



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

WESCAN CALIBRATION  
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CALIBRATION

Valid until: May 31, 2012

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<sup>1</sup>:

I. Dimensional

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Gage Blocks	Up to 4 in (4 to 20) in	(2.0 + 3L) µin (3 + 4L) µin	Gage blocks
Length Standards	(1 to 60) in	(12 + 4.7L) µin	Gage blocks, gauging head/amplifier
Diameter – External	Up to 10 in (10 to 60) in	(26 + 2D) µin 4.5D µin	Supermicrometer and gage blocks
Internal	Up to 12 in	(6.5 + 4.5D) µin	Comparator and gage blocks

Parameter/Equipment	Range	CMC <sup>2,4</sup> (±)	Comments
Flatness –  Optical quality  Surface Plate <sup>3</sup> (Grading is Based on Flatness Only)	Up to 3 in  12 in × 12 in to 12 ft × 12 ft	4.5 μin  70 μin	Optical flat  Electronic leveling system
Height Gages	Up to 24 in (24 to 40) in	(30 + 3L) μin (100 + 3L) μin	Gage blocks
Calipers <sup>3</sup>	Up to 60 in	(300 + L) μin	Gage blocks
Micrometers (OD) <sup>3</sup>	Up to 80 in	(70 + 6L) μin	Gage blocks
Dial Indicators <sup>3</sup>	Up to 2 in	70 μin	Gage blocks
Dial Indicator Calibrators	Up to 2 in	60 μin	Gage blocks
Gage Head/Amplifier	(0.0001 to 0.2) in	5 μin	Gage blocks
Step Gages	Up to 40 in	(5 + 6L) μin	Gage blocks
ID Instruments – Bore Gages, ID Micrometers, and Similar) <sup>3</sup>	Up to 10 in (10 to 80) in	130 μin (100 + 2L) μin	Ring gages, gage blocks, gaging head/amplifier
Depth Micrometers <sup>3</sup>	(0 to 12) in	(40 + 12L) μin	Gage blocks
Thickness Gages	(0.001 to 1) in	80 μin	Gage blocks
Radius Gages	(0.01 to 1) in	450 μin	Optical comparator

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Sine Bars, Fixed Points	5 in 10 in	30 µin 50 µin	Gage blocks, gage head/amplifier
Squares	Up to 18 in	10 µin/in	Master square, gauging head and amplifier
Precision Levels	Up to 72 in	35 µin/in	Sine bar, gage blocks
Protractors	(0 to 10) degrees (10 to 90) degrees	0.05 degrees 0.1 degrees	Sine bar, gage blocks
V Blocks	Up to 4 in	65 µin	Gage head/amplifier
Thread Plugs (Pitch Diameter)	Up to 10 in	120 µin	Thread wires and supermicrometer;

