The Full Range of Electricity Management Solutions for Every Application

Multi-tenant Submetering
- Asset Management
- Energy Management & Billing

Energy Efficiency & Cost Allocation
- Power Measurement

Utilities & Renewable
- Commercial & Industrial

Power Quality Analysis
- Substation Automation

Smart Grid & Demand Response
- Revenue Metering

Fault Recording
- Electrical Meters

RS-232/422/485, Profibus, Ethernet, Dialup modem, GPRS, RF

The Full Range of Electricity Management Solutions for Every Application
The Experts in Energy Management

Company Profile

Technological excellence, innovation, quality and a commitment to customer service place SATEC at the forefront of the energy industry.

SATEC has been a proven solutions-oriented global leader in the research, development and manufacturing of energy management systems since 1987. With two decades of rich experience in energy management, SATEC provides total solutions for customer applications worldwide. Our greatest strength lies in our deep technological expertise and our ability to provide flexible solutions for a wide range of customer applications.

SATEC exports to over 60 countries worldwide throughout Europe, North and South America, Asia, Oceania and Africa. Our worldwide distribution network provides local marketing service and prompt professional support.

Application-Based Solutions

SATEC's device product line serves both energy utilities and energy consumers in various fields. Our application-based product line includes devices spanning from basic power meters up to high performance revenue meters with advanced power quality analysis capabilities. All SATEC devices comply with world-acknowledged regulations and are supported by our energy management software.

Our cutting-edge power quality analysis capabilities provide a rewarding solution enabling energy utilities to take timely corrective action and permitting energy consumers to prevent equipment failures.

Our Expertise at Your Service

Our team of scientists and industry experts are available to dispense expert technical support, and provide technical solutions to questions ranging from generic to complex. SATEC's support team is closely involved in the development process, to assure a product of the highest quality that is also tailored to our customer's needs.

SATEC Calibration Lab

Our calibration lab is certified by ILAC (International Laboratory Accreditation Cooperation) for compliance with ISO/IEC 17025. ISO/IEC 17025 is general requirements for the competence of testing and calibration laboratories and is the main ISO standard used by testing and calibration laboratories. In most major countries, ISO/IEC 17025 is the standard for which most labs must hold accreditation in order to be deemed technically competent.

100% of our products are tested and calibrated with automatic test calibrator and test and calibration report is generated with option for ISO/IEC 17025 calibration certificate.

SATEC and the Environment

SATEC is committed to protecting the environment. SATEC products help our customers save energy and reduce CO₂ as well as other greenhouse gas emissions, while our unique renewable energy management solutions increase the performance of solar and wind power generation plants. SATEC products are RoHS compliant and are lead free.

Customer Satisfaction

We at SATEC regard our clients as our most valuable asset. We consider excellence of products and service as a key to gaining customer loyalty and satisfaction. Our customer base consists of industrial facilities, commercial enterprises, government and public services, and major power utilities.

SATEC takes pride in catering to the unique needs of our varied customer base. As a leader in the field, we at SATEC set the standard by continuously developing and upgrading our products and services, to perfect our clients' energy management systems. Our products are user-oriented and designed for easy installation and operation.
The PM130/135 are multi-functional 3-phase power meters with basic revenue metering, power quality and harmonics analysis.

The PM130/135 are widely integrated in panel boards and SCADA systems, with integral RS-485 communication port and a wide range of protocols, such as Modbus, DNP 3.0 and IEC 60870. 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 industry standard protocols DNP 3.0, Modbus RTU and IEC 60870-5-101/104, as well as its I/O capabilities (using the Digital Input/Output modules).

The PM130/135 consist of two basic models providing digital measurements of more than 80 electrical parameters locally, and more than 100 electrical parameters via communication: from basic frequency, voltages and currents, to four quadrant power parameters (active, reactive and apparent). The EH models also measure harmonics, energies (active, reactive and apparent) and Time of Use (TOU).

The PM130/135 expansion module allows connection of a second communication port, including Ethernet, Profibus, RF or 2G/3G, as well as second RS-485 and RS-232 ports.

### Measurement Features

<table>
<thead>
<tr>
<th><strong>P</strong></th>
<th>Multi-functional 3-phase power meter functionality (see Features)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EH</strong></td>
<td>All the features of the <strong>P</strong> model, plus Revenue Meter and Power Quality control (see Features)</td>
</tr>
</tbody>
</table>

### Current Inputs

| **1A** | Standard 1A CT |
| **5A** | Standard 5A CT |
| **RS5** | Remote Split Core for Standard 5A CT |
| **HACS** | High Accuracy Current Sensors (see pg. 15) |

### Basic Power Quality *

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

### Revenue Meter *

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

### Alarm and Control Functions

- 16 programmable set-points
- 4 counters

### Real Time Clock

- Built-in clock and calendar functions
- RTC battery backup *

### Communication protocols

- Modbus RTU, ASCII, DNP 3.0, Modbus/TCP, DNP3/TCP, Profibus DP, IEC 60870-5-101, IEC 60870-5-104 (EM133-AR supports Modbus protocols only)

* See comparison table on page 5
EM132/133 Series

EM132
Multi-Function Transducer

The EM132 is a cost-effective multi-function transducer with local display, designed to replace analog or digital transducers. Its local display allows setup and verification of installation, without the hassle of using computers. One device supports all network configurations (i.e., 3 wire, 4 wire, wye, delta, etc.) and is field configurable.

The unique field installable add-on feature allows adding digital and analog I/Os. When using the 4 analog output add-on, the EM132 can replace 4 analog 4-20mA transducers. Each one can be freely programmed to any parameter and scaling.

