 0.016 μ A 78 μ A/A + 0.039 μ A 78 μ A/A + 0.20 μ A 78 μ A/A + 2.0 μ A 0.016 % + 32 μ A 0.03 % + 32 μ A 0.039 % + 390 μ A 0.078 % + 580 μ A	552X series calibrator
Clamp-On Meters	(20 to 149.999) A (150 to 549.999) A (550 to 1025) A	0.58 % + 0.17 A 0.58 % + 0.58 A 0.59 % + 0.58 A	552X series w/ 5500A/coil
DC Current – Generate	(0 to 220) μ A (0.2 to 2.2) mA (2 to 22) mA (22 to 22) mA (0.2 to 2.2) A (2 to 11) A (11 to 20) A	0.0069 % + 0.012 μ A 0.0069 % + 0.000 013 mA 0.0069 % + 0.0012 mA 0.0079 % + 0.0015 mA 0.010 % + 0.000 056 A 0.018 % + 0.0029 A 0.038 % + 0.000 62 A	Fluke 5700A 5700A with Fluke 5220A
Resistance ³ – Measure – Generate (Monitor)	(1 to 11) m Ω 11 m Ω to 10 Ω (10 to 100) Ω 100 Ω to 1 k Ω (1 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	0.052 % 18 $\mu\Omega/\Omega$ + 58 $\mu\Omega$ 15 $\mu\Omega/\Omega$ + 0.58 m Ω 13 $\mu\Omega/\Omega$ + 0.57 m Ω 13 $\mu\Omega/\Omega$ + 5.7 m Ω 13 $\mu\Omega/\Omega$ + 56 m Ω 18 $\mu\Omega/\Omega$ + 2.3 Ω 58 $\mu\Omega/\Omega$ + 120 Ω 0.058 % + 1200 Ω 0.58 % + 12 k Ω	Leeds & Northrup 4300 w/HP 3458A opt 002 HP 3458A opt 002
AC Resistance ¹² Measure – Generate (Monitor) 12 Hz to 100 kHz	0.1 Ω 1 Ω 6.25 Ω to 410 k Ω 1 M Ω 10 M Ω 100 M Ω	0.72 % 0.083 % 0.024 % 0.04 % 0.29 % 2.8 %	Genrad 1689 CMC is stated at 1 kHz

Parameter/Equipment	Range	CMC ^{2, 11} (\pm)	Comments
Resistance ³ – Generate Fixed Points	0 Ω 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	0.11 m Ω 0.14 m Ω 0.25 m Ω 0.40 m Ω 0.71 m Ω 2.4 m Ω 4.5 m Ω 34 m Ω 34 m Ω 0.17 Ω 0.32 Ω 1.9 Ω 2.0 Ω 28 Ω 56 Ω 0.57 k Ω 1.4 k Ω 17 k Ω	Fluke 5700A
Resistance ³ – Generate	(0 to 10.9999) Ω (11 to 32.9999) Ω (33 to 109.9999) Ω (110 to 329.9999) Ω (330 to 1.099 999) k Ω (1.1 to 3.299 999) k Ω (3.3 to 10.999 99) k Ω (11 to 32.999 99) k Ω (33 to 109.9999) k Ω (110 to 329.9999) k Ω 330 k Ω to 1.099 999 M Ω (1.1 to 3.299 999) M Ω (3.3 to 10.999 99) M Ω (11 to 32.999 99) M Ω (33 to 109.9999) M Ω (110 to 329.9999) M Ω (330 to 1100) M Ω	32 $\mu\Omega/\Omega$ + 0.78 m Ω 24 $\mu\Omega/\Omega$ + 1.2 m Ω 22 $\mu\Omega/\Omega$ + 1.1 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 1.6 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 16 m Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 22 $\mu\Omega/\Omega$ + 0.16 Ω 25 $\mu\Omega/\Omega$ + 1.6 Ω 25 $\mu\Omega/\Omega$ + 1.6 Ω 47 $\mu\Omega/\Omega$ + 24 Ω 0.011 % + 36 Ω 0.02 % + 2.0 k Ω 0.039 % + 2.4 k Ω 0.24 % + 78 k Ω 1.2 % + 390 k Ω	552X series calibrator

