

PA1000 Power Analyzer

New Product Introduction



Tektronix[®]

PA1000 Power Analyzer

Introduction

- What does the PA1000 measure?
- Target Applications
- Why the Tektronix PA1000?
 - Unique Features & Value
- Whole Product Solution
 - Accessories
 - Software
 - Compliance Testing
- Pricing & Ordering Information



PA1000 – What does it measure?

- Measures **electrical power** (Watts). Provides many other measurements as standard, but this is primary. The PA1000 is a “wattmeter”.
- Measures apparent power (VA), power factor (PF), reactive power (VAr), volts RMS, amps RMS, crest factors, peaks, frequency.
- Measures **harmonics** of voltage, current and power.
- Measures electrical **energy consumption** over time (W-h), the rate at which power is consumed.
- Measures **standby power** in full compliance to standards.



The image shows a screenshot of the PA1000 Power Analyzer's display. The display is divided into a grid of measurement boxes. The top row shows Vrms (118.46 V) and Arms (87.48 mA). The second row shows Watt (7.498 W) and VA (10.362 VA). The third row shows VAr (7.152 VAr) and PF (0.724). The fourth row shows Aof (2.172) and Freq (59.99 Hz). The fifth row shows Vthd (2.249 %) and Athd (57.85 %). The sixth row shows Vpk+ (164.02 V) and Apk+ (189.97 mA). The seventh row shows Vpk- (-164.02 V) and Apk- (-187.09 mA). On the right side of the display, there are several control buttons: a green up arrow, a yellow HOLD button, a green down arrow, a green Normal button, and a green down arrow.

Vrms 118.46 V	Arms 87.48 mA
Watt 7.498 W	VA 10.362 VA
VAr 7.152 VAr	PF 0.724
Aof 2.172	Freq 59.99 Hz
Vthd 2.249 %	Athd 57.85 %
Vpk+ 164.02 V	Apk+ 189.97 mA
Vpk- -164.02 V	Apk- -187.09 mA

PA1000 Target Applications

- Design & development of any single phase electrical or electronic product.

- Power Supplies & Chargers



- UPS and Generators

- Audio-visual & network devices

TV, DVD, Recorders, Set-top boxes, WI-Fi modems and routers.



- Appliances

Washing machine, refrigerator, vacuum cleaner



- Office equipment

Computers, printers



- Lighting

Lamps and luminaires. LED and Fluorescent.



PA1000 Power Analyzer

Specifications Overview



Voltage Input Range	Up to 600 Vrms, 1000 Vpeak
Basic Voltage Accuracy	0.05% Reading +/- 0.05% Range
Current Input Range	40 μ A to 20 Arms with 2 built-in shunts
Basic Current Accuracy	0.05% Reading +/- 0.05% Range
Measurements	Vrms, Irms, VA, VAR, W, PF, Freq, Whr, Vahr, THD, etc.
Measurement Bandwidth	DC - 1 MHz
Harmonics Measurement	to 50 th harmonic
Automatic Modes	Lamp Ballast, Standby Power, Inrush, Energy Integration
Connectivity	USB, LAN, GPIB all standard
Warranty	Five Years

