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PM3000ACE PM3300CE

UNIVERSAL POWER ANALYSERS



Precision Power Analysis from Voltech



CH3
H02 = 46.84mA -143.9°



Voltech

CH3
= +604.5 +602.5 W
= 105.30 105.30 V
= 8.162 5.72% A
= 859.8 602.8 VA
= 0.703 -0.999
= 61.02 Hz



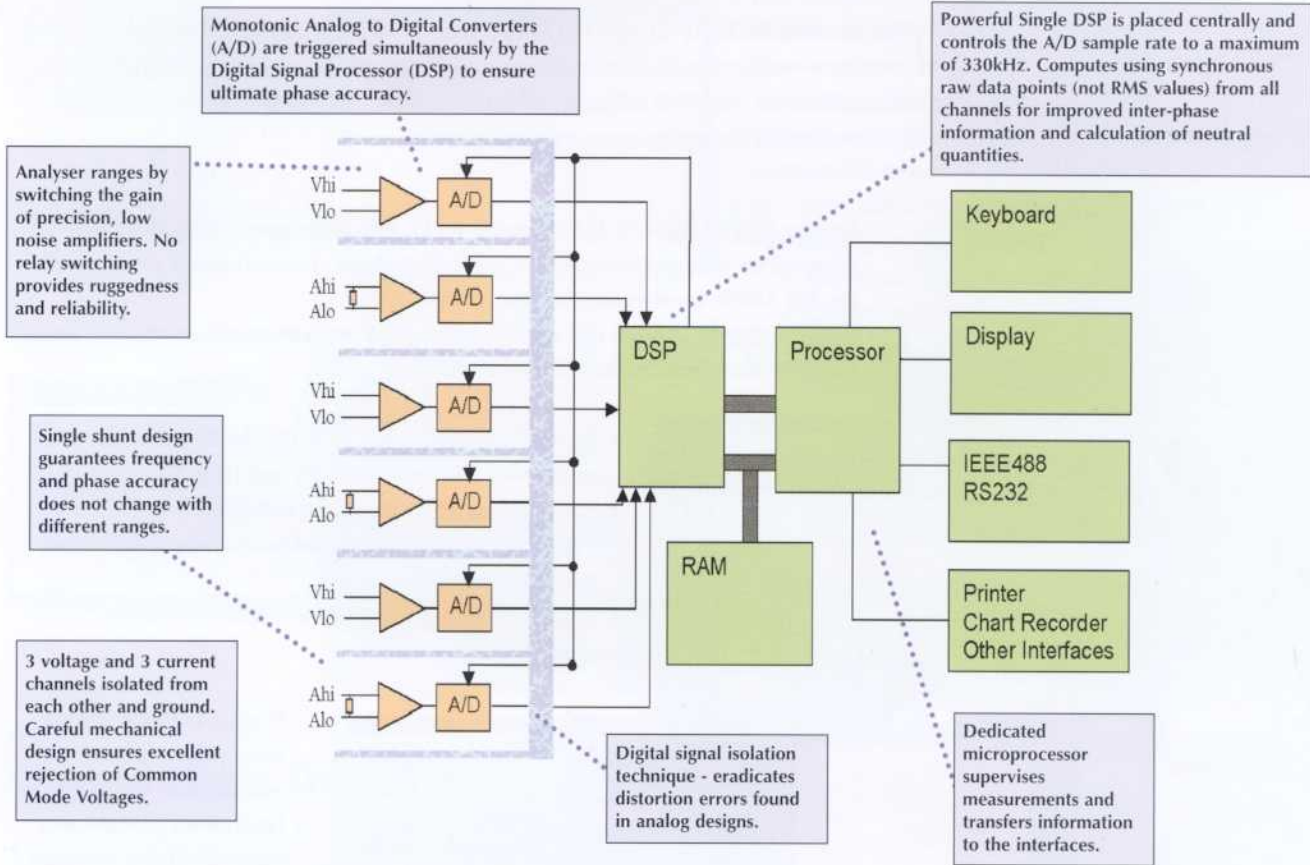
Voltech launched the world's first commercially available digital power analyser, the PM1000, in 1987 and the world's first digital three phase power analyser, the PM3000, in 1989. In 1993 the PM3000A Power

Analyser was the first to use DSP (Digital Signal Processor) technology. Today, the PM3000ACE and PM3300CE offer power measurement professionals an unrivalled combination of versatility and accuracy.

