Precision Power Analyzers



PPA3500 Series 1~6(7) Phase Power Analyzer



Up to 6(7) Phase Power Analysis within a 2U single Chassis



Product Overview				
1 to 7 Phase Configuration	Up to 7 Phase Analysis within 1 chassis (App Note 36)			
Dual Core Power Processing	Enable dual analysis modes with maximum performance			
PWM Motor Drive Measurements	High Performance PWM Motor Drive Analysis			
Leading Wideband Accuracy in 2U form factor	0.04% Accuracy with class leading high frequency performance			
Wide Screen Display for 6 Phase Analysis	Unique wide aspect ratio for 6 Phase Analysis			
Market Leading Phase Accuracy	0.005 Degrees Phase Accuracy			
Built in High Precision Shunt	30Arms or 20Arms (LC) Internal Current Shunt			
Versatile interfaces	RS232, USB, LAN, GPIB, Torque, Speed and Extension for ADI40 Option			
Compact Size	Unique 6 Phase Power Analysis in 2U form factor			
Fast Sample Rate and No-Gap	1M sample/s			
Wide Frequency Range	DC & 10mHz to 1MHz			

PPA3500 Precision Power Analyzer

FRONT VIEW



1 POWER BUTTON

② FRONT USB PORT

USB memory port allows data or screendumps to be saved directly to a USB pen drive

③ WIDE ANGLE VIEW DI SPLAY SCREEN

Double white LED backlit colour TFT display with high contrast and wide viewing angle

4 SCREEN DISPLAY OPTIONS

Zoom, Real time, Table and Graph options

5 MEASUREMENT FUNCTION SELECTION BUTTONS

• POWER ANALYZER

- HARMONIC ANALYZER
- TRUE RMS VOLTMETER and AMMETER
- OSCILLOSCOPE



Measurement Mode Control

6 MEASUREMENT SETTINGS BUTTONS

Acquisition settings - Sets wiring configuration,

Smoothing and data logging

Coupling - Set coupling to AC, DC or AC+ DC, also set bandwidth

Range - Internal or external attenuator, autoranging settings, scale factors

Application mode - PWM, ballast, inrush current, power transformer, standby power,

Plus direct configuration of - Alarm, Auxiliary, Remote, System and Program functions

⑦ MENU SELECTION AND CURSOR CONTROL

8 START, STOP, ZERO AND TRIGGER

Trigger button refreshes measurement, Zero resets datalog or allows an offset trim Start and Stop buttons provide manual control of a measurement period

REAR VIEW



9 PHASE INPUTS

Direct voltage Input: 2.5kVpk (1kVrms) in 10 ranges Direct current Input: 1000Apk (30Arms) Standard Model, 300Apk (20Arms) Low Current Model in 10 ranges External voltage and current sensor inputs to 3Vpk in 8 ranges - BNC Connector

10 SYNC CONNECTOR

Can be utilised for external triggering

11 EXTERNAL SENSOR INPUTS

+/-10V or pulsed input from torque and speed sensors provides direct measurement of mechanical power + analogue output

Extension Port: Connection of auxiliary devices such as the ADI40 40 Channel Analogue Input/Output Interface for Multi-Channel Sensor and Direct Thermocouple Measurement

12 PC INTERFACE CONNECTIONS

Standard interfaces : RS232 + USB + LAN Optional Interfaces : GPIB

13 Safety Earth Connection

Screw type safety earth connection



FEATURES

High Speed Power Measurement - 5ms Datalog Interval PPA3500

Measurements include all frequency components in power waveforms for example, fundamental, harmonics of the fundamental and the carrier of a PWM inverter output by maintaining 1Ms/s sampling at any drive frequency



1MHz Wideband Frequency Response PPA3500

With 1MHz bandwidth and exceptionally flat response, the PPA3500 provides precision analysis of total power in applications such as lighting ballasts or PWM drives that involve a wide range of frequency components. Proprietary to N4L, a digital process called Expanded Nyquist Sampling ensures no alias components.



High Accuracy PPA3500

Unique voltage and current analogue card design ensures high accuracy for both power and harmonic analysis



DFT Real Time No Gap Analysis PPA3500

Many power applications have fast changing asynchronous current pulses which are not suited to fixed data length FFT analysis. The PPA series combine a real time DFT (Discrete Fourier Transform) technique with variable window no gap analysis to ensure the optimum speed and accuracy at all times



· Long term measurement integration achieves approximately correct average power



· Simultaneous fundamental and pulse frequency synchronization quickly obtains the correct power

Up to 6 Phase (8 Wire) Analysis PPA3500

The PPA3560 offers 12 channel, 6 Wattmeter measurements from a single chassis. All measurements are time synchronised utilising a central FPGA core which acquires the sample points from all 12 channels simultaneously, avoiding serialised data acquisition. This enables the PPA3560 to achieve unrivalled channel to channel phase angle accuracy and is one of the key contributors to the market leading 0.005deg phase accuracy.



FPGA Core

· Simultaneous data acquisition, time synchronising phases

- High speed harmonic analysis
- True "Real Time" power computation with no gap

Measurement parameter examples

- Input/Output power measurement
- Efficiency of the inverter
- Inverter output voltage harmonics · Motor drive characteristics

FUNCTIONS

Input Torque and Speed Sensor PPA3500

Direct measurement of torque and speed from dedicated inputs that are fully synchronized with the voltage and current channels permits true real time power conversion efficiency to be evaluated



①TORQUEIsolated Bipolar±10V / pulsed②SPEEDIsolated Bipolar±10V / pulsed③SYNCIsolated Bipolar±10V / pulsed

Built in Amplifier and Unique Shunt Resistor PPA3500



The PPA series use a single shunt resistor unique to N4L that combines exceptional linearity and no need for relay switching which can cause measurement errors

	Model	Low Current Model	Standard Model
ĺ		10 ranges: 10mApk - 30Apk (20Arms)	10 ranges: 30mApk - 1000Apk (30Arms)
	PPA3500	10mΩ Shunt	3mΩ Shunt

External shunt options

(DC \sim 1MHz, 0.1% Accuracy, Inductance<1nH)

