



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994 & ANSI/NCSL Z540.3-2006

WESCAN CALIBRATION
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CALIBRATION

Valid until: January 31, 2019

Certificate Number: 1500.03

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Chemical

Parameter/Equipment	Range	CMC ² (±)	Comments
pH – Measuring Equipment ⁵	4 pH 7 pH 10 pH	0.010 pH 0.011 pH 0.018 pH	Standard solutions

II. Dimensional

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Length Standards	(1 to 40) in	(13 + 3.5L) μin	Gauge blocks, gauging head and amplifier
Crimp Tools	(0.011 to 0.25) in Above 0.25 in	0.000 23 in 0.000 23 in	Pin gauges, precision micrometer, digital caliper

Parameter/Equipment	Range	CMC ^{2,4} (\pm)	Comments
Surface Plate ³	12 in \times 12 in to 12 ft \times 12 ft	(26 + 0.056L) μ in	Repeat readings
Height Gauges ^{3,5}	Up to 24 in (24 to 40) in	(1.0 + 3.7L) μ in (13 + 3.5L) μ in	Gauge blocks
Calipers ^{3,5}	Up to 40 in	(5.6 + 4.1L) μ in	Gauge blocks
Micrometers ^{3,5} – OD ID Depth	Up to 60 in Up to 24 in Up to 12 in	(8.2 + 3.8L) μ in (5.5 + 4.0L) μ in (2.9 + 3.4L) μ in	Gauge blocks Gauge blocks Gauge blocks
Indicators ^{3,5}	Up to 3 in	(7.0 + 2.8L) μ in	Gauge blocks
Indicator Calibrators ⁵	Up to 2 in	12 μ in	Gauge blocks
Gauge Head/Amplifier (MU Checker)	(0.0001 to 0.2) in	5.4 μ in	Gauge blocks
Step Gauges	Up to 6 in	(7.7 + 0.90L) μ in	Gauge blocks
ID Instruments ^{3,5}	Up to 24 in	(5.5 + 4.0L) μ in	Gauge blocks, gauging head/amplifier
Thickness Gauges ^{3,5}	(0.001 to 0.6) in (>0.6 to 1) in	4.7 μ in 11 μ in	Shims and gauge blocks
Precision Levels ⁵	Up to 12 in	27 μ in/in	Sine bar, gauge blocks, surface plate
Rulers ⁵	Up to 42 in	6.0L μ in	Gauge blocks

Parameter/Equipment	Range	CMC ^{2,4} (±)	Comments
Protractors ⁵	At 0° and 90° (> 0° to < 90)°	0.0015 ° 0.0029 °	Sine plate, gauge blocks, square
Thread Plugs (Major and Pitch Diameter)	Up to 2 in	150 μin	Thread wires and precision micrometer

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
DC Voltage – Measure and Generate ³	(0 to 100) mV 100 mV to 1 V (1 to 10) V (10 to 100) V (100 to 1 000) V	8.4 μV/V + 1.4 μV 7.4 μV/V + 3.4 μV 9.7 μV/V + 2.2 μV 9.5 μV/V + 0.29 mV 25 μV/V + 0.50 mV	Fluke 5520A w/ HP 3458A
	Measure Only (1 to 6) kV	0.15 % - 1.2 V	Fluke 80E-10 w/ HP3458A
DC Current – Measure ³	(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	290 μA/A + 73 pA 25 μA/A + 68 pA 23 μA/A + 0.12 nA 23 μA/A + 0.93 nA 23 μA/A + 5.9 pA 23 μA/A + 59 pA 40 μA/A 0.013 % + 12 μA	HP 3458A
	(1 to 3) A (3 to 10) A (10 to 20) A	0.016 % + 48 μA 0.017 % + 16 μA 0.025 % - 0.38 mA	Fluke Y5020 and HP 3458A



