N4L

PPA2500 KinetiQ
Precision Power Analyzers

PPA2530   Precision Power Analyzer KinetiQ

A new generation in high performance power analysis

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

- 0.04% 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 INTEG HARM RMS IMP SCOPE

Power analyzer

```
                POWER ANALYZER
Vrange: 300V    Arange: 3A      coupling: ac+dc   bandwidth: wide
PH2             true            fundamental
watts           6.4361W         6.0867W
VA              29.594VA        22.797VA
VAr             28.885VAr       -21.970VAr
pf              0.218           +0.267
voltage         143.11V         112.54V         -117.44°
current         206.79mA        202.56mA        -191.95°
frequency       50.098Hz
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
                    coupling: ac+dc   bandwidth: wide
            phase 1     phase 2     phase 3
watts       7.2346      6.4361      6.0093      W
VA          28.306      29.594      29.571      VA
VAr         27.366      28.885      28.954      VAr
pf          0.256       0.218       0.203
voltage     136.69      143.11      144.02      V
current     207.08m     206.79m     205.32m     A
frequency   50.098Hz
H3          0.012       0.002       -0.012      %
dc watts    69.957µ     110.21µ     143.67µ     W
```

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
watts       7.2346      W
PH1
voltage     136.69      V
PH1
current     207.08m     A
frequency   50.098      Hz
```

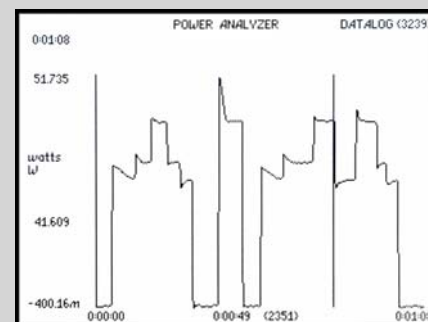Measurement functions selected with zoom can be enlarged even further for easy viewing.

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


```
0:01:16          POWER INTEGRATOR
Vrange: 300V    Arange: 3A      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.
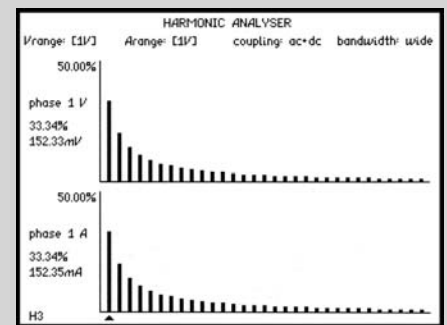
For convenience and flexibility, other measurement modes can be viewed while integration continues to operate in the background.

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
Vrange: [1V]    Arange: [1V]    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%    21.865μA    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%    41.538mA    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      8.2821μV    0.002%    19.066μA    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%
```



```
                  HARMONIC ANALYSER
Vrange: [1V]    Arange: [1V]    coupling: ac+dc   bandwidth: wide
50.00%
phase 1 V
33.34%
152.33mV

50.00%
phase 1 A
33.34%
152.35mA
H3
```

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
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
```
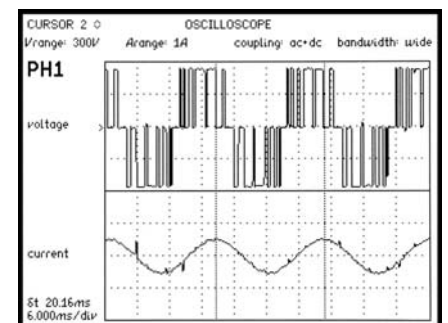


```
              RMS VOLTMETER
                    coupling: ac+dc   bandwidth: low
A       phase 1      phase 2      phase 3
rms     204.05m      203.34m      203.17m    A
dc      -138.81μ     319.36μ      -2.0127m   A
ac      204.05m      203.33m      203.16m    A
peak    289.4m       -288.5m      -287.9m    A
cf      1.42         1.42         1.42
surge   -290.4m      -303.1m      1.359      A
```
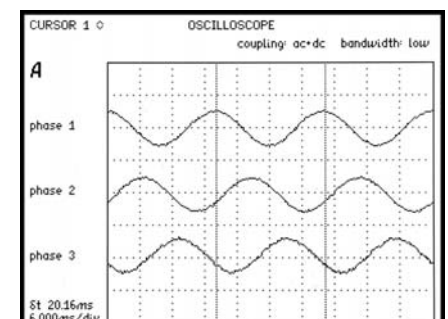
In addition to the true rms value of voltage and current on any measurement channel, RMS mode also provides real time measurement of dc, ac, peak, crest factor and surge.

