PM135

MULTIFUNCTIONAL POWERMETER

The PM135 is a multi-functional three-phase power meter with basic revenue metering, power quality and harmonics analysis.

The PM135 provides a cost-effective substitute for numerous analog meters used by industrial, commercial and utility customers for basic power metering.

The PM135 is widely integrated in panel boards and SCADA systems. With the addition of the unique TOU module, the EH model answers the needs of revenue metering applications. It is also suitable for utility substation automation with its support of the industry standard DNP 3.0, Modbus RTU and IEC 60870-5-101/104 protocols, as well as its I/O capabilities (using the Digital Input/Output modules).

The PM135 series consists of two basic models providing digital measurements of more than 80 electrical parameters locally, and more than 100 electrical parameters via RS-485 interface.
The PM135 has a 3x2" / 76x49mm backlit LCD display as well as SATEC's unique bar graph loading indicator.

Measurement & Communication

The PM135 accurately measures over 100 parameters from basic frequency, voltages and currents, to all power parameters, four quadrant active, reactive and apparent energies, harmonics and time of use (TOU).

The PM135 has an integral RS-485 communication port for a wide range of protocols—Modbus, DNP 3.0 and IEC 60870. Its expansion module allows connection of a second communication port, including Ethernet, Profibus, RF or GPRS, as well as second RS-485 and RS-232 ports.

Models

Measurement Features

PM135P   Multi-functional 3-phase power meter functionality (see Features)

PM135E   All the features of the P model plus Revenue Meter (see Features)

PM135EH All the features of the E model plus Power Quality control (see Features)

Current Inputs

1A   Standard 1A CT
5A   Standard 5A CT
RS5   Remote Split Core for Standard 5A CT
HACS   High Accuracy Current Sensors

Features

Multifunctional 3-Phase Power Meter

➔ Voltage, current (including neutral current), power, energy, power factor, frequency, voltage/current unbalance
➔ Current range up to 200%
➔ Supported frequencies: 25, 50, 60 and 400 Hz
➔ Direct connection up to 690V L-L (up to 1.15 MV via PT)

Basic Power Quality Control (EH Model)

➔ Individual voltage and current harmonics (up to the 40th)
➔ Voltage and current THD, TDD & K-Factor
➔ Time stamped max/min values
➔ Waveforms 128 samples/cycle (via comm.)

Revenue Meter (EH Model)

➔ Exceeds accuracy class 0.5S
➔ Time Of Use (TOU) tariffs

Event/Data Log (EH Model)

➔ System events & data logging
➔ Real-time stamps

Harmonic Analyzer (EH Model)

➔ 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
➔ Simultaneous 6-channel one-cycle waveform capture at a rate of 64 samples per cycle

Billing/TOU Energy Meter (E & EH Models)

➔ 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

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)

Alarm and Control Functions

➔ 16 programmable set points
➔ 4 counters

Programmable Logical Controller

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

Event and Data Recording (E & EH)

➔ 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 PM135 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 ±1mA output; 1-cycle update time

Real Time Clock

➔ Built-in clock and calendar functions
➔ Internal clock with 20-second retention time
➔ Optional battery backup (TOU+4DI module)

Power Supply

➔ Multi-purpose AC/DC power supply (85-265V AC, 88-290V DC)
➔ Special versions (12, 24-48V DC)

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

Construction

➔ Dual panel mounting: 4" Round; Square 96x96 DIN
➔ Weight: 1.5 lbs / 0.7 kg
➔ H×W×D: 4.5×4.5×4.3" / 114×114×109 mm
➔ One add-on module

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

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	➔ 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 mm2)

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 mm2)

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 kΩ, Closed @ Input resistance < 100 Ω
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 mm2)

OPTIONAL ANALOG OUTPUTS

4 Analog Outputs optically isolated
(AO Optional module)

Ranges (upon order)	➔ $\pm$1 mA, maximum load 5 kΩ (100% overload) ➔ 0-20 mA, maximum load 510 Ω ➔ 4-20 mA, maximum load 510 Ω ➔ 0-1 mA, maximum load 5 k Ω (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 mm2)

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 mm2)

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 mm2)

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
3.5" LCD Monochrome Display, 240 x 128 dots resolution
Tri-color LED load bar graph 4(0-)%110
COM1 RXT/X activity LED
Diagnostics indication LED
kWhk/varh Pulse LED f(or E and EH models)
Keyp :ad5 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
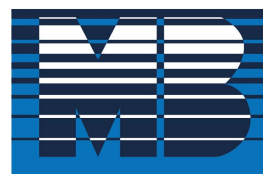➔ Comply with IEC CISPR 22: Radiated/Conducted class A

Safety/Construction

➔ 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

PM135 Order String

MODEL		
Power Version		PM135P
Energy and Harmonic Version		PM135EH
Energy Only		PM135E
OPTIONS		
Current Inputs		
5 Ampere		5
1 Ampere		1
5A split core remote high accuracy current sensor (HACS)		RS5
High Accuracy Current Sensors (HACS). Requires ordering of 3 HACS (refer to HACS datasheet)		HACS
Calibration at Frequency		
25 Hz		25HZ
50 Hz		50HZ
60 Hz		60HZ
400 Hz		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 60870-101/104		870
Display Language		
English		EN
Russian		RU
Spanish		ES
Mounting		
Panel Mount (standard)		-
DIN Rail Mounting		DIN
Expansion Module (Max. 1 module per instrument, can be ordered separately)		
4 Analog Outputs:	±1mA	AO1
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:	2G/3G GSM Modem *	T3G
Communication:	2G/3G CDMA Modem *	T3C
Communication:	RF (see note)**	RF-x-y
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
12 Digital Inputs (Dry Contact) / 4 Relay Outputs 250V/5A AC		12DIOR-DRC
12 Digital Inputs (125VDC) / 4 Relay Outputs 250V/5A AC		12DIOR-125V
12 Digital Inputs (250VDC) / 4 Relay Outputs 250V/5A AC		12DIOR-250V
12DIOR-DRC with Ethernet		12DIOR-DRC-ETH
12DIOR-125V with Ethernet		12DIOR-125V-ETH
12DIOR-250V with Ethernet		12DIOR-250V-ETH
12DIOR-DRC with RS-485		12DIOR-DRC-485
12DIOR-125V with RS-485		12DIOR-125V-485
12DIOR-250V with RS-485		12DIOR-250V-485

Notes

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

**   Does not support 870 protocol.

Innovative Electronics For You

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