Madal	Maximum	n Current	Deneluuialtile	AN4L
Model	Rated A	Peak	Danowidin	HF100m CURR
HF500	500Arms	5000Apk		Continuent Content Pressures Barter
HF200	200Arms	2000Apk		
HF100	100Arms	1000Apk		C€ℤ
HF020	20Arms	200Apk	$DC \sim IMHZ$	
HF006	6Arms	60Apk		
HF003	3Arms	30Apk		HF00





MEASUREMENT DISPLAY

Power Analysis PPA3500

Wide Angle display for convenient viewing of 6 Phase Power Analysis

POWER ANALYZERVrange:1kVArange:10Acoupling:ac+dcVrange:1kVArange:10Acoupling:ac+PH1totalPH1totalfundamentaltotaltotalwatts22.464w23.103W28.019µWdcwatts22.2761WVA84.243VA24.100VAtotaltotal85.138VApf0.2667-0.95864000.00°total50.0010Hzvoltage216.64V216.64V4000.00°frequency50.009HzHzV ph-ph375.80V375.76V-329.67°total24.272%						POWER ANALYZER	
Vrange:1kV Arange:10A coupling:act PH1 total fundamental total total total VA 84.243UA 23.103W 28.019µWdc total Additional VA 84.243UA 24.100VA total total Additional VA 84.243UA 24.100VA total VA 85.138 VA pf 0.2667 -0.9586 voltage 216.64V 1000.00° total 50.0010 Hz voltage 216.82V 216.64V 111.24mA -345.46° frequency 50.0010 Hz frequency 50.009Hz 375.76V -329.67° total efficiency 74.87% %		POWER	R ANALYZER		Vrange:1kV	Arange:10A	coupling:ac+dc
PH1 total fundamental total 23.103W 28.019µWdc total Z <thz< th=""> Z <thz< th=""> <thz< th=""> <thz< th=""> <thz< th=""></thz<></thz<></thz<></thz<></thz<>	Vrange:1kl	/ Arange:10	A	coupling:ac+	PH1	00 T 0 1	
watts 22.464L/L 23.103W 28.019µWdc watts 84.243UA 24.100VA total VA 84.243UA 24.100VA total Value 85.138 VA pf 0.2667 -0.9586 total VA 85.138 VA voltage 216.82V 216.64V +000.00° frequency 50.0010 Hz frequency 50.009Hz 375.76V -329.67° total 74.24% Kotal 6fficiency	PH1	total	fundamental		total		ليا
VA 84.243VA 24:00VA total 85.138 VA pf 0.2667 -0.9586 +000.00° 50.0010 Hz voltage 216.64V +000.00° frequency 50.009Hz Hz V ph-ph 375.80V 375.76V -329.67° total 24.24% %	watts	22.464W	23.103W	28.019µWdc	watts		
pf 0.2667 -0.9586 VA 50.010 Hz voltage 216.64V +000.00° Frequency 50.010 Hz current 388.55mA 111.24mA -345.46° Frequency 50.009Hz Hz V ph-ph 375.80V 375.76V -329.67° total efficiency 74.87% %	VA	84.243VA	24.1001/A		total	85138	IJД
voltage 216.64U 216.64U	pf	0.2667	-0.9586		VA	\overline{OO} .TOO	
current 388.55mA 111.24mA -343.46° frequency DUULU Hz frequency 50.009Hz 100.0000000000000000000000000000000000	voltage	216.82V	216.641/	+Q00.00°			
frequency 50.009Hz Trequency V ph-ph 375.80V 375.76V -329.67° total efficiency 74.777 %	current	388.55mA	111.24mA	-343.46°	Fraguaday	JUUTU	Hz
V ph-ph 375.80V 375.76V - 329.6 7° total efficiency 74.87% 74.24% efficiency	frequency	50.009Hz			nequency		
efficiency 74,87% 74.24% efficiency	V ph-ph	375 . 801/	375.76V	-329.6 7°	total	/4//	%
	efficiency	74.87%	74.24%		efficiency		

Zoom function enabled on total watts, total VA, frequency and total efficiency

	POWER ANALYZER						
	coupling:ac+dc						
	phase 1	phase 2	phase 3				
watts	23.142	11.967	27.226	W			
VA	85.827	56.944	94.807	VA			
pf	0.2696	0.2102	0.2872				
Vrms	217.62	219.16	219.91	ν			
Arms	394.39m	259.83m	431.11m	A			
frequency	50.013			Hz			
V ph-ph	377.13	380.26	379.21	ν			
efficiency	74.80%						

3 Phase analysis display

All power measurement and RMS values are computed simultaneously across 6 phases, allowing measured values to be selected and viewed during analysis.

Here, three phase input and 3 phase output power can be selected with all primary power functions in each phase plus frequency, a selected harmonic, dc watts and phase to phase voltage

Mechanical power, Maths and Efficiency functions can also be added to this screen giving real time analysis of electrical or electrical to mechanical systems

MEMORY

Large 500MB internal memory, data logging from 5ms intervals with synchronization to the fundamental frequency and no gap between measurements

Datapoint storage up to 5M

Alternatively the data can be stored in an external USB pen drive or directly to PPALoG PC software

Voltage, Current, Frequency and Power - Examples of graph mode



Trend analysis

Power Integrator (power consumption) Mode, RMS Meter Mode and Impedance Meter Mode PPA3500

0:01:25	POWER	INTEGRATOR	coupling a	etde		TRUE R	MS VOLTMETE	ER PWM 02	2:03:12		IMPED4	INCE METER	PWM 02	2:02:29
W hours	phase 1 1.1599k 4.40051-	phase 2 555.48 2.05.401	phase 3 1.4493k	Wh V4b	V Vrms dc	phase 4 219.36 - 322.52m	phase 5 220.38 284.13m	phase 6 224.54 	V 1 V	inductance	phase 4 879.7m 34.71	phase 5 869.6m 34.33	phase 6 883.8m 32.67	H
VAr hours pf avrg V avra	4.4880K 4.3360k 0.258 217.88	2.9013k 2.9013k 0.188 219.52	3.037 4K 4.8453k 0.287 220.16	VArh	ac peak surge	219.36 -340.9 -343.2	220.38 -341.8 343.9	224.54 -362.9 -365.2	ע. עע	Q factor phase frequency	2.731 -290.11 17.154Hz	2.730 -290.12	2.915 -288.93	
A hours	20.601	13.457	22.972	Άh	mean frequency cf	215.8 17.209 1.55	216.8 1.55	220.2 1.62	V Hz					

Power Integrator mode

RMS Voltmeter mode

Impedance meter mode

Note

In addition to detailed measurements of the phase power parameters, you can check the balance of power between the phases and observe computed neutral current when 3 phase 4 wire connection is selected, this can be performed over 6 phases with 3 Phase 3 Wattmeter + 3 Phase 3 Wattmeter wiring configuration.