Parameter/Range	Frequency	CMC ^{2, 11} (±)	Comments
Capacitance ³ – Generate			552X series calibrator
(0.22 to 0.399 99) nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF	
(0.4 to 1.0999) nF	10 Hz to 10 kHz	0.39 % + 0.0078 nF	
(1.1 to 3.2999) nF	10 Hz to 3 kHz	0.39 % + 0.0078 nF	
(3.3 to 10.999) nF	10 Hz to 1 kHz	0.20 % + 0.0078 nF	
(11 to 32.9999) nF	10 Hz to 1 kHz	0.20 % + 0.078 nF	
(33 to 109.999) nF	10 Hz to 1 kHz	0.20 % + 0.078 nF	
(110 to 329.999) nF	10 Hz to 1 kHz	0.20 % + 0.24 nF	
(0.33 to 1.099 99) μF	(10 to 600) Hz	0.20 % + 0.78 nF	
(1.1 to 3.299 99) μF	(10 to 300) Hz	0.20 % + 2.4 nF	
(3.3 to 10.9999) μF	(10 to 150) Hz	0.20 % + 7.8 nF	
(11 to 32.9999) μF	(10 to 120) Hz	0.32 % + 24 nF	
(33 to 109.999) μF	(10 to 80) Hz	0.35 % + 78 nF	
(110 to 329.999) μF	(0 to 50) Hz	0.35 % + 240 nF	
(0.33 to 1.099 99) mF	(0 to 20) Hz	0.35 % + 0.78 μF	
(1.1 to 3.2999) mF	(0 to 6) Hz	0.35 % + 2.4 μF	
(3.3 to 10.9999) mF	(0 to 2) Hz	0.35 % + 7.8 μF	
(11 to 32.9999) mF	(0 to 0.6) Hz	0.59 % + 24 μF	
(33 to 110) mF	(0 to 0.2) Hz	0.86 % + 78 μF	

Parameter/Equipment	Range	CMC ^{2, 8 11} (±)	Comments
Capacitance ¹² – Measure – Generate (Monitor) 12 Hz to 100 kHz	1 pF 10 pF 100 pF 400 pF to 25 μF 100 μF 1000 μF	4.6 % 0.47 % 0.057 % 0.024 % 0.057 % 0.47 %	Genrad 1689 CMC is stated at 1 kHz
Capacitance – Generate, Cardinal Points Only	Nominal 1 pF 10 pF 100 pF 1000 pF 1 nF 10 nF 100 nF 1000 nF	0.14 % of charted value 0.12 % of charted value 0.12 % of charted value 0.12 % of charted value 0.058 % of charted value 0.058 % of charted value 0.058 % of charted value 0.058 % of charted value	HP 16380A & GR 1409 series standard capacitors
Inductance ¹² – Measure – Generate (Monitor) 100 Hz to 10 kHz	100 μH 1 mH to 10 H	0.13 % 0.024 %	Genrad 1689 CMC is stated at 1 kHz

Parameter/Equipment	Range	CMC ^{2, 8, 11} (±)	Comments
DC Power ³ – Generate 33 mV to 1020 V (@) (0.33 to 330) mA (0.33 to 3) A (3 to 20.5) A	(0.000 011 to 336.6) W (0.011 to 3060) W (0.99 to 20 910) W	0.022 % + 48 μW 0.020 % + 0.18 mW 0.063 % - 0.24 mW	Fluke 552X series calibrator

Parameter/Range	Frequency	CMC ^{2, 11} (±)	Comments
AC Power ³ – Generate (33 to 330) mV @ (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A 330 mV to 1020 V @ (3.3 to 9) mA (9 to 33) mA (33 to 90) mA (90 to 330) mA (330 to 900) mA (0.9 to 2.2) A (2.2 to 4.5) A (4.5 to 20.5) A	(45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz (45 to 65) Hz	0.27 % - 0.024 μW 0.11 % + 0.18 μW 0.13 % + 0.028 μW 0.091 % + 0.032 μW 0.12 % - 0.42 μW 0.10 % + 2.3 μW 0.12 % - 1.2 μW 0.10 % + 7.0 μW 0.11 % + 0.29 μW 0.10 % - 0.27 mW 0.11 % - 0.035 μW 0.073 % - 0.65 mW 0.11 % - 0.59 mW 0.084 % - 0.18 mW 0.11 % + 21 mW 0.091 % + 1.1 mW	Fluke 552X series calibrator

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Simulation of RTD Indicators & Indicating Systems ³ – Pt 385, 100 Ω	(-200 to -80) °C (-80 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C (630 to 800) °C	0.039 °C 0.039 °C 0.055 °C 0.07 °C 0.078 °C 0.094 °C 0.18 °C	552X series calibrator
Electrical Simulation of Thermocouples & Thermocouple Indicating Devices 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	552X series calibrator
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.39 °C 0.13 °C 0.11 °C 0.13 °C 0.17 °C	
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.21 °C 0.13 °C 0.11 °C 0.14 °C 0.18 °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 0.14 °C 0.13 °C 0.21 °C 0.32 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.32 °C 0.18 °C 0.15 °C 0.14 °C 0.21 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments	
Electrical Simulation of Thermocouples & Thermocouple Indicating Devices ³ – (cont)				
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 0.32 °C	552X series calibrator	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (140 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 0.13 °C 0.11 °C		
Thermistors	(-80 to -40) °C (-40 to 100) °C (100 to 150) °C	0.084 °C 0.0063 °C 0.0095 °C		Decade resistance boxes w/HP 3458A opt 002