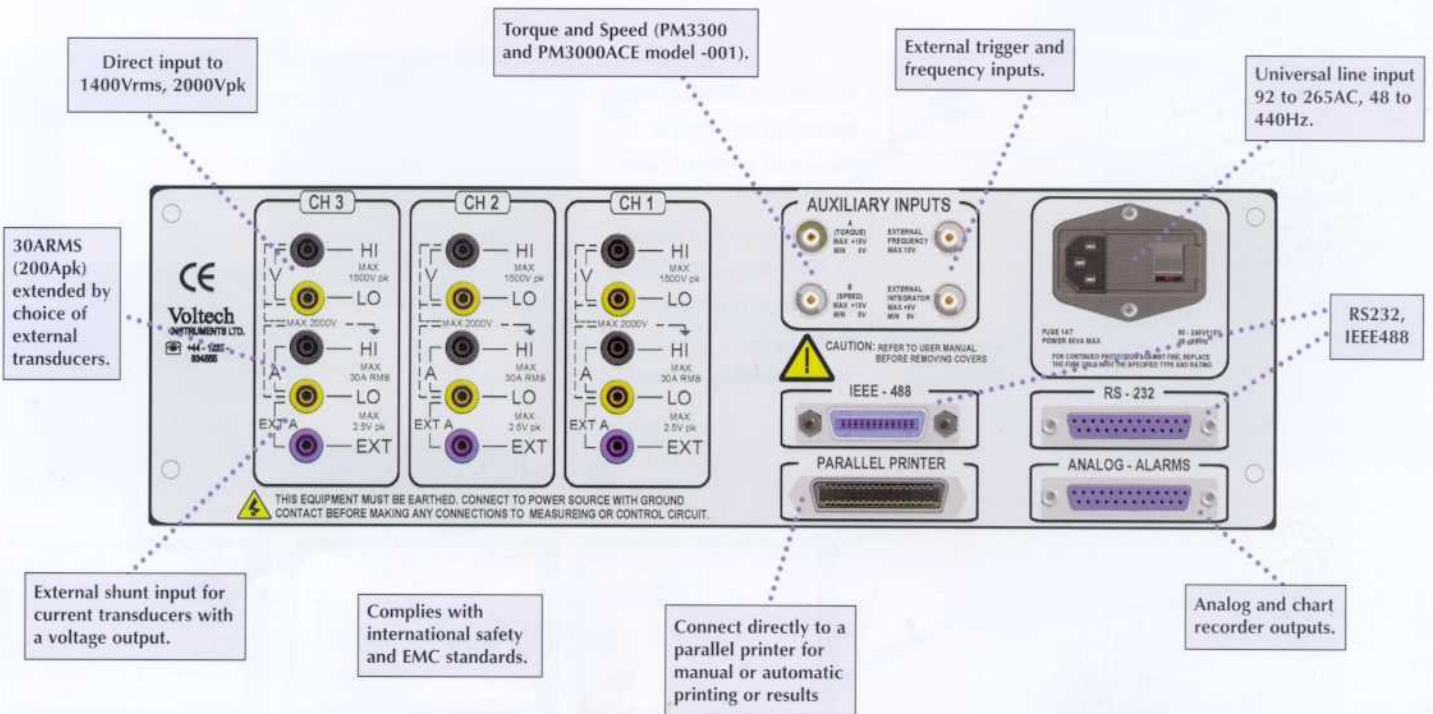
- Single and Three Phase Models
- Intuitive front panel or Windows software operation
- High 0.05% Basic Accuracy
- Wide bandwidth measurements, DC and 0.1Hz to 1MHz
- Measures W, V, A, VA, Var, Power Factor, Cos, Vpk, Apk, Crest Factors, Frequency and Inrush Current.
- Harmonics of V, A, (incl. Phase) and W to the 99th. THD.
- Integrator for W-hr, VA-hr, A-hr, VA-hr, Average and target PF
- Crest factors up to 20
- Accurate on distorted waveforms and at low power factors
- VPAS PC software for setup, data storage and handling
- IEC555/1000-3 Windows software for full or pre-compliance testing
- Versatile Graphics Display (PM3300)
- On Board Thermal Printer (PM3300)
- All interfaces fitted as standard.
(See back page for model options)
- All instruments supplied with test leads, user manual and certificate of calibration and conformance traceable to international standards.
- Range of accessories includes current clamps and transformers, PS1000 switch for inrush measurements and Ballast CT for electronic ballast testing.



