

Voltech

PM1000+ Wattmeter - Power Analyzer

- Easy-to-use analyzer for the design, test and QA of all electrical products.
- Measures 15+ essential power and energy parameters, plus harmonics.
- High-speed interfacing for production testing.



The No Compromise Power Analyzer

Driven by consumer demand and energy efficiency legislation, tomorrow's electrical and electronic products must operate with ever-greater efficiency and employ increasingly complex control methods.

The accurate measurement of electrical power has never been more important than it is today.

The Voltech PM1000+ is the first power analyzer to combine bench instrument accuracy with sophisticated features and at an affordable price. The PM1000+ measures power consumption from milliwatts to megawatts, providing accurate power and harmonic data on products ranging from the tiniest cell phone charger to the latest electric hybrid vehicles.

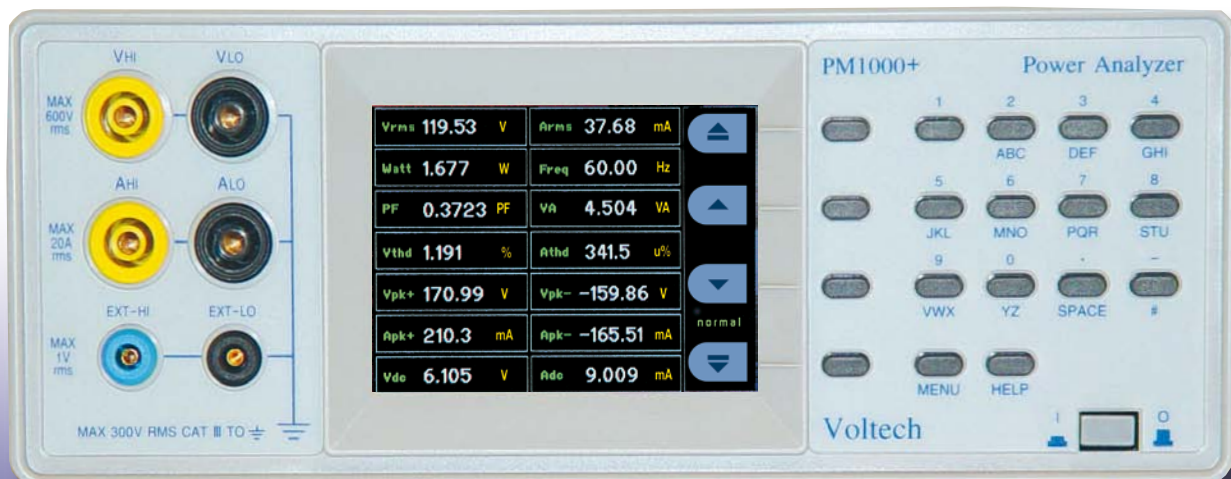
Designed and built using over 20 years of Voltech know-how. The PM1000+ is a powerful, accurate, no-compromise power and energy analysis tool for the design and test of tomorrow's products.

The Voltech PM1000+

- Versatile Color display.
See the measurements and graphics you need.
- Intuitive Set-Up Menu.
Powerful and easy-to-use, straight out of the box.
- Pre-compliance Harmonics and Flicker Option.
Essential for power supply and product design.
- High-Speed Digital Sampling.
High bandwidth measurements without aliasing.
- USB (slave) and RS232 interfaces are standard.
Free general purpose and IEC62301 software.
PC control, display and datalog always available.
- Communications model with Ethernet and USB host.
For networking and USB memory.



When you really want to be sure, you can trust Voltech.