Harmonic Analyzer and Oscilloscope PPA3500

In Harmonic Analyzer Mode, the PPA3500 provides up to 100 Harmonics with real time, table or bar graph presentation. Measurements are in absolute magnitude and percentage of fundamental with harmonic phase also available. The Discrete Fourier Transform (DFT) is utilised, resulting in highly accurate harmonic analysis. With accuracy figures matching the headline Voltage and Current specification the PPA3500 is a highly capable harmonic analyzer. The use of the DFT is made possible via high speed parallel FPGA signal processing as well as proporietary low level DSP algorithms. The DFT was selected for signal decomposition due to the fact that sample by sample window resolution is possible, instead of the restrictive 2ⁿ sample window size of the FFT, the DFT is capable of minimal leakeage without the need of error prone window filtering functions.





Oscillosope - Voltage and Current display



Three phase display of voltage

	Harmonic Accuracy			
Voltage 0.04% Rdg+0.1% Rng+(0.005%×kHz)+5mV				
Current	PPA3500-LC 0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+300uA			
Current	PPA3500 0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+900uA			



Oscillosope Cursors - Enable cursors and display Vrms, Vpk, Watts, Power Factor, Arms and Apk

ACQUISITION SETTINGS

Auto-Ranging, Range Up Only or Manual PPA3500

Range modes are selectable

1 Auto-Ranging

②Range up only ③Manual

Performs automatic switching of voltage and current ranges up and down depending on the level of the measured value with all inputs linked or ranged independently to ensure optimum accuracy Performs automatic ranging when the input is 120% of range, ranging up only No automatic ranging, user specifies the range in which to operate (used when input voltages and currents are known) or during inrush current testing

Independently Set Input Coupling PPA3500

Independently set input coupling so different methods of sensing can be implemented. Such as CT's on phase 1+2, resistive shunt sensing on phase 3 and Rogowski coils on phase 4~6.

DC Waveforms





AC Waveforms

AC+DC and DC coupling both provide 1MHz bandwidth measurements, the coupling setting ensures the instrument is synchronised to the largest power component of the measured waveform. DC coupling should be used for DC bus measurements and AC+ DC coupling used for Inverter Output and AC input power measurements.



The PPA3500 utilises a dual control menu system, the instrument is divided into 2 distinct groups. Group 1 is controlled via display 1(left hand) and group 2 is controlled via display 2(right hand).



ACQUISITION SETTINGS

Bandwidth Settings PPA3500

Low(DC-200kHz)	Basic power (50/60Hz) including
	harmonics of the fundamental while
	rejecting high frequency noise
Wide(DC-1MHz)	Wideband applications such as PWM
	inverter drives including all power
	components for true total power



Example of wiring configuration showing 1 phase, individual coupling settings also available.

Note

The PPA3500 series includes a programmable digital filter that allows users to set a preferred bandwidth

Display Settings, Smoothing Response and Frequency Reference PPA3500

1Display update rate

Various settings for the display update rate (5ms \sim 100s) which also increases the smoothing when used together with the smoothing option. A 'window' option permits direct control of the measurement window size



②Smoothing settings

Working in conjunction with the speed setting, a smoothing filter can then be applied to the measurements. Normal and slow options are available which apply an increasing time constant to the output of the measurement window

	,
ACQUISITI	ON CONTROL
wiring speed window smoothing response frequency reference frequency reference phase angle reference trequency filter low frequency	OUTPUT 3 phase 3 wattmeter window 10.000ms finormal fislow phone voltage off on

Example of setting the window, eg (100Hz set to 10ms)

speed	update rate	normal time constant	slow time constant
Very Fast	1/80s	0.055	0.25
fast	1/20s	0.2s	0.8s
medium	1/3s	1.5s	6s
slow	2.5s	12s	48s
very slow	10s	48s	192s

Display update speed settings
 Setting the filter (normal/slow)

Frequency Reference PPA3500

When making a precision measurement of ac power, correct synchronization with the fundamental frequency is essential. The PPA series provides a solution to frequency synchronization in a wide range of applications including Standby Power, Variable Speed Drives, Electronic Ballasts and DC to AC Inverters with the option to select voltage, current, speed or ac line input as the frequency reference.

ACQUISITI	ON CONTROL
	OUTPUT
wiring	3 phase 3 wattmeter
speed	window
window	10.000ms
smoothing	normal
smoothing response	<u>fixed time</u>
frequency reference	
frequency reference	Pourrent
phase angle reference	Vennenc
frequency filter	off
low frequency	on

Frequency Reference

Simultaneous Dual Mode Capability

The PPA3500 has the capability to output two modes simultaneously utilising N4L's proprietary "Dual Core Power Processing" Architecture, providing great flexibility to the user. Of particular interest is the ability to display both Power Analysis and Oscilloscope data at the same time, while maintaining full sample rate on all power measurements. Traditionally, it is common for instruments to decrease raw sample rate within the power analyzer function when another mode is enabled. The PPA3500's "Dual Core" architecture allows for maximum performance of both modes.



Group 2 : Oscilloscope mode, analysing phase 1~3 at sample rate dictated by timebase

APPLICATIONS

PWM Motor Drive Evaluation PPA3500

The PPA3500 is the ideal solution for 6 Phase Analysis within a single instrument, a typical application is Variable Speed Inverter Drive analysis. Utilising proprietary digital filtering algorithms, the N4L power analyzer range offers unrivalled performance. The PPA3500 can be used in conjunction with external current sensors such as the WR5000 - a 1MHz 5000A Rogowski Coil in high current applications as well as the LEM range of Zero Flux Current Transducers. Inverter efficiency is available via 3 Phase 2 Wattmeter method + CH3 + 3 Phase 3 Wattmeter, whereby PH1+PH2 are utilised to measure the input power to the three phase rectifier, PH3 is used to monitor DC bus power and PH4~PH6 are used to monitor the output power of the variable speed inverter drive.



