

# PowerLogic® PM800 series

power meter





## Compact power, energy and power quality meters

The Square D® PowerLogic® PM800 series power meters combine accurate, 3-phase energy and power measurement with data logging, power quality analysis, alarm and I/O capabilities not typically available in a compact meter. The meters are ideally suited to local and remote monitoring of low or high voltage electrical installations in industrial facilities, commercial buildings, utility networks or critical power environments. Facility and operations personnel will benefit in reducing energy-related costs while avoiding power quality conditions that can reduce equipment life and productivity.

PowerLogic® PM800 series power meters are easy to install and use, offering integrated or remote high-visibility displays. A choice of three models and a range of expansion modules help match features to the application and support field-upgrading of meters as required. Serial and Ethernet communication options enable the meters to be used within a PowerLogic power and energy management system or with third-party automation systems.

### Typical applications

#### Power quality compliance monitoring

Validate that power delivered or received complies with the EN50160 international power quality standard.

#### Disturbance and harmonic analysis

Detect, troubleshoot and resolve power anomalies that can affect sensitive manufacturing, production, data or laboratory processes and equipment.

#### Energy metering, cost allocation and sub-billing

Upload metered energy values to software to support utility bill verification, contract optimization and cost allocation or billing by department, area or process.

#### Demand and power factor control

Trend and forecast energy and demand to help analyze usage patterns, compare load characteristics and manage energy costs. Manage demand or power factor using setpoint-triggered relays to control loads or capacitor banks.

#### Load studies and circuit optimization

Optimize load curtailment and load preservation programs to drive down energy costs and improve system reliability. Reveal unused electrical system capacity.

#### Equipment monitoring and control

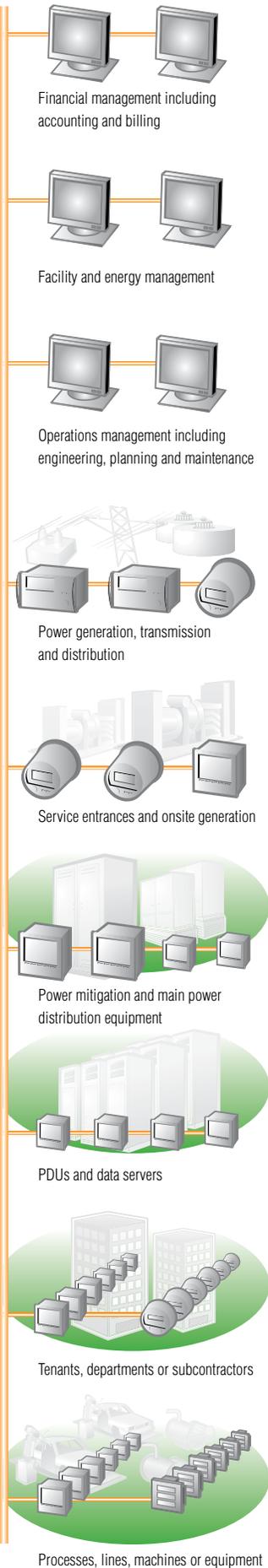
Monitor the status or condition of breakers, generators or other equipment. Automatically or manually control equipment using on-board relays.

#### Preventive maintenance

Track and alarm on equipment conditions that could indicate excessive wear, imminent malfunction or poor energy inefficiency. Verify that power distribution and mitigation equipment is operating reliably and within specified tolerances.

#### Integrated utility metering

Read energy pulses from other water, air, gas, electric, or steam (WAGES) meters. Automatically aggregate and convert pulses to energy units for upload to energy management software.



Financial management including accounting and billing

Facility and energy management

Operations management including engineering, planning and maintenance

Power generation, transmission and distribution

Service entrances and onsite generation

Power mitigation and main power distribution equipment

PDUs and data servers

Tenants, departments or subcontractors

Processes, lines, machines or equipment

## Features

### Cost-effective, modular design

Standard features include a range of 3-phase power and energy measurements, total harmonic distortion (THD) metering, one RS-485 Modbus communication port, one digital input, one KY-type digital output, and alarming on critical conditions. A choice of four models offers incremental levels of custom logging and power quality analysis capabilities, while expansion modules offer additional logging, I/O and Transparent Ready® Ethernet port. Downloadable firmware helps keeps meter capabilities updated.

