PPA2600 KinetiQ
Precision Power Analyzers

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
- Up to 50Arms - 1000Apk direct current input
- 5 millidegree basic phase accuracy
- 1, 2 or 3 phase versions
- Master - slave configuration for 6 phase operation
- High speed sampling on all channels

- Easy to use - Single button access to all measurement modes
- True no-gap measurement
- Real time Digital, Tabular, Graphic and Oscilloscope displays
- Real time datalog and integration
- Simple BNC connection of N4L shunts for high current applications
- RS232, IEEE488, USB, LAN, Torque, Speed and Extension ports
- Rack mounting option

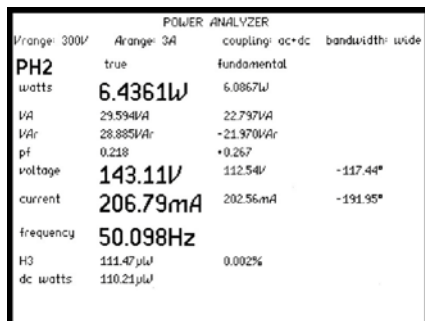# Precision Power Analysis for today's applications

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 PPA2600 series. In common with many advances in technology, the PPA2600 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 PPA2600 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.
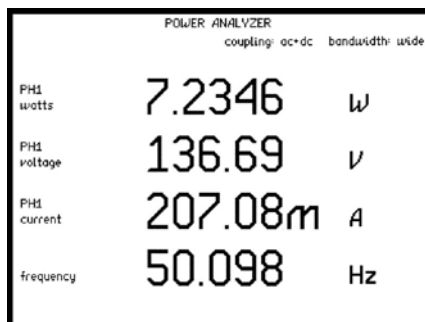
| POWER | INTEG | HARM | RMS | IMP | SCOPE |

Power analyzer

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

By providing all primary measurement functions within the default display, users instantly see every function without the need to enter a separate menu.
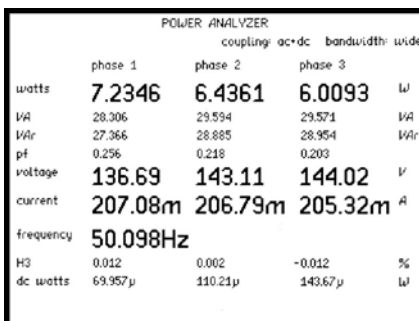
Using the zoom buttons, functions of particular interest can be enlarged without losing other data.

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.

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.
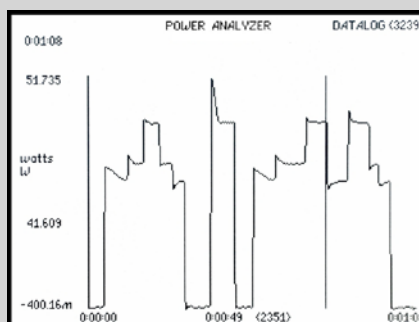
Datalog

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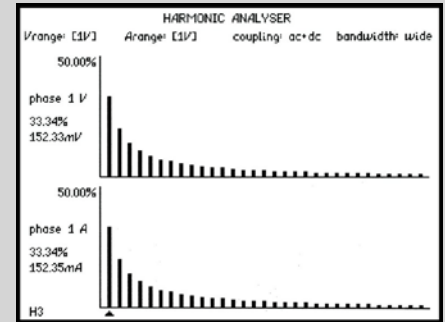
For convenience and flexibility, other measurement modes can be viewed while integration continues to operate in the background.

Harmonics analyzer

Real time harmonic analysis to the 100th 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 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.
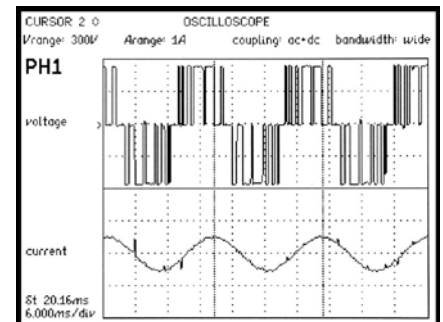
RMS Multimeter

```
                 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       -138.81m     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
```
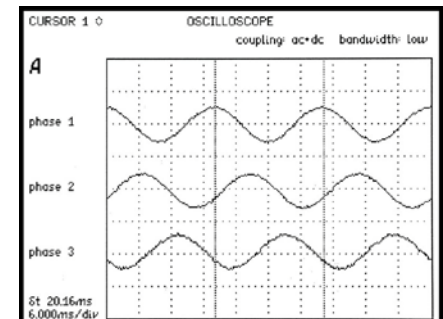
In addition to the true rms value of voltage and current on any measurement channel, RMS mode also provides real time measurement of dc, ac, peak, crest factor and surge.

