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 To: January 31, 2017 Certificate Number: 1500.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations[1]:

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
Electrolytic Conductivity – Measuring Equipment	10 µS/cm 100 µS/cm 1 000 µS/cm 10 000 µS/cm	0.30 µS/cm 0.61 µS/cm 5.3 µS/cm 36 µS/cm	Standard solutions

II. Dimensional

Parameter/Equipment	Range	CMC[2] (±)	Comments
Angle Blocks	(0 to 30)º	3.1”	Gauge blocks, sine bar, gauging head and amplifier

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Length Standards	(1 to 40) in	(13 + 4.0*L*) µin	Gauge blocks, gauging head and amplifier
Crimp tools	(0.011 to 0.25) in Above 0.25 in	0.00023 in 0.00023 in	Pin gauges, Supermicrometer™[6], digital caliper
Diameter –			
External	Up to 10 in	(3.8 + 4.3*D*) µin	Supermicrometer™[6] and gauge blocks
	(10 to 24) in	(13 + 4.0*D*) µin	Gauge blocks, gauging head and amplifier
Internal	Up to 12 in	(6.5 + 4.5*D*) µin	Comparator and gauge blocks
Flatness –			
Optical quality	Up to 3 in	4.1 µin	Optical flat
Surface Plate[3]	12 in × 12 in to 12 ft ×12 ft	35 µin	Electronic leveling system
Height Gauges[3, 5]	Up to 24 in (24 to 40) in	(1.0 + 3.7*L*) µin (13 + 3.5*L*) µin	Gauge blocks
Calipers[3, 5]	Up to 40 in	(5.6 + 4.1*L*) µin	Gauge blocks
Micrometers[3, 5] OD ID Depth	 Up to 60 in Up to 24 in Up to 12 in	 (8.2 + 3.8*L*) µin (5.5 + 4.0*L*) µin (2.9 + 3.4*L*) µin	 Gauge blocks Gauge blocks Gauge blocks
Indicators[3, 5]	Up to 3 in	(7.0 + 2.8*L*) µin	Gauge blocks
Indicator Calibrators[3, 5]	Up to 2 in	12 µin	Gauge blocks

Parameter/Equipment	Range	CMC[2, 4] (±)	Comments
Gauge Head/Amplifier	(0.000 1 to 0.2) in	5.4 µin	Gauge blocks
Step Gauges	Up to 6 in	(7.7 + 0.90*L*) µin	Gauge blocks
ID Instruments[3, 5] – Bore Gages, ID Micrometers, and Similar)[3]	Up to 60 in	(5.5 + 4.0*L*) µin	Gauge blocks, gauging head/amplifier
Thickness Gauges[3, 5]	(0.001 to 0.6) in (>0.6 to 1) in	4.7 µin 11 µin	Shims & gauge blocks
Rulers, Tapes[3, 5]	Up to 144 in	(15 + 3.5*L*) µin	Gauge blocks
Sine Bars –			
Parallelism	5 in 10 in	37 µin 39 µin	Gauging head and amplifier
Angle (5 in bar) Angle (10 in bar)	(0 to 45)° (0 to 45)°	5.5” 3.0”	Gauge blocks, Supermicrometer™[6], gauging head and amplifier
Squares	Up to 18 in	11 µin/in	Master square, gauge blocks
Precision Levels[5]	Up to 12 in	15 µin/in	Sine bar, gauge blocks, surface plate
Protractors[5]	At 0° and 90º (>0 to <90)°	0.00056° 0.014°	Master square Sine bar, gauge blocks, master square
Thread Plugs – Major and Pitch Diameter	(0.07 to 10) in	98 µin	Thread wires and Supermicrometer™[6]

Parameter/Equipment	Range	CMC[2] (±)	Comments
Area –			
X-Axis Y-Axis	6 in 5 in	0.86 m·in 0.86 m·in	Optical comparator

III. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
DC Voltage – Generate[3]	(0 to 199.9) µV (0.2 to 1.999) mV (2 to 19.99) mV (20 to 199.99) mV (0.2 to 1.999) V (2 to 19.99) V (20 to 199.99) V (200 to 1100) V	0.0052 % + 0.46 µV 0.00041 % + 0.00047 mV 0.00081 % + 0.00046 mV 0.00082 % + 0.00045 mV 0.00063 % + 0.0000010 V 0.00062 % + 0.0000036 V 0.00077 % + 0.000045 V 0.00089 % + 0.00045 V	Wavetek 4808
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 1000) 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/ HP 3458A opt 002
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	0.029 % + 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 0.13 % + 12 µA	HP 3458A opt 002
	(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 opt 002

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
DC Current – Generate[3]	(0 to 100) nA 100 nA to 1 µA (1 to 10) µA (10 to 100) µA 100 µA to 1 mA (1 to 10) mA (10 to 100) mA 100 mA to 1 A	0.058 % + 100 pA 40 µA/A + 90 pA 22 µA/A + 0.14 nA 23 µA/A + 0.94 nA 23 µA/A + 6.5 pA 23 µA/A + 64 pA 40 µA/A 0.013 % + 12 µA	Fluke 5520A w/ HP 3458A opt 002
	(1 to 3) A (3 to 10) A (10 to 20) A	0.016 % +47 µA 0.017 % + 12 µA 0.035 % - 1.4 mA	Fluke 5520A w/ Fluke Y5020 and HP 3458A opt 002
Generate only: Torroidal Clamps	(20 to 150) A (150 to 1025) A	0.23 % + 13 mA 0.25 % + 22 mA	Fluke 5520A w/ Fluke 5500A/coil
Non-torroidal Clamps	(20 to 150) A (150 to 1025) A	0.45 % + 0.13 A 0.46 % + 0.43 A	
DC Current – Generate	(0 to 199.9) µA (0.2 to 1.999) mA (2 to 19.99) mA (20 to 199.99) mA (0.2 to 1.999) A	0.010 % + 0.001 8 µA 0.0054 % + 0.000018 mA 0.0060 % + 0.000091 mA 0.0052 % + 0.00090 mA 0.014 % + 0.000 022 A	Wavetek 4808
Resistance – Generate[3], Fixed Points	10 Ω 100 Ω 1 kΩ 10 kΩ 100 kΩ 1 MΩ 10 MΩ 100 MΩ	0.33 mΩ 1.5 mΩ 14 mΩ 0.14 Ω 1.8 Ω 37 Ω 0.74 kΩ 22 kΩ	Wavetek 4808

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Resistance – Measure and Generate[3]	(1 to 11) mΩ	0.052 %	Leeds and Northrup 4300 w/HP 3458A opt 002
	11 mΩ to 10 Ω	13 μΩ/Ω + 0.10 mΩ	Fluke 5520A w/HP 3458A
	(10 to 100) Ω	13 μΩ/Ω + 0.72 mΩ	
	100 Ω to 1 kΩ	11 μΩ/Ω + 1.6 mΩ	
	(1 to 10) kΩ	10 μΩ/Ω + 19 mΩ	
	(10 to 100) kΩ	11 μΩ/Ω + 0.12 Ω	
	100 kΩ to 1 MΩ	15 μΩ/Ω + 5.4 Ω	
	(1 to 10) MΩ	50 μΩ/Ω + 0.20 kΩ	
	(10 to 100) MΩ	0.058 % + 1.4 kΩ	
	100 MΩ to 1 GΩ	0.58 % + 11 kΩ	

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
Capacitance – Generate[3]			
(0.19 to 0.4) nF	10 Hz to 10 kHz	0.51 % + 8.7 pF	Fluke 5520A
(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 μF	
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/Range	Frequency	CMC[2, 8] (±)	Comments
Capacitance – Generate and Measure			
(1 to 10) pF	1 kHz	0.012 % + 0.046 pF	Genrad 1689M w/ capacitance source
(10 to 100) pF		0.012 % + 0.046 pF	
(100 to 400) pF		0.012 % + 0.046 pF	
(400 to 1 000) pF		0.023 % + 0.00026 pF	
(1 to 10) nF		0.023 % + 0.000007 6 nF	
(10 to 100) nF		0.023 % + 0.000078 nF	
(100 to 1 000) nF		0.023 % + 0.00077 nF	
(1 to 10) µF		0.023 % + 0.000007 2 µF	
(10 to 100) µF		0.062 % - 0.003 8 µF	
(100 to 1 000) µF		0.52 % - 0.46 µF	
Inductance – Generate and Measure			
(0.1 to 1) mH	1 kHz	0.012 % + 0.00012 mH	Genrad 1689M w/ inductance source
(1 to 10) mH		0.023 %	
(10 to 100) mH		0.023 %	
(100 to 1000) mH		0.023 %	
(1 to 10) H		0.023 %	

