SATEC EM132

# EM132 DATASHEET


## Multi-Function Power Meter & Smart Transducer

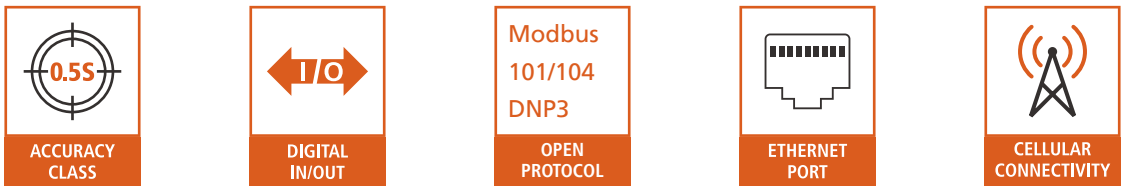
SATEC EM132 is a power meter, ideal for a wide range of applications such as revenue metering, industrial power monitoring and for interfacing SCADA in utility substations.

Based on SATEC PM13X family functionality, this version is designed as DIN-rail mount, equipped with a built-in communication port and anti-tamper enclosures.

## HIGHLIGHTS

- **Energy Meter:** Class 0.5S/0.5 accuracy per IEC62053-22/ANSI
- **Smart Transducer:** 4 analog outputs for selectable power parameters plus load-shedding and alerting of irregularities
- **Communication**
  - Built-in ports: 1×RS485. Optional: additional built-in RS485
  - Optional ports: ETH; Wi-fi; cellular; Profibus
  - Open protocol: Modbus RTU; DNP3.0; IEC 60870-5-101/104
- **Digital & Analog I/O**
  - Modular I/O: up to 16 I/O
- **Broad-range frequency measurement**: 25-400 Hz

## MODULAR VERSATILITY



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## FEATURES

### MULTIFUNCTIONAL 3-PHASE SMART 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
- 128 samples per cycle

### ENERGY METER

- Accuracy Class 0.5S per IEC 62053-22 / ANSI
- Four-quadrant active and reactive energy poly-phase static meter
- Three-phase total and per phase energy measurements; active, reactive and apparent energy counters
- Automatic logging of daily energy and maximum demand profiles

### REAL-TIME WAVEFORM CAPTURE (VIA PC)

- Real-time “scope mode” waveform monitoring via PAS software

### PROGRAMMABLE LOGICAL CONTROLLER

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

### MODELS

| | |
|---|---|
| EM132 | Standard model |
| EM132-TP | Includes a second built-in RS485 port (with AUX. power supply model only) |

### EVENT AND DATA RECORDING

- Non-volatile memory for timestamped event and data recording: over 90 days of 2 half-hourly writing of 4 parameters and recording more than 200 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 INPUTS

- Direct measurement 0-690V AC

### CURRENT INPUT OPTIONS

- 1A or 5A inputs from CT secondary
- 40mA input designed for SATEC HACS CTs (100-3000A options)
- 63A Direct connection
- RS: unique input for 5A rated split-core HACS CTs, ideal for retrofit installation

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## DIGITAL AND ANALOG I/O

- Built-in: 2 Digital Inputs and 1 form A SSR
- Available I/O modules
  - **4DIO:** four digital inputs and two relay outputs (as SSR or EM relay). 1-cycle update time; unlatched, latched, pulse and KYZ operation; energy pulses
  - **12DIO**: twelve digital inputs, 4 relay outputs (incl. optional port: ETH or additional RS485)
  - **4AO**: four analog outputs (internal power supply); selection of 0-20mA, 4-20mA, 0-1mA, 0-3mA, 0-5mA, ±1mA and ±5mA output; 1 cycle update time
  - **8DI**: eight digital inputs with 1-ms scan time
  - **2AI**: 2 analog inputs (4-20mA. available with T3G-y-2AI cellular module)

