

A new generation in high performance power analysis

**Watts, Volts, Amps, VA, VAr, Vdc, Adc, Vac, Aac, Vpk, Apk, Asurge, pf, frequency, phase, impedance, datalog, integration, fundamentals, harmonics**

- 0.04% basic accuracy
- Frequency range dc and 10mHz to 2MHz
- High precision internal shunts
- 1000Vrms - 3000Vpk direct voltage input
- 30Arms – 300Apk direct current input
- 5 millidegree basic phase accuracy
- 1, 2 or 3 phase versions
- High speed sampling on all channels
- True real time analysis with no measurement gap
- Easy to use - Single button access to all measurement modes
- Real time Digital, Tabular, Graphic and Oscilloscope displays
- Real time datalog and integration
- Master - slave configuration for 6 phase operation
- Simple BNC connection of N4L shunts for high current applications
- RS232, IEEE488, USB, LAN, Torque, Speed and Extension ports

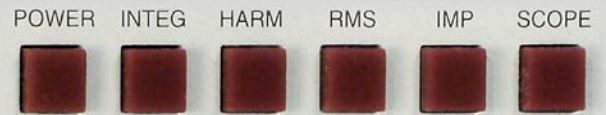
# Precision Power Analysis for today's applications



Today's designers of electronic devices ranging from power supplies and lighting ballasts to microwaves and motor drives face continued pressure to develop smaller and more efficient products. This push for greater efficiency results in an ever increasing frequency of power conversion techniques and with these new techniques comes the need for power measurement instruments with much greater high frequency accuracy.

Responding to this growing need, N4L has combined years of experience in high frequency measurement instrumentation with innovative developments in analog and digital design to produce a new generation of class leading precision power analyzers called the PPA2500 series. In common with many advances in technology, the PPA2500 series not only excels in performance but it achieves this at an exceptionally competitive price, putting high performance power analysis within the reach of all those who need it.

As with our PSM range of Phase Sensitive Multimeters, our priority when designing the user interface of the PPA2500 was to combine great flexibility with ease of use. The result is an instrument providing a greater range of functions than any competitive product and yet all primary measurements can be seen instantly by pressing just one of six mode keys.



## Power analyzer

POWER ANALYZER			
V range: 300V	Arange: 3A	coupling: ac+dc	bandwidth: wide
PH2	true	fundamental	
watts	<b>6.4361W</b>	6.0867W	
VA	29.594VA	22.737VA	
VAh	28.885VAh	-21.970VAh	
pf	0.218	+0.267	
voltage	<b>143.11V</b>	112.54V	-117.44*
current	<b>206.79mA</b>	202.56mA	-191.95*
frequency	<b>50.098Hz</b>		
H3	111.47µW	0.002%	
dc watts	110.21µW		

By providing all primary measurement functions within the default display, users instantly see every function without the need to enter a separate menu.

Using the zoom buttons, functions of particular interest can be enlarged without losing other data.

POWER ANALYZER			
	phase 1	phase 2	phase 3
	coupling: ac+dc bandwidth: wide		
watts	<b>7.2346</b>	<b>6.4361</b>	<b>6.0093</b>
VA	28.306	29.594	29.571
VAh	27.366	28.885	28.954
pf	0.256	0.218	0.203
voltage	<b>136.69</b>	<b>143.11</b>	<b>144.02</b>
current	<b>207.08m</b>	<b>206.79m</b>	<b>205.32m</b>
frequency	<b>50.098Hz</b>		
H3	0.012	0.002	-0.012
dc watts	69.957µ	110.21µ	143.67µ

In the three phase mode, all primary power functions can be viewed simultaneously on all three phases.

DC power and a selected harmonic are also displayed for all phases giving instant information on the dc and harmonic power content.

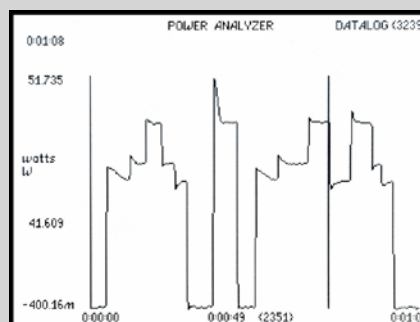
Power Analyzer mode displaying all primary power functions with both total and fundamental values plus the phase relationship to phase 1 volts.