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Capacitance – Generate, Cardinal points only			
	Nominal		
	1 pF	0.14 % of charted value	HP 16380A & GR 1409 series standard capacitors
	10 pF	0.12 % of charted value	
	100 pF	0.12 % of charted value	
	1000 pF	0.12 % of charted value	
	1 nF	0.058 % of charted value	
	10 nF	0.058 % of charted value	
	100 nF	0.058 % of charted value	
	1000 nF	0.058 % of charted value	

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
DC Power[3] –			
33 mV to 1020 V			
(0.33 to 330) mA	DC	0.022 % + 48 µW	Fluke 5520A
(0.33 to 3) A	DC	0.020 % + 0.18 mW	
(3 to 20.5) A	DC	0.063 % - 0.24 mW	
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 1 020 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	
Electrical Calibration of RTD Indicators and Indicating Systems[3] –			
Pt 385, 3926, 100 Ω	-200 °C to 0 °C	0.050 °C	Fluke 5520A
	0 °C to 100 °C	0.060 °C	
	100 °C to 300 °C	0.080 °C	
	300 °C to 400 °C	0.090 °C	
	400 °C to 630 °C	0.11 °C	
Pt 385 Only	630 °C to 800 °C	0.21 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of RTD Indicators and Indicating Systems[3] – (cont)			
Pt 3916, 100 Ω	-200 °C to -190 °C -190 °C to -80 °C -80 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C 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	Fluke 5520A
Pt 385, 200 Ω	-200 °C to 100 °C 100 °C to 260 °C 260 °C to 300 °C 300 °C to 400 °C 400 °C to 600 °C 600 °C 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 °C to -80 °C -80 °C to 260 °C 260 °C to 400 °C 400 °C to 600 °C 600 °C to 630 °C	0.040 °C 0.050 °C 0.070 °C 0.08 °C 0.10 °C	
Pt 385, 1000 Ω	-200 °C to 0 °C 0 °C to 100 °C 100 °C to 300 °C 300 °C to 600 °C 600 °C to 630 °C	0.030 °C 0.040 °C 0.050 °C 0.060 °C 0.21 °C	
PtNi 385, 120 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.070 °C 0.13 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.27 °C	

Parameter/Equipment	Range	CMC[2] (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems[3] –			
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.42 °C 0.14 °C 0.13 °C 0.16 °C 0.18 °C	Fluke 5520A
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.42 °C 0.18 °C 0.17 °C 0.15 °C 0.19 °C	
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.28 °C 0.19 °C 0.16 °C 0.22 °C 0.33 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.51 °C 0.20 °C 0.14 °C 0.13 °C	
Thermistors	-80 ºC to -40 ºC -40 ºC to 100 ºC 100 ºC to 150 ºC	0.084 ºC 0.0063 ºC 0.0095 ºC	Decade resistance boxes

