



Compact high performance power analysis

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

- 0.05% basic accuracy
- Frequency range dc and 10mHz to 1MHz
- High precision internal shunts
- 1000Vrms - 2500Vpk direct voltage input
- 20Arms - 300Apk direct current input
- 10 millidegree basic phase accuracy
- 1, 2 or 3 phase versions
- High speed sampling on all channels
- True no-gap measurement
- x10 increased sensitivity mode
- Real time Digital, Tabular, Graphic and Oscilloscope displays
- Real time datalog and integration
- BNC external sensor inputs
- RS232, USB, LAN, Extension and Auxiliary ports
- USB Memory port
- Easy to use - Single button access to main measurement modes
- Direct Standby Power measurement to IEC62301

# 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 superior wideband performance and low power accuracy.

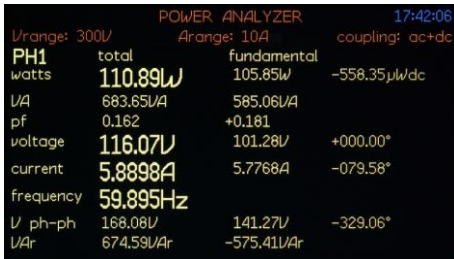
In response to this growing need, N4L has combined years of experience in high frequency measurement instrumentation with innovative developments in analog and digital design to produce a range of truly class leading precision power analyzers.

Joining the established PPA2500 series and the ultimate accuracy PPA5500, the PPA1500 series ensures that N4L power analyzers provide the optimum solution to almost any power measurement application and budget.

As with all N4L measurement instruments, the PPA1500 user interface combines great flexibility with ease of use. The result is an instrument providing a greater range of functions than any competitive product and yet primary measurements can be seen instantly by pressing just one of four mode keys.



## Power analyzer



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

Power Analyzer mode displays all primary power functions with both total and fundamental values plus the phase relationship to a selected phase reference.



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

Measurement functions in the bottom two lines are user selectable. In this example, dc watts and phase to phase voltage are shown.

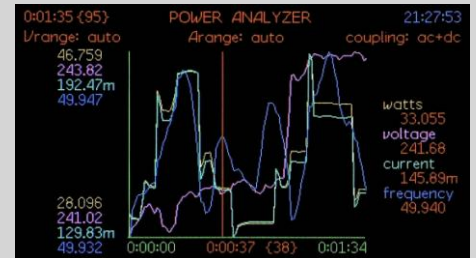


Using the zoom key any four selected measurement items can be enlarged even further for easy viewing.

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				17:52:38
	phase 1	phase 2	phase 3	coupling: ac+dc
W hours	1.4480	1.4496	1.4197	Wh
VA hours	7.4255	7.6867	7.4749	VAh
VAh hours	7.2829	7.5487	7.3388	VAh
pf avg	0.195	0.189	0.190	
V avg	115.33	115.10	113.28	V
A hours	64.382m	66.785m	65.987m	Ah

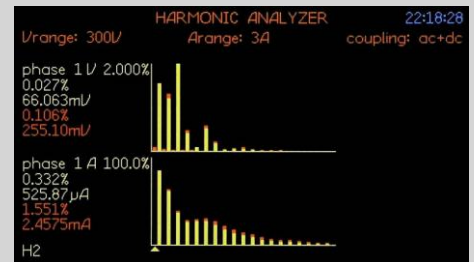
When the INTEG mode is selected, true and fundamental values of all integrated values are presented. Using the NEXT and BACK buttons, any individual phase or the sum value of all phases can be viewed.

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 50th harmonic is made simultaneously on both voltage and current inputs.

THD computation with either series or difference formula can be selected plus TIF, THF, TRD and TDD computation is included as standard.



HARMONIC ANALYZER						17:04:13
	phase 1		phase 2		phase 3	
V	110.0V	100.0%	110.0V	100.0%	110.0V	100.0%
1	183.4mV	0.122%	190.6mV	0.128%	178.8mV	0.119%
2	49.88V	33.24%	49.70V	33.24%	49.84V	33.23%
3	93.58mV	0.062%	98.28mV	0.066%	91.34mV	0.061%
4	29.60V	19.73%	29.49V	19.73%	29.58V	19.73%
5	20.56mV	0.014%	21.96mV	0.015%	23.18mV	0.015%
6	20.82V	13.87%	20.74V	13.87%	20.80V	13.87%
7	4.903mV	0.003%	6.692mV	0.004%	3.258mV	0.002%
8	15.81V	10.53%	15.74V	10.53%	15.79V	10.53%
9	61.34mV	0.041%	63.91mV	0.043%	60.92mV	0.041%
10	12.63V	8.416%	12.58V	8.416%	12.62V	8.416%
11	33.65mV	0.022%	34.11mV	0.023%	30.58mV	0.020%
12	10.33V	6.887%	10.30V	6.887%	10.32V	6.885%
13						

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.