## COMMUNICATION

- On-board interfaces
  - Standard 2-wire RS-485
  - Optional: additional built-in RS485 port
- Optional interfaces
  - Multipurpose RS-232/422/485
  - 10/100Base T
  - PROFIBUS
  - RF (certain regions only)
  - 2G/3G/4G cellular modem
- 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
  - IEC 60870-5-101 (optional)
  - IEC 60870-5-104 (optional)

## DISPLAY

- 2 x 16 Characters LCD display; adjustable update time
- Auto-scroll option; auto-return to a default page

## METER SECURITY

- 3-level password access to meter setups and data

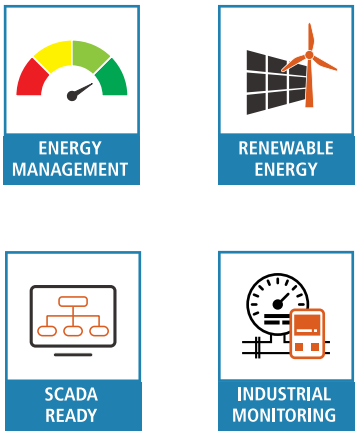
## UPGRADEABLE FIRMWARE

- Easy upgrading via serial or ETH ports

## SOFTWARE SUPPORT

- Includes comprehensive Power Analysis Software (PAS) for configuration and data acquisition
- SATEC's Expertpower web-based energy management platform (subscription)
- Any 3rd party software supporting open-protocol

## APPLICATIONS



# TECHNICAL SPECIFICATIONS

## INPUT RATINGS

### VOLTAGE INPUTS

| | |
|---|---|
| Installation | Category III |
| Over-voltage withstand | 1000V AC continuous, 2000V AC for 1 second |
| Input impedance | 1 MΩ |
| Wire size | up to 12 AWG (up to 2.5mm²) |

### MODEL WITH AUX. POWER SUPPLY

| | |
|---|---|
| Nominal voltage | 400/690V AC (L-N/L-L) |
| Measurement range | 15-480/828V AC (L-N/L-L) |
| Frequency range measurement | 25-400 Hz |
| Burden for 400V | < 0.4 VA |
| Burden for 120V | < 0.04 VA |

### MODEL SELF ENERGIZED FROM VOLTAGE INPUTS *

| | |
|---|---|
| Nominal voltage<br>**HACS** model:<br>**1A/5A/RS5** models: | <br>120/207V AC to 230/400V AC (L-N/L-L)<br>120/207V AC to 277/480V AC (L-N/L-L) |
| Frequency range measurement | 50/60 Hz |
| Burden for 277V | < 1.5 VA |
| Burden for 120V | < 2 VA |

### CURRENT INPUTS

| | |
|---|---|
| Current Connections | 3 galvanic isolated inputs |
| Current Ratings | Choice of 4 options:<br>» ../5A CT connection<br>» ../1A CT connection<br>» Direct up to 63A **<br>» Remote CT (40mA) |
| Starting Current | 0.2% In |
| Burden per phase | <0.2 VA (../5A)<br><0.05 VA (../1A) |
| Overload (continuous) | 2×$I_N$ (1.2×$I_N$ for 100A model) |
| Over current | 50×$I_N$ (for 1 second) |
| Galvanic isolation | 4000V AC (L-G) for 1 min. |
| Terminal Blocks | 6 Sealed, pitch 7-10mm<br>4 to 16 mm² |

* Not available with EM132-TP model
** Connecting up to 100A is possible under certain conditions

## AUXILIARY POWER SUPPLY

| | |
|---|---|
| Rated Input | 57.7-277V AC; 48-290V DC |
| Tolerance | @V AC = ±15%; @V DC = ±10% |
| Insulation dielectric withstand | 4000V AC for 1 min. |
| Burden | 5VA |
| Terminal Blocks | 2 Sealed, pitch 7-10mm 2.5 to 4mm² |

