# PM130 DC ENERGY METER

## PM130 DIRECT CURRENT (DC) ENERGY METER DATASHEET


## DC Energy Meter

The PM130 DC is a 96x96mm panel size, multi-function direct current (DC) energy power meter, designed for up to three (3) channel DC metering.

Featuring versatile I/O options, communication ports and protocols it is suitable for integration in utility substation, industrial, data centres, renewable energy systems, SCADA, BMS etc.

## DC Measurement

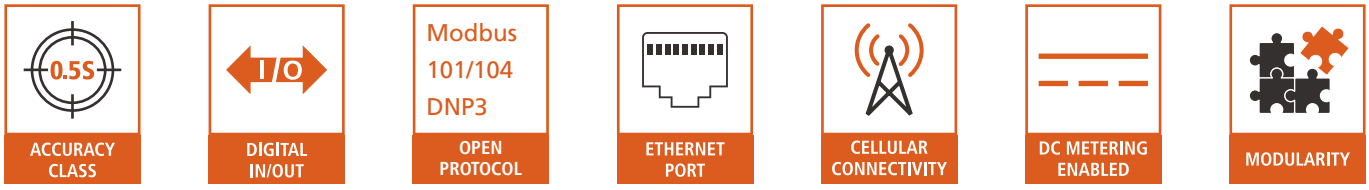
Measurement of PM130 DC system via shunts for single channel input

Measurement of PM130 DC system via Hall Effect Sensors for up to three (3) channel input

## HIGHLIGHTS

- Accuracy: Class 0.5/1.0 per IEC 62053-41
- Communication:
  - Built-in port: standard RS-485
  - Optional ports: Ethernet; 4G Modem; Profibus
  - Open protocol: Modbus RTU, DNP3.0, IEC 60870-5-101/104
- Digital and Analog I/O Modules: up to 16 I/O
- Dual Mounting: suitable for 4-inch round and 92×92mm square cutouts
- DIN Rail mounting option
- LED Bar-graph: Displays load as percentage of nominal current

## MODULAR VERSATILITY



## FEATURES

### DC ENERGY METERING

- DC Volts
- DC Amps
- DC Power
- DC Energy
- DC Ampere
- DC Volt Demand

### BILLING/TOU ENERGY METER (PM130 DC)

- Accuracy
  - Class 0.5/1.0 per IEC 62053-41
  - Plus Accuracy Shunt or Hall Effect Sensor (HES)
- Total and per phase energy measurements
- Time-of-Use, 4 totalisation and tariff energy/ demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day,
- Easy programmable tariff calendar schedule
- Automatic daily energy and maximum demand profile log for total energy and tariff registers

### PROGRAMMABLE LOGIC CONTROLLER (PLC)

- Embedded programmable controller
- 16 control setpoints; programmable thresholds and delays
- Optional relay output control, alarming (load control)
- 1-cycle response time (20ms @ 50Hz)

### EVENT AND DATA RECORDING

- non-volatile memory for timestamped event and data recording: 48 days for 2 daily TOU records, half-hourly writing of 4 parameters and recording over 100 events during the entire period

### MODELS

**PM130-DCE** *DC Shunt Inputs

- 50 millivolt
- 60 millivolt
- 75 millivolt
- 100 millivolt (maximum)

* DC Current Input shunt dependent

### PM130E-HES HALL EFFECT SENSOR INPUT

- HCS100-S 100A Split Core
- HCS1000 1000A Solid Core
- HCS2000-S2000A Split Core

### VOLTAGE INPUTS

- DC Voltage Input 0-670V DC
- Above 670V DC up to 1500V DC with use of SATEC VRM
- Ranges above 1500V DC on application

- Event recorder for logging internal diagnostic events and setup changes
- Two data recorders; programmable data logs on a periodic basis; automatic daily energy log and maximum demand profile

## VOLTAGE INPUT OPTIONS

- Direct Measurement:
  - 670V DC
  - Extended range up to 1500V DC is possible via SATEC Voltage Ratio Module (VRM)

## CURRENT OPTIONS

- DC Shunts
- Hall Effect Sensors

## DIGITAL AND ANALOGUE

**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 Ethernet 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
  - Ethernet (10/100Base T)
  - 4G Modem
  - Multipurpose RS-232/422/485
  - PROFIBUS
- Client (Modbus/TCP over Ethernet or 4G)
  - 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 (standard)
  - IEC 60870-5-104 (requires Ethernet)

## 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 unauthorised 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). Always make sure to update .exe file with latest version on webpage
- SATEC's Expertpower web-based energy management platform (subscription). Please visit https://satec-global.com.au/solutions/expertpower-energy-management-software/