To the left, a square wave signal has been applied illustrating the accuracy and resolution of harmonic measurements.

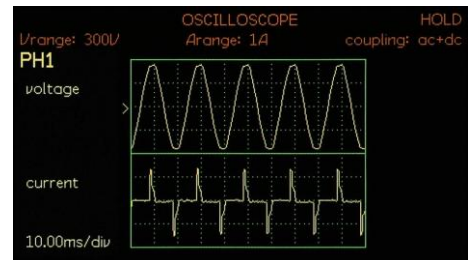
## RMS Multimeter

TRUE RMS VOLTMETER				17:53:42
	phase 1	phase 2	phase 3	coupling: ac+dc
V rms	115.46	115.22	113.40	V
dc	-11.945m	-8.9701m	-21.594m	V
ac	115.46	115.22	113.40	V
peak	161.6	165.0	159.8	V
surge	162.3	165.6	161.4	V
mean	91.72	91.83	90.62	V
frequency	59.892			Hz
cf	1.40	1.43	1.41	

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

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

## Oscilloscope



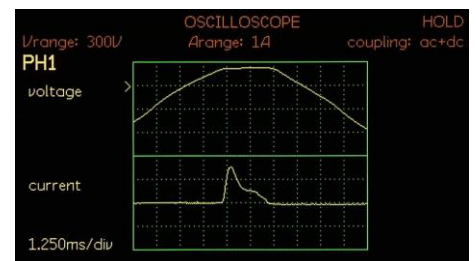
While a precise measurement in power applications generally requires the use of a numeric presentation, the SCOPE mode provided by the PPA1500 is a valuable aid to development and test.

## Impedance analyzer

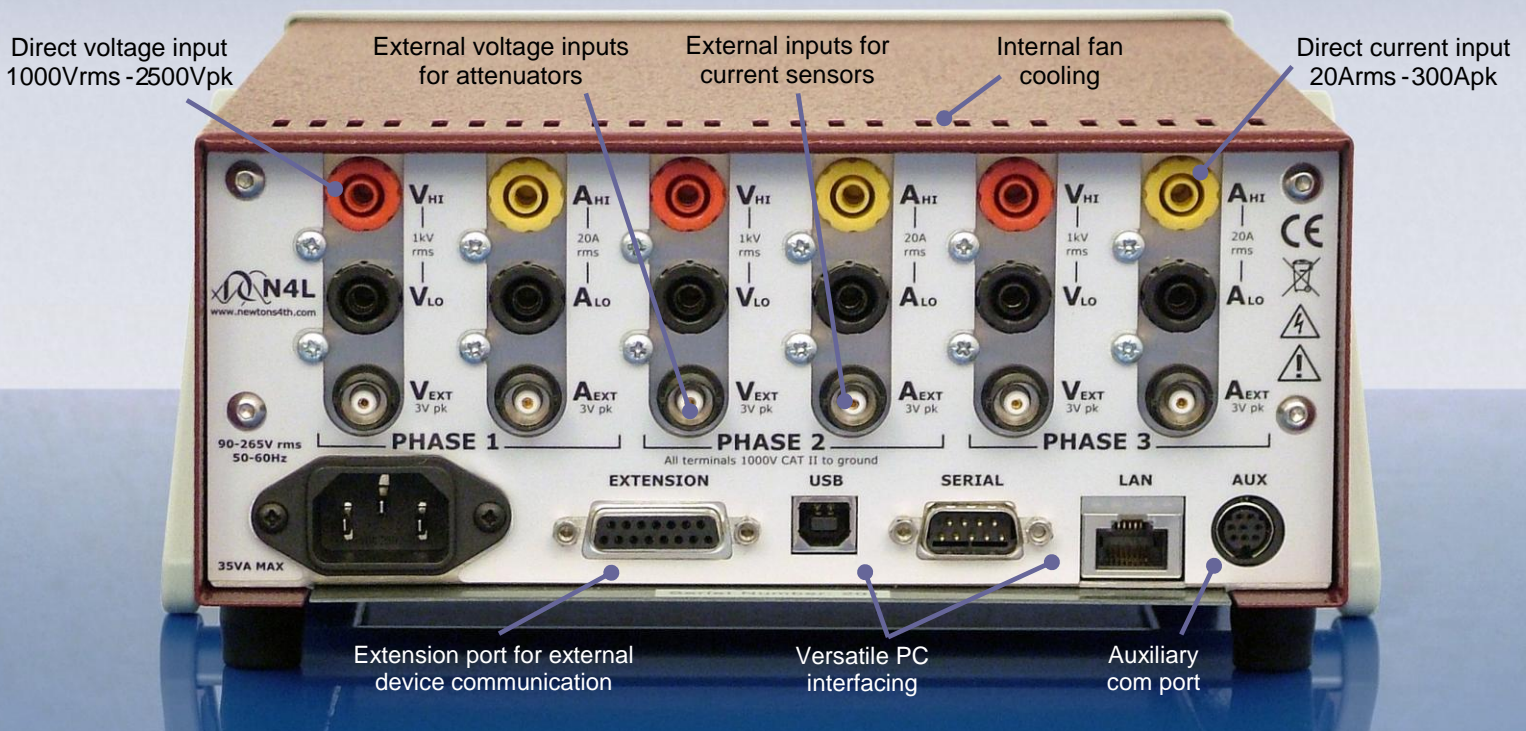
IMPEDANCE METER				17:47:47
	phase 1	phase 2	phase 3	coupling: ac+dc
impedance	17.38	16.55	16.70	Ω
resistance	3.342	3.181	3.210	Ω
reactance	+17.06	+16.24	+16.39	Ω
phase	-281.08	-281.08	-281.08	°
frequency	59.887Hz			