Parameter/Range	Frequency	CMC ^{2,11} (±)	Comments
AC Voltage ³ – Generate			
(0.3 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	0.020 % + 0.0080 mV 0.0055 % + 0.0075 mV 0.0014 % + 0.0075 mV 0.0094 % + 0.0085 mV 0.045 % + 0.013 mV 0.038 % + 0.024 mV 0.050 % + 0.044 mV 0.15 % + 0.046 mV	Fluke 5700A
(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	0.053 % + 0.011 mV 0.016 % + 0.011 mV 0.0067 % + 0.0095 mV 0.033 % + 0.011 mV 0.090 % + 0.014 mV 0.10 % + 0.031 mV 0.15 % + 0.052 mV 0.32 % + 0.062 mV	

Parameter/Range	Frequency	CMC ^{2, 11} (±)	Comments
AC Voltage ³ – Generate (cont)			
(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	0.060 % + 0.011 mV 0.024 % + 0.011 mV 0.011 % + 0.011 mV 0.039 % + 0.011 mV 0.098 % + 0.014 mV 0.12 % + 0.031 mV 0.19 % + 0.052 mV 0.38 % + 0.062 mV	Fluke 5700A
(0.2 to 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	0.061 % + 0.000 32 V 0.018 % + 0.000 10 V 0.0089 % + 0.000 031 V 0.014 % + 0.000 070 V 0.030 % + 0.000 16 V 0.049 % + 0.000 34 V 0.13 % + 0.000 82 V 0.24 % + 0.0021 V	
(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	0.061 % + 0.0032 V 0.018 % + 0.0010 V 0.0087 % + 0.000 35 V 0.014 % + 0.000 73 V 0.029 % + 0.0013 V 0.062 % + 0.0038 V 0.15 % + 0.0096 V 0.29 % + 0.024 V	
(20 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.061 % + 0.032 V 0.018 % + 0.011 V 0.0091 % + 0.0040 V 0.026 % + 0.011 V 0.067 % + 0.018 V	
(200 to 1100) V	50 Hz to 1 kHz	0.0092 % + 0.021 V	

Parameter/Range	Frequency	CMC ^{2, 11} (\pm)	Comments
AC Voltage ³ – Generate (cont)			
(1 to 32.999) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.063 % + 4.7 μ V 0.012 % + 4.7 μ V 0.016 % + 4.7 μ V 0.078 % + 4.7 μ V 0.28 % + 9.4 μ V 0.63 % + 39 μ V	552X series calibrator
(33 to 329.999) mV	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.024 % + 6.3 μ V 0.012 % + 6.3 μ V 0.013 % + 6.3 μ V 0.028 % + 6.3 μ V 0.063 % + 25 μ V 0.16 % + 55 μ V	
330 mV to 3.299 99 V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 500) kHz	0.024 % + 39 μ V 0.012 % + 47 μ V 0.015 % + 47 μ V 0.024 % + 39 μ V 0.055 % + 97 μ V 0.19 % + 470 μ V	
(3.3 to 32.9999) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.024 % + 510 μ V 0.012 % + 470 μ V 0.019 % + 470 μ V 0.028 % + 470 μ V 0.07 % + 1300 μ V	
(33 to 329.999) V	45 Hz to 1 kHz (1 to 10) kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.015 % + 1600 μ V 0.016 % + 4700 μ V 0.02 % + 4700 μ V 0.024 % + 4700 μ V 0.16 % + 39 000 μ V	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 7800 μ V 0.02 % + 7800 μ V 0.024 % + 7800 μ V	

Parameter/Range	Frequency	CMC ^{2, 11} (±)	Comments
AC Current ³ – Generate			
(20 to 220 μA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.086 % + 0.36 μA 0.042 % + 0.045 μA 0.012 % + 0.044 μA 0.075 % + 1.2 μA 0.20 % + 4.6 μA	Fluke 5700A
(0.2 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	0.090 % + 0.000 12 mA 0.015 % + 0.000 094 mA 0.015 % + 0.000 13 mA 0.078 % + 0.0024 mA 0.20 % + 0.0047 mA	
(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	0.090 % + 0.0015 mA 0.047 % + 0.000 53 mA 0.015 % + 0.000 86 mA 0.078 % + 0.012 mA 0.20 % + 0.024 mA	
(20 to 220) mA	10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.089 % + 0.013 mA 0.046 % + 0.011 mA 0.015 % + 0.015 mA 0.078 % + 0.064 mA 0.20 % + 0.13 mA	
(0.2 to 2.2) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.083 % + 0.000 13 A 0.095 % + 0.000 20 A 1.1 % + 0.000 55 A	
(2 to 20) A	30 Hz to 1 kHz (1 to 5) kHz	0.053 % + 0.0022 A 0.42 % + 0.000 20 A	