Measurement Functions

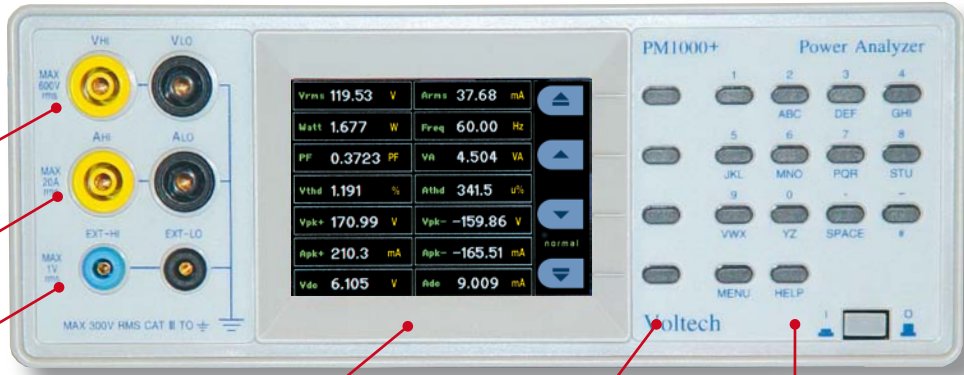
Direct Input Ratings

600Vrms, 900Vpk

20Arms, 100Apk

External Shunt Input

Ideal for current transducers with a voltage output as well as resistive shunts

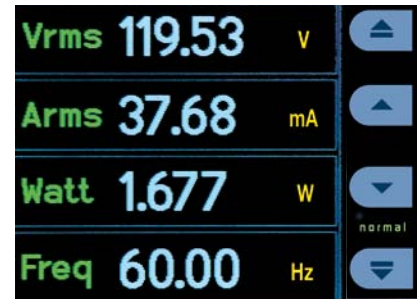


Bright 320 X 240 color display

Easy-to-use menu keys

On-board help and character entry

Volts	0 to 600V RMS, $\pm 900V$ Peak
Current	0 to 20A RMS, $\pm 100A$ Peak
Power (Watts)	0 to 90kW
Apparent Power	0 to 90kVA
Reactive Power	0 to 90kVAR
Frequency	DC, 10Hz to 1MHz
Power Factor	-1.000 to +1.000
Crest Factor	1 to 20
Ballast Input Ballast Output	50 / 60 / 400Hz Up to 500kHz
Harmonics	0 to 50 Voltage and Current
THD	0 to 999%
Energy Whr	Programmable Timer
Inrush Current	Up to 100A peak
Low Power Standby	1 to 600 second window
Impedance	5m Ω to 1M Ω
Basic Voltage Accuracy $\pm 0.05\%$ reading $\pm 0.05\%$ range.	



4 Parameter Measure Mode



14 Parameter Measure Mode



Measurement Selection

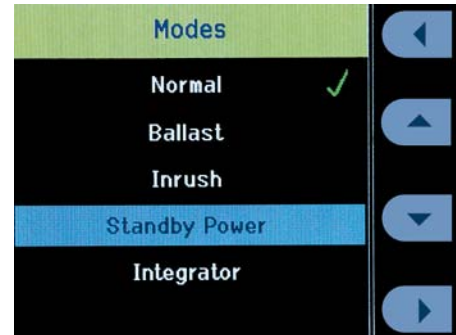
Measurement Functions

Application Operating Modes

Quick set-up of the PM1000+ for optimum measurements in specific applications:

- High-Frequency Lighting Ballast Output
- Inrush Current
- Low-Power Standby
- Energy Integrator

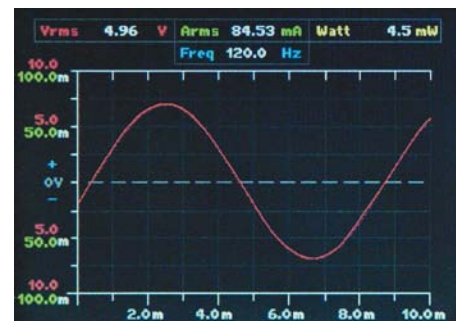
Pre-compliance IEC 61000-3-2/3 Harmonics and Flicker available as an option.



Modes with standby selected

Waveform Display

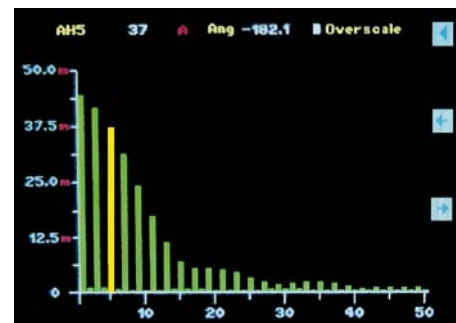
- Voltage, Current and Power Waveforms
- Cursor readout: Volts & Amps RMS



Voltage waveform

Harmonics and THD

- Up to the 50th harmonic
- Amplitude and phase from trouble-free DFT
- THD - Total Harmonic Distortion
- Accurate DC measurements in the presence of AC
- 450kHz bandwidth for harmonics
- Harmonic bargraph display with cursor selection



Harmonic bargraph

Modes of Operation - Applications

Low-Power Standby

The first power analyzer developed with low power measurements built-in as standard.