PM3000A/PM3300 Functional Block Diagram



Backpanel interface

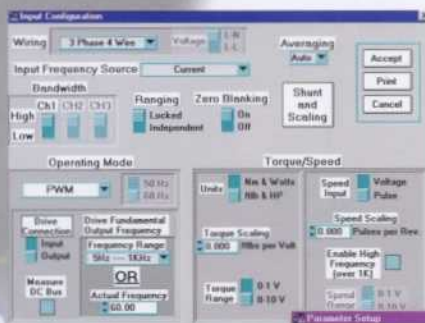


Measurements

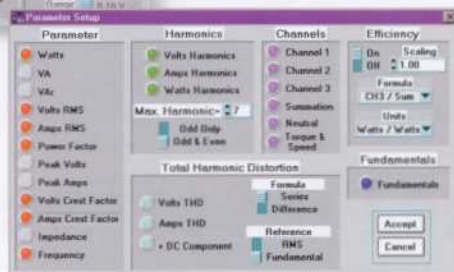
The versatile PM3000ACE and PM3300CE can be quickly configured to make reliable, accurate measurements in even the most demanding power electronics applications. Illustrated here by the VPAS software, all features except IEC1000-3 are also available with a few simple keystrokes upon the front panel.



- **Unique PWM Motor Drive mode** locks onto wide range of fundamental frequencies from 0.1Hz to 1kHz. Total W, V, A etc. measurements are made to the full 1MHz bandwidth. No data is lost.
- **Ballast mode** quickly sets up the analyser for measurements on the waveforms found in electronic ballasts and ultrasonics.

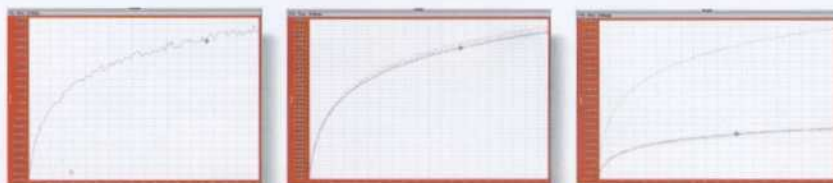
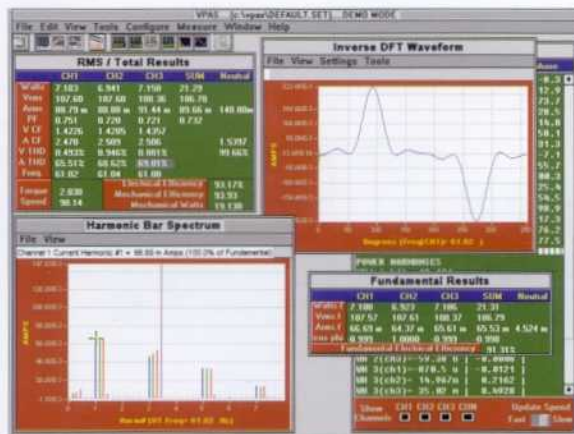


- **Power transformer test mode** displays corrected power and k factors to IEC76 and IEEE57.
- Scale factors for current and voltage transformers/transducers and torque/speed inputs are quickly entered and stored.
- Over 200 further functions and features quickly accessible.



