

PM135 DATASHEET



Multi-Functional Power Meter

The PM135 is a compact multi-function power-meter, designed for metering three-phase AC current circuits.

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

HIGHLIGHTS

- ▶ **Accuracy:** Class 0.5/0.5S per ANSI / IEC 62053-22
- ▶ **Communication:**
 - Built-in port: standard RS-485
 - Optional ports: ETH; 3G/4G cellular; 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 92x92mm square cutouts
- ▶ **Broad-range frequency measurement:** 25-400 Hz
- ▶ **LED Bar-graph:** Displays load as percentage of nominal current

MODULAR VERSATILITY



ACCURACY CLASS	DIGITAL IN/OUT	MODBUS 101/104 DNP3 OPEN PROTOCOL	ETHERNET PORT	CELLULAR CONNECTIVITY	DC METERING ENABLED	REVENUE METERING	MODULARITY

FEATURES

MULTIFUNCTIONAL 3-PHASE POWER METER

- ▶ True RMS volts, amps, power, power factor, neutral current, angles and unbalance for voltage and current, frequency, symmetrical components and many more
- ▶ Ampere/Volt demand meter
- ▶ 25, 50, 60 and 400 Hz measurements @ 3 decimal digit values
- ▶ 128 samples per cycle

BILLING/TOU ENERGY METER (PM135E & PM135EH)

- ▶ Accuracy Class 0.5S per IEC 62053-22 and Class 0.2 per IEC 61557-12
- ▶ 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,
- ▶ Easy programmable tariff calendar schedule
- ▶ Automatic daily energy and maximum demand profile log for total energy and tariff registers

HARMONIC ANALYZER (PM135EH)

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

REAL-TIME WAVEFORM CAPTURE

- ▶ Real-time "scope mode" waveform monitoring via PAS software

MODELS

- PM135P** Basic model offering voltage, current, power and frequency measurements
- PM135E** Offers all the features above, as well as energy measurements and data logging (available in certain regions only).
- PM135EH** Offers all the features above, as well as harmonic analysis

All models offer identical communication and control features.

PROGRAMMABLE LOGICAL CONTROLLER

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

EVENT AND DATA RECORDING (PM135E & PM135EH)

- ▶ 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
- ▶ 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: 0-690V AC

CURRENT OPTIONS

- ▶ 1A or 5A inputs from CT secondary
- ▶ 40mA input designed for [SATEC HACS CTs](#) (100-3000A options)
- ▶ RS: unique input for 5A rated HACS CT

I/O OPTIONS

- ▶ **4DIOR**: 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, ± 1 mA, 0-3mA, ± 3 mA, 0-5mA and ± 5 mA 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)
 - 2G/3G cellular modem
 - Multipurpose RS-232/422/485
 - PROFIBUS
 - RF (certain regions only)
- ▶ Client (Modbus/TCP over ETH or 3G/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 (optional)
 - IEC 60870-5-104 (optional)

DISPLAY

- ▶ 3x2" / 76x49mm backlit LCD 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): www.satec-global.com/power-analysis-software. Always make sure to update .exe file with latest version on webpage
- ▶ SATEC's Expertpower web-based energy management platform (subscription). Please visit www.satec-global.com/Expertpower
- ▶ Any 3rd party software supporting open-protocol

REAL-TIME CLOCK

- ▶ Internal clock with 20-second retention time with battery backup

UNIQUE DESIGN

- ▶ Pass through CT connection
- ▶ Built-in auxiliary terminal for loose CT wires.
- ▶ Dual panel mounting:
92x92mm square or 4" round cutout



APPLICATIONS



TECHNICAL SPECIFICATIONS

INPUT RATINGS

VOLTAGE INPUTS

Installation	Category III
Nominal voltage (L-N/L-L)	57/100V AC 230/400V 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 3.5mm ²)

CURRENT INPUTS (VIA CT)