- Special mode averages and captures power supplies in burst mode to provide accurate measurements in the shortest possible time. (Typically 10 seconds).
- Very low current range (< 1mA with Voltech universal break-out box).
- Average power and accumulated energy measurements for ENERGY STAR and IEC62301.
- Crest factor up to 20.
- Resolution better than 10mW.



Universal Break-Out Box



- Safe and simple connections using the universal line socket
- Precision external shunt extends the current ranges to less than 1mA
- Switch between low and normal ranges without changing connections
- The switch automatically moves the voltage connection to optimize low-power measurements.

Free PC Software

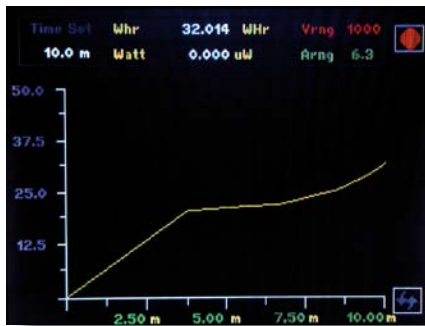
Voltech IEC 62301 Test Report				
Appliance Details				
Brand:	Voltech			
Model:	PM1000+			
Type:	Power Analyzer			
Serial No:	100008200056			
Product Description:	Universal Power Analyzer			
Rated Voltage:	230V			
Rated Frequency:	50Hz			
Manufacturer Information:	Voltech Instruments			
Test Parameters				
	Measured Value	Lower Limit	Upper limit	Test Result
Vthd (%)	3.901%	0.000%	2.000%	FAIL
Crest Factor	1.386	1.340	1.490	PASS
Test Voltage (V):	237.240V			
Frequency (Hz):	50.000Hz			
PM1000+ S/N:	100008200056			
Communication Interface:	GPIO			
Operation Mode:	Normal			
Measurement Items:	Vrms,Arms,Watt,VA,VA/,Freq,PF,Vpk+,Vpk-,Apk+,Apk-,Vdc,Adc,Vcl,Act,Vthd,Athd,Z,R,X,V-Harm,A-Harm,Vrng,Arng			
Ambient Temperature (°C):	25			
Circuits Used:	one phase break out box.			
Measured Data				
	Last Reading	Min Reading	Max Reading	Test Result
Power (W):	6.244W	6.083W	6.389W	STABLE
Average Power (W):	6.231W			
Apparent Power (VA):	14.544VA			
Real Power Factor:	0.429			
Accumulated Energy (Whr):	N/A			
Test Period (mm:ss):	05:00			
Measurement Method:	The load is stable. Power value is recorded directly from the Watt reading of PM1000+ Power Analyzer			
Mode Chosen Reason:	N/A			
Sequence of Events:	N/A			
Appliance Operation Notes:	N/A			
Test & Laboratory Details				
Test Report No.:	0001			
Test Date:	October 30, 2008 14:08			
Lab Name & Address:	#18 Xingtai Rd, Nantong, China			

Modes of Operation - Applications

Energy Consumption

The power consumption of everyday home and office electrical appliances is of importance to consumers and generators of electricity alike.

When the power consumption varies over time, then integration of the power (W-hr integration) is required. The PM1000+ provides comprehensive integration features suitable for ENERGY STAR measurements and for low-power measurements in accordance with international directives such as IEC 62301.



- Measures:
W-h, VA-h, VAR-h, A-h.
- Graph display:
W, W-h, VA, VA-h, VAR, VAR-h,
A, A-h, V vs hours.



Lighting Ballasts

- 1MHz bandwidth for high-frequency ballasts
- Accurate (2% at 100kHz) and with excellent common-mode rejection for lamp measurements.
- THD and Harmonics measurements as standard.