EM133 / EM133-AR
TOU Smart Energy Meter

Comprehensive multi-functional energy meter, providing a complete range of energy measurement and management. The EM133 measures the electrical energy and connects via digital inputs to water, gas or air condition meters. A built-in relay output can be freely programmed to remotely disconnect the supply (using external contactors), raising alarms or pulsing. The information is displayed locally and is available via communication.

The field-installable add-on feature allows adding digital and analog I/Os to facilitate any control scheme (up to 14 digital inputs and 5 relay outputs).

The AR model (Advanced Residential) also displays and stores present, previous and before previous day, week, month and quarter of all energy, hot and cold water and gas, with customized pulse multiplication factors and labels.

### Models

**Measurement Features**

<table>
<thead>
<tr>
<th>Models</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM132</td>
<td>Multi-functional 3-phase power transducer functionality (see Features on pg. 4)</td>
</tr>
<tr>
<td>EM132-TP</td>
<td>All the features of the EM132, plus two integral RS-485 ports</td>
</tr>
<tr>
<td>EM133</td>
<td>All the features of the EM132 model, TOU, 2xDI, DO and Harmonic measurements (see Features on pg. 4)</td>
</tr>
<tr>
<td>EM133-AR</td>
<td>Similar to the EM133 plus detailed energy display and accumulation</td>
</tr>
</tbody>
</table>

### Current Inputs

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Standard 1A CT</td>
</tr>
<tr>
<td>5A</td>
<td>Standard 5A CT</td>
</tr>
<tr>
<td>RS5</td>
<td>Remote Split Core for standard 5A CT</td>
</tr>
<tr>
<td>HACS</td>
<td>High Accuracy Current Sensors (see pg. 15)</td>
</tr>
<tr>
<td>63A</td>
<td>Direct Connection</td>
</tr>
</tbody>
</table>

### COMPARISON

<table>
<thead>
<tr>
<th>Feature</th>
<th>PM13X-P</th>
<th>PM13X-EH</th>
<th>EM132</th>
<th>EM133</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Power Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Revenue Meter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event/Data Log</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real Time Clock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTC battery backup</td>
<td>130: with TOU module (see pg. 4) / 135EH: included</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Power Supply</td>
<td>85-265V AC 50/60 Hz, 88-290V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optional Power Supply (replaces the standard PS)</td>
<td>12V DC</td>
<td>12/24/48V DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Communication</td>
<td>RS-485</td>
<td>RS-485 (x2 for EM132-TP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Digital I/O</td>
<td></td>
<td>2DI, 1DO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>PM130: 3-line LED / PM135: graphic LCD</td>
<td>2x16 characters LCD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td>Dual panel mounting: 4” Round; Square 96x96 DIN</td>
<td>DIN Rail sealable connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>1.5 lbs / 0.7 kg</td>
<td>1.2 lbs / 0.53 kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions HxWxD</td>
<td>4.5×4.5×4.3“ / 114×114×109mm</td>
<td>3.5×4.9×2.7“ / 90×125×68.5mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The wide choice of plug-in modules includes:

**2nd Comm. port**
- Small form
- One of the following:
  - Ethernet (TCP/IP)
  - PROFIBUS
  - RS-232/422/485
  - Cellular Modem
  - CANopen (CAN Bus)
  - RF *
- * Module & accessories available in certain regions only

**Analog Outputs**
- Small form
- 4 analog outputs, selection of ranges upon order:
  - ±1mA
  - 0-20mA
  - 0-1mA
  - 4-20mA
  - 0-3mA
  - ±3mA
  - 0-5mA
  - ±5mA

**Digital I/O**
- Small form
- 4 Digital Inputs (Dry Contact) / 2 Relay Outputs 250V / 5A AC
- 4 Digital Inputs (dry contact) / 2 SSR outputs 250V / 0.1A AC
- 8 Digital Inputs (dry contactor)
- 4 Digital Inputs (dry contact) with RTC battery backup for TOU (PM13X models only)

**Digital I/O**
- Large form
- Comprehensive expansion module that includes:
  - 12 Digital Inputs (Dry Contact or 250V DC)
  - 4 Relay Outputs 250V/5A AC
  - Optional selection of Ethernet or RS-485

The 13X modular approach enables users to assemble a system that meets their specific needs.

Dimensions (HxWxD):
- Small form: 2.8×1.8×1.3” / 72×46×34 mm
- Large form: 3.7×3×1.7” / 95×77×45 mm
The PM172 is a high performance feeder monitoring instrument that includes revenue class measurements and logging capability. With over 100 electrical measurements, long term memory logging capability and breaker contact status inputs, this series is an economical approach to distribution automation for utilities. The PM172 series is widely integrated in panel boards and SCADA systems by commercial and industrial facilities. It is also successfully used for electric generator applications.

Revenue class metering and the built-in TOU function provide a solid background for commercial and industrial submetering applications. The event and data log on the basis of programmable set-points is a differentiating feature of the PM172 series. This capability facilitates a wide range of commercial and industrial applications demanding data analysis as well as corrective actions for specific recorded events. The recorded data is a valuable asset for energy management.

The PM172 series includes a choice of built-in communication platforms, such as modem, Ethernet, Profibus and serial communication.

