

# PA9PLUS

## Portable Power Quality Analyzer



- **A ruggedized, full-featured instrument measuring to worldwide power quality standards (EN50160, IEC61000-4-15, IEEE1159/519)**
- **Trends voltage, current, imbalance, power, energy, events, flicker (PST/PLT), THD, TDD, individual harmonics, and frequency**
- **Real-time, graphical display of harmonic content, power and source direction**
- **On-site, integrated analysis and data retrieval capabilities without requiring a computer or PDA**
- **Intelligent download—preview and retrieve only the information of interest**
- **Remote communications and alarming capabilities**
- **Includes enhanced MEGPA9IEC software for instrument configuration, communications, data retrieval and charting/reporting**

### DESCRIPTION

The new Megger PA9Plus is the latest innovation of the successful PA-9 Power Quality Analyzer platform. It incorporates newly enhanced key features including a faster Digital Signal Processor (DSP) to support continually evolving capabilities, a full 12 MB of nonvolatile internal memory and standard auxiliary power input capabilities.

To address worldwide requirements and applications, the PA9Plus is CE marked, supports several international languages, and adheres to applicable European and North American standards (EN50160, IEC61000-4-15, IEEE1159, IEEE519), including automatic phase lock loop synchronization of input frequencies ranging from 20 Hz to 70 Hz, flicker measurements and recording, and out of limits/frequency trending.

The optional removable memory capabilities allows internally recorded data to be copied directly to an external standard compact flash card using the same technology available with most of today's digital cameras. This means that without a computer on site, data can be manually or automatically copied from the instrument to external memory cards, increasing the effective instrument memory storage to the size of the card used. Similarly, new configuration setups may be programmed in the same, simple manner.

The standard software has been enhanced to fully support

the new functionality and is included at no cost with every PA9Plus purchased. A new, optional report generator has also been developed to support your customized documentation/reporting needs.

The PA9Plus records power quality and power flow information simultaneously. The recorded information can be viewed via the built-in graphics display, downloaded to a computer using the serial interface and optional modem, or transferred using the optional removable Flash Memory Module.

Megger offers a comprehensive line of self-powered (no batteries required) flexible and clamp-on current probes for use with the entire PA-9 Series. If you would prefer to use your own probes, simply order the applicable Megger adapter.

### Power Quality

- The PA9Plus has a sample rate of 256 samples/cycle for all input channels and harmonic analysis through the 63rd harmonic.
- Long-term (days/weeks/months) recording of voltage/current RMS values with a response time as fast as every cycle.
- Captures pre-fault and post-fault waveforms.
- Reports out-of-limits events.

- Frequency trending and IEC Flicker measurements.
- Waveform capture with event (voltage and current sags, swells, harmonics and sub-cycle transients down to 65 microseconds), time, or harmonic trending limits.

### Power Flow

- Records all power parameters for all major configurations using single, 2, 2-1/2 and 3 element measurement methods.
- Power parameters are recorded for demand intervals from one hour down to every cycle, which is always necessary when recording in-rush characteristics during start-up of motors, generators, transformers, and large loads.

### Records all Power Quality and Power Flow Parameters

- **Voltage/Current & Power** – volts (line-neutral)\*, volts (line-line)\*, volts (neutral-earth)\*, amps\*, frequency, neutral amps\*, real power\*\*, reactive power\*\*, apparent power\*\*
- **Demand Interval Data** – (for fixed or sliding window) volts (line-neutral) or volts (line-line), current, real power\*\*, reactive power\*\*, apparent power\*\*, real energy\*\*, reactive energy\*\*, apparent energy\*\*, true power factor, displacement power factor, volts & amps imbalance, phase relationships
- **Minimum/Maximum/Demand** – volts, amps, real power, reactive power, apparent power, volts and amps imbalance, true power factor
- **Waveforms/Harmonics** – (for each input) voltage and current waveforms captured on time or exceedance triggered basis, total harmonic distortion, total demand distortion, individual harmonic trending, harmonic analysis, amplitude, phase shift, K factor

\*RMS as well as 1 cycle minimum and maximum value

\*\*Bidirectional measurement capability

### Versatile Data Recording Modes

For ultimate flexibility, the user determines how data is recorded:

- **Continuous Recording** – the PA9Plus records all selected parameters (i.e. minimum, average and maximum values of voltage/ current, power parameters, etc.) with date and time stamp for each storage interval.
- **Exceedance only Recording** – the PA9Plus only records abnormal events based on user selected limits. This technique saves memory and allows longer recording times.

