PM130 PLUS
DATASHEET

MULTI-FUNCTIONAL POWER METER

The PM130 PLUS is a compact, multi-function power-meter, designed for metering three-phase AC current or three DC current circuits.

Featuring versatile I/O options, communication ports and protocols, it is suitable for integration in utility substation or industrial SCADA systems.
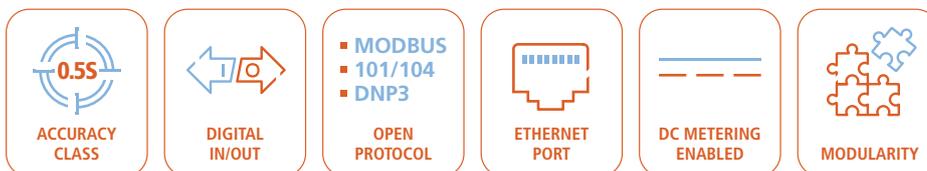
DC METERING

The meter features unique high-accuracy direct metering of DC systems (via shunt resistors).

MODULAR VERSATILITY

HIGHLIGHTS

- **Accuracy:** Class 0.5/0.5S per ANSI/IEC 62053-22
- **Communication:**
  - Built-in port: standard RS-485
  - Optional ports: ETH; Profibus
  - Open protocol: Modbus RTU, DNP3.0, IEC 60870-5-101/104
- **Digital and Analog I/O Modules:** up to 16 I/O
- **DC Enabled:** metering DC loads via shunt resistors
- **Broad-range frequency measurement:** 25-400 Hz
- **LED Bar-graph**: Displays load as percentage of nominal current

0.5S ACCURACY CLASS	DIGITAL IN/OUT	MODBUS 101/104 DNP3 OPEN PROTOCOL	ETHERNET PORT	DC METERING ENABLED	MODULARITY

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VOLTAGE INPUT OPTIONS

- Direct Measurement:
  0-690V AC
  0-670V DC*

  * extended range up to 1500V DC is possible via SATEC VRM

CURRENT OPTIONS

- 1A or 5A inputs from CT secondary
- 40mA input designed for SATEC HACS CTs (100-3000A options)
- DC metering: current measurements using Hall Effect Sensors. meter accuracy: 0.5%. System accuracy set by implemented sensor
- RS: unique input for 5A rated HACS CT

DIGITAL AND ANALOG I/O

Available I/O modules:

- **TOD (TOU+4DI)**: four digital inputs with 1-ms scan time and battery backup for real time clock; automatic recording of last five digital input change events with timestamps (see the PM130 PLUS Modbus Reference Guide)
- **DIOR**: 4 digital inputs and 2 relay outputs with 1-cycle update time; unlatched, latched, pulse and KYZ operation; energy pulses, selection of solid state or electromechanical relays
- **12DIOR**: 12 digital inputs, 4 relay outputs (incl. optional ETH port or additional RS485 port)
- **4AO**: four optically isolated analog outputs with an internal power supply; selection of 0-20mA, 4-20mA, 0-1mA, and ±1mA output; 1 cycle update time.
- **8DI**: eight digital inputs with 1-ms scan time

COMMUNICATION

- On-board interface
  - Standard 2-wire RS-485
- Optional interfaces
  - ETH (10/100Base T)

- Multipurpose
- PROFIBUS
- Client (Modbus/TCP over ETH)
  - TCP notification client for communicating events or periodic reports to remote server
  - Expertpower client on subscription basis
- Communication protocols
  - Modbus RTU
  - SATEC ASCII
  - DNP 3.0 (Level 2)
  - IEC 60870-5-101 (optional)
  - IEC 60870-5-104 (optional)

DISPLAY

- Easy to read 3-row (2x4 digits + 1x5 digits) bright LED display
- Adjustable display brightness and update rate
- Auto-scroll option with adjustable page; auto-return to a default page
- LED bar-graph displaying load as percentage of nominal load current (user-definable)

METER SECURITY

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

UPGRADEABLE FIRMWARE

- Device firmware is easily upgraded through the serial or Ethernet port

SOFTWARE SUPPORT

- SATEC's Power Analysis Software (PAS) for comprehensive configuration and data acquisition is available for download (free): https://www.satec-global.com/products/pas/ Always make sure to update .exe file with latest version on webpage

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- Expertpower web-based energy management platform (subscription)
  Please visit https://www.satec-global.com/products/expertpower/
- Any 3rd party software supporting open-protocol

REAL-TIME CLOCK

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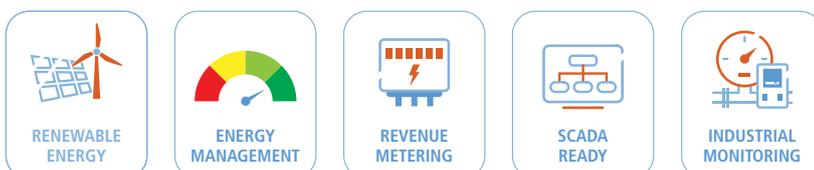- Optional battery backup (TOU+4DI module)