Parameter/Equipment	Range	CMC ^{2,7} (\pm)	Comments
DC Current – Generate ³	(0 to 100) nA	580 μ A/A + 100 pA	Fluke 5520A w/ HP 3458A
	100 nA to 1 μ A	40 μ A/A + 90 pA	
	(1 to 10) μ A	22 μ A/A + 0.14 nA	
	(10 to 100) μ A	23 μ A/A + 0.94 nA	
Generate Only –	100 μ A to 1 mA	23 μ A/A + 6.5 pA	Fluke 5520A w/ Fluke Y5020 and HP 3458A
	(1 to 10) mA	23 μ A/A + 64 pA	
	(10 to 100) mA	40 μ A/A	
	100 mA to 1 A	0.013 % + 12 μ A	
Torroidal Clamps	(1 to 3) A	0.016 % + 47 μ A	Fluke 5520A w/ Fluke Y5020 and HP 3458A
	(3 to 10) A	0.017 % + 12 μ A	
Non-torroidal Clamps	(10 to 20) A	0.035 % - 1.4 mA	Fluke 5520A w/ Fluke 5500A/coil
	(20 to 150) A	0.23 % + 13 mA	
Torroidal Clamps	(150 to 1025) A	0.25 % + 22 mA	Fluke 5520A w/ Fluke 5500A/coil
	(20 to 150) A	0.45 % + 0.13 A	
Non-torroidal Clamps	(150 to 1025) A	0.46 % + 0.43 A	Fluke 5520A w/ Fluke 5500A/coil
Resistance – Measure and Generate ³	(1 to 11) m Ω	0.052 %	Leeds and Northrup 4300 w/HP 3458A
	11 m Ω to 10 Ω	13 $\mu\Omega/\Omega$ + 100 $\mu\Omega$	Fluke 5520A w/HP 3458A
	(10 to 100) Ω	13 $\mu\Omega/\Omega$ + 0.72 m Ω	
	100 Ω to 1 k Ω	11 $\mu\Omega/\Omega$ + 1.6 m Ω	
	(1 to 10) k Ω	10 $\mu\Omega/\Omega$ + 19 m Ω	
	(10 to 100) k Ω	11 $\mu\Omega/\Omega$ + 120 m Ω	
	100 k Ω to 1 M Ω	15 $\mu\Omega/\Omega$ + 5.4 Ω	
	(1 to 10) M Ω	50 $\mu\Omega/\Omega$ + 200 Ω	
	(10 to 100) M Ω	0.058 % + 1.4 k Ω	
	100 M Ω to 1 G Ω	0.58 % + 11 k Ω	

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
Capacitance – Generate ³			Fluke 5520A
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.51 % + 8.7 pF	
(0.4 to 1.1) nF	10 Hz to 10 kHz	0.34 % + 8.9 pF	
(1.1 to 3.3) nF	10 Hz to 3 kHz	0.38 % + 9.0 pF	
(3.3 to 11) nF	10 Hz to 1 kHz	0.20 % + 8.9 pF	
(11 to 33) nF	10 Hz to 1 kHz	0.20 % + 80 pF	
(33 to 110) nF	10 Hz to 1 kHz	0.20 % + 82 pF	
(110 to 330) nF	10 Hz to 1 kHz	0.20 % + 0.24 nF	
330 nF to 1.1 μF	(10 to 300) Hz	0.20 % + 0.82 nF	
(1.1 to 3.3) μF	(10 to 300) Hz	0.20 % + 2.5 nF	
(3.3 to 11) μF	(10 to 150) Hz	0.20 % + 82 pF	
(11 to 33) μF	(10 to 120) Hz	0.32 % + 24 nF	
(33 to 110) μF	(10 to 80) Hz	0.37 % + 78 nF	
(110 to 330) μF	(0 to 50) Hz	0.37 % + 0.24 nF	
330 μF to 1.1 mF	(0 to 20) Hz	0.35 % + 0.92 μF	
(1.1 to 3.3) mF	(0 to 6) Hz	0.36 % + 2.4 μF	
(3.3 to 11) mF	(0 to 2) Hz	0.36 % + 8.1 μF	
(11 to 33) mF	(0 to 0.6) Hz	0.22 % + 69 μF	
(33 to 110) mF	(0 to 0.2) Hz	0.88 % + 80 μF	