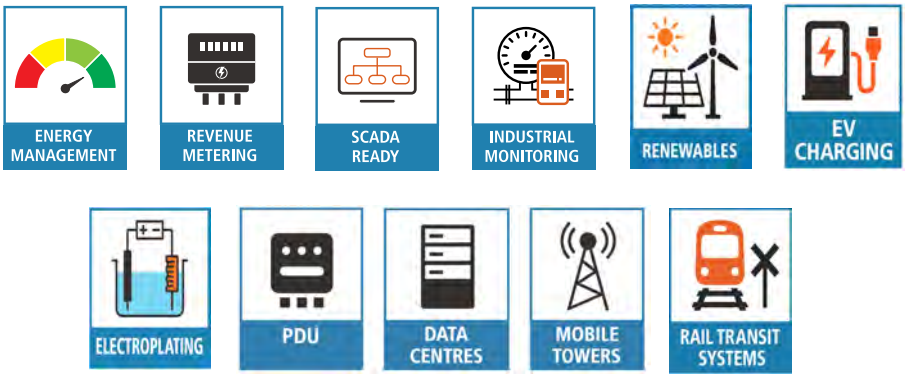
## REAL-TIME CLOCK

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

## UNIQUE DESIGN

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

## APPLICATIONS



# TECHNICAL SPECIFICATIONS

## INPUT RATINGS

| * VOLTAGE INPUTS | |
|---|---|
| Nominal voltage (L-N ) (1 Voltage Reference Channel) | 0-670V DC<br>Use VRM above 670V DC |
| Over-voltage withstand | 1000V AC continuous, 2000V AC for 1 second |
| Input impedance | 1 MΩ |
| Wire size | up to 12 AWG (up to 3.5mm$^2$) |

## CURRENT INPUTS

| | |
|---|---|
| DC Shunts | |
| Hall Effects Sensors (HES) | |
| Wire size | 12 AWG (up to 3.5 mm$^2$) |
| Galvanic isolation | 3500V AC |

| POWER SUPPLY | |
|---|---|
| 120/230V AC-DC Option | » Rated input: 88-290V DC, Burden 9VA, 85-265V AC 50/60/400 Hz Isolation: 1500V DC<br>» Input to ground: 2500V AC |
| 12V DC Option | » Rated input: 9.5-18V DC, Burden 4VA<br>» Isolation: 1500V DC |
| 24/48V DC Option | » Rated input: 18.5-58V DC, Burden 4VA<br>» Isolation: 1500V DC<br>» Wire size: up to 12 AWG (up to 3.5 mm$^2$) |

## OPTIONAL MODULAR 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<br>» 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 mm$^2$) |

| 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 mm$^2$) |

* Measuring up to 3000V DC on application

### DIGITAL INPUTS

| | |
|---|---|
| Dry Contacts, internally wetted @ 24V DC or Wet contact @ 250V DC (12DI/4DO only) | |
| 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 $mm^2$) |

### ANALOGUE OUTPUTS

| | |
|---|---|
| Ranges (upon order) | » ±1 mA, max. load 5 kΩ (100% overload)<br>» 0-20 mA, max. load 510 Ω<br>» 4-20 mA, max. load 510 Ω<br>» 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 $mm^2$) |

## 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 $mm^2$) |

### 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 $mm^2$) |

## ADDITIONAL SPECIFICATIONS

### REAL TIME CLOCK

| | |
|---|---|
| Standard Meter Clock | » Non-backed clock<br>» Accuracy—typical error: @ 1 minute per month @ 25°C<br>» Typical clock retention time: 30 seconds |
| TOU Module Meter Clock | » Battery-backed clock<br>» Accuracy—typical error: 7 seconds per month @ 25°C (±2.5ppm)<br>» 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 |

### 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) |

## STANDARDS COMPLIANCE

### ACCURACY

- Complies with IEC62053-41, class 0.5/1.0
- *Accuracy subject to DC Shunt or Hall Effect Sensor input
- Meets ANSI C12.20 –1998, class 10 0.5%
- Complies with IEC 61557-12 (PMD):
  - *Total DC Power 0.5
  - *Total DC Energy 0.5
  - *DC Current 0.05
  - *DC Voltage 0.05

### 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

## ORDER STRING

### MODELS

| | |
|---|---|
| DC Energy Power Version | **PM130-xxx** |

### OPTIONS

| | |
|---|---|
| **CURRENT INPUTS** | |
| DC Shunt | **DCE** |
| Hall Effect Sensors | **HES** |
| **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** |
| **TESTING AND CERTIFICATE** | |
| Full functional test, calibration at various work loads & detailed test report | **-** |
| All of the above plus ISO 17025 and ILAC certified calibration certificate | **CC** |

NOTES
^ -104 requires Ethernet does NOT work over cellular network

## EXPANSION MODULE *

| | |
|---|---|
| **ANALOGUE OUTPUTS** | |
| 4 Analogue Outputs: ±1mA | **AO1** |
| 4 Analogue Outputs: 0-20mA | **AO2** |
| 4 Analogue Outputs: 0-1mA | **AO3** |
| 4 Analogue Outputs: 4-20mA | **AO4** |
| 4 Analogue Outputs: 0-3mA | **AO5** |
| 4 Analogue Outputs: ±3mA | **AO6** |
| 4 Analogue Outputs: 0-5mA | **AO7** |
| 4 Analogue Outputs: ±5mA | **AO8** |
| **ADDITIONAL COMMUNICATION PORTS** | |
| Communication: Ethernet (TCP/IP) | **ETH** |
| Communication: PROFIBUS | **PRO** |
| Communication: RS232/422/485 | **RS232** |
| Communication: 4G Modem ** x: G=Europe; V=Verizon (US); A=AT&T (US); T=Telstra (AUS) | **T4x** |
| **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** |

**12DIOR-** _____ _____

NOTES
* Max. 1 module per instrument. Can be ordered separately.
** Does not support 870 protocol. Supplied with bendable antenna.

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