Features

**Multi-functional 3-Phase Power Meter**
- Voltage, current (incl. neutral current), power, energy, power factor, frequency, voltage/current unbalance, load profile

**Multi-Tariff Revenue Meter (E/EH Models)**
- Exceeds accuracy class 0.2S
- Built-in Time of Use (TOU) tariffs to meet any billing requirements
- Sealing option

**Power Quality Monitoring (EH Model)**
- Individual voltage and current harmonics (up to the 40th via display / 63rd via PAS)
- Voltage and current THD, TDD & K-Factor
- Total Harmonic Powers
- Total Harmonic Energies
- Waveform recording with 6 channels (3 voltage inputs, 3 current inputs)

**Real Time Clock**
- Built-in clock and calendar functions with back-up battery
- Time synchronization via communication port or digital input

**Event/Data Log**
- Logging capability for more than 100 parameters
- Logging parameters with real-time stamps

**Alarm and Control Functions**
- 16 programmable set-points
- 2 programmable relay outputs 3A, 250V
- 2 digital inputs
- Optional 2AI or 2AO
- Optional 2DI+2DO (total 4DI+4DO)

**Power Supply**
- AC/DC: 85-264V AC, 88-290V DC
- Optional: 12V DC, 24V DC, 48V DC

**Communication**
- 2 independent communication ports (RS-232, RS-422, RS-485, modem, Ethernet, Profibus DP, GPRS)
- Protocols: Modbus RTU, ASCII, DNP 3.0, Modbus/TCP, DNP3/TCP

**Construction**
- Full galvanic isolation of voltage and current measuring circuits—6 kV Impulse
- Dual panel mounting: 4” Round; Square 96×96 DIN
- **Weight** (LED display): 2.7 lbs / 1.23 kg
- **HxWxD** (LED display): 5x5x5.6” / 127x127x143 mm

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Models

**Measurement Features**

<table>
<thead>
<tr>
<th>Description</th>
<th>Model Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P Multi-functional 3-phase power meter functionality (see Features)</td>
<td>P</td>
</tr>
<tr>
<td>E All the features of the P model + revenue meter (see Features)</td>
<td>E</td>
</tr>
<tr>
<td>EH* All the features of the E model + power quality monitoring (see Features) *</td>
<td>EH*</td>
</tr>
</tbody>
</table>

**Current Inputs**

<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1A</td>
<td>Standard 1A CT</td>
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<td>5A</td>
<td>Standard 5A CT</td>
</tr>
<tr>
<td>RS5</td>
<td>Remote Split Core for Standard 5A CT</td>
</tr>
<tr>
<td>HACS</td>
<td>High Accuracy Current Sensors (pg. 15)</td>
</tr>
</tbody>
</table>

**Displays**

The PM172 Series offers a selection of display modules: see pg. 14
SATEC’s Branch Feeder Monitor™ (BFM) products provide energy management for multi-point power solutions. The BFM product line includes the well established BFM136, with an install base of over a million channels, and the modular BFM-II. See next page for the differences.

Ideal for both new and retrofit projects, the BFMs automatically provide metering, demand and energy readings, logging and multi-tariff (TOU) data. The BFM-II monitors up to 18 three-phase circuits, 54 single-phase circuits, or any combination of single or three-phase circuits. This flexibility makes the BFM-II perfect for multi-tenant facilities such as residential projects, office buildings and shopping malls as well as substation automation and industrial control. Its modular design offers a selection of 18, 24, 30, 36, 42 or 54 channels to fit any requirement and to easily fit into existing panel boards or be flush mounted nearby, thus eliminating the need for expensive retrofit projects or for allocating extra space for the device.

The BFM-II supports power quality monitoring to identify existing and potential operation problems, such as overloading or malfunctioning due to voltage or current harmonics, or voltage sags and swells (contact SATEC for availability).

The BFM-II utilizes High Accuracy Current Sensors (HACS), which measure and report the current consumed by each of the branch circuits at the panel board. For billing purposes, single or multiple circuits can be defined for each customer. This flexibility allows for a simple reassignment of circuit groups without wiring changes, and enables easy changes when tenants move in and out. Main panel board or load center installation makes for a valuable saving of both time and money.

The BFM’s user-defined and easily configured alarm system enables users to take predictive maintenance action in order to avoid unnecessary outages.

Features

- Multi-channel submetering – up to 54 single-phase, 27 two-phase or 18 three-phase meters in a single device. Any combination of single-, two-, and three-phase consumers can be chosen up to a total of 54 current inputs.
- Automatic totalization energy from different consumers
- Modular design allows selection of 18, 24, 30, 36, 42 or 54 submeters
- Supports high accuracy current transformers with Class 0.5S accuracy
- 3-phase/2-phase/single-phase meters (true RMS, volts, amps, power, power factor, neutral current)
- Ampere/Volt demand meter
- Time-of-Use, 8 energy/demand registers
- x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day, easy programmable tariff schedule
- Automatic 120-day daily profile for energy and maximum demand readings (total and tariff registers) for each submeter
- Power quality monitoring including voltage and current harmonics (up to the 25th), voltage sags, voltage swells and interruptions (contact SATEC for availability)
- Event recorder for logging internal diagnostic events and setpoint operations
- Data recorders: programmable periodical data logs for each submeter
- Embedded programmable controller (4 control setpoints, programmable thresholds and delays) for each submeter
- Optional 3.5” 320×240 pixels touch screen display with backlight
- Internal clock, keeping the clock running for years without external power
- Standard RS-485, Ethernet and USB ports
- Optional cellular communication port plug-in module
- Optional 9/18 digital inputs or 4 analog inputs module
- Modbus RTU, Modbus TCP, DNP3.0 and DNP/TCP communication protocols
- Easy field upgrading device firmware