### Easy installation

Mounts into panel cutouts using two clips with no tools required. Direct connect to circuits up to 600 VAC, eliminating the need for voltage (potential) transformers.

### High-visibility display

Optional integrated or remote LCD offers multi-phase measurements, summary screens, bar charts, intuitive navigation and selectable languages.

### High accuracy measurements

IEC 62053-22 class 0.5S and ANSI C12.20 Class 0.5S energy accuracy for sub-billing and cost allocation.

### Power quality analysis

A choice of THD metering, individual current and voltage harmonics readings, waveform capture, EN50160 power quality compliance evaluation, and voltage and current disturbance (sag/swell) detection.

### Extensive data logging, trending and forecasting

Non-volatile on-board logging of min/max values, energy and demand, maintenance data, alarms, and any measured parameters. Trending and short-term forecasting of energy and demand.

### Custom alarming with time stamping

Trigger alarms on over 50 definable power or I/O conditions. Use boolean logic to combine up to four alarms.

### Expandable I/O

A wide choice of standard or optional digital and analog inputs and outputs for pulse counting, demand metering for other WAGES utilities (pulse inputs from water, air, gas electricity or steam meters), equipment status/position monitoring, demand synchronization, triggering conditional energy metering, equipment control or interfacing.

### Multi-port serial and Ethernet communications

Two Modbus serial ports and one ethernet port. Use the RS-485 port on the base meter unit or the optional Ethernet port that offers e-mail on alarm, web server and an Ethernet-to-serial RS485 gateway. The remote display adapter option offers an additional RS-485/RS-232 port.



Panel-mount meter with integrated display.



DIN-rail mounted meter with remote display option, including adapter, cable and display.

## Installation

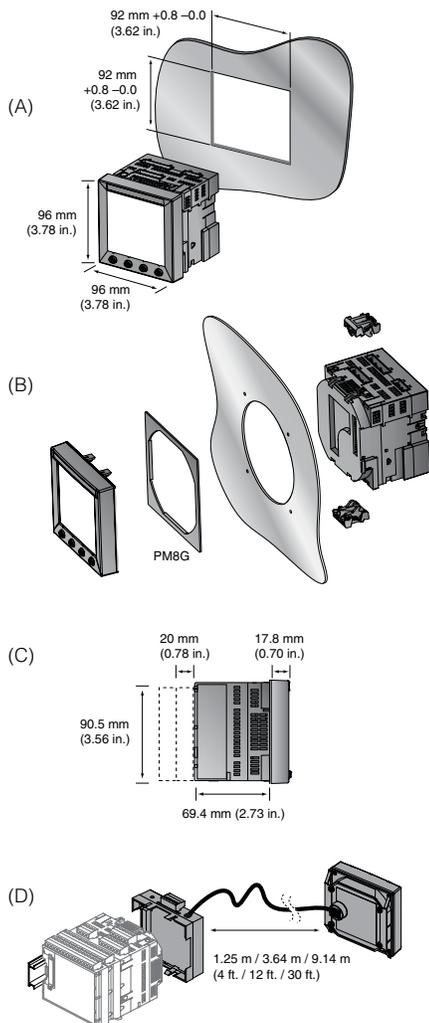
### Mounting Options

A meter with integrated display, or a remote display module, can be panel-mounted through a square cutout or retrofit through an existing round meter hole using two clips with no tools required. A small panel footprint and shallow depth make the meters suitable for low voltage switchboards, shallow cable compartments or on stand-alone machines. The meter unit (without display) is DIN rail compatible.

Meters with the optional integrated display can be door panel mounted when voltage connections are within the local regulation limits. When voltage exceeds these limits, the meter unit can be mounted inside the electrical cabinet with an optional remote display connected via a display adapter and cable. The display adapter includes a configurable 2- or 4-wire RS-485/RS-232 port. A single remote display can be transferred between any meter units equipped with display adapters.

### Circuit and control power connections

Compatible with low and high voltage 3 and 4-wire, wye and delta systems. Direct connect inputs up to 600 V ac line-to-line or use voltage (potential) transformers for higher voltage systems. All models offer a universal AC or DC power supply.