Voltech Ballast Current Transformer

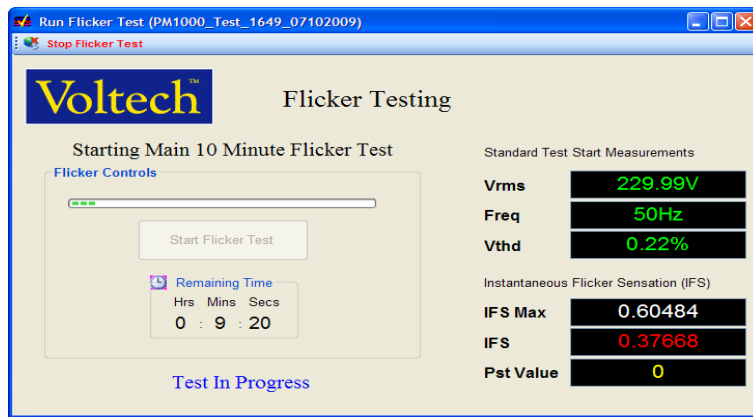
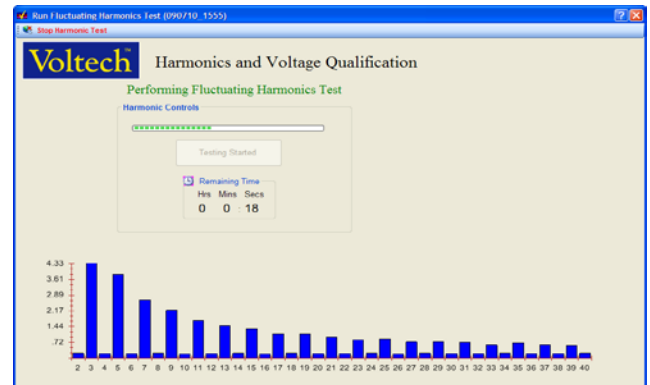
- Simplifies connections
- Isolates common-mode switching voltages
- 5mA to 1A RMS in 2 ranges
- 5kHz to 1MHz bandwidth



Modes of Operation - Applications

IEC61000-3-2/3 Harmonics and Flicker Testing

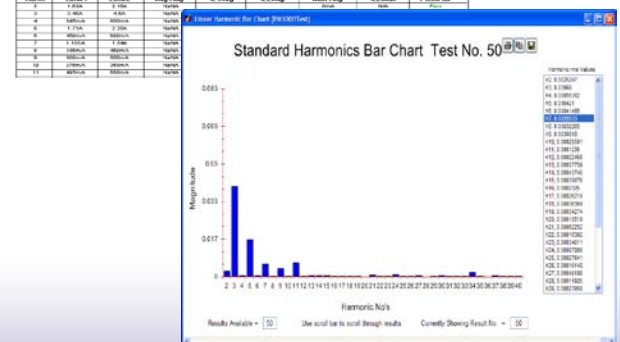
For the first time engineers designing and testing electrical products have a compact, bench-top solution that will enable them to test their product at every stage of development. This will give engineers a high degree of confidence before they ultimately submit their product for full compliance testing. Testing with the PM1000+ will help highlight potential problems, significantly reducing time-to-market and minimizing expensive EMC lab re-test.



Using algorithms from the certified PM6000 power analyzer (as used by leading EMC labs) the PM1000+ analyzer provides many of the key measurements in one cost effective bench-top instrument. PC software configures the instrument automatically and provides detailed diagnostic results similar to those from an EMC lab. The measurements are right up-to-date with the standards, including the measurement of inter-harmonic groups and flicker.

- Harmonics to EN61000-3-2 (pre-compliance)
- Flicker to EN61000-3-3 (pre-compliance)
- Harmonics including inter-harmonic groups to EN61000-4-7
- AC source and impedance network not required (pre-compliance)
- Check compliance at every design stage
- Avoid expensive EMC lab re-test
- PASS / FAIL result and comprehensive diagnostic reports
- PC software operates over USB (all models) or GPIB (communications model)

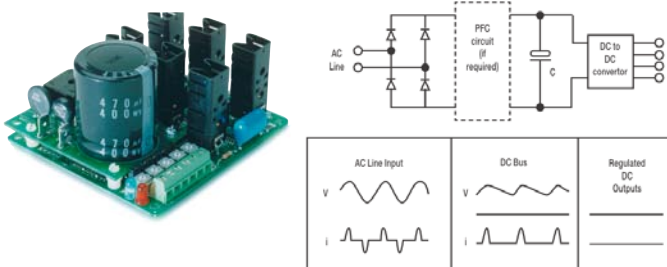
Product	090710_1555	Serial No.	10000000004	Test Date	10-Jul-2009 4:18:56PM	
Description	Example	Page	1 of 1			
Voltech Pre-Compliance EN61000-3-2 Windows Software						
Type of Test	EN61000-3-2 with Interharmonics to EN61000-4-7 2002		Voltage Case Table (2001)			
Power Analyzer	Voltech PM1000+ 10000000004 Ver 4.17	AC Source	Master / AC Source			
Notes	Overall Result	PASS	Class	Class A	Class Multiplier	1
V and A testing limits not 1						