UNIQUE DESIG

- Pass through CT connection
- Built-in auxiliary terminal for loose CT wires
- Dual panel mounting:
  92×92mm square or 4" round cutout

APPLICATIONS

RENEWABLE ENERGY

ENERGY MANAGEMENT

REVENUE METERING

SCADA READY

INDUSTRIAL MONITORING

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TECHNICAL SPECIFICATIONS

INPUT RATINGS

VOLTAGE INPUTS

Nominal voltage (L-N/L-L)	57.7/100V AC 120/208V AC 120/240V AC 230/400V AC 277/480V AC 400/690V AC
Operating range (L-N/L-L)	Direct input and input via PT 15- 480V AC / 15-828V AC
Burden for 400V	< 0.4 VA
Burden for 120V	< 0.04 VA
Over-voltage withstand	1000V AC continuous, 2000V AC for 1 second
Input impedance	1 MΩ
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	3500V AC

5A SECONDARY

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)

REMOTE SENSORS (HACS) / DC

HACS: Depends on sensor rating.
For details see HACS web page (datasheet available online)

DC: 40mA for Hall Sensors.
Current range is determined by sensor rating

SAMPLING RATE MEASUREMENT

Sampling rate	128 samples/cycle

POWER SUPPLY

120/230V AC-DC Option	» Rated input: 88-290V DC » 85-265V @ 50/60/400 Hz » Burden 9VA Isolation: 1500V DC » Input to ground: 2500V AC
12V DC Option	» Rated input: 9.5-18V DC, Burden 4VA » Isolation: 1500V DC
24/48V DC Option	» Rated input: 18.5-58V DC, Burden 4VA » Isolation: 1500V DC » Wire size: up to 12 AWG (up to 3.5 mm²)

OPTIONAL MODULAL I/O

ELECTROMECHANICAL RELAY

Dry contact	1 contact (SPST Form A)
Rating	5A/250V AC; 5A/30V DC
Galvanic isolation	» Between contacts and coil: 3000V AC @ 1 min » Between open contacts: 750V AC
Operate time	10 ms max
Release time	5 ms max
Update time	1 cycle
Wire size	14 AWG (up to 1.5 mm²)

SOLID STATE RELAY

Dry contact	1 contact (SPST Form A)
Rating	0.15A/250V AC/DC
Galvanic isolation	3750V AC @ 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 mm²)

DIGITAL INPUTS

Dry Contacts, internally wetted @ 24V DC or Wet contact @ 250V DC (12DI/4DO only)

* Measuring up to 3000V DC is possible via adapter

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Sensitivity	Open @ input resistance >100 kΩ, Closed @ Input resistance < 100 Ω
Galvanic isolation	3750V AC @ 1 min
Internal power supply	24V DC, 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 mm²)

ANALOG OUTPUTS

Ranges (upon order)	» ±1 mA, max. load 5 kΩ (100% overload) » 0-20 mA, max. load 510 Ω » 4-20 mA, max. load 510 Ω » 0-1 mA, max. load 5 k Ω (100% overload)
Isolation	2500V AC @ 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 mm²)

COMMUNICATION PORTS

COM1 (BUILT IN)

RS-485 optically isolated port	
Isolation	3000V AC @ 1 min
Baud rate	up to 115.2 kbps
Supported protocols	Modbus RTU, DNP3, SATEC ASCII, IEC 60870-5-101
Connector type	Removable, 3 pins
Wire size	Up to 14 AWG (up to 1.5 mm²)

COM2 (OPTIONAL MODULE)

ETHERNET PORT
(as independent module OR add-on to 12DIOR module)

Transformer-isolated 10/100BaseT Ethernet port	
Supported protocols	Modbus/TCP (Port 502), IEC 60870-5-104, DNP3/TCP (Port 20000)
Num. of simultaneous connections	4 (2 Modbus/TCP + 2 DNP3/TCP)
Connector type	RJ45 modular
Isolation	1,500V DC @ 1min

CELLULAR 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

RS-232/422-485 PORT

RS-232 or RS-422/485 optically isolated port	
Isolation	3000V AC @ 1 min
Baud rate	Up to 115.2 kbps
Supported protocols	Modbus RTU, DNP3, SATEC ASCII, IEC 60870-5-101
Connector type	Removable, 5 pins for RS-422/485 and DB9 for RS-232
Wire size	Up to 14 AWG (up to 1.5 mm²)

ADDITIONAL SPECIFICATIONS

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

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

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
Front panel IP	54

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	
Connectors-Plug-in type	Polyamide PA6.6 (UL94-V0)
Packaging case	Carton and Stratocell® (Polyethylene Foam) brackets
Labels	Polyester film (UL94-V0)

