

PRO PM335 / EM235 DATASHEET

PM335

EM235

The compact PRO Series meter is available as the PM335 panel mount (4-inch round / 92x92mm square cutouts) form factor design and the EM235 DIN-rail form factor design.

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

The PRO Series combines and bundles in one physical device multiple features 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 meters are extremely versatile and adaptive.

HIGHLIGHTED FEATURES

- +** Class 0.2S Accuracy (IEC/ANSI)
- +** AC / DC measurements
- +** 16GB on-board memory
- +** IEC 61850 protocol
- +** DNP3, Modbus & 101/104 protocols
- +** Dual port Ethernet
- +** Optical port (IR) supporting IEC 62056-21
- +** USB port (Type C)
- +** Waveform capture and recording
- +** Up to 26 digital and analog I/O

MODELS

PM335 PRO: Panel mounted meter monitoring voltage, current, power, frequency and energy measurements, combined with power quality analysis and data logging capabilities. Features a 3.5" TFT color display.

EM235 PRO: All features as above, in DIN-rail form factor with 1.77" TFT display.

CURRENT INPUTS

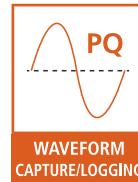
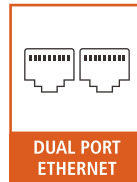
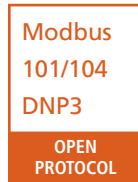
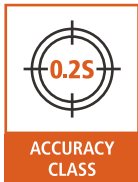
1A or 5A from CT secondary (standard)

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

Hall Effect DC Sensors: utilizing the 40mA HACS inputs for DC Current Measurements



FEATURES



- ▶ Up to 26 external digital triggers from protection relays; onboard zero-sequence currents and volts, current and voltage unbalance; fault waveforms and fast RMS trace; cross triggering between multiple devices via digital inputs for synchronous event capture and recording
- ▶ Event recorder for logging internal diagnostics events, control events and I/O operations.
- ▶ 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
- ▶ Class 0.2S IEC 62053-22 / Class 0.2 C12.20 four-quadrant active and reactive energy polyphase meter
- ▶ Demand Meter: amps, volts, harmonic demands
- ▶ Precise Energy and 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: up to 63rd harmonic for volts and amps; directional power harmonics and power factor; 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 time-code input - future release)
- ▶ Backup power supply unit
- ▶ 4 daisy-chain slots for plug-in I/O/COM modules
- ▶ 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 PRO Series is provided with fully isolated AC inputs for connecting to AC feeders:

- ▶ Three isolated AC voltage inputs (Rating: 10-1000V AC (L-L) @ 50/60 Hz)
- ▶ Four isolated AC current inputs (see pg. 2 for options)

DC Measurements

The PRO Series measures DC voltage and current, calculating DC Power.

- ▶ Three isolated DC voltage inputs (from 10 to 820V DC). Optional: up to 3000V DC (via adapter)
- ▶ DC Voltage Accuracy - 0.2%
- ▶ Four isolated DC current inputs up to 3000A DC (via Hall Effect sensors)
- ▶ DC Current Accuracy - 0.2%

Communication and I/O Modular Expansion Options

The PRO Series meters feature a large range of communication capabilities, as below:

UP TO 4 EXPANSION MODULES SIDE BY SIDE

- ▶ Up to 2 expansion modules: self-energized.
- ▶ 3 expansion modules: requires AUX power supply module

OPTIONAL BUILT-IN I/O PORTS

- ▶ 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 operations, fail-safe operation for alarm notifications; programmable pulse width; direct remote relay control through communications
- ▶ 1 optically isolated analog input; 1mA to 20mA

OPTIONAL DIGITAL I/O MODULES

- ▶ 8 DI: 8 optically isolated digital input options:
 - ▶ Dry contacts
 - ▶ 24/48/125/250V AC/DC wet inputs.
Programmable de-bounce time from 1ms to 1s; 1ms sampling rate; control setpoints, pulse counters and Energy / TOU sub-system, 1pps time synchronization; 1ms sampling rate
- ▶ 4RO: 4 relays: Electro-Mechanic (EMR) or Solid State (SSR) relay option. Unlatched, latched and pulse operations, fail-safe operation for alarm notifications, programmable pulse width and direct remote relay control through communications

OPTIONAL AUXILIARY POWER SUPPLY MODULE

- ▶ Auxiliary Power Supply:
88-264V AC, 125-300V DC

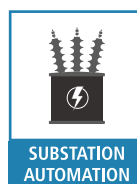
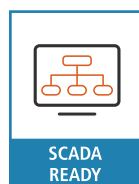
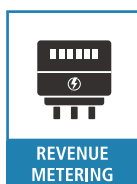
Communication Options