Wire size	12 AWG (up to 3.5 mm ²)
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)

HACS/RS5 REMOTE SENSORS

Depends on sensor rating. See HACS datasheet
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SAMPLING RATE MEASUREMENT

Sampling rate	128 samples/cycle
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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 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 » 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)

DIGITAL INPUTS

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

Sensitivity	Open @ input resistance >100 k Ω , 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)

ANALOG OUTPUTS

Ranges (upon order)	<ul style="list-style-type: none"> » ± 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 kΩ (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)

REAL TIME CLOCK

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

DISPLAY

3x2" / 76x49mm backlit LCD display

3 color LED load bar graph (40-110%)

Keypad 6 push buttons

ENVIRONMENTAL CONDITIONS

Operating range:

- Unit (stand-alone) -30°C to 70°C (-22°F to 158°F)

- Unit with add-on modules -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 [HxWxD] 114x114x109mm (4.5x4.5x4.3")

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 IEC62053-22, 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

ORDER STRING

MODELS

Power Version	PM135P
Energy Only	PM135E
Energy and Harmonic Version	PM135EH

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

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

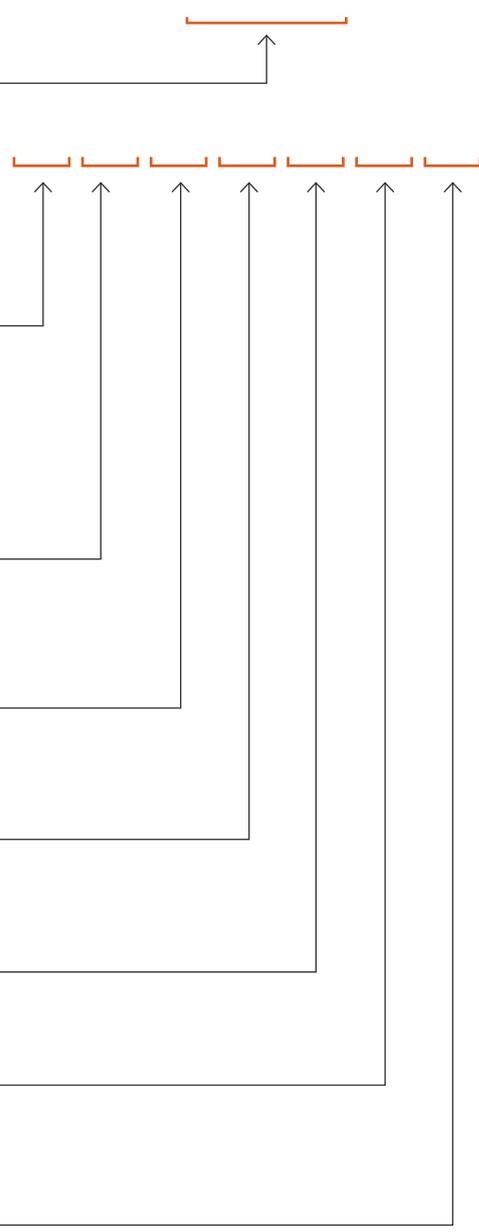
Modbus and DNP 3.0	-
Modbus and IEC 60870-5-101/104**	870

MOUNTING

Panel Mount (standard)	-
DIN Rail Mounting	DIN

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

- * Supported by 1A and 5A models only
- ** -104 requires ETH, does NOT work over cellular network

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: 0-3mA	AO5
4 Analog Outputs: ±3mA	AO6
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
Communication: 2G/3G GSM Modem**	T3G
Communication: 4G Modem ** x: G=Europe; V=Verizon (US); A=AT&T (US); T=Telstra (AUS)	T4x
Communication: RF	RF-x-y

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
8 Digital Inputs (Dry Contact)	8DI
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
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12 DIOR module communication port:

None	-
RS-485	485
Ethernet	ETH
CAN	CAN



NOTES

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