Split Core HACS
BFM-II Add-On Modules

9 OR 18 DIGITAL INPUTS
- Optically isolated input, dry contact sensing (voltage-free)
- Internal power supply 5V DC
- Sensitivity:
  - Open @ input resistance >16kOhm, Closed @ input resistance <10kOhm
- Scan time: 1 cycle.
- Withstanding insulation: 4kVAC@1min
- Wire: 28-16 AWG (0.1-1.5 mm²), 600V isolation
- Terminal pitch: 3.81mm

4 ANALOG INPUTS
- Ranges (upon order):
  - ±1 mA (100% overload)
  - 0-20 mA
  - 4-20 mA
  - 0-1 mA (100% overload)
- Scan time: 2 cycles
- Withstanding insulation: 4kVAC@1min
- Wire: 28-16 AWG (0.1-1.5 mm²), 600V isolation
- Terminal pitch: 5 mm

COMPARISON

<table>
<thead>
<tr>
<th></th>
<th>BFM136</th>
<th>BFM-II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>36</td>
<td>18-54</td>
</tr>
<tr>
<td>Memory</td>
<td>8MB</td>
<td>256MB</td>
</tr>
<tr>
<td>Power Quality</td>
<td>-</td>
<td>Harmonics (25), sags, swells, interruptions</td>
</tr>
<tr>
<td>Optional Power Supply</td>
<td>-</td>
<td>50-290V AC, 40/90-290V DC</td>
</tr>
<tr>
<td>Standard Communication</td>
<td>RS-485</td>
<td>RS-485 / ethernet / USB</td>
</tr>
<tr>
<td>Optional Communication</td>
<td>RS-232 / cellular / RF / ethernet</td>
<td>Cellular modem RS-422/485</td>
</tr>
<tr>
<td>I/O</td>
<td>-</td>
<td>Up to 72 DI / 18 DO</td>
</tr>
<tr>
<td>Display</td>
<td>2x16 characters LCD</td>
<td>3.5” graphic touch screen</td>
</tr>
<tr>
<td>Construction</td>
<td>Compact ruggedized metal enclosure</td>
<td>Configurable, modular polycarbonate units</td>
</tr>
<tr>
<td>Certification</td>
<td>Manifold worldwide certifications</td>
<td>CE approved, more under testing</td>
</tr>
<tr>
<td>Weight</td>
<td>4.2 lbs / 1.9 kg</td>
<td>3.5 lbs / 1.6 kg</td>
</tr>
<tr>
<td>Dimensions</td>
<td>4.2x13x2.3” / 107x331x58 mm</td>
<td>5x10.9x2.8” / 128x278x72.5 mm</td>
</tr>
<tr>
<td></td>
<td>[W] 18 ch.: +5.5”/138 mm, Add-on: +2.2”/55 mm</td>
<td></td>
</tr>
</tbody>
</table>
PM174 / PM175
IEEE1159 / EN50160 / GOST 13109 / GOST 32144-2013
Advanced Power Quality Analyzers

The Advanced Power Quality Analyzers PM174/5 are compact, multi-functional three-phase power and revenue meters equipped with advanced power quality analysis capabilities.

The analyzers have been developed to answer the needs of a wide range of users: substation operators, electrical energy system integrators, generator users, industrial and commercial energy consumers. These analyzers cover the entire range of applications demanding high performance power quality monitoring and root cause analysis.

The PM174 provides the full range of power quality monitoring, logging and statistics according to IEEE1159. The PM175 provides similar performance according to EN50160, GOST 13109 or GOST R 32144-2013.

The PM174/5 allows both suppliers and consumers to monitor the quality of outgoing or incoming electric power. This enables power suppliers to prepare timely corrective action, and helps consumers prevent equipment damages caused by power quality issues.

Features

**Multi-Functional 3-Phase Power Meter**
- Voltage, current (incl. neutral current), power, energy, power factor, frequency, voltage/current unbalance, load profile

**Multi-Tariff Revenue Meter**
- Accuracy class 0.2S according to ANSI C12.20 / IEC 62053-22
- Built-in Time of Use (TOU) tariffs to meet any billing requirements
- Sealing option
- Built-in clock and calendar functions with back-up battery
- Time synchronization via communication port or digital input

**Advanced Power Quality Analysis**
- Monitoring, statistics & reports according to EN50160, IEEE1159, GOST 13109 or GOST 32144-2013 specifications
- Power Quality event logging with waveform recording

- Directional power harmonics (via PAS)
- Waveform recording with 6 channels (3 voltage inputs, 3 current inputs)
- Harmonics & inter-harmonics according to IEC 61000-4-7 (up to the 40th via display / 63rd via PAS)
- Voltage and current THD, current TDD, K-Factor
- Flicker according to IEC 61000-4-15
- Dips, swells, interruptions and transient recording with waveforms

**Event/Data Log**
- Power quality event/data logging
- Logging capability for more than 100 parameters
- Logging parameters with real-time stamps

**Alarm and Control Functions**
- 16 programmable set-points
- 2 programmable relay outputs 3A, 250V
- 2 digital inputs

- Optional 2AI or 2AO
- Optional 2DI+2DO (total 4DI+4DO)

**Power Supply**
- AC/DC: 85-264V AC, 88-290V DC
- Optional: 12V DC, 24V DC, 48V DC

**Communication**
- 2 independent communication ports (RS-232/422/485, modem, Ethernet, Proflbus DP, GPRS)
- Protocols: Modbus RTU, ASCII, DNP 3.0, Modbus/TCP, DNP3/TCP

**Construction**
- Full galvanic isolation of voltage and current measuring circuits—6 kV Impulse
- Dual panel mounting: 4” Round; Square 96x96 DIN
- Weight: 2.7 lbs / 1.23 kg (LED display)
- HxWxD: 5x5x5.6” / 127x127x143 mm (LED display)
PM180
High Performance Analyzer for Versatile Uses

SATEC eXpertMeter™ PM180 is a high performance analyzer that allows versatile uses. The high performance of the PM180, together with the unique flexible design of the expansion cards, enables its use in a large variety of applications, in which it can substitute several other devices—saving costs, space and complexity.