High Speed Analysis PPA3500

The PPA3500 features high speed parallel digital signal processing, this enables high speed tracking of changing inverter drive frequencies and power parameters during ramp up and ramp down conditions, for example in electric vehicle applications. N4L's free to download software package (PPALoG) offers datalog intervals down to 5ms, providing fast, no-gap real-time data direct to software.



APPLICATIONS

4 Phase Solar Inverter Performance Analysis PPA3500

The PPA3500 provides a highly accurate solar inverter analysis and evaluation solution from one measurement chassis, featuring independent frequency detection N4L Power Analyzers exhibit the ability to synchronise to the 50/60Hz output signal simultaneously with the DC input signal from the solar array. Both efficiency of the inverter, quality of the AC output and many other performance parameters can be recorded. In the application below, the PPA3500 is configured as a 4-Channel solution which allows the user to display DC Input to 3 Phase output efficiency data along with THD power quality measurements from one measurement chassis.



Inrush Current PPA3500

Accurate inrush current measurements rely upon two factors aside from fundamental measurement accuracy, these are gapless measurement and a high sampling rate;

1. Gapless Measurement - Inrush waveforms by their nature are transient; gapless measurement is vitally important in order to ensure that inrush waveform data is not missed.

2. High Sampling Rate - When working with mains frequencies, many power analyzers have low sample rates due to the computation of measured values from a data block of finite size. The PPA3500 utilises a proprietary real time signal processing technique that maintains full 1Ms/s sample rate irrespective of the measured load frequency, ensuring that high frequency events are captured without aliasing.

Example Inrush current data, datalogging at nominally 20ms intervals directly to PPALoG





UKAS PPA3500

Newtons4th are an accredited UKAS Calibration laboratory, all PPA3500 Power Analyzers are supplied with an ISO17025 UKAS Calibration Certifcate as standard. Calibration of N4L Power Analyzers is an integral and important part of our service to our clients, we offer quick turnaround times at a competitive price. Re-Calibration is also available at our international offices and various distributors throughout the world*.



Schedule of Accreditation PPA3500

N4L's schedule of accreditation to ISO17025 is wide ranging and an overview of the schedule is detailed below, for more specific information please see the UKAS website to view the full accreditation schedule.

	ISO17025 UKAS Accreditation Sch	iedule
	Signal Amplitude	Frequency Range
Voltage Sine Amplitude	1V to 1008V	16Hz to 850Hz
Voltage Harmonic Amplitude	0V to 302V	16Hz to 6kHz
Current Sinewave Amplitude	100mA to 48A	16Hz to 850Hz
Current Harmonic Amplitude	0A to 15A	16Hz to 6kHz
Current to Voltage Phase Angle	-180° to +180°	16Hz to 850Hz
Apparent Power (VA Product)	100mVa to 48.4kVA	16Hz to 850Hz
AC Power	0W to 48.4kW	16Hz to 850Hz
AC Power (Calorimetry)	1W to 5W	45Hz to 2MHz
Current Harmonic Amplitude to IEC61000-4-7	0A to 6A	16Hz to 6kHz
	Pinst(Sinusoidal Modulation)	
	Pinst(Rectangular Modulation)]
	Pst]
Flicker to IEC61000-4-15	Frequency Changes	1 An mar 15001000
	Distorted Voltage with Multiple Zero Crossings	As per recordou
	Harmonics with Sidebands]
	Phase Jumps]
	Rectangular Changes with Duty Cycle	





Guaranteed Accuracy up to Crest Factor 20

The Newtons4th Power Analyzers feature a guaranteed accuracy up to a crest factor of 20, meaning the autoranging system of the PPA3500 is able to peak detect automatically upon waveforms with a crest factor (peak/rms) of up to 20.



Newtons4th are the only Power Analyzer Manufacturer in the world** to provide ISO17025 calibration certificates on all new Power Anlayzers as standard. Our ISO17025 Schedule of Accredition includes Voltage, Current, Phase, Power, Harmonics and Flicker. With traceable certification of power accuracy down to 0.5W, N4L offer the ideal measurement solution for certified standby power measurement.

Due to the specialist nature of Power Measurement Instrumentation Calibration, N4L utilise both commercially available calibration equipment (such as the Fluke 6105A for UKAS Certification) along with N4L bespoke designed signal generation equipment in order to calibrate our instruments over the full frequency range (up to 2MHz). Calibration over the full frequency range is uncommon given that such signal generation equipment is not commercially available. When supplied with an N4L analyzer, all customers will receive a calibration certificate covering the complete frequency range.



Ranging Principles

10 Stage Solid State Ranging System - PPA3500

Combining highly linear voltage attenuator and current shunt designs with a proprietary 10 stage solid state ranging system on every phase input, the PPA series achieve a uniquely wide dynamic range, with no need to switch between voltage attenuators or current shunts when ranging up or down.



Design features:

Single attenuator on each voltage input High impedance low capacitance Single shunt on each current input Low impedance low inductance Auto peak detect High speed solid state ranging High Noise rejection Auto DC offset trimming

Benefits:

Overload protected on any range Low shunt affect on voltage connections Low voltage burden on current connections Market leading phase accuracy Peak detect ranging ensures no signal clipping Low attenuator/shunt operating temperature Fast range switching Constant frequency response on all ranges Signal can be applied with instrument powered off

Auto Peak Ranging Ensures Complete Waveform Analysis PPA3500

It is often overlooked that for an instrument to correctly calculate power parameters, the entire waveform must be digitised for analysis. The Peak Ranging system employed by all N4L Power Analyzers ensures that the entire waveform is digitised and the correct power parameters are calculated.



Example RMS Ranging system, commonly used in







Peak Ranging system auto-detects the peak of the input signal and selects the ideal range

Note

An RMS Ranging system requires the user to have prior knowledge of the crest factor which in many applications is not practical, either because the user cannot reasonably be expected to know this value before a measurement, or because the crest factor is changing during a measurement period. The ideal ranging system is therefore based upon peak detection which does not require the user to be concerned with a crest factor setting. While many RMS ranging systems are only guaranteed to support a Crest Factor of 6, all N4L Power Analyzers guarantee to auto-range with any crest factor and maintain full accuracy with a CF of at least 20. While waveforms with a true CF above 20 are very unusual, 'auto range up' or 'manual' ranging combined with a market leading range sensitivity enables the PPA to achieve a dynamic range equal to a CF > 300.

