

## PM130 PLUS

### POWER METER

The PM130 PLUS is a compact, multi-function, three-phase AC powermeter specially designed to meet the requirements of users ranging from electrical panel builders to substation operators. The PM130 PLUS measurement inputs and power supply comply with Measuring Category III.

The PM130 PLUS units include:

- A bright 3-row LED display enabling easy reading of local meters.
- A standard RS-485 communication port and a second optional RS-232/RS-422/RS-485, Ethernet, Profibus, Cellular or RF port (in certain regions only). These ports allow local and remote automatic meter readings and setup through the supplemental communication or user data acquisition software.
- Different communication options for remote communications with the meter. These options enable LAN and Internet communication with the unit.
- Selection of I/O cards ranging from 4DI/2DO, 4AO and up to 12DI/4RO with communication.
- All models are suitable for mounting on both 4-inch round and 92×92mm square cutouts.



### Models

The PM130 PLUS comprises of 3 types of models:

- PM130P** The basic model which offers standard voltage, current, power and frequency measurements, and control capabilities.
- PM130E** Offers all the features of the basic model plus energy measurements and data logging. This version is available in certain regions only.
- PM130EH** Offers all the features of the PM130E plus harmonic analysis capabilities.

### Features

#### Multifunctional 3-phase Power Meter

- 3 voltage inputs and 3 current transformer-isolated AC inputs for direct connection to power line or via potential and current transformers
- True RMS, volts, amps, power, power factor, neutral current, voltage and current unbalance, frequency
- Ampere/Volt demand meter
- 25/50/60/400 Hz measurement capabilities

## Billing/TOU Energy Meter (PM130E & PM130EH)

- Class 0.5S IEC 62053-22 four-quadrant active and reactive energy polyphase static meter
- Three-phase total and per phase energy measurements; active, reactive and apparent energy counters
- Time-of-Use, 4 totalization and tariff energy/demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day,
- One-time easy programmable tariff calendar schedule
- Automatic daily energy and maximum demand profile log for total and tariff registers

## Harmonic Analyzer (PM130EH)

- Voltage and current THD, current TDD and K-Factor, up to 40th order harmonic
- Voltage and current harmonic spectrum and angles

## Real-time Waveform Capture

- Real-time “scope mode” waveform monitoring capability
- Simultaneous 6-channel one-cycle waveform capture at a rate of 64 samples per cycle

## Programmable Logical Controller

- Embedded programmable controller
- 16 control setpoints; programmable thresholds and delays
- Relay output control
- 1-cycle response time

## Event and Data Recording (PM130E & PM130EH)

- 64kB (256kB on request) Non-volatile memory for long-term event and data recording
- Event recorder for logging internal diagnostic events and setup changes

- Two data recorders; programmable data logs on a periodic basis; automatic daily energy and maximum demand profile log

## I/O Options

- TOU+4DI module - four digital inputs with 1-ms scan time and battery backup for the real time clock; automatic recording of last five digital input change events with timestamps (see the PM130 PLUS Modbus Reference Guide)
- 4DIO – four digital inputs and two relay outputs with 1-cycle update time; unlatched, latched, pulse and KYZ operation; energy pulses, selection of solid state or electromechanical relays
- 12DIO – twelve digital inputs, 4 relay outputs and optional Ethernet or RS-485 communication port
- 4AO - four optically isolated analog outputs with an internal power supply; Selection of 0-20mA, 4-20mA, 0-1mA, and  $\pm 1$ mA output; 1-cycle update time.

## Display

- Easy to read 3-row (2x4 characters + 1x5 characters) bright LED display, adjustable update time and brightness
- Auto-scroll option with adjustable page exposition time; auto-return to a default page
- LED bar graph showing percent load with respect to user-definable nominal load current

## Real-time Clock

- Internal clock with 20-second retention time
- Optional battery backup (TOU+4DI module)

## Communications

- Standard 2-wire RS-485 communication port
- Optional
- Protocols: Modbus RTU, ASCII, DNP3.0; With Ethernet or GPRS module: Modbus/TCP, DNP3/TCP; Optional IEC 60870-5-101 and -104

- ExpertPower™ client for communicating with SATEC ExpertPower™ Internet services (with Ethernet or GPRS modules)
- TCP notification client for communicating with a remote Modbus/TCP server on events or periodically on a time basis (with the Ethernet or GPRS module)