Examples of Applications
Each function of the PM180 uses cutting edge technologies to provide maximum performance and flexibility while keeping it cost-effective:

- IED with IEC 61850 protocol
- Industrial and Substation Automation controller
- High accuracy Power Quality Analyzer (PQA)
- Revenue grade Check Meter
- Digital Fault Recorder (DFR)
- Sequence of Events (SoE)
- Motors and Large Loads Monitoring

Display
For a choice of displays, see pg. 14.

Modular Design
- Transient Recorder Module
  (4 voltage channels, up to 2kV and 1024 samples per cycle per channel)
- Fault Recorder Module
  (4 current channels, up to 200A)
- Digital Inputs (16 DI/Card, Max. 48 DI)
- Relay Outputs (8 RO/Card, Max. 24 RO)
- 4 Analog Input / 4 Analog Output Module (4AI/4AO/Card, Max. 12AI/12AO)
- IRIG-B and RS-422/485 port
- TXFX (Fiber Optic) and RS-422/485 port
- Auxiliary Power Supply
  (85-265V AC / 40-300V DC or 9.5-36V DC)

ezPAC™ SA300
The ezPAC™ SA300, the PM180 predecessor, offers up to 128 DI, 64 RO or 16 AI0, but without few of PM180’s features. Contact SATEC for details.

Features

Multi-Functional 3-Phase Power Meter
- Accuracy class 0.25 Revenue Meter
- Voltage, current (including neutral), power, energy, power factor, demands, frequency, voltage/current unbalance, load profile
- 1 AC/DC voltage input (up to 400V AC / 300V DC)

Fault Recorder
- Up to 100A fault currents (200A with DFR module)
- Pre and post fault recording
- Fault distance calculations
- Fault reports
- Up to 48 fast (1 ms) digital inputs
- Sequence of events with 1 ms accuracy

Advanced Power Quality Analysis
- Power quality according to IEC 61000-4-30 Class A
- Power quality analysis, statistics & reports according to IEEEl1159, EN50160, GOST 13109 or GOST 32144-2013
- Sags/swells detection and logging
- Interruptions detection and logging
- Harmonics & inter-harmonics according to IEC 61000-4-7
- Directional power harmonics
- Voltage and current THD, current TDD and K-factor
- Flicker measurement according to IEC 61000-4-15
- Transient detection and logging
- 4 voltage and 4 current inputs for fast waveform recording
- Up to 56 channel simultaneous recording (7 AC, 1V AC/DC, & 48 digital input channels)

Transient Recorder
- High Speed Transient detection as little as 17 μs @ 60Hz / 20 μs @ 50Hz
- Transients measured relative to ground
- Measures up to 2 kV pulses

Event/Data Log
- Built-in 256 MB logging memory
- Synchronized waveforms from multiple devices in a single plot (via PAS—pg. 20)
- Power Quality events with waveforms
- Multiple parameter logging with real-time stamps

Control & Alarm Functions
- 64 programmable set-points
- 3 slots for hot swap plug-in I/O modules
- Up to 3 modules of 16-channel DI
- Up to 3 modules of 8-channel RO
- Up to 2 modules of 4-channel AI/AO
- Accurate time sync. (SNTP, DI, IRIG-B)

Multiple Comm. Ports & Protocols
- Standard communication:
  Ethernet, USB, RS-232/485
- Optional communication: IR, front USB, Fiber Optic Ethernet, RS-422/485.
  To be released: WiFi and 2G/3G Modem
- Ethernet: optional 2 Ethernet ports for 10/100 Base-T redundancy with fiber optic module
- Standard protocols: Modbus RTU, ASCII, Modbus/TCP, DNP 3.0, DNP3/TCP
- IEC 60870-5-101 and -104
- Optional protocol: IEC 61850 (MMS and GOOSE Messaging)

Construction
- Weight: 5.51 lbs / 2.5 kg
- HxWxD: 6x8.7x8.3” / 152x220x210 mm
The eXpertMeter™ EM720 and EM920 are 4-in-1 multi-functional energy analyzers that include Class A power meter, high precision revenue meter, unsurpassed power quality analyzer and unique digital fault recorder. They differ in their mechanical construction (the EM720 is built to comply with IEC standards while the EM920 is a socket meter), I/O and add-ons.

The eXpertMeter™ all-in-one solution was developed to comply with the most demanding customer requirements in energy generation and distribution (power stations, electric companies, substation operators, electric energy system integrators) and in energy consumer segments (industrial and commercial).

The EM720/EM920 take the AMI (or AMR) to a new level, by adding power quality and fault recording to gain complete control over the smart grid.