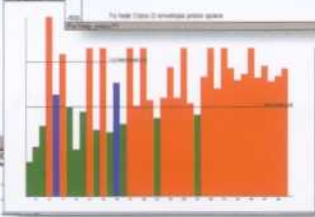
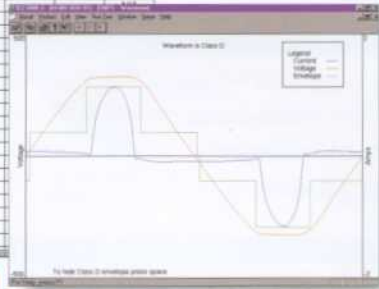
- Results available for all three phases plus SUM and neutral.
- Harmonics of Volts and Amps including accurate harmonic phase for computation of Watts harmonics and inverse DFT waveform (VPAS).

- Waveform datalog and harmonic barcharts shown in software and on PM3300.
- Cycle by cycle capture of RMS data for start-up and other transient conditions.
- Timed datalog of results.



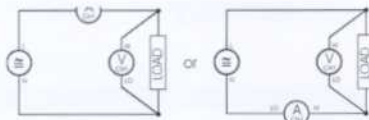
IEC555 / IEC1000-3 Harmonics and Flicker

Harmonic	Reading	Limit 1	Limit 2	Under L1	Over L1	Over L1 Too Long	Over L2	Result
2	0.77mA	None	None					Pass
3	395mA	103mA	275mA					Fail
4	4.90mA	None	None					Pass
5	2.70mA	4mA	14.7mA					Pass
6	2.37mA	None	None					Pass
7	150mA	43mA	64mA					Fail
8	1.35mA	None	None					Pass
9	68.05mA	21mA	33mA					Fail
10	1.26mA	None	None					Pass
11	51.17mA	16mA	25mA					Fail
12	1.39mA	None	None					Pass
13	55.88mA	17mA	25mA					Fail
14	0.95mA	None	None					Pass
15	42.58mA	11mA	16mA					Fail
16	0.70mA	None	None					Pass
17	35.48mA	10mA	14mA					Fail
18	0.73mA	None	None					Pass
19	26.43mA	8mA	14mA					Fail
20	0.67mA	None	None					Pass
21	18.39mA	5mA	8mA					Fail
22	0.63mA	None	None					Pass



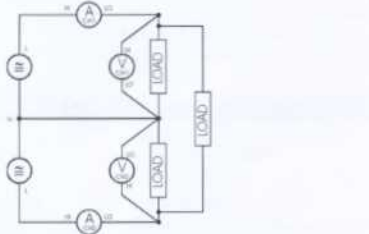
- Full compliance testing to IEC with - 002 model, impedance network and AC source.
- Pre-compliance stand-alone with any model.
- Traceable, certified accuracy.
- Current and voltage harmonics, Power and Power Factor measured throughout a test.
- Windows software with diagnostic features.
- Fluctuating harmonics:
 - Waveform display and Class D checking.
 - Current and voltage harmonics, Power and Power Factor measured throughout a test.
 - Fluctuating limits calculated for each 16 cycle block.
 - Playback of individual harmonic over time showing Power and fluctuating limits.
 - Normalised worst case bar-graph shows margin of safety.
- Flicker
 - Short term (Pst) and long term (Plt) flicker, d(c), d(max), and d(t).
 - Instantaneous Flicker Sensation (IFS) displayed continuously during test.

Connection Details



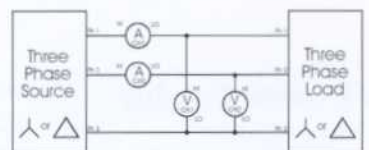
Single-phase, Two-wire and DC measurements.

