SATEC

EM133

DATASHEET

HIGHLIGHTS

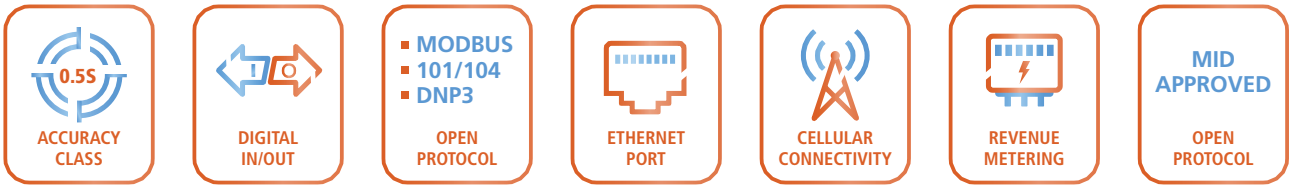
- Accuracy:
  Class 0.5/0.5S per ANSI / IEC 62053-22
  (Optional calibration meets
  Class 0.2/0.2S)
- Revenue Meter: anti-tamper design; can bill 3 individual single phase clients; IR interface
- MID certified
- **Communication**
  - Built-in ports: RS485; IR (optical)
  - Optional ports: ETH; Wi-Fi; cellular; Profibus
  - Open protocol: Modbus RTU; DNP3.0; IEC 60870-5-101/104
- **Digital & Analog I/O**
  - Built-in I/O: 1 RO; 2 DI
  - Modular I/O: up to 16 I/O
  - Smart Transducer: 4 analog outputs
- **Broad-range frequency measurement:**
  25-400 Hz

SMART TOU ENERGY METER AND TRANSDUCER

SATEC EM133 is an energy meter, ideal for a wide range of applications such as revenue metering, industrial power monitoring and for interfacing SCADA in utility substations. Based the SATEC 13x family functionality, it is a version designed as DIN-rail mount, equipped with built-in communication ports, digital I/Os and anti-tamper enclosures.

MODULAR VERSATILITY

FEATURES



MODELS

EM133	Standard
EM133-XM	Extended Memory version. Over 40-fold memory capacity than standard model. Features sensor for internal unit temperature and 3 data recorders
EM133-MID	MID certified (5A)

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

BILLING/TOU ENERGY METER

- Accuracy Class 0.5S per IEC 62053-22 / ANSI
- MID certified EN50470-3 Class B or C (5A)
- Four-quadrant active and reactive energy poly-phase 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
- Easy programmable tariff calendar schedule
- Automatic logging of daily energy and maximum demand profiles (total & TOU)

HARMONIC ANALYZER

- individual voltage & current harmonic spectrum and harmonic angles up to 40th order harmonic
- Voltage and current THD, TDD and K-Factor

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

EVENT AND DATA RECORDING

- Non-volatile memory for timestamped

event and data logging: over 90 days for 2 daily TOU records, half-hourly writing of 4 parameters and recording over 200 events
- Optional extended memory version: 40 times the capacity of the standard model. Reads and displays additional utility meter pulses as customized labels (water, gas etc.). This version includes a sensor for internal unit temperature and a battery status monitor
- Event recorder for logging internal diagnostic events and setup changes
- Two data recorders; programmable data logs on a periodic basis

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

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, 0-5mA, ±1mA and ±5mA output; 1 cycle update time
  - **8DI**: eight digital inputs with 1-ms scan time

COMMUNICATION

- On-board interfaces
  - Standard 2-wire RS-485
  - IR (optical) port
- Optional interfaces
  - Multipurpose RS-232/422/485
  - 10/100Base T ETH port
  - CAT-M / LTE modem
  - PROFIBUS
- Client (Modbus/TCP over ETH)
  - TCP notification client for communicating events or periodic reports to remote server
  - Expertpower client on subscription basis
- Communication protocols
  - Modbus RTU
  - DNP 3.0
  - IEC 60870-5-101/104 (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

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 POWER SUPPLY INPUT

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

MODEL SELF ENERGIZED FROM VOLTAGE INPUTS

Nominal voltage **HACS** model: **1A/5A/RS5** models:	 120/207V AC to 230/400V AC (L-N/L-L) 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: » ../5A CT connection » ../1A CT connection » Direct up to 63A* » Remote CT (40mA)
Starting Current	0.2% In
Burden per phase	<0.2 VA (../5A) <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 4 to 16 mm²

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%

BUILT-IN I/O

SOLID STATE RELAY STANDARD

1 relay rated at 0.15A/24V AC/DC, 1 contact (SPST Form A)	
Galvanic isolation	4000V AC 1 min
Operate time	1 ms max.
Release time	0.25 ms max.
Update time	1 cycle

DIGITAL INPUT (STANDARD)

2 Digital Inputs Dry Contact, internally wetted @ 5V DC	
Sensitivity	Open @ input resistance >100 k Ω Closed @ Input resistance < 100 Ω
Galvanic isolation	4000V AC 1 min
Internal power supply	5V DC
Scan time	1 ms

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 » 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)	