The PRO Series has extensive communication capabilities, including:

STANDARD COMMUNICATION PORTS

- ▶ 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 and IEC 61850 protocols, up to 10 non-intrusive simultaneous connections per Ethernet port
- ▶ Infrared port (19,200 bps) supporting MODBUS RTU/ASCII, DNP3.0 protocols and IEC 62056-21 for local meter data exchange
- ▶ USB 2.0 port (type C)

APPLICATIONS



TECHNICAL SPECIFICATIONS

INPUT RATINGS

VOLTAGE INPUTS

Operating range *	10-1000V AC (L-L)
Operating range for direct DC Voltage*	10-820V DC
Input impedance	4 Mega Ohm
Burden for 400V	≤ 0.04VA
Burden for 120V	< 0.01VA
Isolation	4000V AC @ 1mn
Wire size	up to 14 AWG (≤ 2.5 mm ²)

CURRENT INPUTS

1A or 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 × I _{max}) RMS for ½ second
Optional: 0-20 mA input for DC Hall Effect Sensors	
Optional: Sensors or external Solid or Split core CT (HACS option)	

DIGITAL/ANALOG I/O

BUILT-IN (OPTIONAL)

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 mm ²)
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 mm ²)

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
Connector type	removable, 5 pins
Wire size	14 AWG (up to 1.5mm ²)
Accuracy	< 0.5% FS
Terminal pitch	5mm

ADD-ON MODULES

DIGITAL INPUTS (8 DI)

Dry Contacts, internally wetted	@ 24V DC
Wet contact	@ 250V DC (8DI only)
Sensitivity	Open @ input resistance >100 k**, Closed @ Input resistance < 100**
Galvanic isolation	4000V AC @ 1mn
Internal power supply	24V DC
Scan time	1 ms
Connector type	removable, 2 x 5 pins
Wire size	14 AWG (up to 1.5 mm ²)

DIGITAL OUTPUTS (4 DO)

Electromechanical relay - DRY contact (option 1)

4 relays rated at 5A/250V AC; 5A/30V DC, 1 contact (SPST Form A)	
Galvanic isolation:	
Between contacts & coil	3000V AC @ 1mn
Between open contacts	750V AC
Operate time	10 ms max.
Release time	5 ms max.
Wire size	14 AWG (up to 1.5 mm ²)

Solid state relay - DRY contact (option2)

4 relays rated at 100mA/800V AC, 1 contact (SPST Form A)	
Galvanic isolation	
Between contacts & coil	5000V AC @ 1mn
Between open contacts	800V peak
Operate time	5 ms max.
Release time	5 ms max.
Wire size	14 AWG (up to 1.5 mm ²)
Update time	1 cycle
Wire size	14 AWG (up to 1.5 mm ²)

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

** Measuring up to 3000V DC is possible via adapter

POWER SUPPLY

Rated input	57.7-277V AC @ 50/60 Hz, 48-290V DC
Tolerance	±15%
Burden	11VA@V AC, 6VA@V DC
Isolation	4000V AC @ 1mn
Wire size	Up to 14 AWG (≤2.5 mm ²)

AUXILIARY POWER SUPPLY (AS MODULE)

Rated input	88-264V AC / 125-300V DC
Output	5W
Burden	15VA
Withstanding	4kV AC @ 1min
Wiring	L/+, N/-
Wire size	up to 12 AWG (≤ 2.5 mm ²)

COMMUNICATION PORTS

COM1

RS-485 optically isolated port. Baud rate up to 115200bps

Isolation	4000V AC @ 1mn
Supported protocols	MODBUS RTU DNP3 SATEC ASCII IEC 60870-5-101

COM4

InfraRed COM port, Front Panel access with magnetic head

Supported protocols	MODBUS RTU & DNP3 IEC 62056-21 (for local meter data exchange)
Isolation	4000V AC @ 1mn

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

ADDITIONAL SPECIFICATIONS

REAL-TIME CLOCK

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

16GB memory for long-term waveform and data recording

DISPLAY

PM335 - 3.5" LCD TFT color Display, 320×480 dots resolution

EM235 - 1.77" LCD TFT color Display, 120×160 dots resolution

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	0.70kg (1.54 lb.)
Dimensions (PM335)	108.6 × 74.7 × 113.3 mm
Dimensions (EM235)	89.5 × 72 × 90 mm

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)
Labels	Polyester film (UL94-V0)

* Meets standard requirements

STANDARDS COMPLIANCE
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 0.25
- ▶ IEC 62053-24:2014, class 0.55
- ▶ 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 class 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, 12KV/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