Select **10 2W**



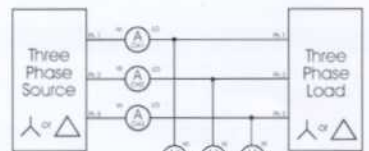
Single-phase, Three-wire.

Select **10 3W**



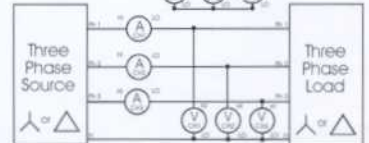
Three-phase, Three-wire (2 wattmeter method)

Select **30 3W**



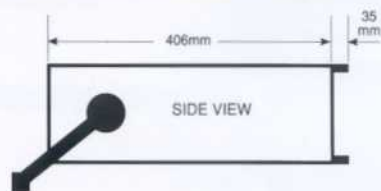
Three-phase, Three-wire (3 wattmeter method)

Select **30 4W**



Three-phase, Four-wire (3 wattmeter method)

Select **30 4W**



Specification

Specifications can often be confusing and time consuming to interpret for use in real life applications. The effects due to frequency, power factor and instrument range must all be considered when

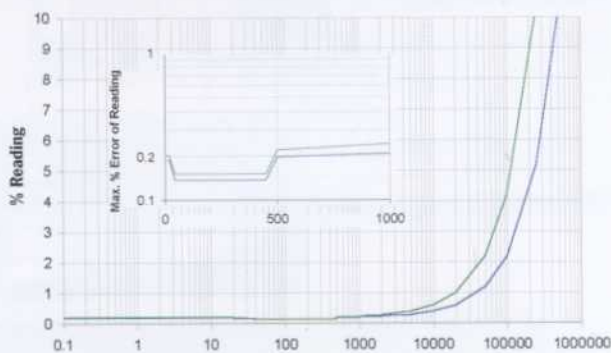
calculating total errors.

The graphs below show the total maximum errors of the PM3000A at 115V rms and 5A rms as a percentage of the reading.

N.B. All specifications valid for one year from calibration and at 23°C ±5°C:

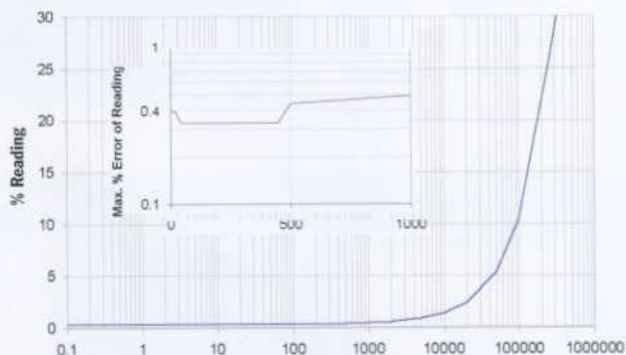
Maximum Voltage and Current Error Vs Frequency

- 115V rms
- 5A rms
- Volts** 45 to 450Hz
±0.05% rdg ±0.05%mg
- Amps** 45 to 450Hz
±0.05% rdg ±0.05%mg
±100µA