### You Manage the Memory

The PA9Plus offers several options for managing the full 12 MB of nonvolatile internal memory and an optional removable memory card (up to 4G).

- **Stop when Full** – recording stops when internal memory is full. All recorded data is saved to internal memory for download or local analysis.

- **Wraparound or “Moving Window”** – when memory is full, the power analyzer automatically writes over the oldest data. This first-in, first-out process guarantees that the most recent data is always recorded and available.
- **Transfer to External Memory Card** – manual and automatic transfer capabilities. This card is available from Megger.

### APPLICATIONS

Using experience gained from supplying thousands of solid state recorders to hundreds of utilities, industrial, and service companies around the world, Megger designed the PA9Plus to be the most versatile instrument available today. The PA9Plus is Megger's next generation analyzer, including important new features requested by our customers.

From substations, to commercial & industrial, to residential monitoring, the PA9Plus is your comprehensive “first line of defense” for analyzing and solving power quantity and power quality problems.

These high performance capabilities, combined with the latest in electronic technology, makes the PA9Plus ideal for both utility and industrial applications:

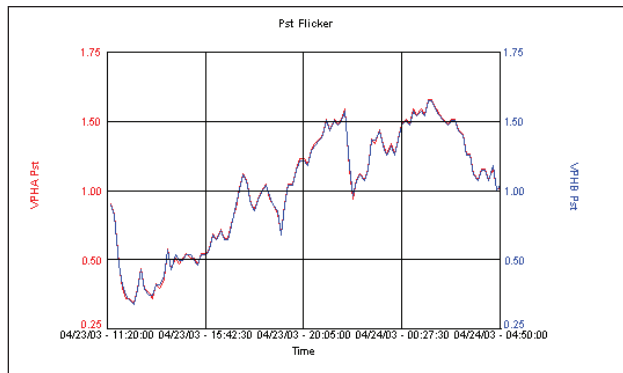
- Analysis comparisons to worldwide PQ standards
- Lamp flicker measurements and recordings
- Energy audits and forecasting
- Capacitor bank sizing
- Load balancing
- Power factor surveys
- Before/after studies
- Load profiling
- Substation monitoring
- Comprehensive power quality investigations
- Billing verification
- Motor, generator and transformer inrush current studies
- Harmonic surveys, analysis, and filter design



**Voltage and current probes connect easily and never require an external power supply.**

## FEATURES AND BENEFITS

- The maintenance-free design provides significant time savings with each installation. With the capability of preprogramming up to 64 internal setups in advance, the PA9Plus is always ready. Simply select from any of the sample or user-defined recording configurations/ setups and begin the analysis. Setups may also be imported via the removable memory option.
- The PA9Plus is typically self-powered from the unregulated voltage on the first input channel (90-600 V ac at 20-70 Hz, or 110-600 V dc). This means that it can be used virtually anywhere since a well-regulated 120 or 240 V ac power source is not required. The auxiliary power input feature allows an alternative to self-power from a 10th, non-recording input source, effectively eliminating the small burden required to power the PA9Plus. This feature also negates any turn-on delays associated with some monitoring applications such as high-speed motor start studies.
- A large, backlit LCD confirms setup information and real-time status, phasors, frequency, harmonics, harmonic power, voltage, current, per phase and total power/ energy data, and minimums/maximums by phase. From data already recorded, charts of trended voltages, currents, waveform graphs, and reports of historical out-of-limits information by event type may be viewed.
- The newly enhanced MEGPA9IEC software for setup, configuration, communications, charting, and reporting continues to be included at no cost with every PA9Plus purchased. Optional enhanced report generation software, METREPORT, may also be purchased separately for creating custom-tailored reports.



**Flicker Trending per IEC61000-4-15 and EN50160**

## MEGPA9IEC SOFTWARE FOR WINDOWS

MEGPA9IEC is a simple, intuitive, menu-driven software package for use with both the new and existing PA9Plus Power Quality Analyzers. This software, provided at no charge to Megger customers, incorporates an instrument firmware upgrade feature for field-updating your PA9Plus to the newest capabilities.

### Retrieve Only the Data That Matters

MEGPA9IEC now includes a remote test log function to preview charts, events, reports, and waveforms prior to actual download. This preview function also includes the capability to select and download only the data content and time frame relevant to the investigation being performed, thus dramatically reducing the download time required.

