

***PYLON ELECTRONICS INC.***

**STATEMENT OF MEASUREMENT  
CAPABILITIES**

# ***ELECTRICAL***

## DC/LOW FREQUENCY

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
<b>DC Voltage</b>	Volts (V)	1µV to 10KV	-	Generate
		1µV to 200mV	0.00072%	Measure
		100mV to 2V	0.00038%	Measure
		2.0V to 1KV	0.00045%	Measure
		1KV to 10KV	1%	Measure
		10 Volt Reference Standard	2 ppm *	Measure
<b>DC Current</b>	Amperes (A)	0A to 100A	-	Generate
		0A to 100A	0.01%	Measure
		100A to 1000A	0.25%	Measure
<b>Resistance Four Terminal</b>	Resistance (Ω)	0.001 to 0.1	0.0210%	Measure
		0.1 to 1	0.0008%	Measure
		1	0.0005%	Measure
		1 to 1M	0.0003%	Measure
		1M to 10M	0.0006%	Measure
		10M to 100M	0.0030%	Measure
Two Terminal up to 1000 Volts	-	100M to 1T	1%	Measure
		1T to 10T	2%	Measure
<b>Capacitance Fixed Standards</b>	Farads (F)	10pF to 1.0µF	-	Generate
		1000pF @ 1KHz	0.002%	Measure
Variable	-	5pF to 1150pF	-	Generate
		0.01pF to 1.2µF	0.01%	Measure
		Up to 0.2F	3%	Measure
<b>Inductance Fixed Standards</b>	Henries (H)	1mH to 10mH	-	Generate
		10µH to 100µH	1%	Measure
		100µH to 1mH	0.1%	Measure
		1mH to 100mH	0.028%	Measure
		100mH to 10H	0.1%	Measure

\* Type I CLAS Certification / SCC Accreditation for 10 Vdc.

## DC/LOW FREQUENCY (Continued).

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
AC Voltage	Volts (V)	1mV (10Hz to 50KHz) (50KHz to 1.2MHz)	≤0.038% ≤0.110%	Measure
		10mV (10Hz to 50KHz) (50KHz to 1.2MHz)	≤0.024% ≤0.099%	Measure
		100mV (10Hz to 50KHz) (50KHz to 1.2MHz)	≤0.019% ≤0.099%	Measure
		1V (10Hz to 50KHz) (50KHz to 1.2MHz)	≤0.004% ≤0.059%	Measure
		10V (10Hz to 50KHz) (50KHz to 1.2MHz)	≤0.004% ≤0.056%	Measure
		100V (10Hz to 50KHz) (50KHz to 200KHz)	≤0.004% ≤0.024%	Measure
		1000V (10Hz to 30KHz)	≤0.008%	Measure
		700V (30KHz to 100KHz)	≤0.035%	Measure
		1mV to 1000V (5Hz to 1MHz)	-	Generate
<b>High Frequency Voltage</b>	<b>Volts (V)</b>	0.5V to 50V @ 30MHz	0.6%	Measure

## DC/LOW FREQUENCY (Continued).

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
<b>AC Current</b>	<b>Amperes (A)</b>	10µA to 20A	-	<i>Generate</i>
		10µA (50Hz to 1KHz)	0.08%	<i>Measure</i>
		100µA (10Hz to 5KHz) (5KHz to 30KHz)	≤0.016% ≤0.090%	<i>Measure</i> <i>Measure</i>
		1mA (10Hz to 5KHz) (5KHz to 30KHz)	≤0.014% ≤0.090%	<i>Measure</i> <i>Measure</i>
		10mA to 100mA (10Hz to 5KHz) (5KHz to 50KHz) (50KHz to 100KHz)	≤0.022% 0.03% 0.05%	<i>Measure</i> <i>Measure</i> <i>Measure</i>
		1A (10Hz to 5KHz) (5KHz to 50KHz) (50KHz to 100KHz)	≤0.035% 0.03% 0.05%	<i>Measure</i> <i>Measure</i> <i>Measure</i>
		1A to 5A (5Hz to 20KHz) (20KHz to 50KHz) (50KHz to 100KHz)	0.02% 0.03% 0.05%	<i>Measure</i> <i>Measure</i> <i>Measure</i>
		5A to 20A (5Hz to 20KHz) (20KHz to 50KHz)	0.03% 0.05%	<i>Measure</i> <i>Measure</i>
		20A to 400A (60Hz)	0.50%	<i>Measure</i>