Parameter/Range	Frequency	CMC ^{2, 5, 11} (±)	Comments
AC Current ³ – Generate			
(29 to 329.99) µA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 0.078 µA 0.12 % + 0.078 µA 0.097 % + 0.078 µA 0.24 % + 0.12 µA 0.63 % + 0.16 µA 1.3 % + 0.32 µA	552X series calibrator
(0.33 to 3.2999) mA	10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.16 % + 0.12 µA 0.097 % + 0.12 µA 0.078 % + 0.12 µA 0.16 % + 0.16 µA 0.39 % + 0.24 µA 0.78 % + 0.47 µA	
(3.3 to 32.999) mA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 1.6 µA 0.07 % + 1.6 µA 0.032 % + 1.6 µA 0.063 % + 1.6 µA 0.16 % + 2.4 µA 0.32 % + 3.2 µA	
(33 to 329.99) mA	(10 to 20) Hz (20 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz (10 to 30) kHz	0.14 % + 16 µA 0.070 % + 16 µA 0.032 % + 16 µA 0.078 % + 39 µA 0.16 % + 78 µA 0.32 % + 160 µA	
(0.33 to 1.099 99) A	(10 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.039 % + 78 µA 0.47 % + 780 µA 2.0 % + 3900 µA	
(1.1 to 2.999 99) A	(10 to 45) Hz 45 to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.14 % + 78 µA 0.047 % + 78 µA 0.47 % + 780 µA 2.0 % + 3900 µA	
(2 to 10.9999) A	45 to 100) Hz 100 to 1 kHz (1 to 5) kHz	0.047 % + 1600 µA 0.078 % + 1600 µA 2.4 % + 1600 µA	

Parameter/Range	Frequency	CMC ^{2, 5, 11} (±)	Comments
AC Current ³ – Generate (cont)			
(11 to 20) A	(45 to 100) Hz (100 to 1000) Hz (1 to 5) kHz	0.11 % + 4.4 mA 0.14 % + 4.4 mA 2.7 % + 4.5 mA	552X series calibrator
Clamp-On Meters:			
Toroidal Type:			
(20 to 54.999) A (55 to 149.999) A (150 to 1025) A	(45 to 65) Hz	0.31 % + 0.054 A 0.34 % + 0.042 A 0.34 % + 0.13 A	552X series w/ 5500A/coil
(20 to 54.999) A (55 to 149.999) A (150 to 400) A	(65 to 440) Hz	0.93 % + 0.054 A 0.94 % + 0.046 A 1.2 % + 0.22 A	
Non-Toroidal Type:			
(20 to 149.999) A (150 to 549.999) A (550 to 1025) A	(45 to 65) Hz	0.65 % + 0.30 A 0.66 % + 1.1 A 0.65 % + 1.1 A	
(20 to 149.999) A (150 to 400) A	(65 to 440) Hz	1.2 % + 0.30 A 1.4 % + 1.1 A	
AC Voltage ³ – Measure – Generate (Monitor)			
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	0.035 % + 3.5 μV 0.024 % + 1.3 μV 0.035 % + 1.3 μV 0.12 % + 1.3 μV 0.58 % + 1.3 μV 4.7 % + 2.4 μV	HP 3458A opt 002
(10 to 100) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.0081 % + 4.7 μV 0.0081 % + 2.4 μV 0.017 % + 2.4 μV 0.035 % + 2.4 μV 0.093 % + 2.4 μV 0.35 % + 12 μV 1.2 % + 12 μV 1.8 % + 12 μV	

Parameter/Range	Frequency	CMC ^{2, 11} (\pm)	Comments
AC Voltage ³ – Measure – Generate (Monitor) (cont)			
(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	0.0081 % + 47 μ V 0.0081 % + 24 μ V 0.017 % + 24 μ V 0.035 % + 24 μ V 0.093 % + 24 μ V 0.35 % + 120 μ V 1.2 % + 120 μ V 1.8 % + 120 μ V	HP 3458A opt 002
(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	0.0081 % + 0.47 mV 0.0081 % + 0.24 mV 0.017 % + 0.24 mV 0.035 % + 0.24 mV 0.093 % + 0.24 mV 0.35 % + 1.2 mV 1.2 % + 1.2 mV 1.8 % + 1.2 mV	
(10 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	0.024 % + 4.7 mV 0.024 % + 2.4 mV 0.024 % + 2.4 mV 0.041 % + 2.4 mV 0.14 % + 2.4 mV 0.47 % + 12 mV 1.8 % + 12 mV	
(100 to 750) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.047 % + 47 mV 0.047 % + 24 mV 0.07 % + 24 mV 0.14 % + 24 mV 0.35 % + 24 mV	HP 3458A opt 002
(1 to 10) kV	(30 to 200) Hz (200 to 450) Hz (450 to 600) Hz	0.14 % + 0.14 V 0.46 % + 0.16 V 0.87 % -0.47 V	Vitrek 4700
(1 to 35) kV	(30 to 200) Hz (200 to 450) Hz (450 to 600) Hz	0.064 % + 0.24 V 0.69 % + 0.28 V 1.5 % - 7.4 V	Vitrek 4700 & HVL-35
(35 to 100) kV	60 Hz	0.57 % + 1.1 V	Vitrek 4700 & HVL- 150