POWER ANALYZER		
	coupling: ac+dc	bandwidth: wide
PH1	<b>7.2346</b>	W
watts		
PH1	<b>136.69</b>	V
voltage		
PH1	<b>207.08m</b>	A
current		
frequency	<b>50.098</b>	Hz

Measurement functions selected with zoom can be enlarged even further for easy viewing.

Here, the default zoom functions on phase 1 are shown and users can select any functions they wish to see, presented in any order.

## Datalog



When measurements over time are of interest, up to four selected functions can be viewed in datalog mode.

Datalog periods can be set with no gap so that no information is missed during datalog capture and the display is updated during datalog with real time, tabular or graphic display.

## Integrator

POWER INTEGRATOR			
	coupling	ac+dc	bandwidth: wide
PH1	true		fundamental
W hours	132.03mWh		125.84mWh
VA hours	603.72mVAh		445.62mVAh
VAr average	27.938VAr		20.273VAr
pf average	0.219		0.282
V average	139.60V		104.95V
A hours	4.3248mAh		4.2459mAh

When the INTEG mode is selected, true and fundamental values of all integrated values are presented. Using the NEXT and BACK buttons, any individual phase or the sum value of all phases can be viewed.

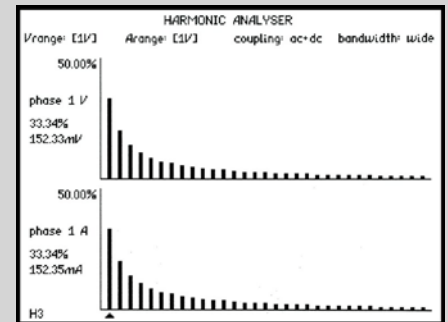
For convenience and flexibility, other measurement modes can be viewed while integration continues to operate in the background.

## Harmonics analyzer

Real time harmonic analysis to the 76th harmonic is made simultaneously on both voltage and current inputs.

THD computation with either series or difference formula is set with any selected number of harmonics up to 76 and TIF computation is included as standard.

HARMONIC ANALYSER				
	coupling	ac+dc	bandwidth: wide	
PH1			voltage	current
2	17.554µV	0.004%	30.509µA	0.007%
3	152.30mV	33.33%	152.32mA	33.33%
4	24.382µV	0.005%	21.862µA	0.005%
5	91.399mV	20.00%	91.402mA	20.00%
6	24.215µV	0.005%	20.628µA	0.005%
7	65.284mV	14.29%	65.293mA	14.29%
8	9.9918µV	0.002%	11.663µA	0.003%
9	50.761mV	11.11%	50.775mA	11.11%
10	32.874µV	0.007%	28.976µA	0.006%
11	41.539mV	9.090%	41.536mA	9.090%
12	17.389µV	0.004%	22.373µA	0.005%
13	35.153mV	7.693%	35.156mA	7.693%
14	8.7512µV	0.002%	19.250µA	0.004%
15	30.471mV	6.668%	30.469mA	6.668%
16	8.2921µV	0.002%	19.065µA	0.004%
17	26.875mV	5.881%	26.873mA	5.881%
18	24.743µV	0.005%	19.069µA	0.004%
19	24.053mV	5.264%	24.055mA	5.264%
20	23.773µV	0.005%	28.895µA	0.006%



At the press of a button, the display can be switched between graphical, tabular or real time displays while measurements are made and without loss of any data.

Here, a square wave signal has been applied illustrating the accuracy and resolution of harmonic percentage values.

## RMS Multimeter

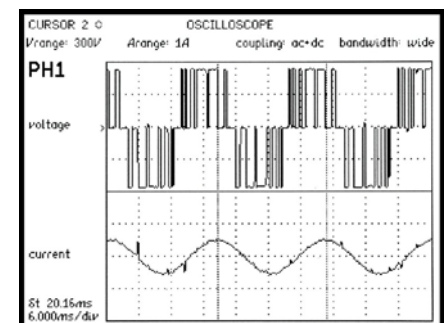
RMS VOLTMETER				
	coupling	ac+dc	bandwidth: wide	
V	phase 1	phase 2	phase 3	V
rms	137.23	148.03	141.17	V
dc	270.41m	306.26m	459.87m	V
ac	137.23	148.03	141.17	V
peak	256.2	240.3	246.3	V
cf	1.87	1.62	1.74	
surge	262.1	252.2	246.3	V

RMS VOLTMETER				
	coupling	ac+dc	bandwidth: low	
A	phase 1	phase 2	phase 3	A
rms	204.05m	203.34m	203.17m	A
dc	-138.8µ	319.36µ	-2.0127m	A
ac	204.05m	203.33m	203.16m	A
peak	289.4m	-288.5m	-287.9m	A
cf	1.42	1.42	1.42	
surge	-290.4m	-303.1m	1.359	A

In addition to the true rms value of voltage and current on any measurement channel, RMS mode also provides real time measurement of dc, ac, peak, crest factor and surge.