- A. Meter with integrated-display panel, mounted into square cutout.  
 B. Meter with integrated-display retrofit into existing 4" round meter cutout.  
 C. Meter unit side view showing mounting depth with and without option modules.  
 D. DIN rail mounted meter unit with optional remote display package, including display adapter module, display cable and display module. Three cable length options are available.

Input(s)	Specifications
<b>Voltage inputs</b>	
Nominal full scale:	347 direct V ac line-to-neutral, 600 V ac direct line-to-line, up to 3.2 MV with external VT/PT
Metering over-range	50%
Input impedance	5 Mohm
Frequency range	45 to 67 Hz, 350 to 450 Hz 0.01 Hz @ 45-67 Hz 0.01 Hz @ 350-450 Hz
<b>Current inputs</b>	
Nominal current	1 A or 5 A ac
Metering range	5 mA to 10 A ac
Withstand	15 A continuous, 50 A for 10 s per hour, 500 A for 1 s per hour
Load/burden	< 0.15 VA
Impedance	< 0.1 ohm
<b>Control power</b>	
Operating range	115 to 415 V ac $\pm 10\%$ at 45 to 67 Hz or 350 to 450 Hz 125 to 250 V dc $\pm 20\%$
Load/burden	15 VA (ac) or 10 W (dc) with all options
Ride through	45 ms at 120 V ac or 125 V dc

### Front panel display

The unique, anti-glare backlit white LCD can be easily read in extreme lighting conditions or viewing angles. An intuitive navigation with self-guided menus make the meter easy to use. Multilingual operation can be user-configured for English, French, or Spanish.

The large 6-line display offers summary screens that simultaneously presents up to 4 concurrent values, including power and energy values, I/O conditions or alarm status. For example, all three voltage or current phases plus neutral can be quickly reviewed at one time. Bar chart displays graphically represent system loading and I/O conditions. Historical and active alarms are displayed with time stamping.



Front panel display showing function selection buttons and 3-phase voltage, current and power summary display.

## Power and energy measurements

Metering is performed by zero-blind sampling all inputs at 128 samples/cycle with a data update rate of 1 second. The meter offers a range of high-accuracy instantaneous RMS, power, demand and energy measurements suitable for real-time monitoring, energy management and sub-billing purposes.

Measurement	Accuracy
Current: per phase, neutral, min/max Current demand: present, peak, predicted <sup>3</sup>	± 0.075% reading + 0.025% full scale
Voltage (line-line, line-neutral): per phase, min/max, unbalance	± 0.075% reading + 0.025% full scale
Power: per-phase, total Power demand: present, peak, predicted <sup>4</sup>	± 0.15% reading + 0.025% full scale
Energy: real, reactive, apparent, in/out <sup>2</sup>	IEC 62053-22 0.5S (real), IEC 62053-23 Class 2 (reactive), ANSI C12.20 0.5S
Power factor: true and displacement, per phase, total, min/max <sup>5</sup>	± 0.002 to 0.5000 leading and ± 0.002 to 0.500 lagging
Frequency: present, min/max	±0.01 Hz at 45-67 Hz, ±0.01 Hz at 350-450 Hz

1 Selectable block, sliding, or thermal demand calculation mode with internal or external (via digital input) demand synchronization.