## DC/LOW FREQUENCY (Continued).

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
<b>Ratio, AC</b>	ACV	-0.0111111 to 1.111111 (50Hz to 1KHz) (1KHz to 5KHz) (5KHz to 10KHz)	2 ppm 15 ppm 60 ppm	Ratio Ratio Ratio
<b>Ratio, DC</b>	DCV	0 to 1.0	0.2 ppm	Ratio
<b>Low Frequency</b>	(db)	40 Vpk-pk (1μHz to 100KHz)	0.1db	Generate
<b>Frequency</b>	Hz	1mHz to 18.0GHz	3 X 10 <sup>-7</sup> to 2 X 10 <sup>-9</sup>	Measure
<b>Time Base Standard</b>	Hz	1, 5, and 10MHz	3 X 10 <sup>-12</sup>	Measure
<b>Time</b>	Seconds	10 to 10 <sup>4</sup> sec	0.001 sec	Measure
<b>Phase Angle</b>  <b>0 Degrees to 360 Degrees, 1Hz to 100KHz</b>	Degrees (°)	Equal Amplitude 50mV to 120V (1Hz to 1KHz) (1KHz to 6.25KHz) (6.25KHz to 50KHz) (50KHz to 100KHz)  Amplitude Ratio=500 50mV to 100V (1Hz to 1KHz) (1KHz to 6.25KHz) (6.25KHz to 50KHz)  (50KHz to 100KHz) Amplitude 100V to 120V (1Hz to 1KHz) (1KHz to 6.25KHz) (6.25KHz to 50KHz)	0.005° 0.005° 0.010° 0.020°  0.030° 0.060° 0.090° 0.240°  0.060° 0.120° 0.180° 0.600°	Measure/ Generate

*DC/LOW FREQUENCY (Continued).*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
<b>Magnetism Fixed Standards</b>	Gauss	500 gauss 2000 gauss	0.04% 0.04%	<i>Measure</i>
<b>Conductivity</b>	PH	4.00 7.00 10.00	0.01 0.01 0.02	<i>Generate</i>
	Siemens	84 µS/cm 1382 µS/cm 1413 µS/cm 12880 µS/cm	3 µS/cm 9 µS/cm 0.7 µS/cm 1.5 ppm	

## RF/Microwave Frequency

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty <math>\pm</math></b>	<b>Capability</b>
<b>RF/Microwave Power (50 OHM)</b>	Watts (W)	up to 100W (30MHz, 100MHz, 300MHz, 400MHz, 500MHz)	1%	Generate
	(dbm)	+19dbm (500KHz to 512MHz)	N/A	Generate
		+13dbm (512MHz to 1024MHz)	N/A	Generate
		+12dbm (10MHz to 20GHz)	N/A	Generate
		+2.5dbm (20GHz to 50GHz)	N/A	Measure
		0dbm (50MHz)	2.4%	Measure
		-30dbm to +20dbm (100KHz to 4GHz)	3.3%	Measure
		-70dbm to -30dbm (10MHz to 18GHz)	2.4%	Measure
		-30dbm to +20dbm (10MHz to 18GHz)	2.0%	Measure
	(18GHz to 26.5GHz)	3.9%	Measure	
	(26.5GHz to 40GHz)	4.2%		
<b>Pulse Power</b>	Watts (W)	5KW (950 to 1220MHz)	0.85db	Measure
		5KW < 2350MHz	0.2%	Generate
		4KW < 3100MHz	0.2%	Generate
		500W @ 6100MHz	0.2%	Generate