* Connecting up to 100A is possible under certain conditions

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) » 0-20 mA, max. load 510 Ω » 4-20 mA, max. load 510 Ω » 0-1 mA, max. load 5 k Ω (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 » DNP 3.0 » IEC 60870 -5-101 (option)
Terminal Blocks	3 Sealed, pitch 7-10mm; 2.5 to 4mm²

INFRA RED COMMUNICATION

Baud rate	Up to 19.200 kb/s
Protocols	MODBUS RTU/ASCII

COM2 (OPTIONAL MODULE)

ETHERNET PORT

(as independent module OR add-on to 12DIOR module)	
Transformer-isolated 10/100BaseT Ethernet port	
Supported protocols	Modbus/TCP (Port 502) IEC 60870-5-104 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

CAT-M / LTE modem	
Supported protocols	Modbus/TCP (Port 502), 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: » 1 Pulse calibration output » 3 voltage indication » 2 RX/TX activity
Keypad	2 buttons
Nameplate	According to IEC 60688 & IEC 62052-11

CONSTRUCTION	
Enclosure	DIN Rail mount Complies with EN50022
Dimensions [W×H×D]	125 × 90 × 75mm
Enclosure Material	Reinforced Polycarbonate
Enclosure protection	IP20

STANDARDS COMPLIANCE

EMC PER IEC 60688 AND IEC 62052-11

IMMUNITY

- IEC61000-4-2:
  Electrostatic discharge, 15/– 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 2 KV for auxiliary circuits
- IEC61000-4-5:
  Surge 4KV on current and voltage circuits and 1 KV 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, 4 kV 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
- EN 50470-3, class B or C (5A version)
- ANSI C12.20, Class 0.5

ORDER STRING

MODELS

EM133: Energy Meter	**EM133**
EM133-XM-AR: Extended Memory Residential Energy Meter	**EM133-XM-AR**
EM133-MID: MID Certified Energy Meter	**EM133-MID**

OPTIONS

CURRENT INPUTS

5 Ampere (mandatory for MID)	**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 (mandatory for MID)	**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

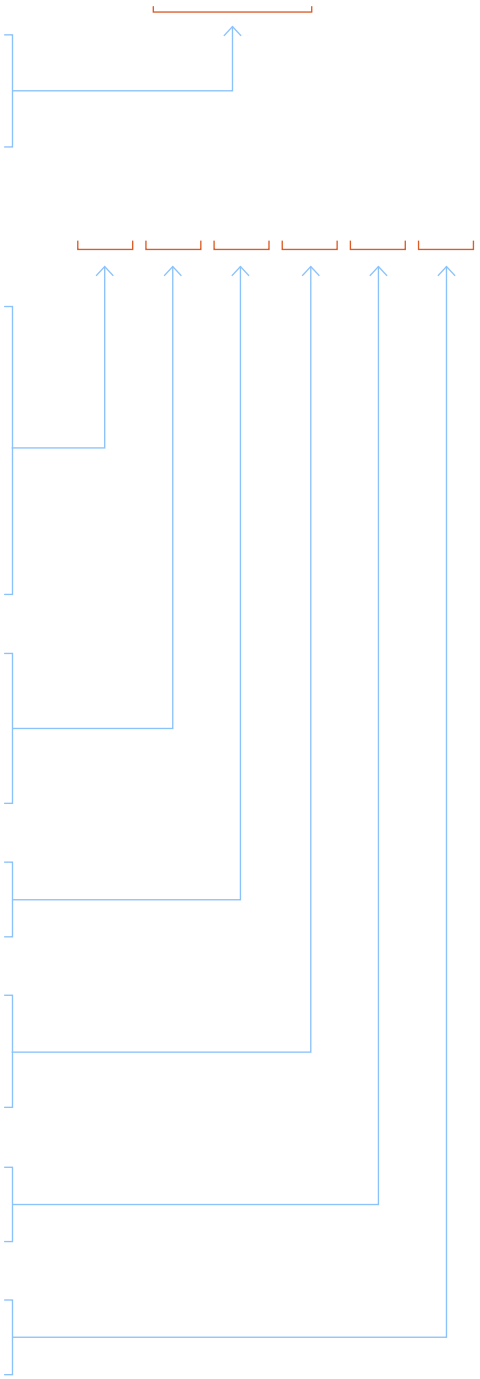
40-300V AC/DC (mandatory for MID)	**ACDC**
Powered from measured voltages (120-277 V L-N) *	**SE**
12V/24V DC power supply	**21DC**

MECHANICAL SEAL

Standard seal (mandatory for MID)	**-**
Special seal	**S**

ELECTRONIC SEAL

Energy register is accessible	**-**
Energy register is protected (mandatory for MID)	**P**



Notes

* For 50/60Hz only

** For 50/60Hz only, requires ordering of 3 HACS

COMMUNICATION PROTOCOL (not available for EM133AR)	
Modbus and DNP 3.0 (mandatory for MID)	-
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**
IR ADAPTER	
Magnetic Adapter for IR port	**MA**

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: 0-5mA	**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**
CAT-M / LTE Modem ** x: G=Europe; V=Verizon (US); A=AT&T (US); T=Telstra (AUS). y: T=Top Antennal; F=Front Antenna	**LTEx-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). Not compatible with EM133-AR	**8DI**

12DIOR-

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**

Notes

* -104 requires ETH; not compatible with AR version, does NOT work over cellular network

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