## Measurement

- Direct voltage measurement of up to 690v
- Selection of current input connection:
- 5A - measurement of up to 10A using conventional 5A CTs
- 1A - measurement of up to 2A using conventional 1A CTs
- RS5 - allowing connection remotely of 5A conventional CTs with split core remote sensors
- HACS - selection of remote sensors up to 1200A with built in shorting circuit and class 0.5s system accuracy (meter plus CTs)

## Unique Design

- Pass through CT connection provides minimal burden
- Auxiliary CT connection terminal for simple installation
- Dual panel mounting - 92\*92mm square or 4" round cutout
- Add on modular design to add second communication port, digital I/O or Analog outputs



## Meter Security

- Password security for protecting meter setups and accumulated data from unauthorized changes

## Upgradeable Firmware

- Easy upgrading device firmware through a serial or Ethernet port.

## Software Support

- PAS – Free meter configuration and data acquisition tool, including waveforms, phasors, harmonics and more
- ExpertPower™ – SATEC's unique Energy Management Software (EMS), without client software installation
- 3<sup>rd</sup> Party Software – Fully open protocol for easy 3<sup>rd</sup> party software integration

## Technical Specifications

### ENVIRONMENTAL CONDITIONS

Operating temperature	-30°C to 60°C (-22°F to 140°F)
Storage temperature	-40°C to 85°C (-40°F to 185°F)
Humidity	0 to 95% non-condensing

### CONSTRUCTION

Weight	0.70kg (1.54 lb.)
Dimensions [H×W×D]	114×114×109mm (4.5×4.5×4.3")

### MATERIALS

Case enclosure	plastic PC/ABS blend
Front panel	plastic PC
PCB	FR4 (UL94-V0)
Terminals	PBT (UL94-V0)
Connectors-Plug-in type	Polyamide PA6.6 (UL94-V0)
Packaging case	Carton and Stratocell® (Polyethylene Foam) brackets
Labels	Polyester film (UL94-V0)

### POWER SUPPLY

120/230V AC-DC Option	<ul style="list-style-type: none"> <li>» Rated input: 85-265V AC 50/60/400 Hz, 88-290VDC, Burden 9VA</li> <li>» Isolation: 1500V DC</li> <li>» Input to ground: 2500V AC</li> </ul>
12 VDC Option	<ul style="list-style-type: none"> <li>» Rated input: 9.5-18V DC, Burden 4VA</li> <li>» Isolation: 1500V DC</li> </ul>
24/48 VDC Option	<ul style="list-style-type: none"> <li>» Rated input: 18.5-58 VDC, Burden 4VA</li> <li>» Isolation: 1500VDC</li> <li>» Wire size: up to 12 AWG (up to 3.5 mm<sup>2</sup>)</li> </ul>

### Input Ratings

#### VOLTAGE INPUTS

Operating range	690VAC line-to-line, 400VAC line-to-neutral
Direct input and input via PT	up to 790VAC line-to-line, up to 460VAC line-to-neutral
Input impedance	1000 kΩ
Burden for 400V	< 0.4 VA
Burden for 120V	< 0.04 VA
Over-voltage withstands	1000 VAC continuous, 2000 VAC for 1 second
Wire size	up to 12 AWG (up to 3.5mm <sup>2</sup> )

#### CURRENT INPUTS (Via CT)

Wire size	12 AWG (up to 3.5 mm <sup>2</sup> )
Galvanic isolation	3500 VAC

#### 5A SECONDARY or 5A REMOTE SENSOR (RS5)

Operating range	Continuous 10A RMS
Burden	< 0.2 VA @ In=5A (with 12AWG wire and 1 m long)
Overload withstand	15A RMS continuous, 300A RMS for 1 second (with 12AWG section wire)

#### 1A SECONDARY

Operating range	Continuous 2A RMS
Burden	< 0.02 VA @ In=1A (with 12AWG wire and 1 m long)
Overload withstand	3A RMS continuous, 80A RMS for 1 second (with 12AWG section wire)

#### HACS REMOTE SENSORS

Depends on sensor rating. See HACS datasheet

#### SAMPLING RATE MEASUREMENT

Sampling rate	128 samples/cycle
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## OPTIONAL RELAY OUTPUTS

### ELECTROMECHANICAL RELAY

Dry Contact, Option (4DI/DO or 12DI/DO Optional module)

2 or 4 relays rated at 5A/250 VAC; 5A/30 VDC, 1 contact (SPST Form A)

Galvanic isolation » Between contacts and coil: 3000 VAC 1 min  
 » Between open contacts: 750 VAC