*RF/Microwave Frequency (Continued).*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty ±</b>	<b>Capability</b>
<b>Attenuation 600 OHM</b>	(db)	0 to 111db 0.1db steps (DC to 1MHz)	0.02db ±0.25%	<i>Generate</i>
		0 to 110db (DC to 18GHz)	4%	<i>Generate</i>
<b>Attenuation 50 OHM</b>	(db)	0 to 100db (DC to 1 KHz)	1.0db	<i>Measure</i>
		0 to 80db (1KHz to 2.5MHz)	0.3db	<i>Measure</i>
		0 to 127dbm (2.5MHz to 1300 MHz)	0.05db +0.25/10db	<i>Measure</i>
		0 to 70dbm (1300MHz to 18GHz)	0.02db +0.02/10db	<i>Measure</i>
		70 to 85 dbm (1300 MHz to 18GHz)	0.05db +0.02/10db	<i>Measure</i>
		85 to 95 dbm (1300MHz to 18GHz)	0.10db +0.02/10db	<i>Measure</i>
		95 to 100 dbm (1300MHz to 18GHz)	0.20db +0.02/10db	<i>Measure</i>
		100 to 110 dbm (1300MHz to 18GHz)	0.6db	<i>Measure</i>

*RF/Microwave Frequency (Continued).*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty <math>\pm</math></b>	<b>Capability</b>
<b>Return Loss</b> (50 OHM) Type "N" connector	(db)	5 MHz to 18 GHz		<i>Measure</i>
<b>Return Loss</b> (50 OHM) Type "A" connector		2 GHz to 18 GHz	Directivity >35db	<i>Measure</i>
<b>Return Loss</b> (50 OHM) Type "K/SMA" connector		10 MHz to 40 GHz		<i>Measure</i>
<b>(50 OHM) Airline Bridge Directivity</b>	(db)	Test Port Connectors  K male & Female (up to 40 GHz)  APC (up to 18 GHz)  N female (up to 18 GHz)	> 45db Directivity  > 45db Directivity  > 45db Directivity	<i>Measure</i>  <i>Measure</i>  <i>Measure</i>

# ***PHYSICAL PROPERTIES***

*Physical/Dimensional.*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty</b> $\pm$
<b>Gauge Blocks</b>  Length	Inches  mm	0.010" to 1" 1" to 4" 0.5 to 25mm 25 to 100mm	4 $\mu$ inch (4 + 1L) $\mu$ in 0.1 $\mu$ m (0.1+0.025L) $\mu$ m L=length in UOM
<b>Length Standards</b>	Inches  mm	to 12" 12" to 32" to 300mm 300 to 800mm	20 $\mu$ inch Consult Lab 0.0005mm Consult Lab
<b>External Dimensions</b>  External Measurements	Inches  mm	Up to 12" Up to 300mm	20 $\mu$ inch 0.0005mm
Thread Gauge Plugs		12" to 48" 300 to 1200mm	Consult Lab.
		48 to 4tpi	Consult Lab.
<b>Internal Dimensions</b>  Cylindrical Ring Gauges	Inches  mm	Up to 5.0" Up to 125mm	20 $\mu$ inch 0.0005mm
Internal Measurements		5.0" to 12" 125 to 300mm	Consult Lab.
		Up to 48" Up to 1200mm	Consult Lab.
<b>Straightness</b>	Inches/mm	Consult Lab.	50 $\mu$ in / 0.0013mm
<b>Surface Plate</b>	Inches/mm	Consult Lab.	Grade "A" for most common sizes.
<b>Parallels</b>	Inches/mm	-	50 $\mu$ in / 0.0013mm
<b>Indicator dial</b>	Inches/mm	up to 12" Up to 300mm	25 $\mu$ inch 0.0006mm