Features

Multi-Functional 3-Phase Power Meter
- Voltage, current (including neutral current), power, energy, power factor, frequency, voltage/current unbalance, load profile
- GOST 32144-2013 (EM720 only)
- Back-up battery and/or auxiliary power supply for recording major dips and interruptions
- Harmonics & Inter-harmonics according to IEC 61000-4-7
- Directional power harmonics (via PAS—see pg. 20)
- Voltage and current THD, current TDD, k-factor
- Flicker measurement according to IEC 61000-4-15
- Waveform recording, up to 1024 samples/cycle (Transient model only)
- Three voltage & four current inputs for waveform records
- Dips, swells, interruptions
- Fault recording
- Four measured and recorded currents up to 50 A (10In)
- ITI (CBEMA) curves (via PAS)

Multi-Tariff Revenue Meter
- Precise 0.05% measurement
- Accuracy class 0.2S according to IEC 62053-22 / ANSI C12.20
- Time of Use (TOU) tariffs to meet any billing requirements (8 tariffs, 4 seasons)
- Unique anti-vandalism & anti-tampering features
- Transformer and transmission line losses calculation (8 points, PT & CT)

Advanced Power Quality Analysis
- Power Quality Analysis according to IEC 61000-4-30 Class A
- Built-in EN50160 statistics & reports
- GOST 13109

Transient Recorder
- High Speed Transient detection as little as 17 μs @ 60Hz / 20 μs @ 50Hz
- Transients measured relative to ground
- Measures up to 2 kV pulses

Event/Data Log
- Power Quality events with waveforms
- Logging capability for more than 100 parameters with real-time stamps
- Logging memory 16 MB built-in
- Time synchronization—IRIG-B (GPS), Ethernet (SNTP) or Digital Input

Additional Features
- I/O and Comm. Ports isolation—4 kV AC
- Optional Remote Display Module (RDM)
- LED front panel display (see pg. 14)
- Anti-tampering and self test functions
**eXpertMeter™ EM720**

The EM720’s unique “Add-On” hot-swap module concept allows you to configure the meter to your changing needs, thus saving valuable time in the field or future costly replacements. Technological advancements revitalize legacy applications to rapidly and cost-efficiently respond to changing market conditions.

### Models
- EM720: Standard
- EM720T: Transient Power Master

### Alarm and Control Functions
- 16 programmable set-points
- 4 digital inputs with 1 ms sample rate
- Up to 4 programmable relay outputs
- Up to 4 digital inputs with ½ cycle sampling rate

### Rechargeable battery
- Up to 6 hours full operation

### Communications
- RS-232/RS-485/Ethernet/USB/GPRS/IR
- Protocols: Modbus RTU, ASCII, DNP 3.0, Modbus/TCP, DNP3/TCP, IEC 62056-21/61 (OBIS), IEC 61850

### Construction
- **Weight**: 3.39 lbs / 2.9 kg
- **HxWxD**: 12×7×5.7" / 303×177×144 mm

---

**eXpertMeter™ EM920**

The Model EM920 eXpertMeter™ is an advanced energy meter that exceeds Class 0.2S class revenue billing requirement. It provides long term memory for load and trend profiles, as well as battery backup and auxiliary power supply that allow logging even during power outages. The EM920 also includes advanced power quality analysis to detect and record waveform events and fault currents harmful to power systems.

### Models
- EM920: Standard
- EM720T: Transient Power Master

### Alarm and Control Functions
- 16 programmable set-points
- 4 digital inputs with 1 ms sample rate
- Up to 8 digital inputs with ½ cycle sample rate
- 1 KYZ relay output
- Up to 6 programmable relay outputs
- Up to 4 programmable analog outputs

### Communications
- RS-232/RS-485/Ethernet/USB/GPRS/IR
- Protocols: Modbus RTU, ASCII, DNP 3.0, Modbus/TCP, DNP3/TCP, IEC 62056-21/61 (OBIS), IEC 61850

### Display Customization
- Customized display screens
- Customized logo import

### Construction
- **Weight**: 3.3 lbs / 1.5 kg
- **H×Diameter**: 8.5×7" / 214.3×176.7 mm

---

**EM920 Modules**

- **Transient**
  - Transient module

### Communications
- Ethernet / IRIG-B / RS-232/485
- GPRS/GSM

### Input/Output—2DI/2DO
- 6 relay outputs (2 form A, 4 form C)
- 8 digital inputs
- 4 analog outputs ±1mA
- 4 analog outputs 0-1 mA
- 4 analog outputs 0-20 mA
- 4 analog outputs 4-20 mA

### Auxiliary Power Supply Options
- 50-288V AC and 90-290V DC

---

**Field Replaceable Hot Swap Modules**

### Communication Modules
- RS-232/485 / IRIG-B
- Ethernet / USB / RS-232/485
- GPRS/GSM

### Auxiliary Power Supply Options
- 24V DC
- 88-265V AC and 90-290V DC
- 6H battery power supply option

### Digital Input/Output—2DI/2DO
- Form A Relay Output 250V AC/5A
- Form A Solid State Relay Output 250V AC/0.1A
Displays

RGM180 Graphic Touch Screen

The RGM180 is a 5.7” large color graphic touch screen that takes power quality and energy monitoring to a new level.

The RGM180 displays comprehensive information in an easy to read screen that allows monitoring complex information at a glance.

Compatible Devices

- EM132/133
- PM130 PLUS/PM135
- PM172
- PM174/175
- BFM136/II
- EM720/920
- PM180
- ezPAC™

RGM180-G1

The RGM180-G1 controls and monitors data from a single SATEC Instrument. The RGM180-G1 adds to existing SATEC meter devices full speed USB 2.0 capabilities.

RGM180-G3

The RGM180-G3 controls and monitors data from up to 32 SATEC eXpertMeters™ over RS-485, or up to 36 SATEC eXpertMeters™ over 10/100 Base-T Ethernet.