With a three phase display as shown above, all values can be seen on all phases for easy phase to phase comparisons.

## Oscilloscope



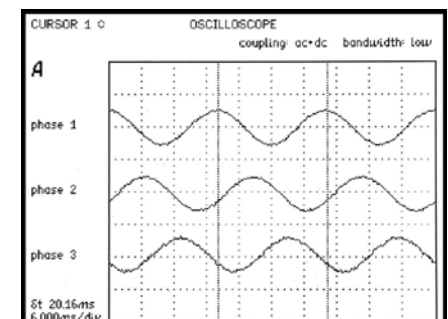
While a precise measurement in power applications generally requires the use of a numeric presentation, the SCOPE mode provided by the PPA2500 is a valuable aid to development and test.

## Impedance analyzer

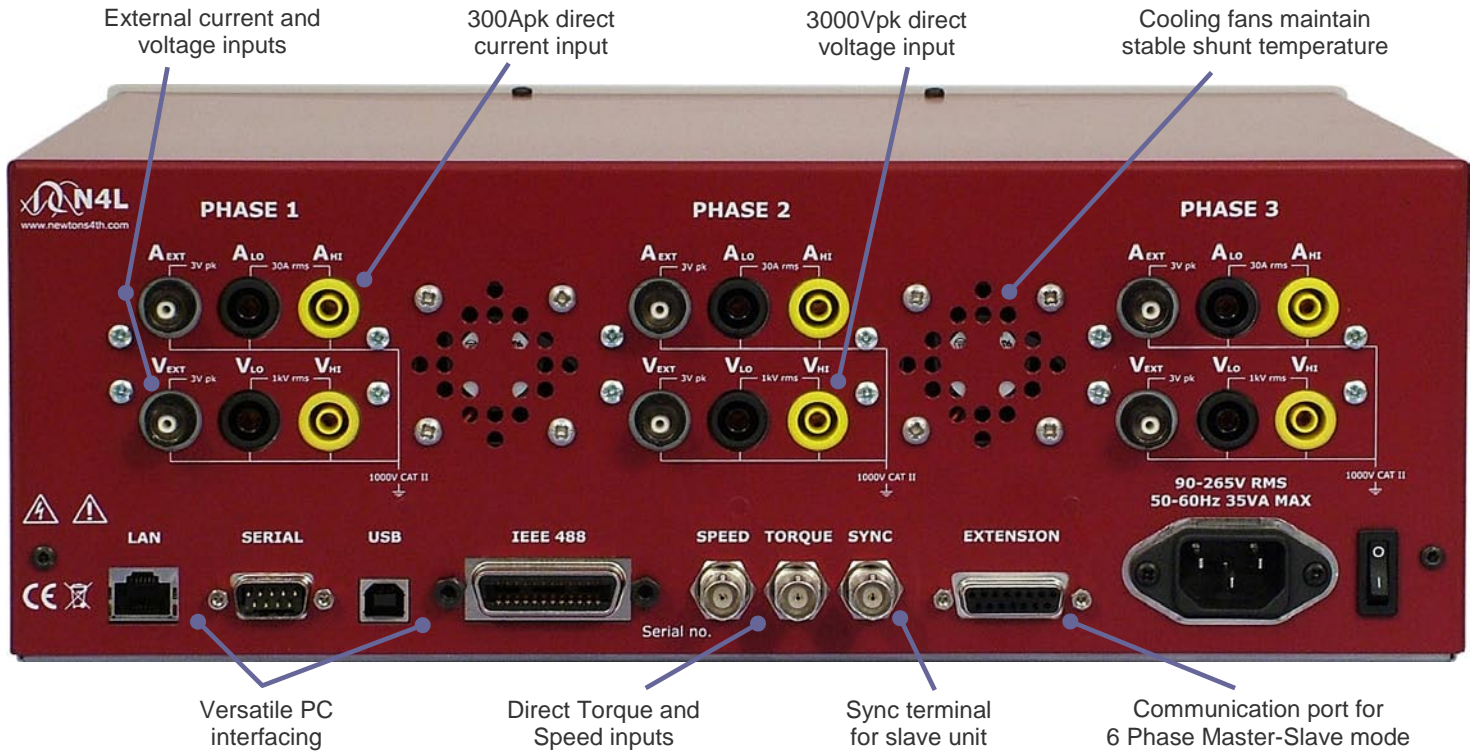
IMPEDANCE ANALYZER			
	coupling	ac+dc	bandwidth: low
	phase 1	phase 2	phase 3
impedance	+556.6	+532.9	+532.7
resistance	+160.6	+133.0	+159.3
reactance	+533.0	+516.0	+508.4
phase	-286.76°	-284.46°	-287.40°
frequency	50.087Hz		