Parameter/Range	Frequency	CMC ^{2, 11} (\pm)	Comments
AC Current ³ – Measure – Generate (Monitor)			
(0 to 100) μ A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % + 23 nA 0.17 % + 23 nA 0.070 % + 23 nA 0.070 % + 23 nA	HP 3458A opt 002
100 μ A to 1 mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.17 % + 23 μ A 0.17 % + 0.23 μ A 0.070 % + 0.23 μ A 0.035 % + 0.23 μ A 0.068 % + 0.25 μ A 0.46 % + 0.46 μ A	
(1 to 10) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.46 % + 2.3 μ A 0.17 % + 2.3 μ A 0.070 % + 2.3 μ A 0.035 % + 2.3 μ A 0.070 % + 2.3 μ A 0.46 % + 4.6 μ A	
(10 to 100) mA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz (20 to 50) kHz	0.46 % + 23 μ A 0.17 % + 23 μ A 0.070 % + 23 μ A 0.035 % + 23 μ A 0.070 % + 23 μ A 0.46 % + 46 μ A	
100 mA to 1 A	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz (5 to 20) kHz	0.46 % + 0.23 mA 0.46 % + 0.23 mA 0.093 % + 0.23 mA 0.12 % + 0.23 mA 0.35 % + 0.23 mA	
(1 to 20) A	45 Hz to 1 kHz (1 to 5) kHz	0.031 % + 65 μ A 0.046 % + 0.21 mA	HP 3458A opt 002 w/Fluke Y5020 shunt
Distortion (THD) – Measure	20 Hz to 20 kHz (20 to 100) kHz	14 % of Indicated THD 30 % of Indicated THD	HP 8903A

Parameter/Equipment	Range	CMC ^{2, 8, 11} (\pm)	Comments
Oscilloscopes ³ –			
Amplitude – DC Signal: 50 Ω Load	1 mV to 6.6 V	0.20 % + 32 μ V	552X/SC1100
1 M Ω Load	1 mV to 130 V	0.039 % + 32 μ V	
Amplitude – Square Wave: 50 Ω Load	1 mV to 6.6 Vp-p 10 Hz to 100 kHz	0.20 % + 32 μ V	
1 M Ω Load	1 mV to 130 Vp-p 10 Hz to 100 kHz	0.078 % + 32 μ V	
Bandwidth Flatness	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1100) MHz	1.2 % + 78 μ V 1.6 % + 78 μ V 3.2 % + 78 μ V 3.9 % + 78 μ V	
Time Marker	50 ms to 5 s 2 ns to 20 ms	(20 + (t 1000)) μ s/s 1.9 μ s/s	t = time in seconds
Resistance – Measure	(40 to 60) Ω (0.5 to 1.5) M Ω	0.079 % 0.078 %	

III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC ^{2, 8, 11} (\pm)	Comments
Relative Power – Measure, Attenuation			HP 8902A w/ 11793A
(0 to -10) dBm	2.5 MHz to 26.5 GHz	0.026 dB	
(-10 to -20) dBm	2.5 MHz to 26.5 GHz	0.038 dB	
(-20 to -30) dBm	2.5 MHz to 26.5 GHz	0.046 dB	
(-30 to -40) dBm	2.5 MHz to 26.5 GHz	0.063 dB	
(-40 to -50) dBm	2.5 MHz to 26.5 GHz	0.082 dB	
(-50 to -60) dBm	2.5 MHz to 26.5 GHz	0.084 dB	
(-60 to -70) dBm	2.5 MHz to 26.5 GHz	0.10 dB	
(-70 to -80) dBm	2.5 MHz to 26.5 GHz	0.12 dB	
(-80 to -90) dBm	2.5 MHz to 26.5 GHz	0.13 dB	
(-90 to -100) dBm	2.5 MHz to 26.5 GHz	0.14 dB	
(-100 to -110) dBm	(2.5 to 1300) MHz	0.15 dB	
(-110 to -120) dBm	(2.5 to 1300) MHz	0.17 dB	