2 Configurable accumulation mode, triggerable from digital input.

3 Full scale = 10A, Add 0.006% (Temperature -25°C to upper limit error for temperatures below 25°C).

4 Full scale = 600V, Add 0.001% (Temperature -25°C to upper limit error for temperatures below 50°C).

5 Full scale = 120V x 10A, Add 0.006% (Temperature -25°C to upper limit error for temperatures below 25°C).



3-phase and neutral current display



Energy in, out, total display



Peak power demand date/time display



Digital inputs and outputs display



Current total harmonic distortion display



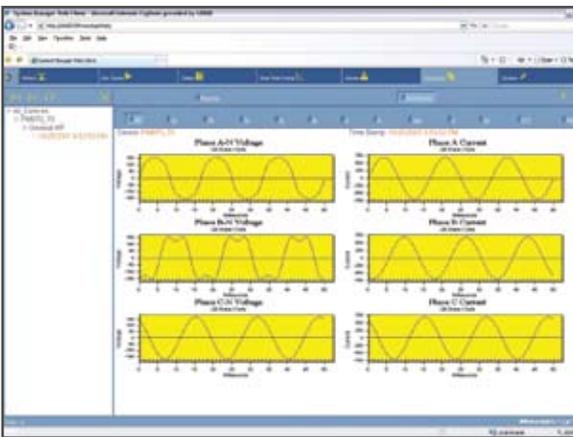
Alarm display showing active alarm

## Power quality analysis

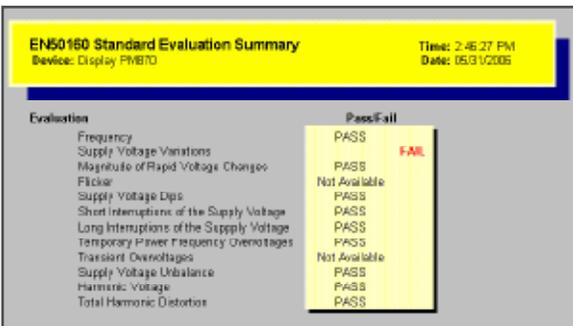
A choice of models offers an incremental range of measurement and event capture features for troubleshooting and diagnosing power quality related problems.

- **Basic THD** (all models): on voltage and current, per phase, min/max, custom alarming (see Alarm section)
- **Individual harmonic magnitudes and angles** on voltage and current, up to the 31st harmonic for the PM820, up to the 63rd for PM850 and PM870.
- **Waveform capture** (PM850 and PM870): triggered manually or by alarm, 3-cycle, 128 samples/cycle on 6 user configurable channels, manual or alarm-triggered initiation.
- **Configurable waveform capture** (PM870): flexible resolution permits you to adapt the waveform captures according to the type of event/disturbance on selected channels, from 185 cycles on 1 channel at 16 samples per cycle up to 3 cycles on 6 channels at 128 samples per cycle
- **EN50160 standard compliance evaluation** (PM850 and PM870): pass/fail indication on power frequency, supply voltage magnitude, supply voltage dips, short and long interruptions, temporary overvoltages, voltage unbalance and harmonic voltage
- **Disturbance detection** (PM870): sag/swell on any current and voltage channel, alarm on disturbances.

Use PowerLogic® System Manager™ or PowerLogic® ION Enterprise v.5.6 software to upload and plot PM850/PM870 waveforms to analyze conditions.



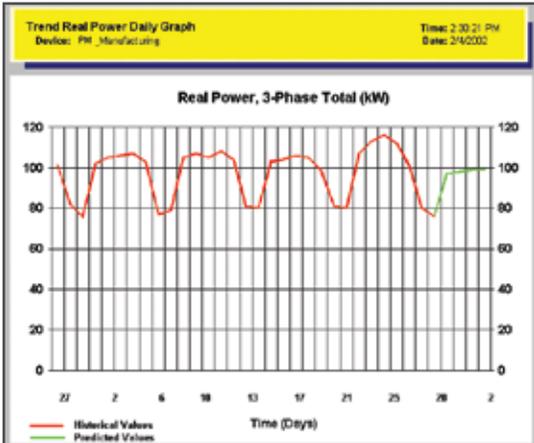
Captured voltage and current waveforms viewed using PowerLogic® System Manager™.



EN50160 evaluation summary viewed using PowerLogic® System Manager™.

All Devices	Time of Occur	Device	Function	State
All Alarms (PM870)	2/10/2006 12:12	PM870	Seg Vbc	Voltage/Current Sag Pickup
	2/10/2006 12:12	PM870	Seg Vbc	Voltage/Current Sag Pickup
	2/10/2006 12:12	PM870	Seg Vab	Reinitialized
	2/10/2006 12:12	PM870	Seg Vbc	Reinitialized
	2/10/2006 12:12	PM870	Seg Vab	Reinitialized
	2/10/2006 12:12	PM870	Seg Vbc	Voltage/Current Sag Pickup
	2/10/2006 12:12	PM870	Seg Vbc	Voltage/Current Sag Pickup
	2/10/2006 10:33	PM870	Seg Vab	Voltage/Current Sag Pickup

Meter alarm log viewed using PowerLogic® System Manager™ software.



Meter trend log with forecasting, viewed using PowerLogic® System Manager™ software.