Utilising true real time DFT analysis, the PPA1500 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.



## PPA1500 Series - 1, 2 or 3 Phase Analyzers

### Measurements

W, VA, VArms, 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

Normal: DC and 10mHz to 1MHz  
 x10 mode: DC and 10mHz to 100kHz

### Voltage Input

Ranges: Normal - 1Vpk to 2500Vpk (1000Vrms) in 8 ranges  
 x10 mode - 100mVpk to 300Vpk in 8 ranges  
 Accuracy: Normal - 0.05%Rdg +0.1%Rng +(0.005% x kHz) +5mV\*  
 x10 mode - 0.05%Rdg +0.1%Rng +(0.01% x kHz) +1mV\*  
 External sensor input: 1mVpk to 3Vpk in 8 ranges - BNC connector  
 Accuracy 0.05%Rdg +0.1%Rng +(0.005% x kHz) +1uV\*

### Current Input

Ranges: Normal - 100mApk to 300Apk (20Arms) in 8 ranges  
 x10 mode - 10mApk to 30Apk in 8 ranges  
 Accuracy: Normal - 0.05%Rdg +0.1%Rng +(0.005% x kHz) +500uA\*  
 x10 mode - 0.05%Rdg +0.1%Rng +(0.01% x kHz) +100uA\*  
 External sensor input: 1mVpk to 3Vpk in 8 ranges - BNC connector  
 Accuracy 0.05%Rdg +0.1%Rng +(0.005% x kHz) +1uV\*

### Phase Accuracy

Normal: 10 millidegrees + (10 millidegrees x kHz)  
 x10 mode: 10 millidegrees + (20 millidegrees x kHz)

### Watts Accuracy

Normal: [0.1% +0.1%/pf +(0.01% x kHz)/pf] Rdg +0.1%VA Rng  
 x10 mode: [0.1% +0.1%/pf +(0.02% x kHz)/pf] Rdg +0.1%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)

### Datalog

Up to 4 user selectable measurement functions (30 with optional PC software)  
 Datalog window From 10ms with no gap between each log  
 Memory RAM up to 16,000 records

### General

Crest factor Voltage and Current - 20  
 Sample rate Real time no gap - 1Ms/s on all channels  
 Remote operation Full capability, control and data

### Ports

RS232 Baud rate to 38400 - RTS/CTS flow control  
 LAN (option L) 10/100 base-T Ethernet auto sensing RJ45  
 USB USB device - 2.0 and 1.1 compatible  
 USB USB memory port  
 Extension N4L accessory port  
 Auxiliary N4L auxiliary port

### Standard Accessories

Leads Power, RS232, USB  
 Connection cables 20A rated 1.5 meter long leads with 4mm - stackable terminals  
 1x Red, 1x Yellow and 2x Black per phase  
 Connection clips 4mm terminated alligator clips - 1x Red, 1x Yellow and 2x Black per phase  
 Documentation Calibration Certificate, User manual and quick start guide

### Physical

Display 480x272 dot Full colour widescreen TFT - white LED  
 Size 88H x 210W x 312D mm - excluding feet  
 Rack Mounting 1/2 19" rack width x 2U high - shelf required  
 Safety isolation 1000V rms or dc - category II  
 Withstand 3,250Vrms or 4,600Vdc / ac peak for 1 minute  
 Power supply 90-265 rms 50-60Hz 35VA max

### Models

1, 2 or 3 phase PPA1510, PPA1520 or PPA1530

\* 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