SATEC

PM17x PRO

DATASHEET

The **PM17x PRO** Series power quality analyzers are available as the **PM172/ PM174/PM175 PRO** panel mount (4-inch round / 92 x92 mm square cutouts) form factor.

This series combines metering and control in one device, providing the ultimate solution for substation / industrial automation and commercial energy management.

The PRO Series bundles in one physical device multiple capabilities which ordinarily would be found in several different pieces of equipment.

Featuring a variety of communication interfaces and supporting a multitude of SCADA-driven protocols, these analyzers are extremely versatile and adaptive.

HIGHLIGHTED FEATURES

- Class 0.2S accuracy (IEC/ANSI)
- Class A Ed. 3.1 Power Quality Analyzer, per IEC 61000-4-30
- EN 50160 / IEEE 1159 reports
- IEEE 519 harmonic analysis
- IEC 61850, Ed. 2
- Dual port Ethernet
- Extra wide range input rating: 1,000V AC (L-L)
- Leakage / residual current detection
- 1µsec time-sync accuracy via IRIG-B / PTP v2 (IEEE 1588)
- 4^{th} voltage input (V_{ref})

MODELS

PM172:
Panel-mounted meter monitoring voltage, current, power, frequency and energy measurements, combined with power quality analysis and data logging capabilities.

PM174:
Panel-mounted Class A Ed. 3.1 power quality analyzer, monitoring voltage, current, power, frequency and energy measurements
(U.S. IEEE 1159 PQ standard).

PM175:
Panel-mounted Class A Ed. 3.1 power quality analyzer, monitoring voltage, current, power, frequency and energy measurements
(European EN50160 PQ standard).

RPM17x:
Transducer Version

CURRENT INPUTS

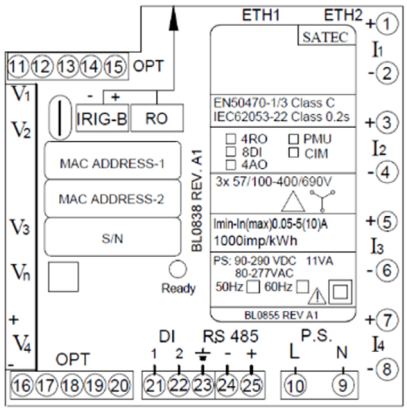
1A or 5A from CT secondary (standard)

HACS: 40mA inputs for SATEC's High Accuracy Current Sensors

LPCT-D: RJ45 LPCT Sensor Inputs supporting up to 650A primary current, and a secondary of 80 A/150 mV at 50 Hz and 80 A/180 mV at 60 Hz

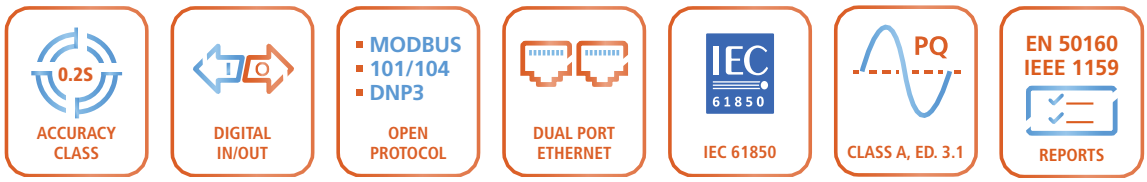
RS-5: Dedicated to operate with 5A split core high accuracy current sensor (HACS) installed on secondary part of existing CTs.