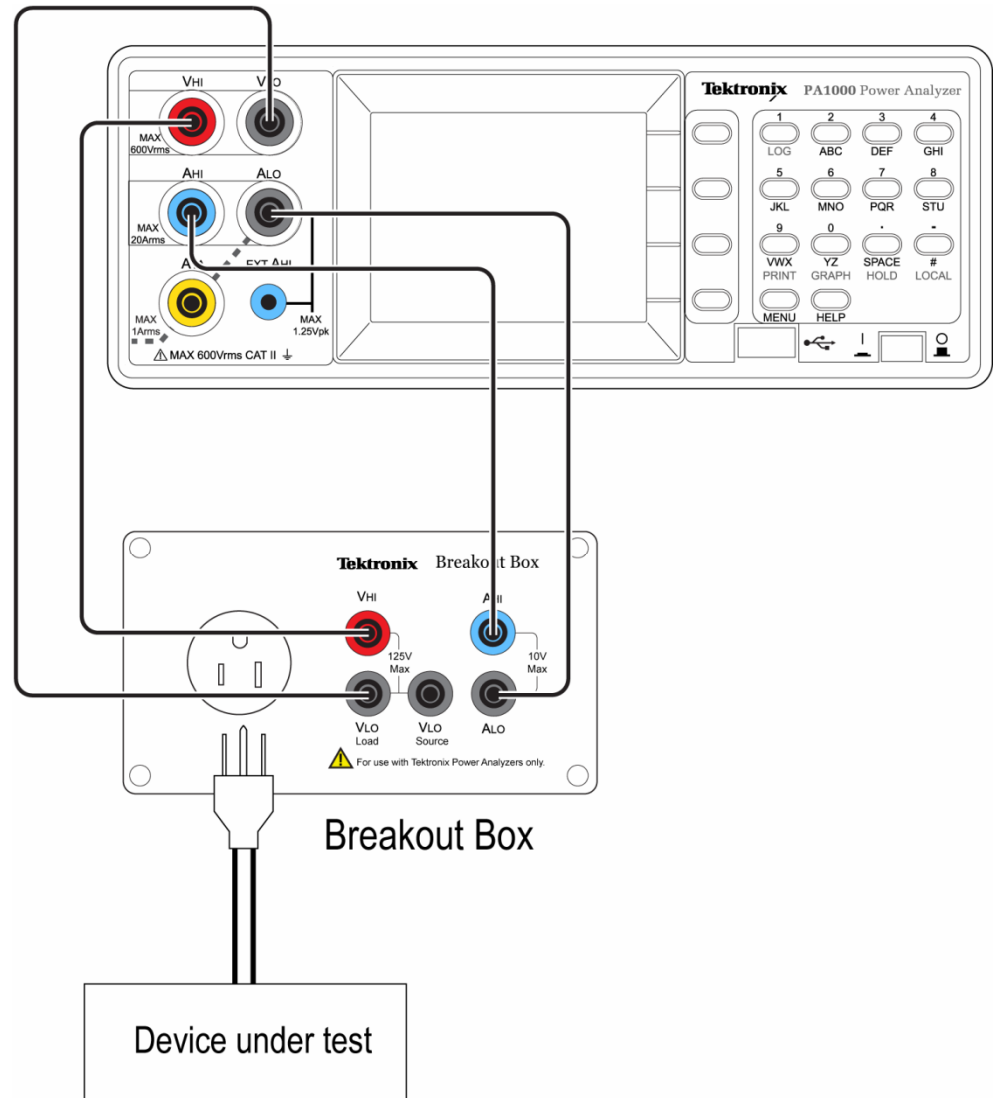
PA1000 Accessories

- **BB1000 Breakout Box**
 - Makes connection to device-under-test easy
 - Three versions:
 - BB1000-NA (North America receptacle)
 - BB1000-EU (Euro receptacle)
 - BB1000-UK (United Kingdom receptacle)
- **BALLAST-CT**
 - Specialized current transducer for lamp ballast testing
- **CL200, CL1200**
 - Current Clamps used with PA1000, PA4000 (both are current products)



Making Test Connections Easy

- BB1000 Breakout Box
Makes wiring connections to your device-under-test easy and safe
- “Breaks out” device current and routes it to analyzer shunt for measurement



PA1000 – Key Features & Benefits

- Dual current shunts (1A and 20A) for wide range
 - 40 μ A to 20A RMS direct input
 - ✓ Maintains accuracy even on low current
- 0.05% basic accuracy, 1MHz bandwidth
 - ✓ Meets todays measurement requirements
- Versatile color graphics display with application modes, menu-driven UI
 - ✓ Easy to set up, easy to read results
- Front-panel USB for data logging + standard comm. ports
 - USB, LAN, GPIB all standard
 - ✓ Transfer data for offline analysis & reporting
- PWRVIEW software with setup wizards & compliance test automation
 - ✓ Simplifies application-specific and regulatory testing



Application: Standby Power Testing

- “Standby power is the power used while an electrical device is in its lowest power mode.”
Lawrence Berkley National Laboratory.

Examples of products in Standby:

Laptop / Tablet / Phone charger connected to the AC line but not charging



Domestic appliance with a clock




Video or Set-top box inactive waiting for remote control



Standby Power Regulation - IEC62301 Ed.2

- EU Standard for Domestic and Office Appliances
- Reference for other programs
 - including ENERGY STAR
- Recognizes the measurement challenges
- Defines accuracy in terms of crest factor and power factor
 - $MCR = \text{Crest Factor} / \text{Power Factor}$
- Defines averaging length in terms of measurement stability

Energy		Fridge-Freezer
Manufacturer Model		
More efficient		
A		A
B		
C		
D		
E		
F		
Less efficient		
G		
Energy consumption kWh/year (Based on standard test results for 24h)		325
<small>Actual consumption will depend on how the appliance is used and where it is located.</small>		
Fresh food volume l		190
Frozen food volume l		126

Noise (dB(A) re 1 pW)		
<small>Further information is contained in product brochures</small>		
<small>Norm EN 153 May 1990 Refrigerator Label Directive 94/2/EC</small>		

Fridge-Freezer Labeling

PWRVIEW software for PC

- Remote Instrument Control
- Measurements
- Waveforms
- Harmonic bar charts
- Export data to Excel
- **Wizard-driven automated testing for key applications**
- **IEC62301 full compliance (Standby Power Test)**
- [Free download from tek.com](http://tek.com)

The screenshot displays the Tektronix PWRVIEW software interface. The main window shows test results for a 'Standby Power' test. The 'Results' menu is open, showing options for 'Full Report', 'Summary', 'Results', and 'Power Graphs'. Below the menu, there are two tables of data.