### Software Features

This software offers many powerful features specifically designed to save time via:

- Easy, fill-in-the-form instrument setup and configuration
- Advanced local and remote connection capabilities
- Locate specific data files using the integrated search function
- Generate charts of voltage/current and demand data
- Perform harmonic and waveform analysis
- Chart individual harmonics, THD, TDD, frequency, and imbalance
- Zoom/unzoom on specific graphical areas of interest
- Choose from several built-in analysis reports

### Quick Recorder Setup

With Megger MEGPA9IEC, the PA9Plus can be set up for different test conditions in a matter of seconds. By simply filling in a form, the operator chooses which phases to record, the corresponding out-of-limit values, which statistics to save (minimum, RMS, and/or maximum), etc. For added convenience, the software provides default configurations for use as templates in creating customer-specific setups. Further, the software computes the maximum recording time based upon the selections made. Once the PA9Plus is configured for a test, it will retain this setup information until changed. Setup files may also be saved for re-use, or transported amongst instruments using the optional removable memory card.

### Harmonic Analysis

The PA9Plus records data for harmonic analysis and Megger MEGPA9IEC provides the following on that data:

- **Charts** of actual waveforms analyzed
- **Bar Chart** of the harmonics magnitude and signature for any selected waveform cycle through the 63rd harmonic
- **Harmonic Analysis Report** for the selected waveform cycle
- **Harmonic Trending** – Total Harmonic Distortion (THD), Total Demand Distortion (TDD), and all individual harmonic voltages and currents through the 63rd
- **IEC Flicker** – both PST/PLT measurement and recording

- **Trending** – Out-of-limits reports, RMS values, frequency, unbalance, demand, and energy

### Complete Reports

Megger MEGPA9IEC provides comprehensive reports of the recorded data which can be viewed, printed, or exported to popular word processing or spreadsheet programs.

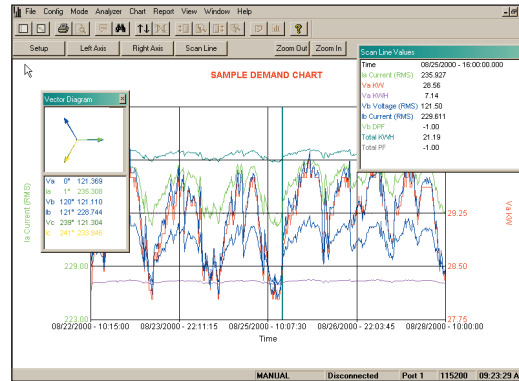
- **Summary and Setup Report** lists the instrument setup information, overall data summaries, and forecasts projections of future power and energy needs.
- **Tabular Report: Power** – includes “all” power and energy data recorded for each phase and total, as well as voltage and current imbalance.
- **Weekly Energy Report** – a powerful, totaled summary and analysis of any power/energy parameter over every hour of every day for a week.
- **Tabular Report – Voltage and Current** includes all trended true RMS minimums, maximums, and averages throughout the test.
- **Total Harmonic Distortion (THD) Summary Report** includes the THD for each input as a percentage of fundamental for the first cycle of each waveform capture snap shot.
- **Out of Limits Report** details the specifics of every measured input during an event, as well as the exacting event type and duration.

### Detailed Charts

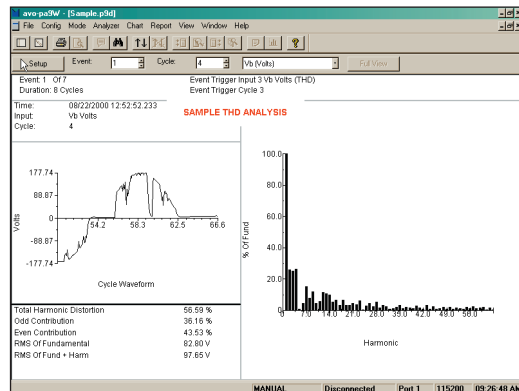
Megger MEGPA9IEC allows you to graph and overlay any or all recorded parameters on a single chart. This feature dramatically reduces the time for problem analysis and identification. An important feature allows you to zoom in/zoom out of particular windows, as well as to copy and paste data directly from the chart to a third-party spreadsheet, database, or analysis program. The scan-line feature provides exacting data and timing information at any particular point in the chart, thus removing all guesswork and approximation in the investigation. In addition, you can graphically view vector information and relationships for any demand interval, as well as modify the look of the chart axis and title information. All charts and graphs may be printed directly to your local or network printer, and copied and pasted to third-party applications.