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 PPA2600 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
```
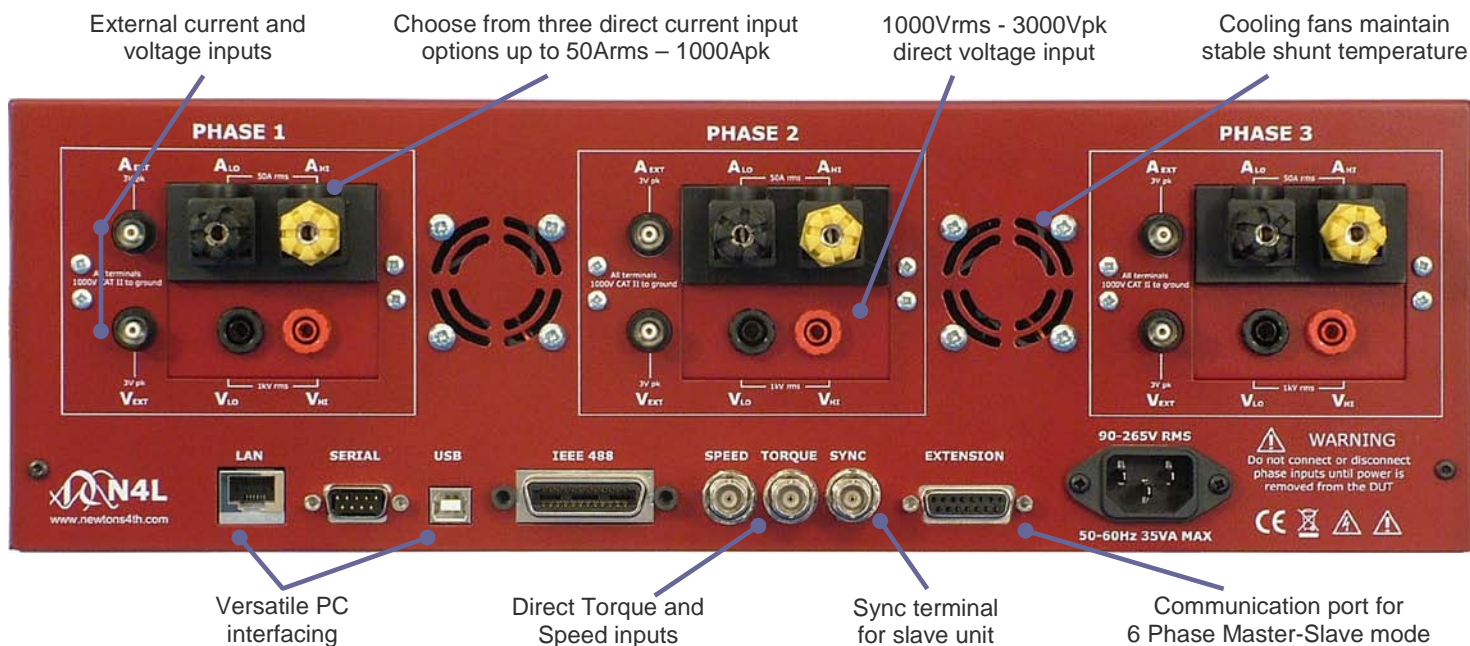
Display of voltage and current on a single phase or all three phase waveforms can be selected with user control of trigger level, pre trigger, timebase and cursors.

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 PPA2600 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.

N4L PPA2600 Series
1 to 6 Phase Power Analysis Solutions

External current and voltage inputs

Choose from three direct current input options up to 50Arms – 1000Apk

1000Vrms - 3000Vpk direct voltage input

Cooling fans maintain stable shunt temperature

Versatile PC interfacing

Direct Torque and Speed inputs

Sync terminal for slave unit

Communication port for 6 Phase Master-Slave mode

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   (10Arms or 30Arms versions)
DC and 10mHz to 1MHz   (50Arms version)

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% x kHz) + 1mV *
External sensor input to 3Vpk – BNC connector

Current Input

The PPA is fitted with either 10, 30 or 50Arms internal shunts
  10Arms Shunt (4mm safety type connection terminals)
    Ranges – 10mApk to 30Apk (10Arms) in 8 ranges
    Accuracy – 0.04% Rdg + 0.04% Rng + (0.004% x kHz) + 10uA*
  30Arms Shunt (4mm safety type connection terminals)
    Ranges – 100mApk to 300Apk (30Arms) in 8 ranges
    Accuracy – 0.04% Rdg + 0.04% Rng + (0.004% x kHz) + 100uA*
  50Arms Shunt (Touch Proof screw type connection terminals)
    Ranges – 300mApk to 1000Apk (50Arms) in 8 ranges
    Accuracy – 0.04% Rdg + 0.04% Rng + (0.004% x kHz) + 100uA*
External shunt input to 3Vpk – BNC connector

Phase Accuracy

5 millidegrees + (10 millidegrees x kHz)
10 millidegrees + (20 millidegrees x kHz)   (50Arms shunt)

Watts Accuracy

[0.05% + 0.03%/pf + (0.01% x 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

Up to 4 user selectable measurement functions (30 with optional PC software)	
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 #	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
Note #	No Connection cables or clips supplied with 50Arms version
Documentation	Calibration Certificate, User manual and quick start guide

Physical

Display	320 x 240 dot LCD – white LED backlight
Size	135H x 430W x 250D mm – excluding feet
Weight	5.5kg – 1 phase 6kg – 3 phase
Rack Mounting	Front panel bracket option -Rear support or shelf required
Safety isolation	1000V rms or dc – category II
Power supply	90-265 rms 50-60Hz 35VA max