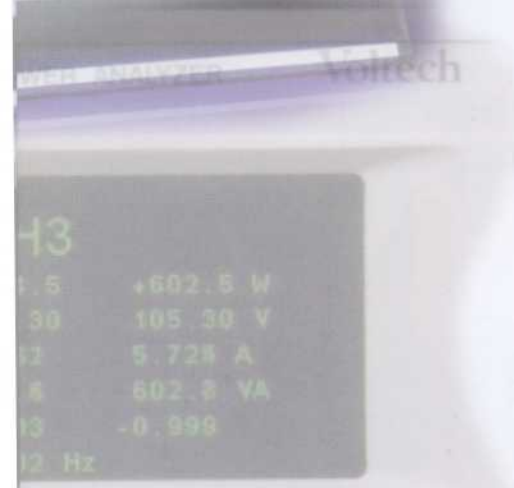
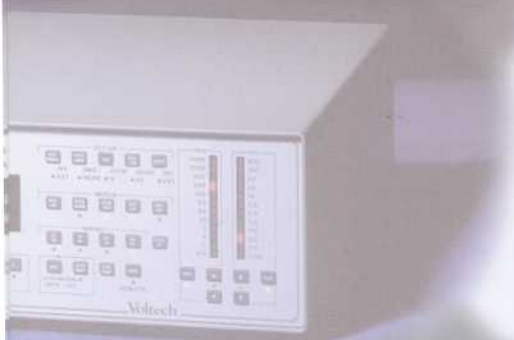
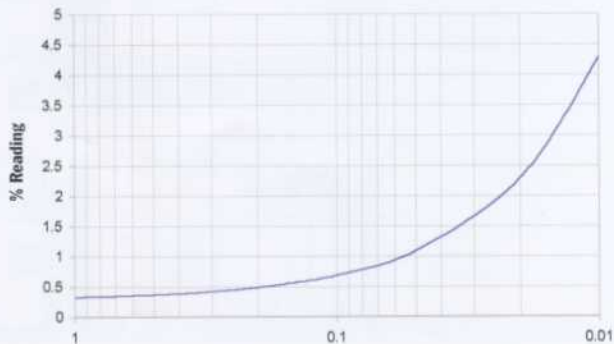
Maximum Power Error Vs Frequency

- Watts** 45 to 450Hz, PF = 1
- ±A rdg x V error
- ±V rdg x A error
- ±0.04% rdg



Maximum Power Error Vs Power Factor

- Watts** 45 to 450Hz
- ±A rdg x V error x PF
- ±V rdg x A error x PF
- ±(0.04/PF)% rdg



Specification

Voltage Channels

Ranges	0.5V to 2000Vpk (1400Vrms)	12 ranges in 1-2-5 sequence
Overload withstand	5000Vpk for 1 second	
Input Impedance	1M Ω and 10pF	
Effect of Common Mode Voltages:		
1000V rms at 60Hz	Less than 20mV	
100V rms at 100kHz	Less than 500mV	(1V PM3000ACE-002 and PM3300CE)

Current Channels

Internal shunt ranges	0.05A to 200Apk (30Arms)	12 ranges in 1-2-5 sequence
External shunt ranges	6.25mVrms to 2.5Vpk	
Overload withstand	200A rms for 1 second	
Internal Impedance	0.0125 Ω	(0.0035 Ω PM3000ACE-002 and PM3300CE)
External Impedance	1M Ω in parallel 10pF	(20k Ω in parallel 33pF PM3000ACE-002 and PM3300CE)
Effect of Common Mode Voltages:		
1000V rms at 60Hz	Less than 2mA	
100V rms at 100kHz	Less than 20mA	(50mA PM3000ACE-002 and PM3300CE)