PC Software PPA3500

Analysis carried out by the instrument can easily be transferred to a PC via USB, RS232 or LAN

① **PPALoG** Exceptional flexibility and ease of use with all the functions included in the orginal PPAcomm program plus multiple instrument control for 7-24 phase applications and data export to Text file, Excel, Bitmap or Clipboard



Data Export options



⁽²⁾ **PPA Standby Power** Full compliance testing to EN50564 (IEC62301). Meets or exceeds the requirements and methodology of U.S. EPA (Energy Star), U.S.DOE, California Energy Commission (CEC), among others.



N4L	N S	ewtons4th Ltd. Itandby POWER		Connected to PP
Standby Power	Present Reading	Mn Reading	Max Reading	Test Result
Power (VV)	1.170030	1.17228	1.18173	STANLE
Average Power (W)	1.17746	1.41272	1.41651	PASS
Accmulated Power (Whr)	0.098448			
Monitor Vime 230.048	Total Power F	actor 0.31126	Supply Frequence	y (Hz) 49.9929
Arms 0.0164522	Apparent Pov	er (VA) 3.78463	Load Duty Cycle	(Hz) 49.9975
Test Automatic Test Period 00	Seca. 00	Elapsed Time 05 : 00	Test - Manual Sant	, Step

Standby power test screen with real time update of EN50564 (IEC62301) criteria



On completion of the standby test, a full test report can be exported directly to a spreadsheet

				PPA3500				
Frequen	cy Range							
	Normal	PPA3500-LC(20Arms) DC,10mHz ~ 1MHz, PPA3500(30Arms) DC,10mHz ~ 1MHz						
		Range 1+2* ** : DC, 10mHz ~ 100kHz						
No. of Pl	nases							
Valtara	la aut			3~6				
voitage	Range		Normal :	100mVpk~2500Vpk(1000Vrms) in 10 ranges (240Vrms within 300Vpk range, using 20% overange)				
Internal	Accuracy			1V ~ 2500Vpk range : 0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+5mV				
	Accuracy			Range 1+2* : 0.04% Rdg+0.1% Rng+(0.01%×kHz Rdg)+1mV				
External	Accuracy			1mVpk ~ 3Vpk in 8 ranges [BNC connector 3Vpk max input] 0.04%Rdn+0.1%Rpn+(0.005%xkHz Rdn)+3uV				
Current	Input							
		20Arms Low Current	Ranges	10mApk ~ 300Apk(20Arms) in 10 ranges				
		(PPA3500-LC)	Accuracy	100mA ~ 300Apk ranges: 10mA** ~ 30mA** ranges:				
		411111 Salety connectors	Banges	0.04% Rdg+0.1% Rig+(0.005%×Rdz Rdg)+ 300μA [0.04% Rdg+0.1% Rig+ (0.01%×Rdz Rdg)+100μA 30m Ank ~ 1000 Ank/(30 Arms) in 10 ranges				
		30Arms (PPA3500)	hanges					
		4mm safety connectors	Accuracy	300mA ~ 1000Apk ranges. 0.04% Rdq+0.1% Rnq+(0.005%×kHz Rdq)+ 900μA 0.04% Rdq+0.1% Rnq+(0.01%×kHz Rdq)+ 300μA				
F			-					
External (External	input I shunt	BNC Connector (Max	Ranges	1 m Vpk ~ 3 Vpk in 8 ranges				
Current s	sensor)	input 3Vpk)	Accuracy	0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+ 3µV				
Phase A	ccuracy		<u> </u>					
				Normal : 0.005deg+(0.01deg×kHz) Range 1+2* ** : 0.005deg+(0.02deg×kHz)				
Power A	ccuracy							
				[0.1% + 0.1%/pf + (0.01%xkHz)/pf] Rdg + 0.05%VA Rng				
				Range 1+2* ** : [0.1% + 0.1%/pf + (0.02%xkHz)/pf] Rdg + 0.05%VA Rng				
40-850H	7			[0.06% + 0.1%/pf + (0.01%xkHz)/pf] Rda + 0.03%VA Rna				
Conorol	_							
Crest Fac	tor			20(Voltage and Current)				
Sample F	Rate			1Ms/s on all channels, No-Gap				
IEC Mode	es			IEC50564 (Replaced IEC62301) and Energy Star				
Applicatio	on Modes			PWM Motor Drive, Ballast, Inrush, Power Transformer, Standby Power				
CMRR -	Common	n Mode Hejection Hatio 250V @ 50Hz - > 1mA (150dB)						
		100V @ 100kHz - ≥ 3mA (130dB)						
Measure	ment Parameters							
		W, VA, Va	r, pf, V & A	A - rms, rectified mean, AC, DC, Peak, Surge, Crest Factor, Form Factor, Star to Delta Voltage, +ve Pk, -ve Pk				
		Harmonics, THD, TIF, THF, TRD, TDD						
	Harmonics, THD, THF, THF, TKD, TDD Integrated Values. Datalog. Sum and Neutral values		Integrated Values, Datalog, Sum and Neutral values					
Datalog	- Up to 4	Up to 4 user selectable measurement functions across 6 phases, 32 total (60 with optional PC software)		ctions across 6 phases, 32 total (60 with optional PC software)				
Datalog \	Window			No-Gap analysis, Minimum window 5ms				
Memory	isstics D	500MB, 5M records						
RS232				Baud rate up to 38.4kbps.RTS/CTS flow control				
LAN			10/100 Base-T Ethernet auto sensing					
GPIB				(Option G - External Adapter) IEEE488.2 Compatible				
USB	Outrast			USB 2.0 and 1.1 Compatible				
Speed In	gue Output			BIPOIAR ± 10V(BNC) BNC Bipolar+10V or Pulse count 1Hz to 1MHz 0 01% Rdg				
Torque	par			BNC Bipolar±10V or Pulse count 1Hz to 1MHz 0.01% Rdg				
Standard	d Accesso	ries						
Leads		Power, RS232, USB						
Connecti	on Cables			36A 1.5m long 4mm stackable terminals				
Connecti	on Clips	4mm terminated aligator clips - 1x red, 1x yellow and 2x black per phase						
CD-ROM			CommView2 (RS232/USB/LAN), Command line, Script based communication software					
Documer	nts			Communications manual, Calibration certificate, Quick start guide				
Input Im	cal/Enviro	onmental		Voltage Attenuator and External Inputs 3 3MO II 25nF				
Display	Pedance			2 x 480x272 dot full colour TFT, White LED Backlit				
Dimensio	ons			92H x 404W x 346D mm excluding feet				
Weight				5.9kg(3 Phase), 8.8kg(6 Phase)				
Safety Is	olation		1000Vrms or DC(CATII), 600Vrms or DC(CATIII)					
Power su	рріу	E to A	0°C Ambi	$90 \sim 265 \mathrm{vrms}, 50 \sim 60 \mathrm{Hz}, 50 \mathrm{vrmax}$				
Condition	y IS	5 to 4		Temperature coefficient $\pm 0.01\%$ per °C of reading at 5-18°C and 28-40°C				
				,				