## Onboard data and event logging

Data is stored in nonvolatile onboard memory, increasing the reliability of critical information used for billing and troubleshooting by eliminating data gaps that can occur due to network outages or computer server downtime.

- **Minimum/maximum log:** for all instantaneous readings, logs worst phase since last reset, including date and time stamp. See measurements table for parameters logged.
- **Maintenance log (all models):** records date and time of energy, I/O and demand resets, firmware downloads, power outages and option module changes.
- **Alarm log (all models):** records all user-defined alarm conditions with date/time stamping to 1 second resolution.
- **Billing log and energy per interval:** logs kWh in and total, kVARh in and total, kVAh total, PF total, kW and kVar demand. Logs at 15 minute, daily and monthly intervals. Energy per interval log tracks usage and cost for up to three user-defined shifts per day.
- **Customizable data logs:** One on PM820, three on PM850 and PM870. Each log can record up to 96 user-defined parameters.
- **Trend logging and forecasting (PM850 and PM870):** trending for energy and demand average, minimum and maximum values by four trend curves. Min/max and average data available for each quantity at intervals of minutes, hours, days and months. Forecasting feature “looks into the future” by automatically forecasting average, minimum and maximum for the next four hours and next four days. Statistical summaries available for hours and weeks.

Logging capacity is 80 kB for PM820, and 800kB for PM850 and PM870. All models provide a battery-backed internal clock. Default logging is set at the factory, logging starts as soon as meter is powered up.

## Digital and analog inputs and outputs

All models provide a single digital status/counter input and digital (KY type) output on the meter unit. A range of optional field-installable expansion modules will add more digital and analog I/O as required. Up to two expansion modules can be installed per meter (including logging or communication modules).

Digital output relays can act in response to internal alarms, external digital input status changes, or commands over communications. Digital inputs can be used to trigger alarms, trigger logging, synchronize to a demand pulse or control conditional energy accumulation. All models offer five channels for metering of water, air, gas, electricity or steam utilities (WAGES) through the digital input pulse counting and consumption/demand calculation capabilities of the meter. Pulses from multiple inputs can be summed through a single channel.



Attachment of logging, I/O, or Ethernet expansion modules to meter unit.



Bottom view of PM8ECC Ethernet communications module and main meter unit, showing Ethernet and RS-485 communication port connectors and configuration switches.

Type	Input / output	Specifications
Standard (meter unit)	1 digital KY output	6 to 220 V ac $\pm 10\%$ or 3 to 250 V dc $\pm 10\%$ , 100 mA maximum at 25 °C, 1350 V rms isolation
	1 digital input	20 to 150 V ac/dc $\pm 10\%$ , < 5 mA maximum burden
PM8M26 option	2 digital relay outputs <sup>1</sup>	6 to 240 V ac or 6 to 30 V dc, 2 A rms, 5 A maximum for 10 seconds/hour
	6 digital inputs	20 to 150 V ac/dc, 2 mA max., 24 V internal supply: 20 to 34 V dc, 10 mA maximum (feeds 6 inputs)
PM8M2222 option <sup>2</sup>	2 digital relay outputs <sup>1</sup>	6 to 240 V ac or 6 to 30 V dc, 2 A rms, 5 A maximum for 10 seconds/hour
	2 digital inputs	20 to 150 V ac/dc, 2 mA maximum
	2 analog outputs	4 to 20 mA dc into 600 ohms maximum
	2 analog inputs	Adjustable from 0 to 5 V dc or 4-20 mA dc

<sup>1</sup> Endurance: 5 million operations, 25000 commutations at 2 A / 250 V ac

<sup>2</sup> When using two PM8M2222 modules the temperature should not exceed 25 °C.

Alarm Summary Readings		Time: 12:15:17 PM Date: 06/05/2006	
Device: PM870_6			
Over Current	Count	Average Magnitude	Average Duration
Today	2	10521	19
Yesterday	N/A	N/A	N/A
This Week	2	10521	10
Last Week	N/A	N/A	N/A
This Month	2	10521	18
Last Month	N/A	N/A	N/A
This Year	2	10521	18
Last Year	N/A	N/A	N/A
Trend (30 Days)	N/A	N/A	N/A
Trend (52 Weeks)	N/A	N/A	N/A

Meter alarm summary report viewed using PowerLogic® System Manager™ software.