Modes of Operation - Applications

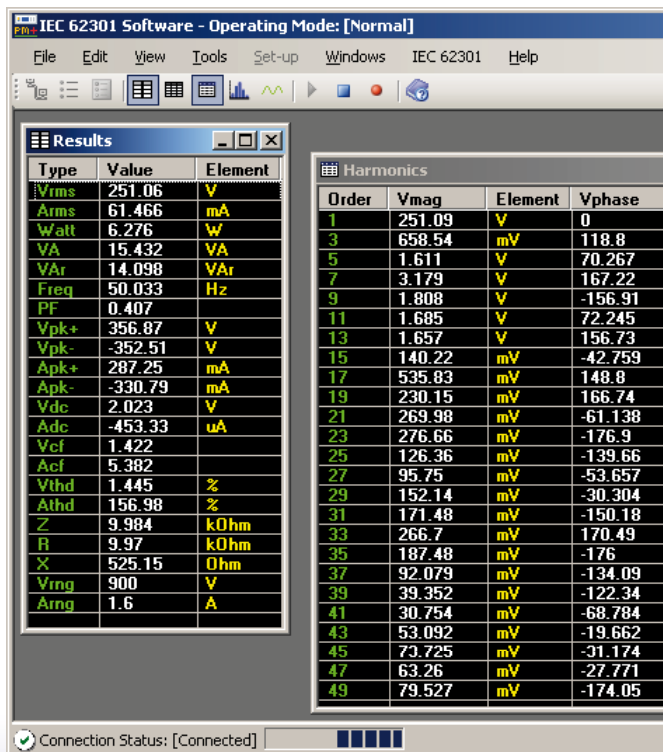
Power Supplies

Ideal for measurements on power supplies, from wall chargers to UPS and high-power converters, the PM1000+ makes accurate measurements on all waveforms including those heavily distorted by the rectification and smoothing at power supply inputs.



Measurements

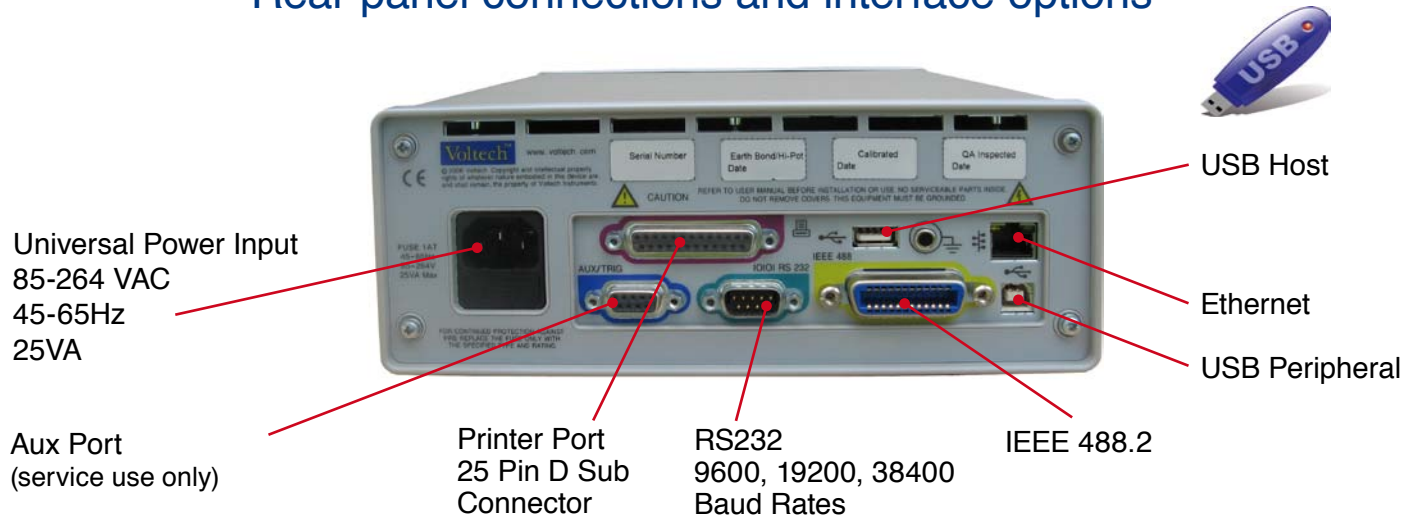
W	Input and Output power
Vrms	Line regulation, drop-out voltage, testing power fail circuits
Arms	Conductor and fuse rating
VA	Apparent power for supply rating
Apk MAX	Inrush Current Verification of inrush limiting circuit design Qualified fuse rating
PF	Power Factor (W/ VA) for verification of power factor control circuits
A harm	Amps harmonics for testing to harmonic standards
A THD	Distortion of input current
V THD	Distortion of supply or AC output
Integrator	Low-power standby measurements
STANDBY	Unique mode for measuring low power
61000-3-2	Harmonics (pre-compliance)
61000-3-3	Flicker (pre-compliance)