Parameter/Range	Frequency	CMC ^{2, 8, 11} (\pm)	Comments
Relative Power – Measure, Attenuation (cont)			
(0 to -10) dBm	100 kHz to 10 MHz	0.020 dB	Rohde & Schwarz FSMR-26
(-10 to -20) dBm	100 kHz to 10 MHz	0.024 dB	
(-20 to -30) dBm	100 kHz to 10 MHz	0.029 dB	
(-30 to -40) dBm	100 kHz to 10 MHz	0.041 dB	
(-40 to -50) dBm	100 kHz to 10 MHz	0.047 dB	
(-50 to -60) dBm	100 kHz to 10 MHz	0.052 dB	
(-60 to -70) dBm	100 kHz to 10 MHz	0.058 dB	
(-70 to -80) dBm	100 kHz to 10 MHz	0.064 dB	
(-80 to -90) dBm	100 kHz to 10 MHz	0.070 dB	
(-90 to -100) dBm	100 kHz to 10 MHz	0.076 dB	
(-100 to -110) dBm	100 kHz to 10 MHz	0.083 dB	
(-110 to -120) dBm	100 kHz to 10 MHz	0.090 dB	
(0 to -10) dBm	10 MHz to 22 GHz	0.018 dB	
(-10 to -20) dBm	10 MHz to 22 GHz	0.024 dB	
(-20 to -30) dBm	10 MHz to 22 GHz	0.029 dB	
(-30 to -40) dBm	10 MHz to 22 GHz	0.041 dB	
(-40 to -50) dBm	10 MHz to 22 GHz	0.047 dB	
(-50 to -60) dBm	10 MHz to 22 GHz	0.053 dB	
(-60 to -70) dBm	10 MHz to 22 GHz	0.058 dB	
(-70 to -80) dBm	10 MHz to 22 GHz	0.064 dB	
(-80 to -90) dBm	10 MHz to 22 GHz	0.070 dB	
(-90 to -100) dBm	10 MHz to 22 GHz	0.076 dB	
(-100 to -110) dBm	10 MHz to 22 GHz	0.084 dB	
(-110 to -120) dBm	10 MHz to 22 GHz	0.089 dB	
(-120 to -130) dBm	10 MHz to 22 GHz	0.12 dB	
(0 to -10) dBm	(22 to 26.5) GHz	0.065 dB	
(-10 to -20) dBm	(22 to 26.5) GHz	0.070 dB	
(-20 to -30) dBm	(22 to 26.5) GHz	0.081 dB	
(-30 to -40) dBm	(22 to 26.5) GHz	0.090 dB	
(-40 to -50) dBm	(22 to 26.5) GHz	0.12 dB	
(-50 to -60) dBm	(22 to 26.5) GHz	0.14 dB	
(-60 to -70) dBm	(22 to 26.5) GHz	0.13 dB	
(-70 to -80) dBm	(22 to 26.5) GHz	0.11 dB	
(-80 to -90) dBm	(22 to 26.5) GHz	0.11 dB	
(-90 to -100) dBm	(22 to 26.5) GHz	0.11 dB	
(-100 to -110) dBm	(22 to 26.5) GHz	0.11 dB	
(-110 to -120) dBm	(22 to 26.5) GHz	0.12 dB	
(-120 to -130) dBm	(22 to 26.5) GHz	0.13 dB	

Parameter/Range	Frequency	CMC ^{2, 8, 11} (\pm)	Comments
Absolute Power – Measure			
(20 to 30) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz	0.26 dB 0.28 dB 0.32 dB	HP 8902A, HP 11722A, HP 11792A
(10 to 20) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz	0.23 dB 0.25 dB 0.30 dB	
(0 to 10) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz	0.21 dB 0.23 dB 0.28 dB	
(-10 to 0) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz	0.34 dB 0.24 dB 0.30 dB	
(-20 to -10) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz	0.27 dB 0.29 dB 0.34 dB	
(-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm (20 to 24) dBm	DC to 4.2 GHz DC to 4.2 GHz DC to 4.2 GHz DC to 4.2 GHz	0.12 dB 0.11 dB 0.11 dB 0.11 dB	Rohde & Schwarz FSMR-26 & NRP-Z37 sensor
(-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm (20 to 24) dBm	(4.2 to 8) GHz (4.2 to 8) GHz (4.2 to 8) GHz (4.2 to 8) GHz	0.14 dB 0.12 dB 0.12 dB 0.12 dB	
(-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm (20 to 24) dBm	(12.4 to 18) GHz (12.4 to 18) GHz (12.4 to 18) GHz (12.4 to 18) GHz	0.20 dB 0.17 dB 0.17 dB 0.22 dB	
(-10 to 0) dBm (0 to 10) dBm (10 to 20) dBm (20 to 24) dBm	(18 to 26.5) GHz (18 to 26.5) GHz (18 to 26.5) GHz (18 to 26.5) GHz	0.22 dB 0.20 dB 0.20 dB 0.20 dB	