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
DC Power ³	33 mV to 1020 V (0.33 to 330) mA (0.33 to 3) A (3 to 20.5) A	0.022 % + 48 μW 0.020 % + 0.18 mW 0.063 % - 0.24 mW	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
AC Power ³			
(33 to 330) mV @			
(3.3 to 9) mA	(45 to 65) Hz	0.27 % - 0.024 μW	Fluke 5520A
(9 to 33) mA	(45 to 65) Hz	0.11 % + 0.18 μW	
(33 to 90) mA	(45 to 65) Hz	0.13 % + 0.028 W	
(90 to 330) mA	(45 to 65) Hz	0.091 % + 0.032 μW	
(330 to 900) mA	(45 to 65) Hz	0.12 % - 0.42 μW	
(0.9 to 2.2) A	(45 to 65) Hz	0.10 % + 2.3 μW	
(2.2 to 4.5) A	(45 to 65) Hz	0.12 % - 1.2 μW	
(4.5 to 20.5) A	(45 to 65) Hz	0.10 % + 7.0 μW	
330 mV to 1020 V @			
(3.3 to 9) mA	(45 to 65) Hz	0.11 % + 0.29 μW	
(9 to 33) mA	(45 to 65) Hz	0.10 % - 0.27 mW	
(33 to 90) mA	(45 to 65) Hz	0.11 % - 0.035 μW	
(90 to 330) mA	(45 to 65) Hz	0.073 % - 0.65 mW	
(330 to 900) mA	(45 to 65) Hz	0.11 % - 0.59 mW	
(0.9 to 2.2) A	(45 to 65) Hz	0.084 % - 0.18 mW	
(2.2 to 4.5) A	(45 to 65) Hz	0.11 % + 21 mW	
(4.5 to 20.5) A	(45 to 65) Hz	0.091 % + 1.1 mW	



Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of RTD Indicators and Indicating Systems ³ –			
Pt 385, 3926, 100 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 400) °C (400 to 630) °C	0.050 °C 0.060 °C 0.080 °C 0.090 °C 0.11 °C	Fluke 5520A
Pt 385 Only	(630 to 800) °C	0.21 °C	
Pt 3916, 100 Ω	(-200 to -190) °C (-190 to -80) °C (-80 to 100) °C (100 to 260) °C (260 to 300) °C (300 to 400) °C (400 to 600) °C (600 to 630) °C	0.23 °C 0.040 °C 0.050 °C 0.060 °C 0.070 °C 0.080 °C 0.090 °C 0.21 °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	0.040 °C 0.050 °C 0.11 °C 0.12 °C 0.13 °C 0.14 °C	
Pt 385, 500 Ω	(-200 to -80) °C (-80 to 260) °C (260 to 400) °C (400 to 600) °C (600 to 630) °C	0.040 °C 0.050 °C 0.070 °C 0.080 °C 0.10 °C	
Pt 385, 1000 Ω	(-200 to 0) °C (0 to 100) °C (100 to 300) °C (300 to 600) °C (600 to 630) °C	0.030 °C 0.040 °C 0.050 °C 0.060 °C 0.21 °C	
PtNi 385, 120 Ω	(-80 to 100) °C (100 to 260) °C	0.070 °C 0.13 °C	
Cu 427, 10 Ω	(-100 to 260) °C	0.27 °C	