### NEW ADVANCED METREPORT UTILITY

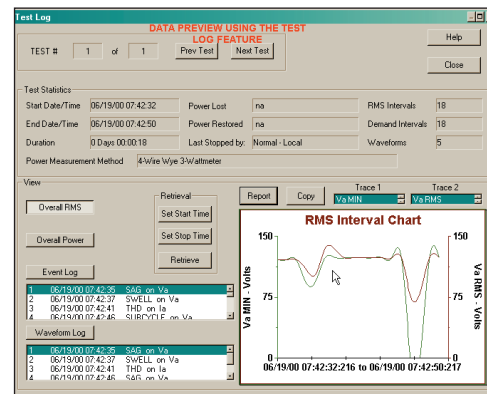
For more sophisticated reporting requirements, our optional METREPORT software creates tailored reports and customized reporting templates. This utility directly reads power quality data files, producing sophisticated reports incorporating company specific logos, in-depth charts, and applicable text into a Microsoft® Word-compatible document. New charting capabilities have been added for correlating recorded power quality data to industry manufacturers tolerance curves such as CBEMA, ITIC, and SEMI-F47. These reports are ideal for professional presentation to utility customers, power quality clients, and senior management.



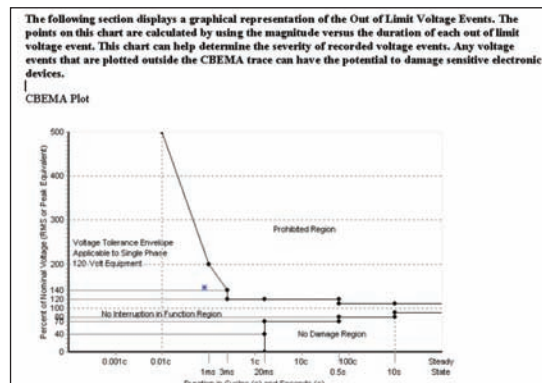
**Demand Data Chart**



**Cycle Waveform with Bar Chart**



**Selective Data Download and Preview Capabilities**



**Comparison to industry tolerance curves using optional METREPORT software**



## SPECIFICATIONS

Specifications are at 25° C (77° F).

### Applicable Measurement Standards

EN50160, IEEE1159, IEEE519, IEC61000-4-15, IEC 61000-4-30

### Voltage (4 Differential Input Channels)

#### Voltage Range

Three high-voltage channels autoranging between 20 to 600 V ac.  
One low-voltage channel autoranging between 0.1 to 350 V ac, true RMS through the 63rd harmonic. The PA9Plus will also measure V dc (Approx. dc only)

#### Low Voltage Channel Accuracy (VAC RMS Only)

Range	Accuracy
0 V to 4.9 V	> .5% of reading
5.0 V to 9.9 V	Within .5% of reading
10 V to 14.9 V	Within .3% of reading
15 V to 340.0 V	Within .2% of reading
340 V to 350 V	> .3% of reading

#### High Voltage Channel Accuracy (VAC RMS Only)

Range	Accuracy
10 V to 30 V	> .4% of reading
30 V to 70 V	Within .4% of reading
70 V to 350 V	Within .25% of reading
350 V to 600 V	Within .4% of reading

### Crest Factor

#### Voltage

Limited to 1500 V peak (not including impulses)  
for high voltage channels

Limited to 500 V peak for low voltage channel

**Current:** 1.4 of full scale at peak input

### Current (5 channels) (AAC RMS Only)

**Current Resolution:** 0.1% of full scale

**Current Accuracy:**  $\pm 0.25\%$  of reading  $\pm 0.5\%$  of range,  
plus the current probe accuracy

Current channels receive 0 to 1 Volt RMS from probes

Current channel voltage 0.25% of reading,  $\pm 5$  mV

### Voltage/Current Connectors

V = 4 color coded pairs of safety banana jacks; I = 5 Amp miniature circular connector; power provided for flexible CTs

### Frequency

**Fundamental Frequency:** 20 Hz to 70 Hz autoranging via phase lock loop

**Frequency Response:** dc to the 63rd harmonic with low pass anti-aliasing filter

**Frequency Resolution:** 0.01 Hz

**Frequency Accuracy:** 0.01 Hz at 60 Hz

### Phase Angle Error

$\pm 1^\circ$  referenced to first voltage channel at 60 Hz

### Sample Rate

**20-70 Hz:** 256 samples/cycle

Voltage and current for each phase are sampled simultaneously

### Channel to Channel Isolation

6000 Volts peak on voltage channels

### Control

Silicon rubber keypad, four cursor controls with select switch and six buttons (home, back, default, record, cursor select, power on)

### Time

**Real Time Clock:** internally maintained and updatable via computer

**Time Accuracy:** Better than  $\pm 0.005\%$

### Power Supply

Selectable between either A-phase voltage input or nonrecording IEC-style power input. A-phase voltage powering input requirement 90-600 V ac or 110-600 V dc. IEC power input requirement 90-250 V ac.