Parameter/Range	Frequency	CMC ^{2, 8, 11} (\pm)	Comments
High RF Power – Measure (0.3 to 100) W	(25 to 1000) MHz	3.6 %	Bird 4421A w/ 4022A
Amplitude Modulation – Measure Carrier: 150 kHz to 10 MHz Depth: Up to 99 % Carrier: (0.1 to 1.3) GHz Depth: Up to 99 % Carrier: 100 kHz to 10 MHz Depth: (5 to 95) % AM Carrier: (0.01 to 26.5) GHz Depth: (5 to 95) % AM	(20 to 50) Hz (0.05 to 100) kHz (20 to 50) Hz (0.05 to 100) kHz 10 Hz to 10 kHz 10 Hz to 50 kHz	3.0 % 2.0 % 1.1 % 3.0 % 1.8 % AM 1.2 % AM	HP 8902A Rohde & Schwarz FSMR-26
Frequency Modulation – Measure Carrier: (0.3 to 10) MHz Dev: Up to 40 kHz Carrier: (0.01 to 1.3) GHz Dev: Up to 400 kHz Carrier: (0.25 to 10) MHz Dev: Up to 50 kHz Carrier: (0.01 to 1) GHz Dev: Up to 100 kHz Carrier: (1 to 6) GHz Dev: Up to 100 kHz	(0.02 to 10) kHz (0.05 to 100) kHz (100 to 200) kHz (0.01 to 10) kHz (0.01 to 100) kHz (0.01 to 100) kHz	2.3 % + 12 Hz 1.2 % + 0.12 kHz 5.8 % + 0.12 kHz 1.3 % 1.4 % 1.4 % + 0.0067 kHz	HP 8902A Rohde & Schwarz FSMR-26
Phase Modulation – Measure Carrier: (0.15 to 10) MHz Carrier: (0.01 to 1.3) GHz Carrier: (0.2 to 10) MHz Carrier: (0.01 to 18) GHz	(0.2 to 10) kHz (0.2 to 20) kHz 50 Hz to 10 kHz 50 Hz to 100 kHz	4.8 % + 0.012 rad 3.7 % + 0.012 rad 1.2 % + 0.0040 rad 1.2 % + 0.0040 rad	HP 8902A Rohde & Schwarz FSMR-26

IV. Fluid Quantities

Parameter/Equipment	Range	CMC ² (±)	Comments
Piston Operated Volumetric Apparatus (Pipettes) ³	(0.5 to 2) μL	0.040 μL	Balances <i>V</i> is the volume in μL
	(2 to 20) μL	0.052 μL	
	(20 to 200) μL	$(0.037 + 0.0033 \cdot V)$ μL	
	(200 to 1000) μL	$(0.26 + 0.0020 \cdot V)$ μL	
	(1000 to 25 000) μL	$(2.1 + 0.0011 \cdot V)$ μL	

V. Mechanical

Parameter/Equipment	Range	CMC ^{2, 8, 10} (±)	Comments
Force –Measuring Equipment ^{3, 5}	Up to 500 lbf	0.038 %	Dead weight
Load Cells / Force Gauges	Up to 5000 lbf Up to 25 000 lbf Up to 60 000 lbf	0.12 % + 0.28 lbf 0.1 % + 0.4 lbf 0.069 % + 3 lbf	Load cells with digital display
Tension	Up to 5000 lbf	0.07 % + 0.03 lbf	Load cells with digital display
	Up to 25 000 lbf	0.23 % + 0.07 lbf	
	Up to 60 000 lbf	0.18 % - 0.7 lbf	
Mass ³	1 mg to 1 g	0.0080 mg	Troemner weights & comparators
	(> 1 to 10) g	$(0.0021 - 0.000 18X)$ %	
	(> 10 to 210) g	0.000 090 %	
	(> 210 to 6.1) kg	$(0.000 66 - 0.000 083Y)$ %	<i>Y</i> : in kg