Parameter/Equipment	Range	CMC ² (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems ³ –			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.42 °C 0.14 °C 0.13 °C 0.16 °C 0.18 °C	Fluke 5520A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.41 °C 0.18 °C 0.17 °C 0.15 °C 0.19 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.27 °C 0.16 °C 0.16 °C 0.22 °C 0.33 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.51 °C 0.20 °C 0.14 °C 0.13 °C	
Type N	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 410) °C (410 to 1300) °C	0.34 °C 0.21 °C 0.20 °C 0.19 °C 0.23 °C	
Type R	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (140 to 1767) °C	0.51 °C 0.31 °C 0.32 °C 0.38 °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

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
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	0.072 % + 5.5 μV 0.014 % + 5.5 μV 0.018 % + 5.5 μV 0.09 % + 5.5 μV 0.31 % + 11 μV 0.72 % + 45 μV	Fluke 5520A
(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	0.027 % + 7.2 μV 0.012 % + 7.2 μV 0.014 % + 7.2 μV 0.032 % + 7.2 μV 0.072 % + 29 μV 0.18 % + 63 μV	
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	0.027 % + 45 μV 0.011 % + 23 μV 0.017 % + 45 μV 0.027 % + 45 μV 0.063 % + 110 μV 0.22 % + 0.54 mV	
(750 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.022 % + 15 V 0.018 % + 16 V 0.022 % + 15 V	
AC Voltage – Measure ³			
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	0.048 % + 4.0 μV 0.027 % + 1.5 μV 0.040 % + 1.5 μV 0.13 % + 1.5 μV 0.67 % + 1.5 μV 0.53 % + 2.7 μV	HP 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	0.027 % + 5.8 μV 0.0094 % + 3.2 μV 0.019 % + 2.7 μV 0.040 % - 2.7 μV 0.11 % + 2.7 μV 0.40 % + 13 μV 1.3 % + 1.3 μV	

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Voltage – Measure ³ (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	0.027 % + 56 μV 0.0094 % + 28 μV 0.019 % + 27 μV 0.040 % + 27 μV 0.11 % + 27 μV 0.40 % + 0.23 mV 1.3 % + 0.13 mV	HP 3458A
(0.7 to 5) kV	60 Hz	0.16 % - 1.2 V	Fluke 80E -10 w/ HP3458A
AC Voltage – Generate and Measure ³			
(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	0.0096 % + 0.55 mV 0.0095 % + 0.27 mV 0.019 % + 0.27 mV 0.040 % + 0.27 mV 0.11 % + 0.27 mV 0.40 % + 1.3 mV 1.3 % + 1.3 mV	Fluke 5520A and/or HP 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	0.027 % + 5.4 mV 0.027 % + 2.7 mV 0.027 % + 2.7 mV 0.047 % + 2.7 mV 0.16 % + 2.7 mV 0.53 % + 13 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	0.053 % + 56 mV 0.054 % + 26 mV 0.080 % + 27 mV 0.16 % + 27 mV 0.40 % + 27 mV	

Parameter/Range	Frequency	CMC ^{2,7} (\pm)	Comments
AC Current – Generate ³			
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.16 % + 86 μ A 0.055 % + 0.13 mA 0.54 % + 0.90 mA 2.3 % + 4.5 mA	Fluke 5520A
(3 to 11) A	(45 to 100) Hz (100 to 1000) Hz (1 to 5) kHz	0.056 % + 1.8 mA 0.091 % + 1.8 mA 2.7 % + 1.8 mA	
(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	
AC Current – Generate and Measure ³			
Up 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 0.07 % + 23 nA 0.07 % + 23 nA	Fluke 5520A and/or HP 3458A
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 0.07 % + 0.23 μ A 0.035 % + 0.23 μ A 0.068 % + 0.25 μ A 0.46 % + 0.46 μ A	