### OPTIONAL POWER SUPPLY

| | |
|---|---|
| Rated input | 12-24V DC |
| Tolerance | ±20% |

## 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<br>» 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 mm²) |

### 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 mm²) |

### DIGITAL INPUTS

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

| | |
|---|---|
| Sensitivity | Open @ input resistance >100 kΩ, 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 mm²) |

### ANALOG OUTPUTS

| | |
|---|---|
| Ranges (upon order) | » ±1 mA, max. load 5 kΩ (100% overload)<br>» 0-20 mA, max. load 510 Ω<br>» 4-20 mA, max. load 510 Ω<br>» 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 mm²) |

## BUILT-IN COMMUNICATION

### SERIAL COMMUNICATION (RS-485)

| | |
|---|---|
| Max. Baud Rate | 115.2 kb/s |
| Optical Isolation | 3000V AC (L-G) for 1 min. |
| Max. Cable Length | 1000 m |
| Protocols | » MODBUS RTU/ASCII<br>» DNP 3.0<br>» IEC 60870 -5-101 (option) |
| Terminal Blocks | 3 Sealed, pitch 7-10mm<br>2.5 to 4 mm² |

## COM2 (OPTIONAL MODULE)

### ETHERNET PORT

(as independent module OR add-on to 12DIOR module)

| | |
|---|---|
| Available as: plug-in, DIN-rail mount: 73x90x32mm plug-in, no mount | |
| Transformer-isolated 10/100BaseT Ethernet port | |
| Supported protocols | Modbus/TCP (Port 502),<br>IEC 60870-5-104<br>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),<br>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 mm²) |

## OTHER CHARACTERISTICS

### FRONT PANEL

| | |
|---|---|
| Display type | 2×16 Characters Transflective LCD with backlight |
| Character size | 3.2×1.85 mm |
| Viewing area | 46×11 mm |
| LEDs | Total 6 LEDs:<br>» 1 Pulse calibration output<br>» 3 voltage indication<br>» 2 RX/TX activity |
| Keypad | 2 buttons |
| Nameplate | According to IEC 60688 & IEC 62052-11 |

### CONSTRUCTION

| | |
|---|---|
| Enclosure | DIN Rail mount<br>Complies with EN50022 |
| Dimensions [W×H×D] | 125 × 90 × 75mm |
| Enclosure Material | Reinforced Polycarbonate |
| Enclosure protection | IP20 |

### ENVIRONMENTAL CONDITIONS

| | |
|---|---|
| Operational | -25°C to 60°C / -13°F to 140°F |
| Storage | -30°C to 85°C / -22°F to 185°F |

## STANDARDS COMPLIANCE

### EMC PER IEC 60688 AND IEC 62052-11

### IMMUNITY

- IEC61000-4-2:
  Electrostatic discharge, 15/8kV air/contact
- IEC61000-4-3:
  Electromagnetic RF Fields, 10V/m @ 80Mhz – 1000MHz
- IEC61000-4-4:
  Fast Transients burst, 4kV on current and voltage circuits and 2kV for auxiliary circuits
- IEC61000-4-5:
  Surge 4kV on current and voltage circuits and 1kV for auxiliary circuits
- IEC61000-4-6:
  Conducted Radio-frequency,
  10V @ 0.15Mhz – 80MHz
- IEC61000-4-8:
  Power Frequency Magnetic Field

### EMISSION (RADIATED/CONDUCTED):

- EN55022: 2010 Class A (CISPR 22)
- FCC p.15 Class A mandatory

### SAFETY

- UL/IEC 61010-1
- UL 916

### INSULATION

- IEC 62052-11:
  Insulation impulse 6kV/500Ω @ 1.2/50 µs
- IEC 62053-22:
  AC voltage tests related to ground, 4kV AC @ 1mn, for power and signal ports (above 40V)
- 2.5kV AC r.m.s. @ 1mn, for other ports (below 40V)