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Voltage – Generate[3]			
(0.09 to 1.999) mV	(10 to 31) Hz	0.014 % + 0.0055 mV	Wavetek 4808
	(32 to 330) Hz	0.016 % + 0.0054 mV	
	300 Hz to 10 kHz	0.016 % + 0.0054 mV	
	(10 to 33) kHz	0.033 % + 0.0054 mV	
	(30 to 100) kHz	0.052 % + 0.0055 mV	
	(100 to 330) kHz	0.12 % + 0.022 mV	
	300 kHz to 1 MHz	0.25 % + 0.025 mV	
(0.9 to 19.99) mV	(10 to 31) Hz	0.020 % + 0.0052 mV	
	(32 to 330) Hz	0.017 % + 0.0052 mV	
	300 Hz to 10 kHz	0.017 % + 0.0052 mV	
	(10 to 33) kHz	0.027 % + 0.0052 mV	
	(30 to 100) kHz	0.050 % + 0.0052 mV	
	(100 to 330) kHz	0.12 % + 0.021 mV	
	300 kHz to 1 MHz	0.24 % + 0.025 mV	
(9 to 199.999) mV	(10 to 31) Hz	0.017 % + 0.0090 mV	
	(32 to 330) Hz	0.013 % + 0.0087 mV	
	300 Hz to 10 kHz	0.012 % + 0.0083 mV	
	(10 to 33) kHz	0.023 % + 0.0083 mV	
	(30 to 100) kHz	0.046 % + 0.0084 mV	
	(100 to 330) kHz	0.12 % + 0.036 mV	
	300 kHz to 1 MHz	0.24 % + 0.13 mV	
(0.09 to 1.999) V	(10 to 31) Hz	0.012 % + 0.000033 V	
	(32 to 330) Hz	0.0076 % + 0.000019 V	
	300 Hz to 33 kHz	0.0076 % + 0.0000094 V	
	(30 to 100) kHz	0.014 % + 0.000019 V	
	(100 to 330) kHz	0.040 % + 0.0.000090 V	
	300 kHz to 1 MHz	0.23 % + 0.00036 V	
(0.9 to 19.99) V	(10 to 31) Hz	0.013 % + 0.00028 V	
	(32 to 330) Hz	0.0077 % + 0.00018 V	
	300 Hz to 33 kHz	0.0077 % + 0.000091 V	
	(30 to 100) kHz	0.014 % + 0.00019 V	
	(100 to 330) kHz	0.038 % + 0.0045 V	
	300 kHz to 1 MHz	0.22 % + 0.0045 V	

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Voltage – Generate[3] (cont)			
(9 to 199.999) V	(10 to 31) Hz (32 to 330) Hz 300 Hz to 10 kHz (10 to 33) kHz (30 to 100) kHz	0.018 % + 0.00092 V 0.011 % + 0.0018 V 0.0077 % + 0.00092 V 0.0087 % + 0.0018 V 0.028 % + 0.0027 V	Wavetek 4808
(9 to 100.000) V	(100 to 330) kHz	0.098 % + 0.042 V	
(90 to 1100) V	(10 to 31) Hz (to 500 V only) (32 to 330) Hz 300 Hz to 3.3 kHz (3 to 10) kHz (10 to 33) kHz (30 to 100) kHz	0.014 % + 0.050 V 0.016 % + 0.044 V 0.013 % + 0.038 V 0.013 % + 0.039 V 0.015 % + 0.061 V 0.093 % + 0.20 V	
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 0.090 % + 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 % + 0.11 mV 0.22 % + 0.54 mV	

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Voltage – Generate[3] (cont)			
(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	Fluke 5520A
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 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	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	
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	
(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	

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Voltage – Measure[3] (cont)			
(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	HP 3458A opt 002
(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	
(0.7 to 5) kV	60 Hz	0.16 % - 1.2 V	Fluke 80E -10 w/ HP3458A opt 002
AC Current – Generate[3]			
(20 to 199.9) µA	10 Hz to 1 kHz (1 to 5) kHz	0.017 % + 0.0090 µA 0.035 % + 0.13 µA	Wavetek 4808
(0.2 to 1.999) mA	10 Hz to 1 kHz (1 to 5) kHz	0.013 % + 0.000091 mA 0.026 % + 0.00013 mA	
(2 to 19.99) mA	10 Hz to 1 kHz (1 to 5) kHz	0.012 % + 0.00090 mA 0.026 % + 0.00090 mA	
(20 to 199.99) mA	10 Hz to 1 kHz (1 to 5) kHz	0.012 % + 0.0090 mA 0.026 % + 0.0092 mA	
(0.2 to 1.999) A	10 Hz to 1 kHz (1 to 5) kHz	0.014 % + 0.00012 A 0.020 % + 0.00023 A	
(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	Fluke 5520A