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

Oscilloscope


```
CURSOR 2         OSCILLOSCOPE
Vrange: 300V    Arange: 1A      coupling: ac+dc   bandwidth: wide
PH1

voltage

current

δt 20.16ms
6.000ms/div
```

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.


```
CURSOR 1         OSCILLOSCOPE
                    coupling: ac+dc   bandwidth: low
A

phase 1

phase 2

phase 3

δt 20.16ms
6.000ms/div
```
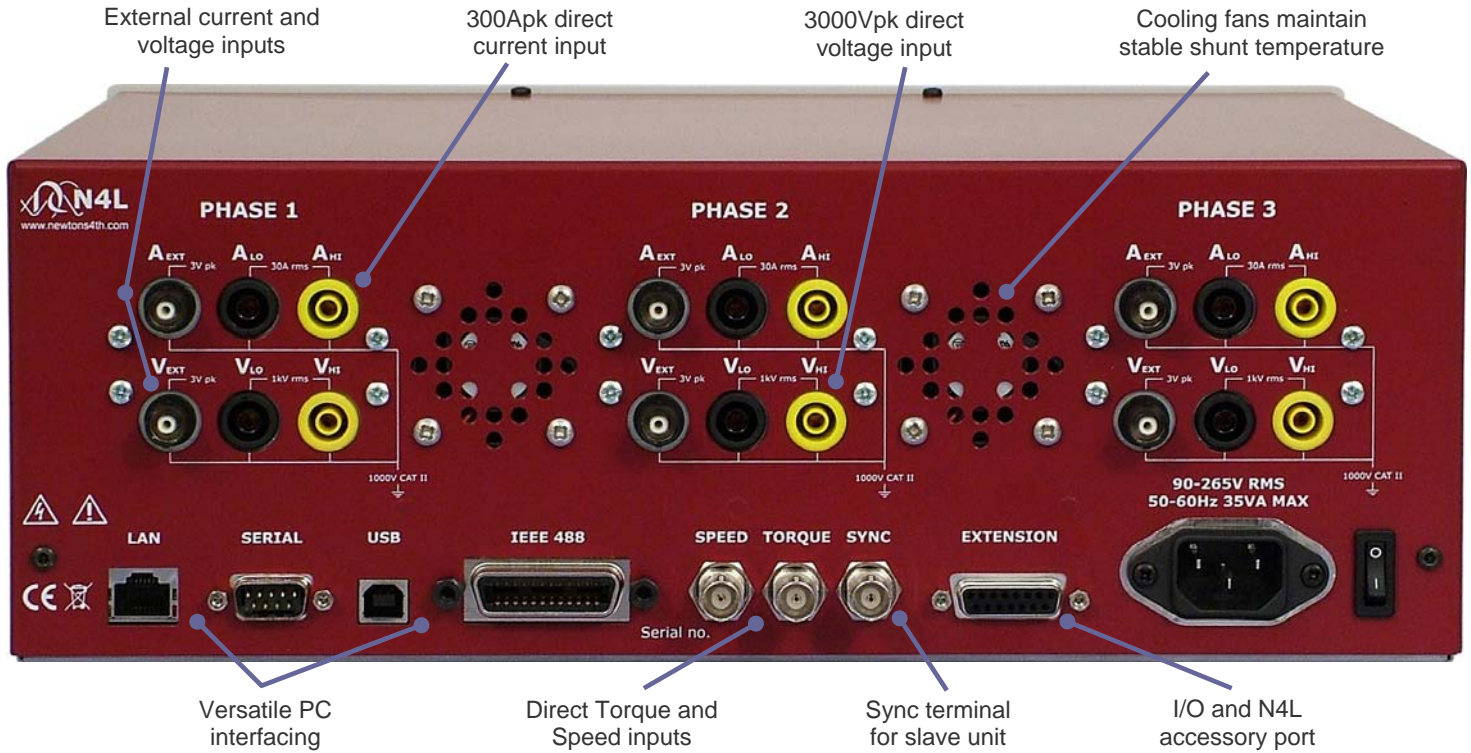
Display of voltage and current on a single phase or all three phase waveforms can be selected with user control of trigger level, pre trigger, timebase and cursors.

Impedance analyzer


```
          IMPEDANCE ANALYZER
                    coupling: ac+dc   bandwidth: low
             phase 1      phase 2      phase 3
impedance    +556.6       +532.9       +532.7     Ω
resistance   +160.6       +133.0       +159.3     Ω
reactance    +533.0       +516.0       +508.4     Ω
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.

External current and voltage inputs

300Apk direct current input

3000Vpk direct voltage input

Cooling fans maintain stable shunt temperature

Versatile PC interfacing

Direct Torque and Speed inputs

Sync terminal for slave unit

I/O and N4L accessory port

Specifications

Measurements

W, VA, VArs, pf, V & A – rms, ac, dc, pk, cf and surge
Frequency, phase, fundamentals and impedance
Harmonics, THD and TIF
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 Refer to low power measurement application note
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
GPIB (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	20A rated 1 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