Front Panel



Back Panel

FEATURES



- **The PM17x PRO Series** is supplied in one of two forms:
  - Three row, 7-segment, bright LED display (2 x 4 characters + 1 x 6 characters)
  - No display (transducer version)
- **EN 50160 Power Quality recorder:**
  - PQ events triggering, programmble limits
  - EN 50160 Power Quality event log,
  - EN 50160 compliance statistics
- **Event recorder** for logging internal diagnostics events, control events and I/O operations
- **16 Data recorders:** Programmable Data Logs on a periodic basis and on any internal or external trigger
- **8 Fast Waveform recorders**: 7-channel (V1-V3, I1-I4) simultaneous recording; selectable AC sampling rate of 32, 64, 128 or 256 samples per cycle; 20 pre-fault cycles; synchronized waveforms from multiple devices in a single plot; exporting waveforms in COMTRADE and PQDIF file formats is possible via PAS software
- **Embedded Programmable Controller**: 64 control setpoints, OR/AND logic, extensive triggers, programmable thresholds and delays, relay control, event-driven data recording, cross triggering between multiple devices via ethernet for synchronous event capture and recording – up to sixteen triggering channels
- **3-phase Power meter**: true RMS, volts, amps, powers, power factors, unbalance, and neutral current
- **Four-quadrant active & reactive energy** polyphase meter: Class 0.2S IEC 62053-22 / Class 0.2 C12.20
- **Demand Meter**: amps, volts, harmonic demands
- **Precise Energy & Power Demand Meter**: Time-of-Use (TOU), 16 Summary (totalization) and TOU energy and demand registers for substation energy management; accumulation of energy pulses from external watt-meters; block and sliding demands; up to 64 energy sources
- **Harmonic Analyzer, per IEC 61000-4-7: Up to 63rd harmonic** for volts and amps; THD for volts and amps, TDD, K-factor, interharmonics for volts and amps, directional power harmonics and power factor
- **IEEE 519** harmonic analysis
- **Phasor, symmetrical components**
- **32 digital counters** for counting pulses from external sources and internal events.**16 programmable timers** from 1/2 cycle to 24 hours for periodic recording and triggering operations on a time basis
- **1-ms satellite-synchronized clock** IRIG-B or PTP v2 (IEEE 1588)

- **ExpertPower client** for MODBUS/TCP communication with either a Remote or Local (Stand Alone) SATEC's ExpertPower server
- **TCP notification client** for communicating with a remote MODBUS/TCP server on events or periodically on a time basis, with any IP enable communication port
- **16GB memory** for long-term waveform and data recording
- **Real Time Clock**; Internal clock with battery backup for three years retention time

AC MEASUREMENTS

The PM17x PRO Series is provided with fully isolated AC inputs for connecting to AC feeders:

- Four isolated AC voltage inputs (Rating: 10-1,000V AC (L-L) @ 50/60 Hz)
- Four isolated AC current inputs (see pg. 2 for options)
- Leakage current detection: accurate calculation of residual current is enabled via a 4th current input for the monitoring of the neutral current line. Accordingly, alerts and control thresholds can be configured in response to leakage current detected

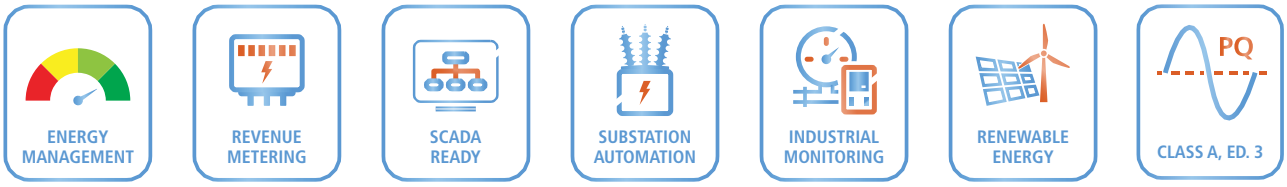
BUILT-IN I/O

- **2 optically isolated inputs**, 24V DC dry contact; programmable de-bounce time from 1ms to 1s; control setpoints, 1pps time synchronization; 1ms sampling rate
- **1 Solid State Relay output;** unlatched, latched and pulse operavtions, fail-safe operation for alarm notifications; programmable pulse width; direct remote relay control through communications
- **1optically isolated analog input:** Universal input of configurable range (±1mA / 0…1mA, 0…20mA, 4…20mA etc.)
- **IRIG-B time sync input**

COMMUNICATION

- Serial communication port; RS-485, up to 115,200 bps, MODBUS RTU/ASCII, DNP3.0 and IEC 60870-5-101 protocols
- 2 × Ethernet 10/100 Base-T port, supporting MODBUS/TCP, DNP3.0/TCP, IEC 60870-5-104, PTP and IEC 61850 protocols, up to 10 non-intrusive simultaneous connections per Ethernet port
- USB 2.0 port (type C)