Note * : Voltage Range[x] 1 + 2 : [1]100mV + [2]300mV

Note ** : Current Range[x] 1 + 2 : PPA3500-LC 20Arms model: [1]10mA + [2]30mA , PPA3500 30Arms model: [1]30mA + [2]100mA

SPECIFICATION

	PPA3500				
Harmonic Specific	ation				
Bandwidth	DC,10mHz ~ 1MHz - PPA3500-LC(20Arms), PPA3500(30Arms)				
No. of Harmonics	monics 100				
Sampling Frequency	1Ms/s				
Signal Processing	DFT (Discreet Fourier Transform)				
Crest Factor	20				
Power Factor	0 to 1				
Harmonic Accurac	У У				
Voltage	0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+5mV				
Current	PPA3500-LC 0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+300uA PPA3500 0.04% Rdg+0.1% Rng+(0.005%×kHz Rdg)+900uA				
	Harmonic Accuracy (above) still applies with Frequency Filter set				
Cycle by Cycle Ana	lysis direct to PC - 2Ms/s sample rate (Window setting)				
Data Rate	10ms (all channels active)				
Cycle by Cycle Ana	lysis direct to Internal RAM - 2Ms/s sample rate				
Data Rate	Sms (all channels active)				
20ms	4 2kVok (3kVrms)				
55	3 1 k/uk (2 2 k/ums)				
Continuous	3kVpk (1kV/ms)				
Voltage Attenuator	Input Impedance				
	3.3MΩ 25pF				
Current Shunt Imp	edance				
20Arms	10mΩ				
30Arms	3mΩ				
Selectable Analgou	e Filter				
	250kHz				
Minimum Current N	Aeasurement at Full Accuracy				
PPA3500-LC	220uArms				
PPA3500	700uArms				

ACCESSORIES SUPPLIED AS STANDARD

Leads and Interfacing			
Туре	Specification		
36A Connection lead set	1.5 Metre - 36A lead set with 4mm stackable safety terminals		
Son connection lead set	1x Red, 1x Yellow and 2x Black per phase plus alligator clips		
RS232 cable	RS232 9pin serial Cable		
USB cable	USB 2 Metre A male to B male		
LAN Interface	LAN fitted as standard		
USB to 9-pin RS232 (Option)	USB \sim 9-pin RS232 Serial Converter		
GPIB Option	GPIB Interface Option		

Documents (Standard)			
Туре	Specification		
Calibration/Test & Inspection Certificate	PPA Certificate of Calibration		
UKAS ISO17025 Certificate	UKAS ISO17025 Certificate of Calibration		
	Quick Start Guide		
Spare set of manuals	Comms manual		
	PPALoG user guide available as website download		

OPTIONAL ACCESSORIES

PC Software (Optional CD, Free to Download)				
Type Specification				
PPALoG	PC control and data acquisition of 1 \sim 24 phases with selectable Real Time data, Graphing, Datalog and versatile export options User Manual for PPALog available as a free download from our website			
PPA Standby Power	Standby power measurements and reporting to IEC62301			

Carry cases (Optional)				
Туре	Specification			
Soft carrying case	Black nylon with shoulder strap			

Connection and extension port accessories (Optional)				
Туре	Specification			
Breakout box	Simple analyzer connection between source and DUT			
PCIS	10Arms 300Apk rated Phase Controlled Inrush Switch			
ADI40	40 Channel Analogue Input/Ouput Interface			
GPIB Communication	CPIP Communication Coble Ontion			
Cable	Carib Communication Cable Option			

Breakout Box



Rack Mount Kit (Optional)				
Туре	Specification			
Rack Mount brackets	PPA3500 19in rack mount brackets			

Interface (Optional)				
Туре	Specification			
PPA-GPIB interface	Option G - GPIB(IEEE488)Interface			

ACCESSORIES

High Performance Voltage Attenuating Probes					
Model	Voltage Range	Frequency Range	Details		
TT-HV250	2500Vpk	300MHz	High Voltage Probe (Passive) 2.5kVpk 100:1		
TTV-HVP	1500Vpk	50MHz	High Voltage Probe (Passive) 15kVpk 1000:1		
ATT10	30Vpk	30MHz	10:1 Voltage Attenuator Box (For use in conjunction with HV Probes when output voltage of probe is >3Vpk, BNC Input/BNC Output)		
ATT20	60Vpk	30MHz	20:1 Voltage Attenuator Box (For use in conjunction with HV Probes when output voltage of probe is >3Vpk, BNC Input/BNC Output)		
ULCP	3000Vpk	2MHz	1000:1 Ultra Low Capacitance Probe (Active), For use in applications such as Ballast Testing (<1pF Capacitance)		