Datalogging with Free PC Software

Connectivity / Options

Rear panel connections and interface options



Clamp-on Current Transformers



- Accuracy better than 1%
- Connect to the PM1000+ via safety leads and normal current input
- CL100 100:1 ratio. 1A to 100Arms range
- CL1000 1000:1 ratio. 0.1A to 1200Arms range
- CL3000 3000:3 ratio. 1A to 3600Arms range

CT1000 –Dual Ratio Precision Current Transformer

- Accuracy (23°C ± 5°C): ± 0.2% of specified ratio
- Frequency range: 45Hz to 1kHz
- Current range: 100:1 ratio: 10A to 120A rms 1000:1 ratio: 100A to 1200A rms
- Maximum input current: 1000A continuous 2000A for 1 hour
- Phase error (23°C ± 5°C): Better than ± 0.1° at 50Hz



PS1000 - Inrush Switch



Solid-state switch for energizing loads (up to 200Apk) at either the peak or the zero crossing of AC voltage. Ideal for inrush current testing.

Ballast CT

Purposely designed for lighting applications, this device overcomes problems that are usually found when using conventional or Hall effect CTs.

- Convenient: No need to feed cables through a CT core.
- Better than 1% accuracy: Trifilar wound toroidal core.
- 5kHz to 1MHz bandwidth .
- 5mA to 1A measurement range



Specification

VOLTAGE	Ranges	900, 215, 46, 10 Vpk
	Frequency range	10Hz to 1MHz
Maximum input	Continuous	600V rms, 1500 Vpk (over voltage), 600V dc
Maximum input	Peak < 1 second	5000 Vpk (over voltage)
	Input Impedance	1 MΩ
	Display	4.5 Digits
	Crest Factor	20 (Peak/RMS)
RMS 45-65Hz, 95-265V, VTHD <5%	Accuracy	0.05% of rdg + 0.05% of range
RMS (General)	Accuracy	0.1% of rdg + 0.1% of range + 4mV + (0.02 * F)% of rdg
DC	Accuracy	0.1% of rdg + 0.4% of range + 5mV
VOLTAGE +/- PEAK	Accuracy	0.5% of rdg + 0.5% of range + (0.02 * F)% of rdg
CURRENT	Range	100, 25, 6.25, 1.6, 0.4, 0.1 Apk
	Frequency range	10Hz to 1MHz
Maximum input	Continuous	20Arms
Maximum input	Peak < 1 second	60Arms (over current)
	Input resistance	12.5 mΩ
	Crest Factor	20 (Peak/RMS)
RMS 45-65Hz, 95-265V	Accuracy	0.1% of rdg + 0.1% of range
RMS 45-65Hz, 95-265V (Ext. Shunt)	Accuracy	0.1% of rdg + 0.1% of range + 20uV / Zext
RMS (General)	Accuracy	0.1% of rdg + 0.1% of range + 1mA + (0.02 * F)% of rdg
DC	Accuracy	0.1% of rdg + 0.4% of range + 1mA
CURRENT +/- PEAK	Accuracy	0.5% of rdg + 0.5% of range + (0.02 * F)% of rdg
WATTS	Range	1W to 90kW
	Frequency range	10Hz to 1MHz
45-65Hz	Accuracy	$\{[(V_{error}/V_{reading}) + (A_{error} / A_{reading})] * W_{reading}\} + (0.1/PF)\%$ of Wreading
	Accuracy	0.2% rdg + 0.1% range + 4mW + ((0.05/PF) * F)% of rdg
VA	RANGES	1VA to 90kVA
	Frequency range	10Hz to 1MHz
	Accuracy	0.2% rdg + 0.1 % of range +4mVA + (0.05 * F)% of rdg
VAr	Range	1VAr to 90kVAr
	Frequency range	10Hz to 1MHz
	Accuracy	0.2% rdg + 0.1% range + 4mVAr + ((0.05/1-PF) * F)% of rdg
POWER FACTOR	Range	-1.000 to +1.000
	Accuracy	+/-0.002 +/- ((0.001/PF) * F)
FREQUENCY	Range	DC and 10Hz to 1MHz
	Accuracy	0.1%