APPLICATIONS



TECHNICAL SPECIFICATIONS

INPUT RATINGS

VOLTAGE INPUTS

STANDARD NOMINAL V AC

Operating range *	10-1,000V AC (L-L)
Input impedance	4MΩ
Burden for 400V	≤ 0.04VA
Burden for 120V	< 0.01VA
Isolation	4000V AC @ 1mn
Wire size	up to 14 AWG (≤ 2.5 mm²)

4TH VOLTAGE (VREF)

Operating range	0-300V AC/DC

LPVT INTERFACE

(PM172 only)

Nominal voltage	0.5-5V
Input impedance **	2MΩ / 50 pF
Interface **	RJ45

CURRENT INPUT OPTIONS

1A / 5A

From CT secondary (standard)

Operating range	Continuous 10A RMS
Burden	< 0.2 VA @ In=1A or 5A
Overload withstands	15A RMS continuous, 200A (20 × Imax) RMS for ½ second

HACS

0-20mA inputs for solid or split core CTs (SATEC High Accuracy Current Sensors)

LPCT-D

Interfacing Rogowski sensors' secondary

Rating	80 A / 150 mV @ 50 Hz 80 A / 180 mV @ 60 Hz
Max primary current	650A
Interface **	RJ45
Input impedance	2MΩ / 50 pF

RS5

5A HACS version

Nominal input:	2.5 mA
Maximum current (overload 200%)	5 mA

Dedicated to work only with HACS: CS05S / RS5 (HX0140)

DIGITAL/ANALOG I/O

DIGITAL INPUTS (2 DI)

Dry Contacts, internally wetted	@ 24V DC
Galvanic isolation	4000V AC @ 1mn
Internal power supply	24V DC
Scan time	1 ms
Connector type	removable, 5 pins
Wire size	14 AWG (up to 1.5 mm²)
Terminal pitch	5mm

DIGITAL OUTPUT (1 DO)

Solid State relay

1 relays rated at 0.15A/250 V AC/DC, 1 contact (SPST Form A)

Galvanic isolation	4000V AC @ 1mn
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)

ANALOG INPUT (1 AI)

Universal (-1mA to 20mA; range configurable: ±1mA, 0…1mA, 0…20mA, 4…20mA etc.)

Galvanic isolation	4000VAC @ 1mn
Scan time	1 ms

* UL listing covers nominal voltage up to 277/480V AC (L-N/L-L)
** According to iec61869-11

Connector type	removable, 5 pins

POWER SUPPLY

Rated input	100-277V AC @ 50/60 Hz, 100-290V DC
Tolerance	±15%
Burden	11VA@V AC, 6VA@V DC
Isolation	4,000V AC @ 1mn
Wire size	Up to 14 AWG (≤2.5 mm²)

AUXILIARY POWER SUPPLY (BUILT-IN)

Rated input	9-36V DC (24V)
Output	7W
Galvanic isolation	4,000V AC @ 1min
Isolation	4KV
Terminals Pitch	5 mm
Wire size	14 AWG (up to 1.5 mm2)

COMMUNICATION PORTS

SERIAL

RS-485 optically isolated port. Baud rate up to 115200bps	
Isolation	4000V AC @ 1mn
Supported protocols	MODBUS RTU DNP3 IEC 60870-5-101

ETHERNET PORT (DUAL / 2 PORTS)

Transformer-isolated 10/100 Base-T Ethernet port – RJ45	
Supported protocols:	MODBUS/TCP (Port 502) DNP3/TCP (Port 20000) IEC 60870-5-104 (Port 2404) IEC 61850 (Port 102)
Number of simultaneous connections	10 (5 MODBUS/TCP + 5 DNP3/TCP)
Isolation	4000V AC @ 1mn

IRIG B

Optically isolated IRIG-B port for GPS time synchronization	
Recommended cable	51Ω low loss - RG58A/U (Belden 8219 or equivalent), BNC connector
Recommended GPS time code generator	Masterclock GPS-200A