Parameter/Range	Frequency	CMC ² (±)	Comments
AC Current – Generate and Measure ³ (cont)			
(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 µA 0.17 % + 2.3 µA 0.07 % + 2.3 µA 0.035 % + 2.3 µA 0.07 % + 2.3 µA 0.46 % + 4.6 µA	Fluke 5520A and/or HP 3458A
(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 µA 0.17 % + 23 µA 0.07 % + 23 µA 0.035 % + 23 µA 0.07 % + 23 µA 0.46 % + 46 µA	
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	
Measure Only (1 to 20) A	45 Hz to 1 kHz (1 to 5) kHz	0.031 % + 65 µA 0.046 % + 0.21 mA	w/Fluke Y5020 shunt
Distortion (THD)	20 Hz to 20 kHz (20 to 100) kHz	14 % of Indicated THD 30 % of Indicated THD	HP 8903A

Parameter/Range	Frequency	CMC ² (±)	Comments
Oscilloscopes ³ –			
DC and Square Wave	Into 50 Ω	0.20 % + 32 μV	Fluke 5520A/SC1100
DC Only	Into 1 MΩ	0.04 % + 32 μV	
Square Wave	Into 1 MΩ	0.09 % + 32 μV	
Leveled Sine Wave	50 kHz reference	1.7 % + 0.24 mV	
	Relative to 50 kHz reference		
	50 kHz to 100 MHz	1.3 % + 80 μV	Fluke 5520A/SC1100
	(100 to 300) MHz	1.7 % + 80 μV	
	(300 to 600) MHz	3.3 % + 80 μV	
	(600 to 1100) MHz	5.8 % + 0.12 mV	
Time Marker	5 s to 50 ms	0.20 % - 0.36 ms	
	50 ms to 2 ns	2.3 μs/s	

IV. Electrical – Microwave/RF

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

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
Absolute Power – (20 to 30) dBm (10 to 20) dBm (0 to 10) dBm (-10 to 0) dBm (-20 to -10) dBm	100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz 100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz 100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz 100 kHz to 2.6 GHz (2.6 to 12) GHz (12 to 26.5) GHz 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 0.23 dB 0.25 dB 0.30 dB 0.21 dB 0.23 dB 0.28 dB 0.34 dB 0.24 dB 0.30 dB 0.27 dB 0.29 dB 0.34 dB	HP 8902A w/ 11793A, HP 11722A, HP 11792A
High RF Power – Measure (0.3 to 1000) W	25 MHz to 1 GHz	6.1 %	Bird 4421 w/ 4022
Amplitude Modulation – Carrier: 150 kHz to 10 MHz Depth: Up to 99 % Carrier: (0.01 to 1.3) GHz Depth: Up to 99 %	(20 to 50) Hz (0.05 to 100) kHz (20 to 50) Hz (0.05 to 100) kHz	3.0 % 2.0 % 1.0 % 3.0 %	HP 8902A
Frequency Modulation – Carrier: (0.25 to 10) MHz Dev: Up to 40 kHz Carrier: (0.01 to 1.3) GHz Dev: Up to 400 kHz	(0.02 to 10) kHz (0.05 to 100) kHz (100 to 200) kHz	2.3 % + 12 Hz 1.2 % + 0.12 kHz 5.8 % + 0.12 kHz	HP 8902A

Parameter/Range	Frequency	CMC ^{2,7} (±)	Comments
Phase Modulation – Carrier (0.15 to 10) MHz Carrier (0.01 to 1.3) GHz	(0.2 to 10) kHz (0.2 to 20) kHz	4.8 % + 0.012 rad 3.7 % + 0.12 rad	HP 8902A

V. Mechanical

Parameter/Equipment	Range	CMC ^{2,7} (±)	Comments
Force – Measure and Measuring Equipment ^{3,5}	(0 to 450) lbf	0.026 %	Dead weight
Scales and Balances ^{3,5}	1 mg to 1 g (1 to 10) g 10 g to 11 kg (11 to 200) kg	0.0050 mg (0.000 48 – 0.000 038X) % 0.000 060 % 0.012 %	Troemner weights X in g Class F weights
Volume ³	(0.5 to 2) µL (2 to 20) µL (20 to 200) µL (200 to 1000) µL (1000 to 25 000) µL	0.040 µL 0.052 µL (0.037 + 0.0033·V) µL (0.26 + 0.0020·V) µL (2.1 + 0.0011·V) µL	Balances V is the volume in µL
Torque – Measure ³	4 in·lbf to 600 ft·lbf	0.30 %	CDI torque system
Torque – Measuring Equipment ³	(1 to 2000 ft·lbf)	0.060 %	Weights and arms
Pressure/Vacuum— Measure and Measuring Equipment ^{3,5}	(-12.5 to 1) psig (1 to 20) psig (20 to 10 000) psig	0.044 psi 0.027 psi 0.12 %	Digital pressure gauges and pressure/vacuum pumps