Specification

VOLTAGE CREST FACTOR	RANGE	1.00 to 20.0
	Accuracy	%Vpk error + % Vrms error
CURRENT CREST FACTOR	RANGE	1.00 to 20.0
	Accuracy	%Apk error + % Arms error
PEAK INRUSH CURRENT	RANGE	100Apk
	Accuracy	2% of range +/- 20mA
HARMONIC ANALYSIS	Number of V & A Harmonics	50
	Accuracy	0.2% of Reading + 0.1% of range +0.04% per kHz
	Frequency Range	10Hz to 450kHz
THD		
Total Harmonic Distortion	Range & Accuracy	Range 0-999%
		Accuracy 0.4% + (0.1 * F)% of reading
	Formula	Series or difference
STANDBY POWER	Time Window	1-600 sec
	Resolution	1 second
IMPEDANCE	Range	0.005Ω to 1MΩ
	Accuracy	0.2% of Reading +0.1% of range
		+5mΩ + ((0.05/PF) * F)% of reading
RESISTANCE	Range	0.005Ω to 1MΩ
	Accuracy	0.2% of reading + 0.1% of range +5mΩ + ((0.05/PF) * F)% of reading
REACTANCE	Range	0.005Ω to 1MΩ
	Accuracy	0.2% of reading + 0.1% of range +5mΩ + ((0.05/1-PF) * F)% of reading
EXTERNAL SHUNT	Input Range	+/- 1250 mVpk
SCALING		0.0001 to 100000
IEC HARMONICS	Accuracy	Class II to IEC61000-4-7
IEC FLICKER	Accuracy	5% for Pst 0.3 to 5.
NOTES		F is in kHz, Zext = impedance of an external shunt.
MECHANICAL		1/2 rack size. Rack height 85mm
		W = 224mm. Height including feet 103mm
		D = 285mm. Weight 3.21Kg (7lbs.)

Ordering Information

	Item	Part #	Description
	PM1000+	100-090	Power Analyzer with integrator, harmonics and THD measurements. 0.05% basic accuracy, 1MHz bandwidth. Includes color display, measuring leads and RS232, USB peripheral and parallel printer interfaces.
Options and Accessories	IEEE488.2 (GPIB)	130-030	IEEE488.2 interface.
	USB (Master) and Ethernet	130-031	USB master (for memory) and ethernet interfaces.
	Extended Warranty (per year)	130-025	Warranty extension per year.
	Universal Break-Out Box	100-089	Safety load connection box and external (low power) shunt.
	IEC Harmonics and Flicker	250-027	Pre-compliance IEC61000-2-2/3 harmonics and flicker testing.
	CL100	CL100	100:1 Clamp-on current transformer.
	CL1000	CL1000	1000:1 Clamp-on current transformer.
	CT1000	CT1000	Dual ratio 1000:1 and 100:1 current transformer.
	PS1000	PS1000	Switch for measuring inrush current.
	Ballast CT	BALLASTCT	Isolating current transformer for ballast measurements.

Free Application Notes and Handbooks

- Power Supply Testing
- ENERGY STAR Measurements
- AC Theory - Back to Basics
- Three -Phase Measurements
- Measurements in Lighting Applications
- Low-Power Standby Measurements (IEC62301)
- IEC61000--3-2/2 Harmonics and Flicker

Contact Us for your application notes or to request a no obligation demonstration.

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