### ACCURACY ACCORDING TO

| | |
|---|---|
| IEC 62053-22, class 0.5S | Active energy |
| IEC 62053-21, class 0.5 | Reactive energy |
| IEC 60688, class 0.5S | Active energy |
| IEC 60688, class 1 | Reactive energy |
| ANSI C12.20, Class 0.5 | |

SATEC EM132

## ORDER STRING

### MODELS

| | |
|---|---|
| EM132: Multifunction transducer | EM132 |
| EM132-TP: EM132 with two integral RS-485 ports (ACDC power supply only) | EM132-TP |

### OPTIONS

| | |
|---|---|
| **CURRENT INPUTS** | |
| 5 Ampere | 5 |
| 1 Ampere | 1 |
| Direct current measurement up to 63A * | 63 |
| Direct current measurement up to 100A * (up to 55°C ambient temperature) | 100 |
| 5A split core remote High Accuracy Current Sensor (HACS)* | RS5 |
| High Accuracy Current Sensors (HACS) ** | HACS |
| High Accuracy Current Sensors (HACS), with wires | HACS-SPDR |
| **CALIBRATION AT FREQUENCY** | |
| 25 Hz (supports 1A and 5A models only) | 25HZ |
| 50 Hz | 50HZ |
| 60 Hz | 60HZ |
| 400 Hz (supports 1A and 5A models only) | 400HZ |
| **RESOLUTION** | |
| Low Resolution 1A, 1V | - |
| High Resolution 0.01A, 0.1V | H |
| **POWER SUPPLY** | |
| 40-300V AC/DC | ACDC |
| **MECHANICAL SEAL** | |
| Standard seal | - |
| Special seal | S |
| **ELECTRONIC SEAL** | |
| Energy register is accessible | - |
| Energy register is protected | P |
| **COMMUNICATION PROTOCOL** | |
| Modbus and DNP 3.0 | - |
| Modbus and IEC 60870-5-101/104 *** | 870 |
| **TESTING AND CERTIFICATE** | |
| Full functional test, calibration at various work loads & detailed test report | - |
| All of the above, **plus** ISO 17025 & ILAC certified calibration certificate | CC |

NOTES
* For 50/60Hz only
** For 50/60Hz only, requires ordering of 3 HACS
*** -104 requires ETH; not compatible with AR version, does NOT work over cellular network

## ORDER STRING

### EXPANSION MODULE

Max. 1 module per instrument, can be ordered separately

| | |
|---|---|
| **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 |
| **COMMUNICATION** | |
| Ethernet (TCP/IP) for DIN rail | ETHD |
| PROFIBUS | PRO |
| RS232 (for DIN rail enclosure) | RS232D |
| RS232/422/485 | RS232 |
| 2G/3G GSM DIN Rail Modem *<br>y: T=Top Antennal; F=Front Antenna | T3G-y |
| 2G/3G GSM DIN Rail Modem **with 2 Analog Inputs 4-20mA** * y: T=Top Antennal; F=Front Antenna | T3G-y-2AI |
| 4G Modem * x: G=Europe; V=Verizon (US); A=AT&T (US); T=Telstra (AUS). y: T=Top Antennal; F=Front Antenna | T4x-y |
| Communication: RF | RF-x-y |
| **DIGITAL INPUTS** | |
| 4 DI (Dry Contact) / 2 Relay Outputs 250V / 5A AC | DIOR |
| 4 DI (Dry Contact) / 2 SSR Outputs 250V / 0.1A AC | DIOS |
| 8 DI (Dry Contact) | 8DI |
| **12 DIOR MODULE** | |
| 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 |
| 12 DIOR module communication port: | |
| None | - |
| RS-485 | 485 |
| Ethernet | ETH |
| CAN | CAN |

12DIOR-

NOTES

* Does not support 870 protocol. Supplied with bendable antenna.