## Physical/Dimensional.

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty</b> ±
<b>Calipers, Micrometers</b>  Outside  Inside  Depth	Inches  mm	Up to 48" Up to 1200mm Up to 48" Up to 1200mm Up to 48" Up to 1200mm	$(44 + 2L)\mu\text{in}$ $(0.0011 + 0.05L)\mu\text{m}$  L = length of measurement in UOM
<b>Hardness Testers</b>  Rockwell	Rockwell units	HRB 60 HRC 30,60,90	1 unit
<b>Flatness</b>	Inches  mm	Area covered by 10" diameter optical flat	$5.0\mu\text{in}$ $0.13\mu\text{m}$
<b>Acoustics</b>  Sensitivity	Decibels (db)	Microphone 1/8" to 1" 250Hz	0.17db
<b>Acceleration</b>	pC/ms <sup>-2</sup>	10Hz to 5KHz	2.6%
<b>Load Cells</b>  Compression and Tension	Lbs (kg)	1000 (500) 5000 (2200) 20000 (9000) 50000 (22000) 100000 (44000)	0.1% F.S. " " " "
<b>Torque</b>	-	0.5 to 215inoz 36gcm to 15.5kgcm  10inlb to 5000 ftlb 1.0 to 575 kgcm	0.3% of Indicated Reading   0.05% of Indicated Reading
<b>Tensiometer</b>	Lbs (kg)	up to 600Lb(300kg)	Consult Lab.

*Physical/Dimensional.*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty</b> ±
<b>Balance and scales</b>	Lbs grams	To 1000Lbs To 500Kg	Class "S" Mass Comparison
<sup>1</sup> Mass Imperial	Lbs	1/16 oz. to 70 lbs	Class 'Q'
Metric	grams	5 mg to 32 Kg	Class 'Q'

1 Better class available for specific mass values. Consult lab.

*Thermal/Pressure.*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty</b> ±
<b>Temperature</b>	Celsius °C (°F)		
Ice point		0°C (32°F)	0.03°C (.05°F)
<sup>2</sup> Thermometer		-50 to 130°C (-58 to 226°F)	0.5°C (0.9°F)
PRT Probe		-183 to 650°C (-297 to 1200°F)	0.002°C + Cal Err (0.0036°F) + Cal Err
<b>Pressure</b>			
Absolute Pressure (air)		0.3 to 15 psia 2 to 105kPa	0.02% of IV*
Gauge Pressure (air)		0.3 to 50 psig 2 to 345kPa	0.02% of IV*
Gauge Pressure (air)		15 to 500 psig 105 to 3450kPa	0.02% of IV*
Gauge Pressure (air)		0 to 10000 psig 0 to 70000kPa	0.05% of IV*
Gauge Pressure (oil)		0 to 15000 psig 2 to 103000kPa	0.02% of IV* * Indicated Value

<sup>2</sup> Due to the lag bath technique employed it is proposed to calibrate at a temperature approximating the specified temperature ±1°C.

# ***FIBER OPTICS***

*Fiber Optics.*

<b>Measured Quantity</b>	<b>Units</b>	<b>Range</b>	<b>Best Measurement Uncertainty</b>	<b>Capability</b>
<b>Wavelength</b>	$\lambda$	<b>LASER</b> 1600.600 nm 1520 – 1570 nm 1310.000 nm	N/A	Generate
		<b>LED</b> 850 nm 1300 nm	N/A	Generate
		<b>LASER</b> 1250 -1625 nm	$\pm 1.5$ pm	Measure
		<b>LED</b> 1250 -1310 nm	$\pm 1.5$ pm	Measure
<b>Power</b>	<b>dBm</b>	<b>LASER</b> 1310 – 1600.60 nm	> 6 dBm	Generate
		<b>LED</b> 850 nm 1300 nm	> -17 dBm	Generate
		<b>LASER</b> 1310 – 1650 nm (+10 dBm–40 dBm)	$\pm 2.5\%$	Measure
		<b>LED</b> 800 – 1300 nm (+10 dBm–40 dBm)	$\pm 2.5\%$	Measure
<b>Attenuation</b>	<b>dB</b>	<b>LASER</b> 1310 nm and 1550 nm	(0 to -40 dB) $\pm 2.5\%$ (-40 to -90 dB) $\pm 0.1$ dB	Generate
		<b>LASER</b> 1310 nm (-40 dB) 1550 nm (-40 dB)	$\pm 2.5\%$	Measure