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Current – Measure[3]			
Up to 100 µA	(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 µA 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 µA 0.17 % + 0.23 µA 0.070 % + 0.23 µA 0.035 % + 0.23 µA 0.068 % + 0.25 µA 0.46 % + 0.46 µA	
(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 0.070 % + 2.3 µA 0.035 % + 2.3 µA 0.070 % + 2.3 µA 0.46 % + 4.6 µA	
(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 0.070 % + 23 µA 0.035 % + 23 µA 0.070 % + 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	

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
AC Current – Measure[3] (cont)			
Measure Only (1 to 20) A	45 Hz to 1 kHz (1 to 5) kHz	0.31 % + 65 µA 0.046 % + 0.21 mA	HP 3458A opt 002 w/Fluke Y5020 shunt

Parameter/Equipment	Frequency	CMC[2, 8] (±)	Comments
Distortion (THD)	20 Hz to 20 kHz (20 to 100) kHz	14 % of THD 30 % of THD	HP 8903A
Oscilloscopes[3] –			
DC and Square Wave	Into 50 Ω	0.2 % + 32 µV	Fluke 5520A/SC600
DC Only	Into 1 MΩ	0.040 % + 32 µV	
Square Wave	Into 1 MΩ	0.090 % + 32 µV	
Leveled Sine Wave	50 kHz Reference	1.7 % + 0.24 mV	
	Relative to 50 kHz Reference		
	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz (600 to 1 100) MHz	1.3 % + 80 µV 1.7 % + 80 µV 3.3 % + 80 µV 5.8 % + 0.12 mV	
Time Marker	5 s to 50 ms 20 ms to 2 ns	0.20% - 0.36 ms 2.3 µs/s	Fluke 5522A/SC1100

IV. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
Relative Power –			
(0 to -10) dBm	2.5 MHz to 26.5 GHz	0.024 dB	HP 8902A w/ 11793A
(-10 to -20) dBm		0.037 dB	
(-20 to -30) dBm		0.045 dB	
(-30 to -40) dBm		0.062 dB	
(-40 to -50) dBm		0.081 dB	
(-50 to -60) dBm		0.084 dB	
(-60 to -70) dBm		0.099 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	
Absolute Power –			
(20 to 30) dBm	100 kHz to 2.6 GHz	0.26 dB	HP 8902A w/ 11793A, HP 11722A, HP 11792A
	(2.6 to 12) GHz	0.28 dB	
	(12 to 26.5) GHz	0.32 dB	
(10 to 20) dBm	100 kHz to 2.6 GHz	0.23 dB	
	(2.6 to 12) GHz	0.25 dB	
	(12 to 26.5) GHz	0.30 dB	
(0 to 10) dBm	100 kHz to 2.6 GHz	0.21 dB	
	(2.6 to 12) GHz	0.23 dB	
	(12 to 26.5) GHz	0.28 dB	
(-10 to 0) dBm	100 kHz to 2.6 GHz	0.34 dB	
	(2.6 to 12) GHz	0.24 dB	
	(12 to 26.5) GHz	0.30 dB	
(-20 to -10) dBm	100 kHz to 2.6 GHz	0.27 dB	
	(2.6 to 12) GHz	0.29 dB	
	(12 to 26.5) GHz	0.34 dB	
High RF Power – Measure			
(0.3 to 1000) W	25 MHz to 1 GHz	3.3 %	Bird 4421A w/ 4022A

Parameter/Range	Frequency	CMC[2, 8] (±)	Comments
Amplitude Modulation –			
Carrier: 150 kHz to 10 MHz Depth: Up to 99 %	(20 to 50) Hz (0.05 to 100) kHz	3.0 % 2.0 %	HP 8902A
Carrier: (0.1 to 1.3) GHz Depth: Up to 99 %	(20 to 50) Hz (0.05 to 100) kHz	1.1 % 3.0 %	
Frequency Modulation –			
Carrier: (0.25 to 10) MHz Dev: Up to 40 kHz	(0.02 to 10) kHz	2.3 % + 12 Hz	HP 8902A
Carrier: (0.01 to 1.3) GHz Dev: Up to 400 kHz	(0.05 to 100) kHz (100 to 200) kHz	1.2 % + 0.12 kHz 5.8 % + 0.12 kHz	
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, 8] (±)	Comments
Force – Measure and Measuring Equipment[3,5]	(0 to 500) lbf	0.038 %	Dead weight
Mass			Troemner weights and comparators
	1 mg to 1 g	0.0080 mg	
	(>1 to 10) g	(0.0021 - 0.00018X) %	X in g
	(>10 to 210) g	0.000090 %	
	(>210 to 6.1) kg	(0.000 66 - 0.000083Y) %	Y in kg