## Alarm and control functions

Over 50 definable alarm conditions with 1 second response time can be used to log critical events or to perform control functions. Trigger on over or under conditions on any measured parameters, phase unbalance, digital input changes and more. Multiple alarms can be defined, with each alarm individually configured with pickup setpoint, dropout setpoint and delay. Each alarm can be assigned one of four priority classes. Assign multiple alarms to a single quantity to create alarm levels. Assign different actions based on the severity level of the alarm. Use alarms to trigger waveform recording, data logging or to control digital outputs.

Boolean alarm logic (PM850 and PM870 only) increases flexibility by allowing the combination of up to four other alarms using NAND, AND, OR, NOR and XOR functions.

Transparent  
Ready.

Example instantaneous readings web browser screen served from the PM8ECC ethernet communications card.

## Communications

Multiple simultaneously operating communication ports allow the meters to be used as part of a power and energy management system and interface with other automation systems. Captured waveforms, alarms, billing data, and more can be uploaded to software for viewing and analysis. Option modules offer a choice of communications standards.

- Standard RS-485 port (on meter unit): 2-wire connection, up to 38.4 kbaud, Modbus (ASCII and RTU) or JBUS protocol.
- PM8RDA display adapter module: offers a second RS-485/232 port, 2- or 4-wire, Modbus (ASCII and RTU). RS-485/232 port is disabled when a PM8ECC module is on the same meter
- PM8ECC Ethernet communications card: 10/100 Base-T UTP port supporting ModbusTCP/IP communications. Full-function embedded web server providing standard web browser access to meter data, and the ability to email on an alarm from the host meter. RS-485/232 port, 2- or 4-wire, Modbus (ASCII and RTU) master port providing Ethernet-to-serial line gateway functionality. Supports Transparent Ready - Level 1 (TRE) functionality.

## Software integration

Integrate within PowerLogic® facility-level or enterprise-wide power and energy management systems. Real-time data and data logs stored onboard can be automatically retrieved on a scheduled basis for analysis at the system level. Compatible with PowerLogic® System Manager, PowerLogic® ION Enterprise®, PowerLogic® Tenant Metering Commercial Edition, and PowerLogic® PowerView™ software.

Modbus compatibility and register-based logged data supports integration and data access by building automation, SCADA and other third-party systems.

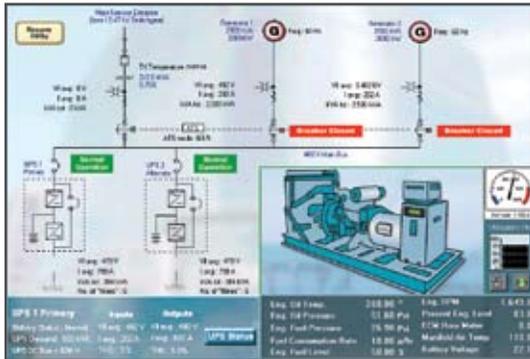
## Special features

Hour counter: load running time in days, hours and minutes

Downloadable firmware: update your meters with the latest features by simply downloading them from [www.powerlogic.com](http://www.powerlogic.com).

## General specifications

Description	Specification
Weight	No options, no display: 0.5 kg (1.1 lb.) With integrated display 0.6 kg (1.3 lb.)
Standards	Europe: CE as per IEC 61010-1 protected throughout by double insulation. US and Canada: UL-listed per UL508, cUL508
Operating temp.	Meter: -25 °C to +70 °C, Display: -10 °C to +50 °C, Temperature derating may apply with remote display and multiple option modules. See PM8ECC Installation Guide
Storage temp.	-40 °C to +85 °C
Relative humidity	5 to 95% at 40 °C (non-condensing)
Altitude	3000 m maximum.
Pollution degree	2
Installation category	III, for distribution systems up to 347 Vac line-to-neutral / 600 Vac line-to-line
Dielectric withstand	As per EN 61010, UL508
IP degree of protection	As per IEC 60529: IP52 front display, IP30 meter body
Immunity	ESD: IEC 61000-4-2 Level 3, Radiated: IEC 61000-4-3 Level 3, Fast transients: IEC 61000-4-4 Level 3, Impulse waves: IEC 61000-4-5 Level 3 Conducted: IEC 61000-4-6 Level 3, Magnetic field: IEC 61000-4-8 Level 3, Voltage dips: IEC 61000-4-11
Emissions	Conducted and radiated: CE industrial environment / FCC part 15 class A EN 55011, Harmonics: IEC 61000-3-2, Flicker: IEC 61000-3-3



Example screen from PowerLogic® ION Enterprise® software showing electrical system diagram with multiple real-time metering points.