High Performance External Current Measurment Options						
Model Number	Measuring Range	Frequency Range	Basic Accuracy	Phase Accuracy	Details	
HF003	3Arms - 30Apk	DC - 2MHz	470mΩ (±0.1%)	0.0001° / kHz	3Arms External Current Shunt, BNC Output (Use with PPA External Input)	
HF006	6Arms - 60Apk	DC - 2MHz	100mΩ (±0.1%)	0.001° / kHz	6Arms External Current Shunt, BNC Output (Use with PPA External Input)	
HF020	20Arms - 200Apk	DC - 2MHz	10mΩ (±0.1%)	0.01° / kHz	20Arms External Current Shunt, BNC Output (Use with PPA External Input)	
HF100	100Arms - 1000Apk	DC - 2MHz	1mΩ (±0.1%)	0.05° / kHz	100Arms External Current Shunt, BNC Output (Use with PPA External Input)	
HF200	200Arms - 2000Apk	DC - 2MHz	0.5mΩ (±0.1%)	0.1° / kHz	200Arms External Current Shunt, BNC Output (Use with PPA External Input)	
HF500	500Arms -	DC - 2MHz	0.2mΩ (±0.1%)	0.1° / kHz	500Arms External Current Shunt, BNC Output (Use with PPA External Input)	



External Shunt HF-003



External Shunt HF-100



External Shunt HF-200



External Shunt HF-500

Probe/Current Clamp Transformer: AC							
Model Number	Measuring range	Frequency range	Accuracy	Details	Clamp diameter	Category	
M3 UB 50A-1V	100m A ~ 50A	$40 \text{Hz} \sim 5 \text{kHz}$	1%	100mA to 50A AC Current Clamp	15mm×17mm	600V CATIII	
M3 U 100A-1V	$1A \sim 100A$	$40 \text{Hz} \sim 5 \text{kHz}$	1%	1A to 100A AC Current Clamp	15mm×17mm	600V CATIII	
S UE 200A-1V	1A~200A	$40 \text{Hz} \sim 5 \text{kHz}$	1%	1 A to 200A AC Current Clamp	50mm ø	600V CATIII	
S UE 250 500 1000-1V	1A~250A/500A/1000A	40Hz ~ 5kHz	1% (250A) 0.5% (500+1000A)	1 A to 250/500/1000A AC Current Clamp	50mm ø	600V CATIII	
US UE 1000A-1V	1A~1000A	$40 \text{Hz} \sim 5 \text{kHz}$	1%	1A to 1000A AC Current Clamp	43mm ø	600V CATIII	
SM UE 1000A-1V	0.5A~1000A(1%>100A)	$15 \text{Hz} \sim 15 \text{kHz}$	1%	0.5A to 1000A AC Current Clamp	54mm ø	600V CATIII	
SM UB 1000A-1V	0.5A~1000A(0.5%>10A)	$15 \text{Hz} \sim 15 \text{kHz}$	0.5%	0.5A to 1000A AC Current Clamp	54mm ø	600V CATIII	
P32 UE 1000A-1V	5A~1000A	40Hz ~ 5kHz	1%	5 A to 1000A AC Current Clamp	83mm ø (125mm×47mm or 100m m×58mm)	600V CATIII	
P32 UE 3000A-1V	5A~3000A	40Hz ~ 5kHz	1%	5 A to 3000A AC Current Clamp	83mm ø	600V CATIII	



Current Clamp M3-UB 50A-1V



Current Clamp S-UE 200A-1V



Current Clamp SM-UB 1000A-1V



Current Clamp P32-UE 1000A-1V

Probe / Current Clamp (Hall effect): AC + DC						
Model number	Measuring range	Frequency range	Accuracy	Details	Clamp diameter	Category
SC 2C 100A-1V	1A~100A	$DC \sim 5 kHz$	2%	1A to 100A AC+ DC Current Clamp	50mm ø	600V CATIII
SC 3C 1000A-1V	1A~1000A	DC~2kHz	1%	1A to 1000A AC+ DC Current Clamp	59mm ø	600V CATIII
P20 3C 2000A-2V	40A~1000/2000A	DC ~ 2kHz	1%	40A to 2000A AC+ DC Current Clamp	83mm ø	600V CATIII
P40 3C 4000A-2V	$40A \sim 2000/4000A$	DC ~ 2kHz	1.5%	40A to 4000A AC+ DC Current Clamp	83mm ø	600V CATIII
P50 3C 5000A-2V	50A~2000/5000A	$DC \sim 2kHz$	1.5%	50A to 5000A AC+ DC Current Clamp	83mm ø	600V CATIII