Utilising true real time DFT analysis, the PPA2500 provides precision impedance measurements on any individual phase or a simultaneous display of all three phases as shown here.

Resistive and reactive components of the total impedance are presented along with the phase angle of each phase impedance and the fundamental frequency.



Display of voltage and current on a single phase or all three phase waveforms can be selected with user control of trigger level, pre trigger, timebase and cursors.



## Specification

### Measurements

W, VA, VARs, pf, V & A – rms, ac, dc, pk, cf and surge  
 Frequency, phase, fundamentals and impedance  
 Harmonics, THD, TIF, THF, TRD and TDD  
 Integrated values  
 Datalog  
 Sum and Neutral values

### Frequency Range

DC and 10mHz to 2MHz

### Voltage Input

Ranges – 1Vpk to 3000Vpk (1000Vrms) in 8 ranges  
 20% over-range ability maintains 300Vpk range with 240Vrms  
 Accuracy – 0.04% Rdg + 0.04% Rng + 0.004%/kHz + 1mV\*  
 External sensor input to 3Vpk – BNC connector

### Current Input

The PPA is fitted with either a 30Arms or 10Arms internal shunt  
**30Arms Shunt:**  
 Ranges – 100mApk to 300Apk (30Arms) in 8 ranges  
 Accuracy – 0.04% Rdg + 0.04% Rng + 0.004%/kHz + 100uA\*  
**10Arms Shunt:**  
 Ranges – 10mApk to 30Apk (10Arms) in 8 ranges  
 Accuracy – 0.04% Rdg + 0.04% Rng + 0.004%/kHz + 10uA\*  
 External shunt input to 3Vpk – BNC connector

### Phase Accuracy

5 millidegrees + 10 millidegrees / kHz

### Watts Accuracy

[0.05% + 0.03%/pf + (0.01%/kHz)/pf] Rdg + 0.05%VA Rng

### Common Mode Rejection

Total Common Mode and Noise effect on current channels  
 Applied 250V @ 50Hz – Typical 1mA (150dB)  
 Applied 100V @ 100kHz – Typical 3mA (130dB)

\* measured fundamental value

All specifications at 23°C +/- 5°C. These specifications are quoted in good faith but Newtons4th Ltd reserves the right to amend any specification at any time without notice

### Datalog

Functions	Up to 4 measured functions user selectable
Datalog window	From 10ms with no gap between each log
Memory	RAM or non-volatile up to 8000 records

### High Speed Data Streaming

Rate	Up to 1000 reading/s single phase
Window	1ms to 1s synchronized to waveform
Buffer	Up to 8000 records

### General

Crest factor	Voltage and Current - 20
Sample rate	Real time no gap - 2.2Ms/s on all channels
Low power accuracy	Compliant with IEC62301 using internal shunt
Remote operation	Full capability, control and data

### Ports

RS232	Baud rate to 19200 – RTS/CTS flow control
LAN (option L)	10/100 base-T Ethernet auto sensing RJ45
GPIO (option G)	IEEE488.2 compatible
USB	USB device – 2.0 and 1.1 compatible
Speed	Analog bipolar +/- 10V or pulse count
Torque	Analog bipolar +/- 10V
Sync	Measurement synchronization for 6 phase mode
Extension	Master slave control and N4L accessory port

### Standard Accessories

Leads	Power, RS232, USB
Connection cables	32A rated 1.5 meter long leads with 4mm – stackable terminals 2x Yellow and 2x Black per phase
Connection clips	4mm terminated alligator clips – 2x Yellow and 2x Black per phase
Documentation	Calibration Certificate, User manual and quick start guide

### Physical

Display	320 x 240 dot LCD – white LED backlight
Size	125H x 355W x 250D mm – excluding feet
Weight	5kg – 1 phase 5.6kg – 3 phase
Safety isolation	1000V rms or dc – category II
Power supply	90-265 rms 50-60Hz 35VA max