Basic Accuracy

V	A	W	VAr
$\pm 0.05\%$ rdg $\pm 0.05\%$ mg	$\pm 0.05\%$ rdg $\pm 0.05\%$ mg	$\pm A$ rdg x V error x PF $\pm V$ rdg x A error x PF	$\pm A$ rdg x V error x (1-PF ²) ^{0.5} $\pm V$ rdg x A error x (1-PF ²) ^{0.5}
Additional maximum errors, PM3000ACE and PM3000ACE-001			
45Hz to 450Hz	$\pm 100\mu A$ $\pm 200\mu A^*$	$\pm (0.04/PF)\%$ rdg	$\pm (0.04 / (1-PF^2)^{0.5})\%$ rdg
DC	$\pm 1mV^*$		
0.1Hz to 250kHz	$\pm 0.05\%$ rdg $\pm 0.02\%$ rdg per kHz $\pm (kHz \times 0.04\% \text{ rdg} \pm 100\mu A)$	$\pm (kHz \times 0.04\% / PF)\%$ rdg	$\pm (kHz \times 0.04 / (1-PF^2)^{0.5})\%$ rdg
250kHz to 500kHz	$\pm 0.05\%$ rdg $\pm 0.02\%$ rdg per kHz $\pm 0.05\%$ rdg $\pm (kHz + 250)$ $\times \pm 0.02\%$ rdg $\pm 100\mu A$	$\pm (kHz + 750) \times 0.01 / PF\%$ rdg	$\pm (kHz + 750) \times (0.01 / (1-PF^2)^{0.5})\%$ rdg
Additional maximum errors, PM3000ACE-002 and PM3300			
45Hz to 450Hz	$\pm 100\mu A$ $\pm 800\mu A^*$	$\pm (0.04/PF)\%$ rdg	$\pm (0.04 / (1-PF^2)^{0.5})\%$ rdg
DC	$\pm 1mV^*$		
0.1Hz to 250kHz	$\pm 0.05\%$ rdg $\pm 0.02\%$ rdg per kHz $\pm (kHz \times 0.08\% \text{ rdg} \pm 100\mu A)$	$\pm (kHz \times 0.06 / PF)\%$ rdg	$\pm (kHz \times 0.06 / (1-PF^2)^{0.5})\%$ rdg
250kHz to 500kHz	$\pm 0.05\%$ rdg $\pm 0.02\%$ rdg per kHz $\pm 0.05\%$ rdg $\pm (kHz + 250)$ $\times 0.04\%$ rdg $\pm 100\mu A$	$\pm (kHz + 1250) \times 0.01 / PF\%$ rdg	$\pm (kHz + 1250) \times (0.01 / (1-PF^2)^{0.5})\%$ rdg
VA			
$\pm A$ rdg x V error x $\pm V$ rdg x A error			

Harmonics

	Voltage	Current PM3000ACE and PM3000ACE-001	Current PM3000ACE-002 and PM3300CE
Fundamental or 1st Harmonic	$\pm 0.1\%$ rdg $\pm 0.1\%$ mg (kHz x 0.02)% rdg	$\pm 0.1\%$ rdg $\pm 0.1\%$ mg $\pm (kHz \times 0.04\% \text{ rdg} \pm 100\mu A)$	$\pm 0.1\%$ rdg $\pm 0.1\%$ mg $\pm (kHz \times 0.08\% \text{ rdg} \pm 100\mu A)$
Harmonics 2 to 99	$\pm ((kHz \times 0.05) + 0.1)\%$ of fundamental		
THD	$\pm ((kHz \times 0.01) + 0.2)\%$	Harmonic series formula, dc excluded	
Bandwidth	0.1Hz to 1MHz		

Other Functions

Power Factor (PF)	0.000 to ± 1.000 $\pm 0.002 \pm (kHz \times 0.001 / PF)$
Crest Factor	1.000 to 19.999
Voltage	$\pm 0.10\%$ rdg $\pm 0.05\%$ mg ± 0.02
Current	$\pm 0.10\%$ rdg $\pm 0.01\%$ mg ± 0.01
Inrush Current	0.1A to 200Apk (with scaling to 200MA) 2.0% mg
Impedance	0.0001 Ω to 9.999M Ω
45Hz to 450Hz	$\pm 0.5\%$ rdg
0.1Hz to 500kHz	$\pm 0.5\%$ rdg $\pm (kHz \times 0.05 / PF)\%$ rdg
Auxiliary Inputs A and B (Torque and Speed)	0 to 1V and 0 to 10V ranges, software selectable $\pm 0.5\%$ rdg $\pm 0.5\%$ mg
External Integrator Trigger	Close switch to trigger. Max. current <5mA
External Frequency Input	4V to 20V p-p; 0.1Hz 1MHz
Analog Outputs	8 outputs. 0 to +5V dc; 5mA max.