Parameter/Equipment	Range	CMC ^{2, 8, 10} (±)	Comments
Scales & Balances ^{3, 5}	1 mg to 1 g	0.0050 mg	Troemner weights
	(1 to 10) g	(0.000 48 – 0.000 038X) %	X: in g
	10 g to 11 kg	0.000 060 %	
	(11 to 200) kg	0.012 %	Class F weights
Torque – Measure & Measuring Equipment ³	(0.4 to 20) lb·in	0.52 %	Norbar torque transducers & display
	(12.5 to 250) lb·in	0.57 %	
Measuring Equipment Only ⁵	(5 to 100) lb·ft	0.54 %	
	(20 to 1000) lb·ft	0.53 %	
Pressure/Vacuum – Measure & Measuring Equipment ^{3, 5}	(-2 to 2) in H ₂ O	0.000 57 in H ₂ O	Dwyer 1430 Microtector hook gauge
	(-5 to 5) in H ₂ O	0.006 in H ₂ O	Additel ADT681-DP5
	(0 to 8.5) psia	0.0011 psia	Mensor CPG2500
	(8.5 to 17) psia	0.0019 psia	
	(-12.5 to 30) psia	0.0034 psi	Fluke 6270A
	(30 to 3000) psi	0.01 %	
	(3000 to 15 000) psi	0.000 80 % + 1.4 psi	Mensor CPT9000
Up to -14.2 psi	0.44 %	Digital pressure gauges	
(0 to 10) psi	0.027 psi		
(> 10 to 15 000) psi	0.12 %		

VI. Thermodynamics

Parameter/Equipment	Range	CMC ^{2, 10} (±)	Comments
Temperature ³ – Measure	(-196 to -20) °C	0.033 °C	Fluke 5609, Hart 1529
Thermocouples	(-196 to 600) °C	0.059 °C	HP3458A, Ice Bath, Fluke 5609/1529
Temperature – Measure & Measuring Equipment ³	-196 °C (Measuring Equipment Only) (-80 to -40) °C (Measuring Equipment Only) Ice Point (Measuring Equipment Only) (-95 to -20) °C (-20 to 150) °C (150 to 200) °C (200 to 425) °C (425 to 600) °C	0.029 °C 0.027 °C 0.0027 °C 0.080 °C 0.033 °C 0.044 °C 0.053 °C 0.089 °C	Liquid N ₂ , Fluke 5609, Hart 1529 Fluke 5609, Hart 1529 with Isopropol alcohol & subzero freezer ASTM E563 ice point w/ Fluke 9190A w/ Fluke 7320 w/ Fluke 6102 w/ Fluke 9172 w/ Hart 9127
Infrared Temperature – Measure & Measuring Equipment ³	(35 to 500) °C	(0.30 + 0.0040 rdg) °C	Fluke 4181 Emissivity = 0.95 where wavelength = (8 to 14) μm
Relative Humidity – Measure & Measuring Equipment ^{3, 5}	(10 to 95) % RH	0.58 % rdg + 0.026 % RH	Thunder Scientific 1200

VI. Time & Frequency

Parameter/Equipment	Range	CMC ^{2, 7, 10} (±)	Comments
Frequency – Measure ⁵	1 mHz to 26.5 GHz	3.5 parts in 10 ¹² + 0.6RE Hz	HP Z3801A GPS locked with frequency counter

Parameter/Equipment	Range	CMC ^{2, 7, 10} (\pm)	Comments
Frequency – Measuring Equipment ⁵	10 MHz Reference 1 mHz to 26.5 GHz	3.5 parts in 10^{12} Hz 3.5 parts in $10^{12} + 0.6RE$ Hz	HP Z3801A GPS HP Z3801A GPS locked with signal generator
Frequency – Measure & Measuring Equipment ³	(0.01 to 10) Hz (10 to 100) Hz 100 Hz to 26.5 GHz	1.1 part in 10^3 Hz 4.1 part in 10^6 Hz 1.1 part in 10^7 Hz	HP 5345A HP5350A, Anritsu 68377B

¹ This laboratory offers commercial calibration service and field and mobile calibration service, where noted.

² Calibration and Measurement Capability Uncertainty (CMC) is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards 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 and mobile calibration service is available for this calibration except pipettes as a mobile laboratory activity. 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 value of the nominal length of the device measured in inches. D is the numerical value of the nominal diameter of the device measured in inches except where noted. R is the resolution of the unit under test.

⁵ The contributions from the "best existing device" are not included in the CMC claim.

⁶ "Supermicrometer" is a registered trademark with a last listed owner of Pratt & Whitney Measurement Systems, Inc., Connecticut U.S.A.

⁷ RE is the resolution of the signal generator or counter.

⁸ Unless otherwise indicated all units listed in % means % of reading.

⁹ This scope meets A2LA's *P112 Flexible Scope Policy*.

¹⁰ 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.

¹¹ 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 percentage or fraction of the reading plus a fixed floor specification.

¹² Measurement uncertainty at intermediate values is calculated using the Manufacturers Limits of Error Calculator.



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Presented this 20th day of January 2025.

A blue ink signature of Mr. Trace McInturff, written over a horizontal line.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 1500.02
Valid to January 31, 2027

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