### Battery

12 V backup battery included for ride-through of outages to 15 minutes and local data analysis without a power connection

**Battery Recharge Time:** 16 hours

**Run Through Time:** If recording, 15 minutes when instrument power input falls below minimum voltage level listed above. After 15 minutes, automatically resume recording on restoration of minimum input power using correct date and time.

**Data Retention:** 10 years via nonvolatile, solid-state internal flash memory

### Environmental

**Operating Temperature:** -20° to +50° C (-4° to 122° F) ambient temperature

**Humidity:** Meets NEMA 4X, rain resistant; 90% non-condensing, not watertight

**Case:** NEMA 4X, (IP54), nonconductive, corrosion resistant, rain resistant, not submersible

### Communications

**RS-232:** 3 wire, 115 KBPS, Standard DB9 connector

**External RS-232 (Optional):** For serial port access to instrument data while front lid remains closed

**Modem (Optional):** internal modem

### Display

**Type:** Backlit, 5 in. x 1.5 in., 240 x 64 pixels graphic LCD

**Operating Temperature:** 0° to +50° C (32° to 122° F)

### Optional Customer Defined Start-up Screen Text

The factory presets two lines of the start-up/about screen to customer specific data (i.e. owner contact information, lost/found message, etc.). Each line may contain up to 40 characters of text.

### Memory Options

**Standard:** 12 megabytes internal flash

**Optional:** Instrument slot and adapter on front panel of PA9Plus for inserting and removing compact flash memory cards.

### Physical

**Size:** Portable — 330 x 254 x 152 mm (13 x 10 x 6 in.)

**Weight:** 5.6 kg (15 lbs)



**The PA9Plus is quick to install and easy to use. Everything needed to monitor power and power quality is included in one package.**

## ORDERING INFORMATION

Order a PA9Plus configured to your specific application. To determine the catalog number, fill in the blanks below with the corresponding number from the detailed information boxes.

Ordering Example:

To order a PA9Plus with the removable memory option, flash card with USB reader, English display, and US auxiliary power cord, request catalog number **P9P 0 0 0 2 1 — 0 1 0 0 0**

Fill in these blanks with the corresponding letter or number.

P9P 0 0 0 2 1 — 0 1 0 0 0	
<b>External RS-232 Port</b> 0 = Not Installed      1 = Installed	
<b>Communications Capabilities</b> 0 = None      1 = Modem	
<b>Voltage Input Color Coding</b> 0 = Standard      1 = Australian	
<b>Removable Memory Option</b> 0 = None 2 = Flash card with USB reader 4 = Flash card with parallel reader	
<b>Power Cable</b> 1 = USA      2 = UK      3 = European	
	<b>Future Firmware Option</b> 0 = None      1 = Not Yet Available
	<b>Customer-defined Firmware Text</b> 0 = None      1 = Customized Text Option
	<b>Future Firmware Option</b> 0 = None      1 = Not Yet Available
	<b>Firmware Language</b> 1 = English      2 = French      3 = Spanish
	<b>Future Firmware Option</b> 0 = None      1 = Not Yet Available



Many additional new starter kit configurations have been created to meet customers evolving power measurement needs

## Item (Qty)

## Cat. No.

Typical Starter Kit includes PA9Plus (P9P00021-01000), English display, kit of four (4) fused voltage cables (CA-PA9-22) with crocodile clips and neutral jumpers, US auxiliary input charging cable, external data transfer memory adapter, external compact flash card, three (3) 600/6000CE current clamps, SC-PA9 soft sided carrying case, MEGPA9IEC software, and manual

SK-P9P-US-EN-1

For additional Starter Kit options (i.e. European versions) including IEC, CTs and voltage probes, contact your sales representative

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Mumbai INDIA, Johannesburg SOUTH  
AFRICA, and Chonburi THAILAND

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