Parameter/Equipment	Range	CMC[2, 8] (±)	Comments
Scales and Balances[3,5]	1 mg to 1 g	0.0050 mg	Troemner weights
	(1 to 10) g	(0.00048 – 0.000 038X) %	X in g
	10 g to 11 kg	0.000060 %	
	(11 to 200) kg	0.12 %	Class F weights
Volume[3]	(0.5 to 2) µL (2 to 20) µL (20 to 200) µL	0.040 µL 0.052 µL (0.037 + 0.0033·*V*) µL	Balances
	(200 to 1000) µL	(0.26 + 0.0020·*V*) µL	V is the volume in µL
Torque – Measure and Measuring Equipment[3]	2 in·lbf to 2000 ft·lbf	0.25 %	AKO torque system
Measuring Equipment Only[5]	(1 to 200) in·lbf	0.13 %	Torque arm and weights
Pressure/Vacuum – Measure and Measuring Equipment[3]	(0 to 2) in H_2O	0.000 60 in H_2O	MicroTector
	(0 to 10) psia (>10 to 1 015) psia	0.012 psi 0.011 %	DHI PPC3
Measure and Measuring equipment[3,5]	(1000 to 10 000) psig	0.12 %	Digital pressure gauges and pressure pump
Durometers[3,5]			
Types A, B, C, D, DO, O	(0 to 100) points	(0.00060 + 0.00040 rdg) points	ASTM D2240

VI. Thermodynamics

Parameter/Equipment	Range	CMC[2] (±)	Comments
Temperature – Measure[3]	(-200 to -20) °C	0.033 °C	Fluke 5609, Hart 1529
Temperature – Measure and Measuring Equipment[3]	-196 °C	0.029 °C	Liquid N_2, Fluke 5609, Hart 1529
	(-70 to -20) °C	0.033 °C	Fluke 5609, Hart 1529 with solid CO_2 and Isopropyl alcohol
	(-20 to 150) °C (150 to 200) °C (200 to 425) °C (425 to 650) ºC	0.033 °C 0.044 °C 0.053 °C 0.089 °C	w/ Fluke 7320 w/ Fluke 6102 w/ Fluke 9172 w/ Hart 9127
	Ice Point (generate only)	0.0027 °C	ASTM E563 ice point
Temperature – Measure and Measuring Equipment[3]	(35 to 500) ºC	(0.30 + 0.0040 rdg) ºC	Fluke 4181
Relative Humidity – Measure and Measuring Equipment[3,5]	(10 to 95) % RH	0.5 % RH	Thunder Scientific 1200

VII. Time & Frequency

Parameter/Equipment	Range	CMC[2, 7] (±)	Comments
Frequency – Measuring Equipment[5]	10 MHz Reference	5 parts in 10^{12} Hz	HP Z3801A GPS
	1 mHz to 26.5 GHz	5 parts in 10^{12} + 0.6*R* Hz	HP Z3801A GPS locked with signal generator
Frequency – Measure[5]	1 mHz to 26.5 GHz	5 parts in 10^{12} + 0.6*R* Hz	HP Z3801A GPS locked with frequency counter

Parameter/Equipment	Range	CMC[2] (±)	Comments
Frequency – Measure and 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 5345B

[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 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 trade mark with a last listed owner of Pratt & Whitney Measurement Systems, Inc., Connecticut U.S.A.

[7] *R* is the resolution of the signal generator or counter.

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

Accredited Laboratory

A2LA has accredited

WESCAN CALIBRATION

Richmond, British Columbia 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 any additional program requirements in the field of calibration. 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 26th day of June 2015.

President & CEO
For the Accreditation Council
Certificate Number 1500.02
Valid to January 31, 2017

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