RGM180 Features

- 5.7” color graphic display with touch panel, TFT technology with LED backlight
- High speed RS-485 communication port at up to 480kb/s
- 10/100 MB RJ45 Ethernet
- Wide range operating temperature: −4°F to +158°F / −20°C to +70°C
- More than 500,000 touch screen operation lifetime
- Programmable system setup, including multi-language support
- Plug & Play device display detecting SATEC device type for device monitoring and configuration
- Programmable screen saver
- Extends SATEC eXpertMeters™ with full speed USB 2.0 port
- Dual power source (RGM180-G3): power over Ethernet (PoE) or external AC/DC-DC/DC. Can be connected in parallel
- Weight: 1.54 lbs / 0.7 kg
- H×W×D: 7.1×8.7x1.9” / 181×221×48 mm

Remote Display Monitors

Remote displays for SATEC RPM Transducers or second display for SATEC instruments via RS-485, with 3-Phase-at-Once bright LED display. The remote monitors display measured parameters and allow menu driven set up.

- RDM172 For PM172 Series
- RDM174 / RDM175 For PM174/5 Series
- RDM174 Green Green Solar Monitoring for PM174
- RDM180 For PM180
- RDM300 For ezPAC™ (SA320 / SA330)
- RDM312 Multi-window display module for PM17X, PM180 and ezPAC™

Transducers

Non-display Remote Power Meters for panel/wall or DIN rail mounting.

- RPM072 PM172 transducer
- RPM074 PM174 transducer
- RPM075 PM175 transducer
# HACS
High Accuracy Current Sensors

The following products can be ordered with dedicated High Accuracy Current Sensors (HACS) rather than with the standard 1A/5A CT input:

- EM132/133 Series
- PM130 PLUS Series
- PM135
- BFM136/BFM-II
- SA330 ezPAC™
- PM172 Series
- PM174/175
- PM180

All HACS have a built-in automatic protection circuit for maximum safety, eliminating the need to use shorting bars.

**Note:** the selection of HACS varies according to your choice of instruments.

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<thead>
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<th>P/N</th>
<th>RATING</th>
<th>CORE</th>
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<td>Ø 0.6</td>
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<tr>
<td>CS1</td>
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<td>Solid</td>
<td>Ø 0.5</td>
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<tr>
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<td>Ø 0.9</td>
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<tr>
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<td>100A</td>
<td>Split</td>
<td>Ø 0.6</td>
</tr>
<tr>
<td>CS1H</td>
<td>100A</td>
<td>Split</td>
<td>Ø 0.5</td>
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<tr>
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<td>CS2S</td>
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<tr>
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<td>200A</td>
<td>Split</td>
<td>1.7x1.3</td>
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<tr>
<th>P/N</th>
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<th>CORE</th>
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<td>CS30S</td>
<td>3000A</td>
<td>Split</td>
<td>3.1x6.3</td>
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</table>

Accuracy:
- Solid Core: 0.1% / Split Core: 0.5%

All HACS are supplied with 8ft / 2.5m cable. Maximum cable length: 650ft / 200m.
PTS175 / PTS180
Pole-Top MV Monitoring with Unique Sensors (PT/CT)
For Smart Grid Deployment

Features

**SENSEORS**

**Electrical Ratings**
- **Insulation Class**
  - Model 9650/E1104 — 15kV
  - Model 9660/E1304 — 25kV
  - Models 9670/C14C0 — 35kV
- **Impulse**
  - Model 9650/E1104 — 110kV
  - Model 9660/E1304 — 150kV
  - Models 9670/C14C0 — 200kV

**Construction**
- **Materials:** molded from POLYSIL, a high dielectric strength, anti-tracking polymer concrete
- **Weight**
  - Model 9650/E1104 — 39 Lbs / 17.7 kg
  - Model 9660/E1304 — 49 Lbs / 22.2 kg
  - Models 9670/C14C0 — 59 Lbs / 26.7 kg
- **Conductor Diameter:** 0.25” to 1.25” / 6.35mm to 31.7mm

**ANALYZER**

PM174/5—See pg. 10

**ENCLOSURE**
- **Protection:** IP 65
- **Weight:** 18.7 lbs / 8.5 kg
- **HxWxD:** 19.7x15.7x7.9” / 500x400x200 mm

The PM175 and PM180 can be supplied with Line Post Sensors for replacing of existing pole isolators with voltage and current sensors for MV grids of 15kV, 25kV or 35kV.

Helps Manage:
- Line losses
- Capacitor controls
- Voltage regulation
- Outage detection
- Load balance
- Harmonics
- Fault location
- Power theft
- Compact, economical power-line sensing
- No line cutting
- Not for dead-end use
- Linear outputs up to fault levels
- Accurate performance
- Non-hazardous voltage on output
- Completely sealed against moisture

The MV Sensors are designed for Distribution Automation to provide:
The ETC-II offers full control of entire power systems, from anywhere, anytime, via an Internet/Ethernet connection, and supports several protocols. Its compact design and easy DIN/Rail wall mounting allow for ease of use.

Operation Modes

1. **Transparent**
   From serial communication to TCP/IP communication

2. **Data Server Applications**
   The ETC-II Data Server provides the user with a mechanism that allows data accumulation from instruments in a background mode, using Modbus protocol (Modbus master). The instruments and register range for polling are defined in the polling tables. A total of 64 address ranges can be defined. The data is stored in a buffer, where 120 16-bit registers are reserved for each server address range. Users can specify up to 120 contiguous registers (per address range) in the connected instrument that would be continuously polled and updated in the server register array. Any number of device register ranges can be defined for each instrument.