## II. Electrical – DC/Low Frequency

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
DC Voltage – Measure and Generate <sup>3</sup>	Range	12 µV/V + 0.04 µV 12 µV/V + 0.35 µV 12 µV/V + 0.6 µV 12 µV/V + 35 µV 18 µV/V + 120 µV	Fluke 5520A w/ HP 3458A opt 002
	Measure Only	0.015 % rdg 3 % rdg 1.5 % rdg 3 % rdg	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
DC Current – Measure and Generate <sup>3</sup>	(0 to 100) nA	53 μA/A + 0.05 nA	Fluke 5520A w/ HP 3458A opt 002
	100 nA to 1 μA	36 μA/A + 0.05 nA	
	1 μA to 10 μA	32 μA/A + 0.12 nA	
	10 μA to 100 μA	32 μA/A + 0.9 nA	
	100 μA to 1 mA	32 μA/A + 6 nA	
	(1 to 10) mA	32 μA/A + 60 nA	
	(10 to 100) mA	32 μA/A + 600 nA	
	100 mA to 1 A	0.014 % rdg + 12 μA	
	(1 to 0.5) A	0.007 % rdg	Fluke 5520A w/ Fluke Y5020 and HP 3458A opt 002
	(0.5 to 20) A	0.02 % rdg	
Measure Only	(20 to 100) A	0.03 % rdg	High current shunts, HP 3458A opt 002
Generate Only	(20 to 1000) A	0.7 % rdg + 0.6 A	Fluke 5520A w/ Fluke 5500A/coil
Resistance – Measure and Generate <sup>3</sup>	(1 to 11) mΩ	0.05 % rdg	Leeds and Northrup 4300 w/ HP 3458A opt 002
	11 mΩ to 10 Ω	23 μΩ/Ω + 120 μΩ	
	(10 to 100) Ω	23 μΩ/Ω + 1.2 mΩ	Fluke 5520A w/ HP 3458A opt 002
	100 Ω to 1 kΩ	17 μΩ/Ω + 1.2 mΩ	
	(1 to 10) kΩ	17 μΩ/Ω + 12 mΩ	
	(10 to 100) kΩ	17 μΩ/Ω + 120 mΩ	
	100 kΩ to 1 MΩ	23 μΩ/Ω + 5 Ω	
	(1 to 10) MΩ	86 μΩ/Ω + 120 Ω	
	(10 to 100) MΩ	0.045 % rdg + 2.7 kΩ	
	100 MΩ to 1 GΩ	1.2 % rdg + 12 kΩ	

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
Capacitance – Generate <sup>3</sup>  (0.19 to 0.4) nF (0.4 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF 330 nF to 1.1 μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF 330 μF to 1.1 mF (1.1 to 3.3) mF (3.3 to 11) mF (11 to 33) mF (33 to 110) mF	10 Hz to 10 kHz 10 Hz to 10 kHz 10 Hz to 3 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz 10 Hz to 1 kHz (10 to 300) Hz (10 to 300) Hz (10 to 150) Hz (10 to 120) Hz (10 to 80) Hz (0 to 50) Hz (0 to 20) Hz (0 to 6) Hz (0 to 2) Hz (0 to 0.6) Hz (0 to 0.2) Hz	0.45 % rdg + 0.009 nF 0.45 % rdg + 0.009 nF 0.45 % rdg + 0.009 nF 0.23 % rdg + 0.009 nF 0.23 % rdg + 0.09 nF 0.23 % rdg + 0.09 nF 0.23 % rdg + 0.27 nF 0.23 % rdg + 0.9 nF 0.23 % rdg + 2.7 nF 0.23 % rdg + 9.0 nF 0.36 % rdg + 27 nF 0.41 % rdg + 90 nF 0.41 % rdg + 270 nF 0.41 % rdg + 0.9 μF 0.41 % rdg + 2.7 μF 0.41 % rdg + 9 μF 0.68 % rdg + 27 μF 0.99 % rdg + 90 μF	Fluke 5520A
Capacitance – Generate and Measure  (0.1 to 10) pF (10 to 100) pF (0.01 to 100) μF  (0.1 to 10) pF (10 to 1000) pF (1 to 1000) nF	@ 1 kHz  @ 400 Hz	0.027 % rdg 0.025 % rdg 0.024 % rdg  0.08 % rdg 0.04 % rdg 0.035 % rdg	Genrad 1689M w/ capacitance source
Inductance – Generate and Measure @ 1 kHz	(0.1 to 100) mHz (0.1 to 1) Hz (1 to 10) Hz	0.12 % rdg 0.12 % rdg 0.12 % rdg	Genrad 1689M w/ inductance source



Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of RTD Indicators and Indicating Systems <sup>3</sup> – (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 0.04 °C 0.05 °C 0.06 °C 0.07 °C 0.08 °C 0.09 °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	0.04 °C 0.05 °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	0.04 °C 0.05 °C 0.07 °C 0.08 °C 0.1 °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	0.03 °C 0.04 °C 0.05 °C 0.06 °C 0.21 °C	
PtNi 385, 120 Ω	-80 °C to 100 °C 100 °C to 260 °C	0.07 °C 0.13 °C	
Cu 427, 10 Ω	-100 °C to 260 °C	0.27 °C	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems <sup>3</sup> –			Fluke 5520A
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.40 °C 0.30 °C 0.30 °C 0.30 °C	
Type C	0 °C to 150 °C 150 °C to 650 °C 650 °C to 1000 °C 1000 °C to 1800 °C 1800 °C to 2316 °C	0.27 °C 0.27 °C 0.28 °C 0.40 °C 0.70 °C	
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	
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 0.16 °C 0.15 °C 0.18 °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 0.18 °C 0.15 °C 0.22 °C 0.33 °C	
Type L	-200 °C to -100 °C -100 °C to 800 °C 800 °C to 900 °C	0.34 °C 0.25 °C 0.19 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.36 °C 0.20 °C 0.19 °C 0.18 °C 0.25 °C	

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Electrical Calibration of Thermocouple Indicators and Indicating Systems <sup>3</sup> – (cont)			
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.50 °C 0.34 °C 0.29 °C 0.34 °C	Fluke 5520A
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.50 °C 0.31 °C 0.31 °C 0.39 °C	
Type T	-250 °C to -150 °C -150 °C to 0 °C 0 °C to 120 °C 120 °C to 400 °C	0.54 °C 0.20 °C 0.16 °C 0.13 °C	
Type U	-200 °C to 0 °C 0 °C to 600 °C	0.51 °C 0.26 °C	
Thermistors	-80 °C to -40 °C -40 °C to 100 °C 100 °C to 150 °C	0.03 °C + 0.0004 °C 0.006 °C + 0.0005 °C 0.008 °C + 0.0006 °C	Decade Resistance Boxes

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup>  (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 % rdg + 5.5 µV 0.014 % rdg + 5.5 µV 0.018 % rdg + 5.5 µV 0.09 % rdg + 5.5 µV 0.31 % rdg + 11 µV 0.72 % rdg + 45 µV	Fluke 5520A

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Voltage – Generate <sup>3</sup> (cont)			
(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 % rdg + 7.2 μV 0.012 % rdg + 7.2 μV 0.014 % rdg + 7.2 μV 0.032 % rdg + 7.2 μV 0.072 % rdg + 29 μV 0.18 % rdg + 63 μV	Fluke 5520A
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 % rdg + 45 μV 0.011 % rdg + 23 μV 0.017 % rdg + 45 μV 0.027 % rdg + 45 μV 0.063 % rdg + 110 μV 0.22 % rdg + 540 μV	
(3.3 to 33) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.027 % rdg + 590 μV 0.014 % rdg + 180 μV 0.022 % rdg + 540 μV 0.032 % rdg + 540 μV 0.081 % rdg + 1.5 mV	
(33 to 330) V	(10 to 45) Hz 45 Hz to 10 kHz (10 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.017 % rdg + 1.8 mV 0.018 % rdg + 5.4 mV 0.023 % rdg + 5.4 mV 0.027 % rdg + 5.4 mV 0.18 % rdg + 45 mV	
(330 to 1020) V	45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.027 % rdg + 9 mV 0.023 % rdg + 9 mV 0.027 % rdg + 9 mV	

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup>			
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	0.049 % rdg + 3.5 μV 0.032 % rdg + 1.3 μV 0.049 % rdg + 1.3 μV 0.14 % rdg + 1.3 μV 0.64 % rdg + 1.3 μV 4.9 % rdg + 2.3 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	0.01 % rdg + 5 μV 0.01 % rdg + 2.3 μV 0.017 % rdg + 2.3 μV 0.037 % rdg + 2.3 μV 0.096 % rdg + 2.3 μV 0.37 % rdg + 12 μV 1.3 % rdg + 12 μV 1.9 % rdg + 12 μV	
100 mV to 1 V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.009 % rdg + 50 μV 0.009 % rdg + 23 μV 0.017 % rdg + 23 μV 0.036 % rdg + 23 μV 0.092 % rdg + 23 μV 0.35 % rdg + 120 μV 1.2 % rdg + 120 μV 1.8 % rdg + 120 μV	