ADDITIONAL SPECIFICATIONS

REAL-TIME CLOCK

Accuracy	Typical error ±15 seconds per month / < 5 minutes/year @ 25˚C

LOG MEMORY

16GB memory for long-term waveform and data recording

DISPLAY OPTIONS

1. Three-row LED 7-segment display
2. No display (RPM07x PRO model)

ENVIRONMENTAL CONDITIONS

Operating temp.	-40°C to +70°C (40°F to 158°F)
Display op. temp.	-20°C to +70°C (4°F to 158°F)
Storage temperature	-40°C to +85°C (40°F to 185°F)
Humidity	0 to 95% RH non condensing
Degree of protection	IP51

CONSTRUCTION

Weight	1.23kg (2.7 lb.)
Dimensions	114 x 127 x 127 mm
Dual installation	4'' / 92x92mm cutout

MATERIALS

Case enclosure	Plastic PC/ABS blend
Display body	Plastic PC/ABS blend
Front panel	Plastic PC
PCB	FR4 (UL94-V0)
Terminals	PBT (UL94-V0)
Plug-in connectors	Polyamide PA6.6 (UL94-V0)

STANDARDS COMPLIANCE

PQ STANDARDS

- IEC 61000-4-30 Ed.3.1: Power quality measurement methods
- IEC 61000-4-7: General guide on harmonics and interharmonics measurement and instrumentation
- IEC 61000-4-15: Flickermeter
- IEC 62586-2: Power quality measurement in power supply systems Part 2: Functional tests and uncertainty requirements
- EN50160: Voltage characteristics of electricity supplied by public electricity networks
- IEEE 1159: IEEE recommended practice for monitoring electric power quality

ELECTROMAGNETIC IMMUNITY

- IEC 62052-11, CLC/TR 50579 (conducted disturbances 2-150kHz), IEEE C62.41 and C37.90.1
- 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
- ANSI/IEEE C37.90.1: Fast Transient SWC

ENVIRONMENTAL

- IEC 60529: Protection
- IEC 60068-2-1: Cold
- IEC 60068-2-2: Dry Heat
- IEC 60068-2-30: Damp Heat
- IEC 60068-2-5: Solar Radiation

ACCURACY

- IEC62053-22:2003, class 0.2S
- IEC 62053-24:2014, class 0.5S
- ANSI C12.20 –2015, class 10 (0.2%)

ELECTROMAGNETIC EMISSION

- IEC 61000-6-4* Radiated/Conducted class B
- IEC CISPR 22* Radiated/Conducted class B
- Emission per EN55011/22 class B, FCC p.15 v B

SAFETY/CONSTRUCTION

- IEC 61010, IEC 62052-11 & IEC 61557-12
- UL61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements , Edition 3, Revision Date 07/19/2019
- CSA C22.2 No. 61010-1, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements, Edition 3, Revision Date 11/2018
- AC Impulse Insulation: Meets IEC 62052-11:4000V AC for 1 minute, 6KV/500Ω @ 1.2/50 µs impulse
- IEC 60068-2-6: Vibration (sinusoidal)
- IEC 60068-2-27: Shock Test
- IEC 60068-2-75: Hammer Test
- AS 62052-11*
- NMI M6-1*

ORDER STRING

MODELS

PM172 Panel-mount Power Meter	**PRO-PM172**
PM174 Panel-mount Power Quality Analyzer (US)	**PRO-PM174**
PM175 Panel-mount Power Quality Analyzer (EU)	**PRO-PM175**
Transducer Version	**PRO-RPM07x**

OPTIONS

CURRENT INPUTS

5 Ampere	**5A**
1 Ampere	**1A**
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**
LPCT Sensor Inputs (RJ45) supporting up to 650A primary current, and a secondary of 80 A/150 mV at 50 Hz and 80 A/180 mV at 60 Hz	**LPCT-D**

CALIBRATION AT FREQUENCY

50 Hz	**50HZ**
60 Hz	**60HZ**

OPTIONAL PROTOCOLS

IEC 61850 Communication Protocol	**850**

AUXILIARY POWER SUPPLY (BUILT-IN)

9-36V DC (24V)	**AUX-24DC**