

## PM130 PLUS

### HIGH PERFORMANCE POTERMETER



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 II. The PM130 PLUS series includes:

- A bright 3-row LED display enabling easy reading of local meters
- A standard RS-485 communication port and an additional plug-in RS-232/RS-422/RS-485, Ethernet, Profibus, GPRS and RF port module (RF is available in certain regions only), enabling local and remote automatic meter readings and setup
- Selection of I/O plug-in modules 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 series offers 3 types of models:

- PM130P** The basic model, providing standard voltage, current, power & 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 and PM130EH)

- 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
- Protocols: Modbus RTU, ASCII, DNP3.0, Optional IEC 60870-5-101; With Ethernet Modbus/TCP, DNP3/TCP; Optional IEC 60870-5-104 and with GPRS module: Modbus/TCP
- 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 connections:
  - 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

- PAST™ – SATEC's bundled software for meter configuration and data acquisition tool, including waveforms, phasors, harmonics and more
- ExpertPower™ – SATEC's unique Internet services offer the industry leading energy management software (EMS) without client software installation

## 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% RH 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: 2500V AC (Input to ground)</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 mm2)</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 3.5mm2)
CURRENT INPUTS (Via CT)	
Wire size	12 AWG (up to 3.5 mm2)
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
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	<ul style="list-style-type: none"> <li>➔ Between contacts and coil: 3000 VAC 1 min</li> <li>➔ Between open contacts: 750 VAC</li> </ul>

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)

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)
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)	<ul style="list-style-type: none"> <li>→ <math>\pm 1</math> mA, maximum load 5 k<math>\Omega</math> (100% overload)</li> <li>→ 0-20 mA, maximum load 510 <math>\Omega</math></li> <li>→ 4-20 mA, maximum load 510 <math>\Omega</math></li> <li>→ 0-1 mA, maximum load 5 k <math>\Omega</math> (100% overload)</li> </ul>
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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)
Number of simultaneous connections	4 (2 Modbus/TCP + 2 DNP3/TCP)
Connector type	RJ45 modular

##### GPRS PORT

Supported protocols	Modbus/TCP (Port 502)
Connector type	SMA

##### Profibus DP (IEC 61158)

RS-485 optically isoated 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

## RS-232/422-485 PORT

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, and 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 → Non-backed clock  
 → Accuracy: typical error 1 minute per month @ 25°C  
 → Typical clock retention time: 30 seconds

TOU Module  
 Meter Clock

- Battery-backed clock
- Accuracy: typical error 7 seconds per month @ 25°C (±2.5ppm)
- Typical clock retention time: 36 months

## 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	<input type="checkbox"/>
Energy and Harmonic Version	PM130EH-PLUS	
Energy Only	PM130E-PLUS	
OPTIONS		
Current Inputs		
5 Ampere	5	<input type="checkbox"/>
1 Ampere	1	
5A split core remote high accuracy current sensor (HACS)	RS5	
High Accuracy Current Sensors (HACS). Requires ordering of 3 HACS (see HACS Order String on next page)	HACS	
Calibration at Frequency		
25 Hz	25HZ	<input type="checkbox"/>
50 Hz	50HZ	
60 Hz	60HZ	
400 Hz	400HZ	
Resolution		
Low Resolution 1A, 1V	-	<input type="checkbox"/>
High Resolution 0.01A, 0.1V	H	
Power Supply		
85-265V AC and 85-290V DC	ACDC	<input type="checkbox"/>
9.5-18V DC	1DC	
18.5-58V DC (24VDC, 48VDC)	23DC	
Communication Protocol		
Modbus and DNP 3.0	-	<input type="checkbox"/>
Modbus and IEC 60870-101/104	870	
Mounting		
Panel Mount (standard)	-	<input type="checkbox"/>
DIN Rail Mounting	DIN	
Expansion Module (Max. 1 module per instrument, can be ordered separately)		
4 Analog Outputs: ±1mA	AO1	<input type="checkbox"/>
4 Analog Output: 0-20mA	AO2	
4 Analog Output: 0-1mA	AO3	
4 Analog Output: 4-20mA	AO4	
4 Analog Output: 0-3mA	AO5	
4 Analog Output: ±3mA	AO6	
4 Analog Output: 0-5mA	AO7	
4 Analog Output: ±5mA	AO8	
Communication: Ethernet (TCP/IP)	ETH	
Communication: PROFIBUS	PRO	
Communication: RS232/422/485	RS232	
Communication: GPRS	GPRS	
Communication: RF (see note)*	RF-x	
4 Digital Inputs (Dry Contact) / 2 Relay Outputs 250V / 5A AC	DIOR	
4 Digital Inputs (Dry Contact) / 2 SSR Outputs 250V / 0.1A AC	DIOS	
Communication: TOU + 4DI	TOD	
12 Digital Inputs (Dry Contact) / 4 Relay Outputs 250V/5A AC	12DIOR-DRC	
12 Digital Inputs (250VDC) / 4 Relay Outputs 250V/5A AC	12DIOR-250V	
12DIOR-DRC with Ethernet	12DIOR-DRC-ETH	
12DIOR-250V with Ethernet	12DIOR-250V-ETH	
12DIOR-DRC with RS-485	12DIOR-DRC-485	
12DIOR-250V with RS-485	12DIOR-250V-485	
RF Accessories (see note)		
Concentrator - ROW	CON-ROW	<input type="checkbox"/>
Concentrator External for 2 x ETC2002	CON-EXT	
Repeater	REP	
Antenna 1: without cable (module or concentrator)	AN-1	
Antenna 2: with 2M cable (module or concentrator)	AN-2	
Antenna 3: external for concentrator only	AN-3	
Antenna 4: external for module or concentrator	AN-4	

**Note:** RF module and accessories are available in certain regions only. Please consult your local supplier.

## HACS (High Accuracy Current Sensors) Order String

### High Accuracy Current Sensors

SATEC Proprietary High Accuracy Current Sensors (HACS) designed to be used with our HACS-ready meters and analyzers.

SATEC current sensors have several benefits over CTs:

1. High accuracy
2. Wide bandwidth (for harmonics measurement)
3. Safe to use - no need for shorting bars
4. Longer cable - up to 200m without performance reduction

100A	Solid Core HACS	Φ12mm hole	CS1
100A	Solid Core HACS	Φ23mm hole	CS1L
100A	Split Core HACS	Φ16mm hole	CS1S
200A	Split Core HACS	26x23.8mm hole	CS2S
200A	Split Core HACS	23x33mm hole	CS2SL
400A	Solid Core HACS	Φ26mm hole	CS4
400A	Split Core HACS	23x33mm hole	CS4S
800A	Solid Core HACS	100x32mm / Φ62mm hole	CS8
800A	Split Core HACS	80x50mm hole	CS8S
1200A	Split Core HACS	80x121mm hole	CS12S