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup> (cont)			
(1 to 10) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz (1 to 2) MHz	0.009 % rdg + 500 µV 0.009 % rdg + 230 µV 0.017 % rdg + 230 µV 0.035 % rdg + 230 µV 0.092 % rdg + 230 µV 0.35 % rdg + 1.2 mV 1.2 % rdg + 1.2 mV 1.8 % rdg + 1.2 mV	HP 3458A opt 002
(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 % rdg + 4.6 mV 0.024 % rdg + 2.3 mV 0.024 % rdg + 2.3 mV 0.04 % rdg + 2.3 mV 0.14 % rdg + 2.3 mV 0.46 % rdg + 12 mV 1.8 % rdg + 12 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	0.047 % rdg + 46 mV 0.047 % rdg + 23 mV 0.069 % rdg + 23 mV 0.14 % rdg + 23 mV 0.35 % rdg + 23 mV	
(1 to 5) kV	60 Hz	0.5 % rdg	Fluke 80K6 w/Tek TX3
(29 to 330) µA	(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	0.18 % rdg + 0.09 µA 0.14 % rdg + 0.09 µA 0.12 % rdg + 0.09 µA 0.27 % rdg + 0.14 µA 0.72 % rdg + 0.18 µA 1.5 % rdg + 0.36 µA	
330 µA 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	0.18 % rdg + 0.14 µA 0.12 % rdg + 0.14 µA 0.09 % rdg + 0.14 µA 0.18 % rdg + 0.18 µA 0.45 % rdg + 0.27 µA 0.90 % rdg + 0.54 µA	

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Voltage – Measure <sup>3</sup> (cont)			
(3.3 to 33) 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	0.16 % rdg + 1.8 µA 0.08 % rdg + 1.8 µA 0.04 % rdg + 1.8 µA 0.07 % rdg + 1.8 µA 0.18 % rdg + 2.7 µA 0.36 % rdg + 3.6 µA	HP 3458A opt 002
AC Current – Generate <sup>3</sup>			
(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	0.16 % rdg + 18 µA 0.08 % rdg + 18 µA 0.04 % rdg + 18 µA 0.09 % rdg + 45 µA 0.18 % rdg + 90 µA 0.36 % rdg + 180 µA	Fluke 5520A
330 mA to 1.1 A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.16 % rdg + 90 µA 0.05 % rdg + 90 µA 0.54 % rdg + 900 µA 2.3 % rdg + 4500 µA	
(1.1 to 3) A	(10 to 45) Hz 45 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.16 % rdg + 90 µA 0.06 % rdg + 90 µA 0.12 % rdg + 230 µA 0.35 % rdg + 230 µA	
(3 to 20) A	45 Hz to 5 kHz	0.012 % rdg	w/HP 3458A opt 002, Fluke Y5020
(20 to 1000) A	(45 to 440) Hz	0.7 % rdg + 0.6 A	w/Fluke 5500A coil
AC Current – Measure <sup>3</sup>			
To 100 µA	(10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz	0.46 % rdg + 0.035 µA 0.17 % rdg + 0.035 µA 0.07 % rdg + 0.035 µA 0.07 % rdg + 0.035 µA	HP 3458A opt 002