   Important features include:
   - Memory logging
   - Reduction of network traffic
   - Backup memory for Internet and other applications

Features

- Ethernet 10/100 MBit port
- USB port
- Two RS-422/RS-485 ports—Master
- One RS-232 port—Slave
- Provides support for communication protocols Modbus/TCP, Modbus RTU
- Real Time Clock
- Large non-volatile memory
- Terminal connection
- Telnet service
- Field setup
- Wide range of power supply options
- Compact design
- Table top (DIN rail and wall mounting option)

**Weight:** 1.76 lbs / 0.8 kg

**H×W×D:** 3.7×7.3×5.6" / 95×186×144 mm

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**RSC232 Communications Converter**

The RSC232 communications converter, with a built-in power supply, is designed to handle up to 31 IEDs connected via RS-485 up to 1200 meters/4000 feet. It can be powered from AC/DC power supply, and permits easy conversion of RS-232 PC signals into full duplex (RS-422) or half duplex (RS-485) communication. DIN/Rail Wall Mounting.

**Construction:** Weight: 0.55 lbs / 0.25 kg, H×W×D: 6×1.6×3.3" / 154×41×84 mm

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**AX-8 Analog Expander**

The AX-8 Analog Expander enables power meters to interface with other devices that require analog signals. The AX-8 can be connected to any power meter equipped with an RS-422 communication port and an analog expander option. 8 channels are provided for high-resolution analog output. Two units can be connected in sequence, providing as many as 16 analog outputs with the use of one power meter. A wide range of options offers current output or voltage output. **Construction:** Weight: 1.54 lbs / 0.7 kg, H×W×D: 3×7.3×5.1" / 76×186×130 mm.
ExpertPower™ comprehensive energy management software solution provides actionable insight and easy consumption visibility. It fully supports Billing, Demand response, Power quality analysis and Generator control. ExpertPower™ is available either as an online service (SaaS – Software as a Service) or as a standalone package (Pro).

ExpertPower™ fast and intuitive online web interface makes it easy to control comprehensive electrical data. It reduces the total cost of ownership (TCO) by eliminating the need for training or using special hardware or software. Its scalability allows starting with a small installation and expanding as you grow your business.

SATEC's complete solution includes our wide range of power analyzers combined with ExpertPower™ software, providing all the information and analytics necessary to improve your energy system efficiency, reliability and profitability.

Applications

Real time & History Visibility
- Electrical data
- Max demands
- Data logs

Energy Consumption
- Import, Export and Total
- TOU (Time of Use)

Power Quality
- Events and notifications
- EN50160 Compliance reports
- Waveforms analysis

Billing & Sub-metering
- Dynamic tariff definitions
- Accurate cost calculations
- Invoice generation

Demand response
- Calculate facility usage and energy distribution
- Automatic generator operation

Advanced Reporting
- Scheduled distribution
- Multi-dimensional comparisons

Open Architecture
- Standard Web service API

Features

State-of-the-art user interface:
- Simple web based multi browser support
- Energy Intelligence BI dashboards with dynamic drilldown
- Customizable reports, charts and calculations
- User defined graphic maps, one-line diagrams and themes

Events and Notifications
- Configurable email and SMS notifications
- Flexible criteria and thresholds
- Live real-time monitor
- Built-in export to Excel, PDF
- Remote device configuration for all SATEC products

Connects to Modbus, BACnet, DLMS or SNMP compatible 3rd party devices
Integration with 3rd party applications: BMS, SCADA, ERP
Controlled access permissions per user or group
HTTPS TLS/SSL Secured
Selected Screenshots

- Heatmap
- Power Quality
- Energy Billing
- Energy Dashboard
- Energy Intelligence: Live Data
PAS
Power Analysis Software

PAS is SATEC’s comprehensive analysis and engineering software designed to program and monitor all SATEC devices. It includes a variety of additional tools to assist in system setup, such as the communication debugging module.

PAS is bundled with all SATEC instruments at no extra charge.

Features

- Programming and control for all SATEC devices
- Automatic power quality reports for EN50160, IEEE1159, GOST 13109 and GOST 32144-2013
- Automatic polling of devices
- Simple off-line instrument setup
- Direct data access for status monitoring or analysis

Wide range of communication platforms:
  - RS standard serial lines
  - TCP/IP over cellular communication
  - USB
  - Telephone/Modem

- Easy export to spreadsheet, Word, Excel or database
- Self-test

- Extensive graphic and reporting capabilities for waveforms and harmonics
- Export COMTRADE (IEEE standard common format for transient data exchange)
  - Export PQ
  - PQDIF for waveforms and data logs
- Remote device configuration
- User-defined line diagram
- Multiple TOU programming

Comprehensive analysis

- Data logs—historical or current
- Trends—individual or 3 phases together
- Trend over time data log or waveform
- Trend based on user-selected parameters or limits
- Harmonic spectrum
- Harmonics power direction
- Vector analysis/phasor diagram
- G5/4 comparison tables for HV and LV applications
- Automatic power quality and fault categorization
- Synchronized waveforms from multiple devices in a single plot
- ITI (CBEMA) curve
- Automatic sort and filter capabilities
- Uploading TOU settings
- Uploading with variable setpoints
- Alarms with variable setpoints
- Delta measurement
Certification

We at SATEC pay special attention to the quality and reliability of our products, by a thorough verification of each product and system at every stage of the products’ lifetime.

SATEC is committed to uncompromising compliance with the highest requirements in the energy field. SATEC devices comply with the most demanding international standards. Standard compliance is tested by world acknowledged independent labs. Our quality system is ISO9001:2015 certified and our laboratory is certified in accordance with ISO/IEC 17025.

Some of SATEC's Certificates*

* Note: products may comply with some standards only
# Device Comparison Table

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<th>P</th>
<th>EH</th>
<th>136</th>
<th>II</th>
<th>P</th>
<th>E</th>
<th>EH</th>
<th>PM174/5</th>
<th>EM720</th>
<th>EM920</th>
<th>PM180</th>
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