Environment

Temperature	5° to +40°C operating
Humidity	10% to 80% RH non-condensing
Dielectric Strength	
Inputs to Case or Power Supply	4kV AC 50/60Hz for 1 minute
Input to Input	2kV AC 50/60Hz for 1 minute
Power Supply to Case	2.9kV DC for 1 minute
Power Requirement	90 - 264Vac 48 to 440Hz
PM3000ACE	30W, 60VA max.
PM3300ACE	50W, 75VA max.

Rdg = displayed reading

mg = analyser range

kHz = measured frequency in kHz

*DC Specification after performing a manual zero.

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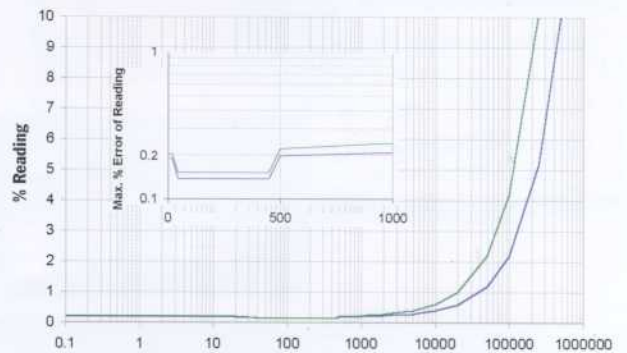
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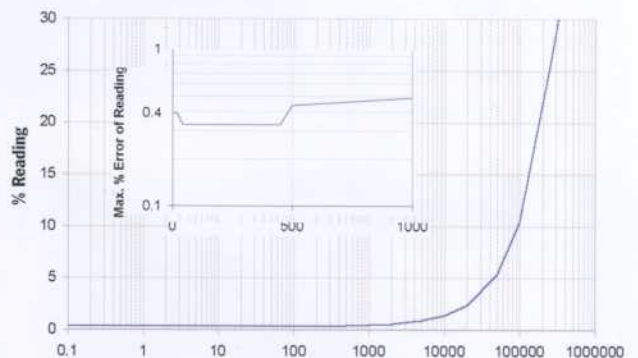
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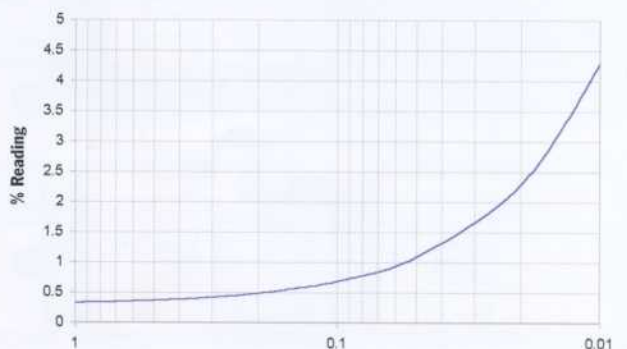
Maximum Power Error Vs Frequency

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- ±A rdg x V error
- ±V rdg x A error
- ±0.04% rdg



Maximum Power Error Vs Power Factor

- Watts** 45 to 450Hz
- ±A rdg x V error x PF
- ±V rdg x A error x PF
- ±(0.04/PF)% rdg



Ordering Information

Products

- PM3000ACE Standard
- PM3000ACE-001 Fitted with Torque and Speed Inputs
- PM3000ACE-002 Single Phase for full compliance IEC555 / 1000-3 Testing
- PM3000ACE-002 Three Phase for full compliance IEC555 / 1000-3 Testing
- PM3300CE Three Phase with Torque and Speed + compliance IEC555 / 1000-3 Testing
- IMP555 Impedance Network for full compliance IEC555 / 1000-3 Testing

Accessories

- PS1000 Switch for Inrush Testing
- Ballast CT for HF Electronic Lighting Applications
- CL100 100:1 Clamp On Current Transformer
- CL1000 1000:1 Clamp On Current Transformer
- CT1000 Precision Dual Ratio 1000/100:1 Current Transformer
- Rack Mounting Kit VPN97-005
- Paper rolls for PM3300 VPN75-021

PC Software

- VPAS General Purpose Software
- IEC555 / 1000-3 Software.

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