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
AC Current – Measure <sup>3</sup> (cont)			
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 (50 to 100) kHz	0.46 % rdg + 0.23 µA 0.17 % rdg + 0.23 µA 0.07 % rdg + 0.23 µA 0.038 % rdg + 0.23 µA 0.07 % rdg + 0.23 µA 0.46 % rdg + 0.46 µA 0.63 % rdg + 1.7 µA	HP 3458A opt 002
(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 (50 to 100) kHz	0.46 % rdg + 2.3 µA 0.17 % rdg + 2.3 µA 0.07 % rdg + 2.3 µA 0.038 % rdg + 0.23 µA 0.07 % rdg + 2.3 µA 0.46 % rdg + 4.6 µA 0.63 % rdg + 17 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 (50 to 100) kHz	0.46 % rdg + 23 µA 0.17 % rdg + 23 µA 0.07 % rdg + 23 µA 0.038 % rdg + 23 µA 0.07 % rdg + 23 µA 0.46 % rdg + 46 µA 0.63 % rdg + 170 µA	w/Fluke Y5020 shunt
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 (20 to 50) kHz	0.46 % rdg + 230 µA 0.18 % rdg + 230 µA 0.09 % rdg + 230 µA 0.12 % rdg + 230 µA 0.35 % rdg + 230 µA 1.2 % rdg + 460 µA	
(1 to 20) A	1 Hz to 5 kHz	0.012 % rdg	

Parameter/Equipment	Frequency	CMC <sup>2</sup> (±)	Comments
Distortion (THD)	20 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.013 % of rdg 0.037 % of rdg 0.065 % of rdg	HP 8903A

Parameter/Equipment	Frequency	CMC <sup>2</sup> (±)	Comments
Oscilloscopes <sup>3</sup> –			
DC and Square Wave	Into 50 Ω	0.2 % + 32 μV	Fluke 5520A/SC600
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 % + 240 μV	
	Relative to 50 kHz reference		
	50 kHz to 100 MHz (100 to 300) MHz (300 to 600) MHz	1.3 % + 80 μV 1.7 % + 80 μV 3.3 % + 80 μV	
Time Marker	5 s to 50 ms	0.0002 % rdg	
	20 ms to 100 ns	0.0002 % rdg	
	(50 to 20) ns	0.0002 % rdg	
	10 ns	0.0002 % rdg	
	(5 to 2) ns	0.0002 % rdg	

### III. Electrical – RF/Microwave

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
Relative Power			HP 8902A with 11793A, 11722A and 11792A
(0 to -10) dBm	10 MHz to 26.5 GHz	0.028 dB	
(-10 to -20) dBm		0.041 dB	
(-20 to -30) dBm		0.044 dB	
(-30 to -40) dBm		0.075 dB	
(-40 to -50) dBm		0.087 dB	
(-50 to -60) dBm		0.093 dB	
(-60 to -70) dBm		0.11 dB	
(-70 to -80) dBm		0.12 dB	
(-80 to -90) dBm		0.16 dB	
(-90 to -100) dBm		0.17 dB	
(-100 to -110) dBm		0.19 dB	
(-110 to -120) dBm		0.20 dB	

Parameter/Range	Frequency	CMC <sup>2</sup> (±)	Comments
Absolute Power –  (20 to 30) dBm  (10 to 20) dBm  (0 to 10) dBm  (-10 to 0) dBm  (-20 to -10) dBm	<2.6 GHz >2.6 GHz  <2.6 GHz >2.6 GHz  <2.6 GHz >2.6 GHz  <2.6 GHz >2.6 GHz  <2.6 GHz >2.6 GHz	3.3 % rdg 4.8 % rdg  3.3 % rdg 4.8 % rdg  1.3 % rdg 3.8 % rdg  1.3 % rdg 3.8 % rdg  1.4 % rdg 3.8 % rdg	HP 8902A w/ 11793A HP 11722A HP 11792A
High RF Power –  1000 W	25 MHz to 1 GHz	67 W	Bird 4421A w/ 4022A
Amplitude Modulation – Carrier: 150 kHz to 10 MHz Depth: Up to 99 %  Carrier: (0.1 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 % rdg 2.0 % rdg  1.1 % rdg 3.0 % rdg	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 (20 to 50) Hz  (0.05 to 100) kHz (100 to 200) kHz	2.3 % rdg 5.8 % rdg  1.2 % rdg 5.8 % rdg	HP 8902A
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	4.7 % rdg 3.5 % rdg	HP 8902A