Current Clamp SC 2C 100A-1V



Current Clamp SC 3C 1000A-1V



Current Clamp P20 3C 2000A-2V



Current Clamp P50 3C 5000A-2V

Rogowski Current Transducer: AC / Zero Flux Current Transducer: AC+ DC							
Model number	Measuring range	Frequency range	Nominal Accuracy	Details	Coil/Through Hole Circumference	Category	
WR5000 Rogowski	1 A ~ 5000A	$1 { m Hz} {\sim} 1 { m MHz}$	0.05%	1A to 5000A AC Rogowski Coil	600mm	600V CATIII	
WR10000 Rogowski	1A~10000A	$1 { m Hz} \sim 1 { m MHz}$	0.05%	1A to 10000A AC Rogowski Coil	600mm	600V CATIII	
LEM IT 60-S	$0A \sim 60A \text{ DC/pk} (42 \text{ Arm s})$	$\mathrm{DC}\sim800\mathrm{kHz}$	0.01%	60A Zero Flux Current Transducer	26mm	600V CATIII	
LEM IT 65-S	0A ~ 60A DC / 85A pk (60Arms)	$\mathrm{DC}{\sim}800\mathrm{kHz}$	0.01%	60A Zero Flux Current Transducer	26m m	600V CATIII	
LEM IT 200-S	0A~200A DC/pk (141Arms)	$ m DC$ \sim 500kHz	0.01%	200A Zero Flux Current Transducer	26mm	600V CATIII	
LEM IT 205-S	0A ~ 200A DC/ 283A pk (200Arms)	$ m DC {\sim} 1 m MHz$	0.01%	200A Zero Flux Current Transducer	26mm	600V CATIII	
LEM IT 400-S	0A ~ 400A DC/pk (282Arms)	$\mathrm{DC}\sim500\mathrm{kHz}$	0.01%	400A Zero Flux Current Transducer	26mm	600V CATIII	
LEM IT 405-S	0A ~ 400A DC/ 566A pk (400Arms)	$ m DC$ \sim 300kHz	0.01%	400A Zero Flux Current Transducer	30 m m	600V CATIII	
LEM IT 700S	0A ~700A DC/pk (495Arms)	$\mathrm{DC}\sim 100\mathrm{kHz}$	0.01%	700A Zero Flux Current Transducer	30m m	300V CATIII	
LEM IT 1000S	0A ~ 1000A DC/pk (707Arms)	$ m DC{\sim}500 kHz$	0.01%	1000A Zero Flux Current Transducer	30m m	300V CATIII	
LEM IT 605S	0A ~ 600A DC/ 849A pk (600Arms)	$\mathrm{DC}{\sim}300\mathrm{kHz}$	0.01%	600A Zero Flux Current Transducer	30m m	300V CATIII	
LEM IT 600S	0A ~ 600A DC/pk (425Arms)	$\mathrm{DC}\sim300\mathrm{kHz}$	0.01%	600A Zero Flux Current Transducer	30m m	300V CATIII	
LEM ITN 900S	0A ~ 900A DC/pk (636Arms)	$\rm DC{\sim}300 kHz$	0.01%	900A Zero Flux Current Transducer	30m m	300V CATIII	
LEM ITN 1000S	0A ~ 1000A DC/pk (707Arms)	$\mathrm{DC}\sim300\mathrm{kHz}$	0.01%	1000A Zero Flux Current Transducer	30 m m	300V CATIII	
LEM IN 1000-S	0A ~ 1000A DC/ 1500Apk (1000Arms)	$DC \sim 440 kHz$	0.01%	1000A Zero Flux Current Transducer	38.2mm	1000V CATII	
LEM IN 2000-S	0A ~ 2000A DC/ 3000Apk (2000Arms)	DC~140kHz	0.01%	2000A Zero Flux Current Transducer	70mm	1000V CATIII	

LEM Interfaces			
Model number	Description	Compatiblity	Nominal Accuracy
LEM6/X Interface	Combined PSU + Configurable Load Resistor interface for connecting up to 6	All LEM transducers listed above except IT 1000-S,	0.10/
	LEM transducers to PPA	ITN 1000-S, IN 1000-S and IN 2000-S	0.1%
LEM-1 Interface	Combined PSU + Load Resistor interface for connecting LEM transducer to PPA.	All LEM transducers listed above	0.1%



WR5000 Rogowski Coil



LEM-1 Interface



LEM IT 700-S

PRODUCT COMPARISON							
	PPA500	PPA1500	PPA3500	PPA4500	PPA5500		
Basic Accuracy							
V. A rdg error	0.05%	0.05%	0.04%	0.03%	0.01%		
Power rdg error	0.10%	0.10%	0.06%	0.04%	0.02%		
Phase Options							
Internal	1~3	1~3	1~ 6	1~3	1~3		
Master/Slave operation	_	_	_	4~6	$4 \sim 6$		
Bandwidth							
20 & 30A Shunt	DC \sim 500kHz	$\rm DC\sim 1 MHz$	DC ~ 1MHz	_	—		
10 & 30A Shunt	_	_	_	$\rm DC\sim 2MHz$	$ m DC\sim 2MHz$		
50A Shunt		-	_	$\rm DC\sim 1 MHz$	$ m DC\sim 1MHz$		
Voltage Input							
Max input voltage	2500Vpk (1kVrms)	2500Vpk (1kVrms)	2500Vpk (1kVrms)	3000Vpk (1kVrms)	3000Vpk (1kVrms)		
No. of ranges	8	8	10	8	9		
Direct Current Input							
10Arms model		_		0	0		
20Arms model	Q	0	0				
30Arms model	0	0	<u> </u>	0	0		
50Arms model		—		0	0		
No. of ranges	8	8	10	8	9		
Features							
Scope and Graph Modes		0		0	0		
USB Memory port	0	0		0	0		
LAN Port	0	0	Q	0	0		
GPIB Port	_	<u>Q</u>		<u> </u>	0		
RS232 Port	0	0		0	0		
Real time clock	O	0	<u> </u>	0	0		
19in Rack mount option	•	<u> </u>		<u> </u>			
Iorque and Speed		—	0	0	0		
PWM Motor Drive Mede							
			<u>0</u>				
Transform or Modo		0					
PWM Filter Options			7	7	7		
Speed/Harmonics/Sec		200/200	200/200	/	1800/coc		
Internal Datalogging	4 Peromotoro	4 Paramatara	22 Peromotoro		16 Parametera		
	410000	4 1 41 41 10 10 10		TO T AT ATT THE TETS	10141411161615		
Datalog Records	16000	18000	INI C	5101	10M		
ADDUIUU.I.8 MODe			-	-			
Internal Memory	192kB	192kB	500MB	500MB	1GB		
Harmonics	50	50	100	100	417		
Minimum Window Size	10 m s	5ms	5ms	2m s	2ms		
Dimensions - Excl. Feet H x W x D (mm)	92 x 215 x 312	92 x 215 x 312	92 x 404 x 346	130 x 400 x 315	130 x 400 x 315		
Weight	3.3 - 4kg	3.3 - 4kg	5 - 8.8kg	5.4 - 6kg	5.4 - 6kg		

- Not Applicable Option

Standard

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 The N4L product range also includes Frequency Response and Impedance Analyzers, Selective Level Meters and Laboratory Power



Applications



- Power supply phase margin and gain margin (FRA)
- Inductance, Capacitance and Resistance (LCR)
- Analysis of mechanical vibration (HARM)
- Phase Angle Voltmeter (PAV)

Contact your local N4L Distributor for further details

Newtons4th

Newtons4th Ltd (abbreviated to N4L) was established in 1997 to design, manufacture and support innovative electronic equipment to a world-wide market, specialising in sophisticated test equipment particularly related to phase measurement. The company was founded on the principle of using the latest technology and sophisticated analysis techniques in order to provide our customers with accurate, easy to use instruments at a lower price than has been traditionally associated with these types of measurements. Flexibility in our products and an attitude to providing the solutions that our customers really want has allowed us to develop many innovative functions in our ever increasing product range.



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In recognition of the technical innovation and commercial success of the PPA series, N4L received the "Innovation 2010" Queen's award for enterprise

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