Operate time 10 ms max

Release time 5 ms max

Update time 1 cycle

Wire size 14 AWG (up to 1.5 mm<sup>2</sup>)

### SOLID STATE RELAY OPTION

(4DI/2DO Optional Module only)

2 relays rated at 0.15A/250 V AC/DC, 1 contact (SPST Form A)

Galvanic isolation 3750 VAC 1 min

Operate time 1 ms max

Release time 0.25 ms max

Update time 1 cycle

Connector type Removable, 4 pins

Wire size 14 AWG (up to 1.5 mm<sup>2</sup>)

### OPTIONAL DIGITAL INPUTS

4 or 12 Digital Inputs (4DI/2DO or 12DI/4DO Optional module) Dry Contacts, internally wetted @ 24VDC or Wet contact @ 250VDC (12DI/4DO only)

Sensitivity Open @ input resistance >100 k $\Omega$ , Closed @ Input resistance < 100  $\Omega$

Galvanic isolation 3750 VAC 1 min

Internal power supply 24VDC, 4DI/2DO or 12DI/4DO

External power supply 250V DC (12DI/4DO only supply)

Scan time 1 ms

Connector type Removable, 5 pins

Wire size 14 AWG (up to 1.5 mm<sup>2</sup>)

## OPTIONAL ANALOG OUTPUTS

4 Analog Outputs optically isolated (AO Optional module)

Ranges (upon order) »  $\pm 1$  mA, max. load 5 k $\Omega$  (100% overload)  
 » 0-20 mA, max. load 510  $\Omega$   
 » 4-20 mA, max. load 510  $\Omega$   
 » 0-1 mA, max. load 5 k $\Omega$  (100% overload)

Isolation 2500 VAC 1 min

Power supply Internal

Accuracy 0.5% FS

Update time 1 cycle

Connector type Removable, 5 pins

Wire size 14 AWG (up to 1.5 mm<sup>2</sup>)

## Communication Ports

### COM1

RS-485 optically isolated port

Isolation 3000 VAC 1 min

Baud rate up to 115.2 kbps

Supported protocols Modbus RTU, DNP3, and SATEC ASCII

Connector type Removable, 3 pins

Wire size Up to 14 AWG (up to 1.5 mm<sup>2</sup>)

### COM2 (Optional module)

### ETHERNET PORT

Transformer-isolated 10/100BaseT Ethernet port.

Supported protocols Modbus/TCP (Port 502), DNP3/TCP (Port 20000)

Num. of simultaneous connections 4 (2 Modbus/TCP + 2 DNP3/TCP)

Connector type RJ45 modular

### GPRS PORT

Supported protocols Modbus/TCP (Port 502), DNP3/TCP (Port 20000)

Connector type SMA

### Profibus DP (IEC 61158)

RS-485 optically isolated Profibus interface

Connector type	Removable, 5 pins
Baud rate	9600 bit/s – 12 Mbit/s (auto detection)
32 bytes input, 32 bytes output	
Supported protocols	PROFIBUS DP
<b>RS-232/422-485 PORT</b>	
RS-232 or RS-422/485 optically isolated port	
Isolation	3000 VAC 1 min
Baud rate	Up to 115.2 kbps
Supported protocols	Modbus RTU, DNP3 & SATEC ASCII
Connector type	Removable, 5 pins for RS-422/485 and DB9 for RS-232
Wire size	Up to 14 AWG (up to 1.5 mm <sup>2</sup> )

### REAL-TIME CLOCK

Standard Meter Clock	<ul style="list-style-type: none"> <li>» Non-backed clock</li> <li>» Accuracy: typical error 1 minute per month @ 25°C</li> <li>» Typical clock retention time: 30 seconds</li> </ul>
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### TOU Module Meter Clock

<ul style="list-style-type: none"> <li>» Battery-backed clock</li> <li>» Accuracy: typical error 7 seconds per month @ 25°C (±2.5ppm)</li> <li>» Typical clock retention time: 36 months</li> </ul>
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### DISPLAY MODULE

High-brightness seven-segment digital LEDs, two 4-digit + one 5 digit windows	
3 color led load bar graph (40-110%)	
Keypad	6 push buttons

## Standards Compliance

### Accuracy

- Complies IEC62053-22, class 0.5S
- Meets ANSI C12.20 –1998, class 10 0.5%

### Electromagnetic Immunity

- Comply with IEC 61000-6-2:
- IEC 61000-4-2 level 3: Electrostatic Discharge
- IEC 61000-4-3 level 3: Radiated Electromagnetic RF Fields
- IEC 61000-4-4 level 3: Electric Fast Transient
- IEC 61000-4-5 level 3: Surge
- IEC 61000-4-6 level 3: Conducted Radio Frequency
- IEC 61000-4-8: Power Frequency Magnetic Field
- Meets ANSI/IEEE C37.90.1: Fast Transient SWC