STANDARDS COMPLIANCE

ACCURACY

- Complies with IEC62053-22, class 0.5S
- Meets ANSI C12.20 –1998, class 10 0.5%
- Complies with IEC 61557-12 (PMD):
  - Total Apparent Power   0.2
  - Total Active Energy   0.5/0.2
  - Total Reactive Energy   0.5
  - Frequency   0.05
  - Current   0.2
  - Neutral Current   0.2
  - Voltage   0.2
  - Power Factor   0.2
  - THDV, THDI   1

ELECTROMAGNETIC IMMUNITY

Complies 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

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

SAFETY/CONSTRUCTION

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

AC AND IMPULSE INSULATION

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

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ORDER STRING

MODELS

Power Version	**PM130P-PLUS**
Energy Only	**PM130E-PLUS**
Energy and Harmonic Version	**PM130EH-PLUS**

OPTIONS

CURRENT INPUTS

5 Ampere	**5**
1 Ampere	**1**
5A split core remote high accuracy current sensor (HACS), 50/60Hz only	**RS5**
High Accuracy Current Sensors (HACS), 50/60Hz only. Requires ordering of 3 HACS	**HACS**
DC current measurement; designed for shunt resistor output, up to 100 mV	**DCC**

CALIBRATION AT FREQUENCY

25 Hz*	**25HZ**
50 Hz	**50HZ**
60 Hz	**60HZ**
400 Hz*	**400HZ**

DISPLAY 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 (24V DC, 48V DC)	**23DC**

COMMUNICATION PROTOCOL

Modbus and DNP 3.0	**-**
Modbus and IEC 60870-5-101/104**	**870**

MOUNTING

Panel Mount (standard)	**-**
DIN Rail Mounting	**DIN**
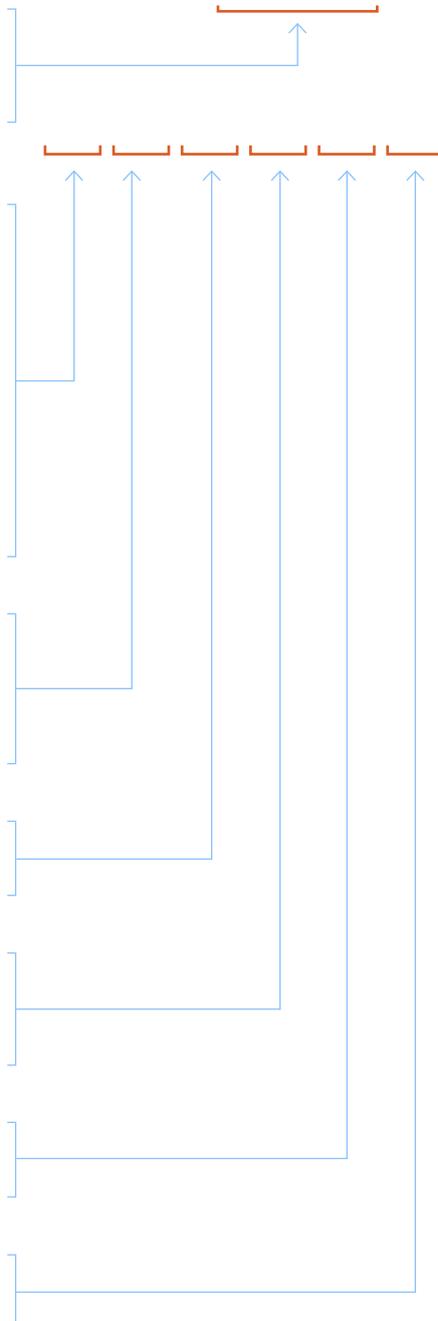
NOTES

* Supports 1A and 5A models only

** -104 requires ETH, does NOT work over cellular network

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EXPANSION MODULE *

ANALOG OUTPUTS

4 Analog Outputs: ±1mA	**AO1**
4 Analog Outputs: 0-20mA	**AO2**
4 Analog Outputs: 0-1mA	**AO3**
4 Analog Outputs: 4-20mA	**AO4**
4 Analog Outputs: 0-5mA	**AO7**
4 Analog Outputs: ±5mA	**AO8**

ADDITIONAL COMMUNICATION PORTS

Communication: Ethernet (TCP/IP)	**ETH**
Communication: PROFIBUS	**PRO**
Communication: RS232/422/485	**RS232**

DIGITAL INPUTS

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**
4 Digital Inputs (Dry Contact) / TOU / RTC Battery	**TOD**
8 Digital Inputs (Dry Contact)	**8DI**

12 DI 4 RO MODULE

12 Digital Inputs / 4 Relay Outputs 250V/5A AC	**12DIOR**
Digital Inputs Rating - Dry Contact (DRC), 48V, 125V or 250V	**DRC or 48V or 125V or 250V**

12 DIOR module communication port:

None	**-**
RS-485	**485**
Ethernet	**ETH**
CAN	**CAN**

12DIOR-

NOTES

*   Max. 1 module per instrument. Can be ordered separately.

**   Does not support 870 protocol. Supplied with bendable antenna.

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