VI. Thermodynamics

Parameter/Equipment	Range	CMC ² (±)	Comments
Temperature – Measure ³	(-200 to -20) °C	0.033 °C	Fluke 5609, Fluke 1529
Temperature – Measure and Measuring Equipment ³	-196 °C	0.029 °C	Liquid N ₂ , Fluke 5609, Fluke 1529
	(-70 to -20) °C	0.033 °C	Fluke 5609, Fluke 1529 with solid CO ₂ and isopropyl alcohol
	(-20 to 125) °C	0.039 °C	w/ Fluke 7103
	(125 to 425) °C	0.053 °C	w/ Fluke 9172
	(425 to 650) °C	0.15 °C	w/ Omega CL700A
Ice Point (generate only)		0.0027 °C	ASTM E563 ice point
Relative Humidity – Measure and Measuring Equipment ^{3,5}	(10 to 90) % RH (90 to 95) % RH	1.3 % RH 2.1 % RH	Vaisala M170/HMP77B

VII. Time & Frequency

Parameter/Equipment	Range	CMC ^{2,6} (±)	Comments
Frequency – Measure ^{3,5}	1 mHz to 18 GHz	3.5 parts in 10 ¹² + 0.6R Hz	HP Z3801A GPS locked with frequency counter
Frequency – Measuring Equipment ^{5,6}	10 MHz Reference	3.5 parts in 10 ¹² Hz	HP Z3801A GPS
	1 mHz to 18 GHz	3.5 parts in 10 ¹² + 0.6R Hz	HP Z3801A GPS locked with signal generator



Parameter/Equipment	Range	CMC ^{2, 6} (\pm)	Comments
Frequency – Measuring Equipment ^{3,5,6}	10 MHz Reference	2 parts in 10^9 Hz	PTB-100 rubidium standard
	1 mHz to 18 GHz	2 parts in $10^9 + 0.6R$ Hz	PTB-100 rubidium standard locked with signal generator or frequency counter

¹ This laboratory offers commercial calibration service and field 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 calibration service is available for this calibration and this laboratory meets A2LA R104 – *General Requirements: Accreditation of Field Testing and Field Calibration Laboratories* for these calibrations. Please note the actual measurement uncertainties achievable on a customer's site can normally be expected to be larger than the CMC found on the A2LA Scope. Allowance must be made for aspects such as the environment at the place of calibration and for other possible adverse effects such as those caused by transportation of the calibration equipment. The usual allowance for the actual uncertainty introduced by the item being calibrated, (e.g. resolution) must also be considered and this, on its own, could result in the actual measurement uncertainty achievable on a customer's site being larger than the CMC.

⁴ 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. 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 R is the resolution of the signal generator or counter.

⁷ Unless otherwise indicated, all % means % of reading.



Accredited Laboratory

A2LA has accredited

WESCAN CALIBRATION

Calgary, AB, CANADA

for technical competence in the field of

Calibration

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of ANSI/NCSLI Z540-1-1994 and the requirements of ANSI/NCSLI Z540.3-2006 and R205 – Specific Requirements: Calibration Laboratory Accreditation Program. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).



Presented this 12th day of May 2017.

A handwritten signature in black ink, written over a horizontal line.

President and CEO
For the Accreditation Council
Certificate Number 1500.03
Valid to January 31, 2019

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