Features and options	PM820	PM850	PM870
<b>Installation</b>			
Fast installation, panel or DIN mount, integrated or remote display	■	■	■
<b>Front panel display (optional)</b>			
Backlit LCD, multilingual, bar graphs	■	■	■
<b>Power and energy metering</b>			
3-phase voltage, current, power, demand, energy, frequency, power factor	■	■	■
<b>Power quality analysis</b>			
THD	■	■	■
Harmonics: individual, up to	31	63	63
Waveform recording		standard	enhanced
EN50160 compliance evaluation		■	■
Disturbance (dip/swell) monitoring			■
<b>Data and event logging</b>			
Standard memory capacity	80 kB	800 kB	800 kB
Min/max log	■	■	■
Maintenance, alarm and event logs	■	■	■
Billing (energy, demand) log	■	■	■
Energy per interval	■	■	■
Customizable data logs	1	3	3
Trending and forecasting		■	■
Timestamp resolution in seconds	1	1	1
<b>Digital and analog inputs/outputs</b>			
Digital inputs (standard / optional) <sup>1</sup>	1/8	1/8	1/8
Digital outputs (standard / optional) <sup>2</sup>	1/4	1/4	1/4
Analog inputs (standard / optional)	0/2	0/2	0/2
Analog outputs (standard / optional)	0/2	0/2	0/2
<b>Alarms and control</b>			
Setpoint response time, seconds	1	1	1
Single & multi-condition alarms	■	■	■
Boolean alarm logic		■	■
<b>Communications</b>			
RS-485 port	2 wire (onboard) 4 wire (with remote display)		
RS-232	with remote display		
Ethernet port	optional (requires PM8ECC)		
Modbus TCP through Ethernet port			
Embedded web server			
Ethernet to RS-485 gateway			

1 On-board and optional digital inputs can be used for on/off status monitoring or for pulse counting.  
2 On-board digital output is KY type, optional digital outputs are relay type

Ordering Information	Part Number		
PM with integrated display	PM820	PM850	PM870
PM with remote display	PM820RD	PM850RD	PM870RD
PM unit only, no display	PM820U	PM850U	PM870U
PM8ECC Ethernet communication card	PM8ECC		
Remote display adapter alone <sup>†</sup>	PM8RDA		
Remote display kit includes remote display, adapter and 10' cable (3.04m) <sup>†</sup>	PM8RD		
RJ-11 thru door 12' cable extender for PM800	RJ11EXT		
PM800 Mounting Adapter for CM2000	PM8MA		
PM800 gasket for analog 4' round cutout	PM8G		
2 digital outputs (relays), 6 digital inputs	PM8M26		
2 digital outputs (relays), 2 digital inputs, 2 analog outputs, 2 analog inputs	PM8M222		
Cable for remote display adapter 1.25 m (4 ft)	CAB4		
Cable for remote display adapter 3.65 m (12 ft)	CAB12		
Cable for remote display adapter 9.14 m (30 ft)	CAB30		

<sup>†</sup> RS-485/232 port is disabled when a PM8ECC module is on the same meter.



"The 2007 award recognizes Schneider Electric for its technological advancements and wide product range in the field of power quality (PQ) and energy management solutions. In total, this is the fourth award that Schneider Electric has received from Frost & Sullivan in recognition of achievements in this arena." — Prithvi Raj, Frost & Sullivan research analyst



Power Measurement and its ION products were recently acquired by Schneider Electric and integrated within our PowerLogic® range of software and hardware, creating the world's largest line of energy and power management solutions.



Schneider Electric - North American Operating Division  
295 Tech Park Drive  
LaVergne, TN 37086  
Tel: 866-466-7627 Toll Free  
PowerLogic.com

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