Test type	Standby Power
Test Date and Time	10/2/2013 10:52:14 PM
Overall Test Status	N/A
Test Duration	00:06:48
Ambient Temperature	23°C ±3°C
Humidity	< 75%
Test Notes	

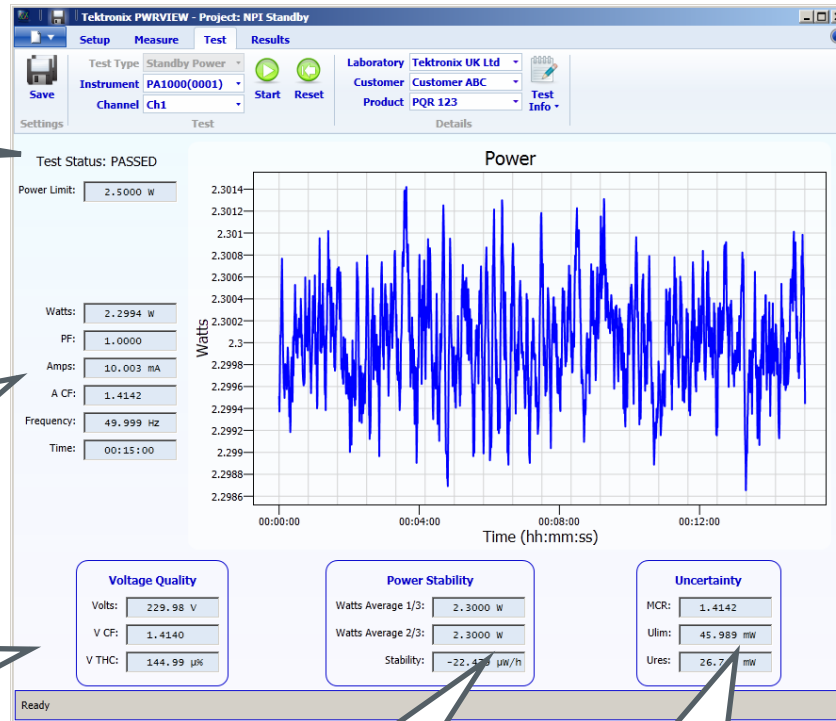
From last 2/3 of test	Average	Minimum	Maximum	Min Limit	Max Limit	Status
Voltage	121.51 V	121.11 V	121.91 V	227.70 V	232.30 V	FAIL
Current	59.196 mA	58.683 mA	59.894 mA	N/A	N/A	N/A
Frequency	60.008 Hz	59.981 Hz	60.025 Hz	49.500 Hz	50.500 Hz	FAIL
Power	3.1260 W	3.1222 W	3.1351 W	N/A	1.0000 W	FAIL
Power Factor	434.62 m	431.01 m	437.45 m	N/A	N/A	N/A
Voltage Crest Factor	1.3851	1.3838	1.3857	1.3900	1.4900	FAIL
Current Crest Factor	3.8726	3.8290	4.2441	N/A	N/A	N/A
Voltage THC	1.7157 %	1.6471 %	1.7946 %	N/A	2.0000 %	PASS
Uncertainty Ratio	762.67 m	761.05 m	764.75 m	1.0000	N/A	FAIL
Result Interval	N/A	N/A	0.50 s	N/A	1.0 s	PASS

PWRVIEW - Full Compliance Test for IEC62301 Ed.2

PASS / FAIL

Measurements
Every measurement is recorded simultaneously with a time stamp.

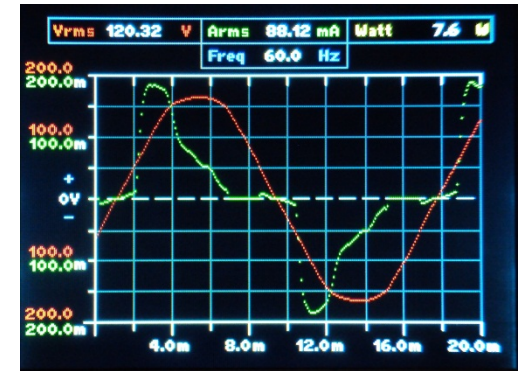
Voltage Quality
Voltage harmonics and THC recorded during the test.



Stability
The slope of the least-squares linear regression through the second 2/3 of the power measurements is displayed in real time.

Uncertainty
The required uncertainty U LIM and the actual uncertainty of the measurement U RES are calculated and displayed in real time.

PA1000 – Unique Benefits for the Price



- **Only** full-color display with waveforms, harmonics, bar charts in this instrument category
- Dual shunts for accurate measurements from as low as 40 microamps.
- Special measurement modes that simplify testing of Lighting Ballasts, Inrush Current and Energy Consumption.
- Full compliance testing for EnergyStar™, IEC50564, IEC62301 and other standards aimed at lowering power consumption.
- **Most Complete** - standard features that are extra-cost on competing analyzers
 - Communication ports, harmonic analysis, PC software, Standards Compliance
- **Industry's Best** 5-year warranty