### Electromagnetic Emission

- Comply with IEC 61000-6-4: Radiated/Conducted class A
- Comply with IEC CISPR 22: Radiated/Conducted class A










### Safety/Construction

- UL File no. E236895
- Meets IEC 61010-1: 2006

### AC and Impulse Insulation

- Comply with IEC 62052-11: 2500 VAC during 1 minute
- 6KV/500Ω @ 1.2/50 μs impulse

## PM130 PLUS Order String

MODEL		
Power Version	PM130P-PLUS	
Energy and Harmonic Version	PM130EH-PLUS	
Energy Only	PM130E-PLUS	
OPTIONS		
Current Inputs		
5 Ampere	5	
1 Ampere	1	
5A split core remote high accuracy current sensor (HACS) High Accuracy Current Sensors (HACS). Requires ordering of 3)	RS5 HACS	
Calibration at Frequency		
25 Hz	25HZ	
50 Hz	50HZ	
60 Hz	60HZ	
400 Hz (supports 1A and 5A models only)	400HZ	
Resolution		
Low Resolution 1A, 1V	-	
High Resolution 0.01A, 0.1V	H	
Power Supply		
85-265V AC and 85-290V DC	ACDC	
9.5-18V DC	1DC	
18.5-58V DC (24VDC, 48VDC)	23DC	
Communication Protocol		
Modbus and DNP 3.0	-	
Modbus and IEC 60870-5-101/104 (-104 requires ETH)	870	
Mounting		
Panel Mount (standard)	-	
DIN Rail Mounting	DIN	
Testing and Certificate		
Full functional test, calibration at various work loads and detailed test report	-	
Full functional test, calibration at various work loads and detailed test report plus ISO 17025 and ILAC certified calibration certificate	CC	

### Expansion Module

(Max. 1 module per instrument, can be ordered separately)

4 Analog Outputs: $\pm 1$ mA	<b>AO1</b>
4 Analog Outputs: 0-20mA	<b>AO2</b>
4 Analog Outputs: 0-1mA	<b>AO3</b>
4 Analog Outputs: 4-20mA	<b>AO4</b>
4 Analog Outputs: 0-3mA	<b>AO5</b>
4 Analog Outputs: $\pm 3$ mA	<b>AO6</b>
4 Analog Outputs: 0-5mA	<b>AO7</b>
4 Analog Outputs: $\pm 5$ mA	<b>AO8</b>
Comm: Ethernet (TCP/IP)	<b>ETH</b>
Comm: PROFIBUS	<b>PRO</b>
Comm: RS232/422/485	<b>RS232</b>
Comm: 2G/3G GSM Modem (Doesn't support 870 protocol)	<b>T3G</b>
Comm: 2G/3G CDMA Modem (Doesn't support 870 protocol)	<b>T3C</b>
Comm: RF	<b>RF-x-y</b>
4 Digital Inputs (Dry Contact) / 2 Relay Outputs 250V / 5A AC	<b>DIOR</b>
4 Digital Inputs (Dry Contact) / 2 SSR Outputs 250V / 0.1A AC	<b>DIOS</b>
4 Digital Inputs (Dry Contact) / TOU / RTC Battery	<b>TOD</b>
8 Digital Inputs (Dry Contact)	<b>8DI</b>
12 Digital Inputs (Dry Contact) / 4 Relay Outputs 250V/5A AC	<b>12DIOR-DRC</b>
12 Digital Inputs (125VDC) / 4 Relay Outputs 250V/5A AC	<b>12DIOR-125V</b>
12 Digital Inputs (250VDC) / 4 Relay Outputs 250V/5A AC	<b>12DIOR-250V</b>
12DIOR-DRC with Ethernet	<b>12DIOR-DRC-ETH</b>
12DIOR-125V with Ethernet	<b>12DIOR-125V-ETH</b>
12DIOR-250V with Ethernet	<b>12DIOR-250V-ETH</b>
12DIOR-DRC with RS-485	<b>12DIOR-DRC-485</b>
12DIOR-125V with RS-485	<b>12DIOR-125V-485</b>
12DIOR-250V with RS-485	<b>12DIOR-250V-485</b>