III. Mechanical

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Force – Measure and Measuring Equipment <sup>3</sup>	(0 to 500) lbf	0.05 % rdg	Dead weight
Mass <sup>3</sup>	1 mg to 4 g 4 g to 6.1 kg	0.022 mg 0.0004 % rdg	Troemner weights and comparator
Scales and Balances <sup>3</sup>	1 mg to 4 g 4 g to 6.1 kg	0.022 mg + 0.6R 0.0004 % rdg + 0.6R	Troemner weights; R is the resolution of the unit under test.
	(6.1 to 200) kg	0.006 % rdg + 0.6R	Class F weights
Volume <sup>3</sup>	(0.1 to 10) µL 10 µL to 210 mL 210 mL to 6.1 L	0.05 µL (0.05 + 0.0015V) µL 0.18 % rdg	Balance; V is the volume in microliters of the unit under test.
Torque – Measure and Measuring Equipment <sup>3</sup>	1 in·lb to 2000 ft·lb	0.25 % rdg	AKO torque system
Pressure/Vacuum – Measure and Measuring Equipment <sup>3</sup>	(0 to 2) inH <sub>2</sub> O	0.0006 inH <sub>2</sub> O	MicroTector
	(0 to 10) psia (10 to 1015) psia	0.0009 psi + 0.6R 0.009 % rdg + 0.6R	DHI PPC3
	(1000 to 10 000) psig	0.12 % rdg	Digital pressure gauges and pressure pump
Indirect Verification of Rockwell Hardness Testers <sup>3</sup>	HRA: (20 to 39) HRA (40 to 70) HRA  HRB: (20 to 39) HRB (40 to 70) HRB  HRC: (20 to 39) HRC (40 to 70) HRC	0.6 HRA 0.43 HRA  1.2 HRB 0.84 HRB  0.56 HRC 0.52 HRC	Indirect verification method per ASTM E18; hardness block values approximate portions of range

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Durometers Types A, B, C, D, DO, O, OO	(0 to 100) points	0.4 point	T.O. 33K6-4-1362-1

#### IV. Thermodynamics

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Temperature <sup>3</sup> – Measure	-200 °C to -20 °C	0.03 °C	Hart 5628, 1529
	Ice Point	0.01 °C	ASTM E563 ice point, Hart 5628, 1529
	-20 °C to 150 °C	0.02 °C	Hart 7320, 5628, 1529
	150 °C to 300 °C 300 °C to 600 °C	0.15 °C 0.25 °C	Hart 9127, 5628, 1529
Relative Humidity – Measure and Measuring Equipment <sup>3</sup>	10 % to 90 % RH 90 % to 95 % RH	1.3 % rdg 2.5 % rdg	Vaisala M170/HMP77B

#### V. Time and Frequency

Parameter/Equipment	Range	CMC <sup>2</sup> (±)	Comments
Frequency – Measure and Measuring Equipment	0.001 Hz to 26.5 GHz	5 parts in 10 <sup>12</sup>	HP Z3801A
Frequency – Measure and Measuring Equipment <sup>3</sup>	0.001 Hz to 26.5 GHz	1 part in 10 <sup>9</sup>	HP 5345B

<sup>1</sup> This laboratory offers commercial calibration service and field calibration service, where noted.

- <sup>2</sup> Calibration and Measurement Capability (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. Calibration and Measurement Capabilities 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.
- <sup>3</sup> 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.
- <sup>4</sup> 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.



World Class Accreditation

The American Association for Laboratory Accreditation

# 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/NCSL Z540-1-1994 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 25<sup>th</sup> day of February 2011.



  
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Peter Meyer

President & CEO  
For the Accreditation Council  
Certificate Number 1500.02  
Valid to May 31, 2012

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