PM335 Panel Mount Power Meter	PRO-PM335
EM235 DIN-rail Mount Power Meter	PRO-EM235
Transducer Version	PRO-RPM035

OPTIONS

CURRENT INPUTS

5 Ampere	5A
1 Ampere	1A
High Accuracy Current Sensors (HACS), 50/60Hz only Requires ordering of 3 HACS	HACS

CALIBRATION AT FREQUENCY

50 Hz	50HZ
60 Hz	60HZ

POWER SUPPLY

88-320V AC / 40-290V DC	ACDC
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INTEGRATED I/Os

2 x digital inputs (dry contact), 1 x Solid State Relay output, 1 x Universal Analog Input (-1mA to 20mA)	IOS
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DISPLAY LANGUAGE

English	EN
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TESTING AND CERTIFICATE

Full functional test, calibration at various work loads & detailed test report	-
Full functional test, calibration at various work loads & detailed test report plus ISO 17025 and ILAC certified calibration certificate	CC

OPTIONAL PROTOCOLS

IEC 61850 Communication Protocol	850
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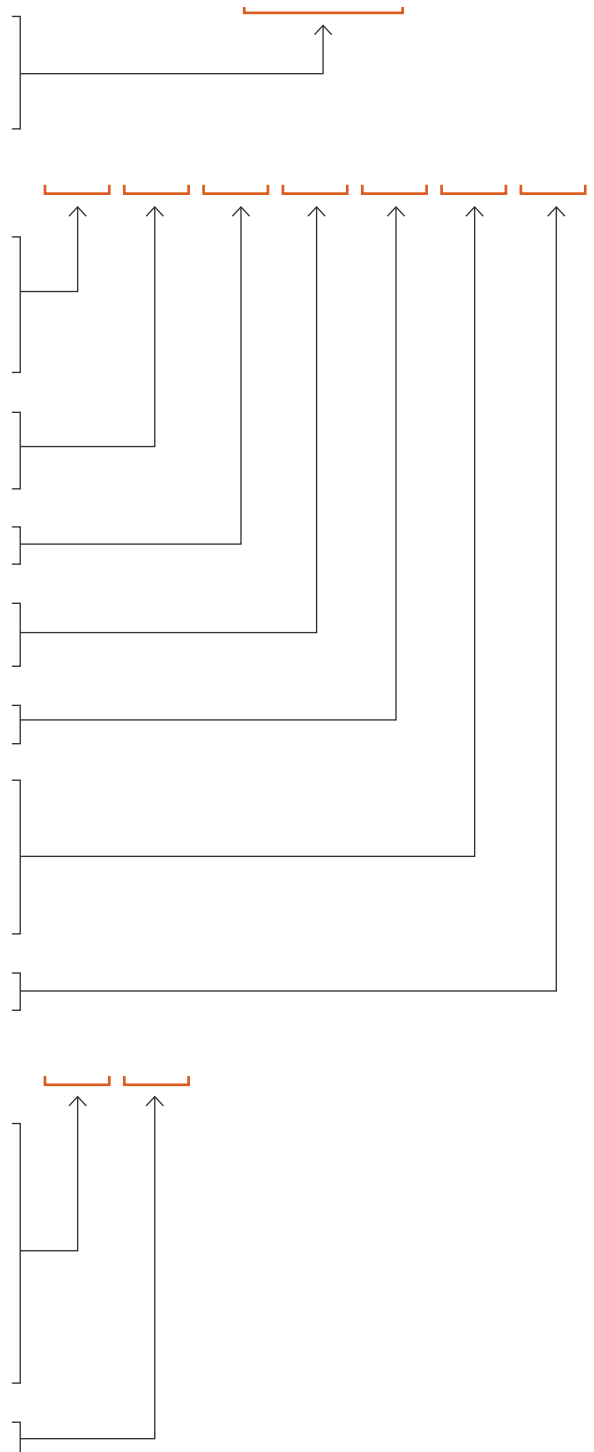
OPTIONAL MODULES *

I/O (MAX. 3 MODULES PER DEVICE)

4 Relay Outputs - 250V / 5A AC	EMR4
4 SSR Outputs - 250V / 0.1A AC	SSR4
8 Digital Inputs - Dry Contact	DI8-DRC
8 Digital Inputs - 24V DC	DI8-24V
8 Digital Inputs - 48V DC	DI8-48V
8 Digital Inputs - 125V DC	DI8-125V
8 Digital Inputs - 250V DC	DI8-250V

AUXILIARY POWER SUPPLY (MAX. 1 PER DEVICE)

AUX. P.S. AC/DC 88-264V AC / 125-300V DC	AUX-ACDC
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* Auxiliary power supply required when configured with 3 modules