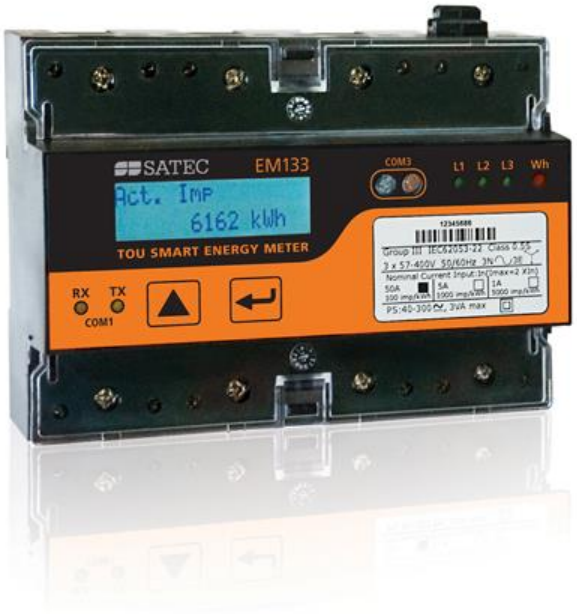
EM133-AR

TOU ADVANCED RESIDENTIAL SMART ENERGY METER



SATEC EM133-AR is a Smart DIN Rail TOU Energy Meter designed for complete in-house energy management. The EM133-AR provides the functionality of the EM133 plus direct connection to pulse output meters, such as cold water, hot water, gas and steam.

Main Features

Multifunctional 3-Phase Smart Meter

- True RMS, volts, amps, power, power factor, neutral current, voltage and current unbalance, frequency
- Ampere/Volt demand meter
- 25, 50, 60 and 400 Hz measurements
- 128 samples per cycle

Billing/TOU Energy Meter

- Accuracy Class 0.5S
- 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, 8 totalization and tariff energy/demand registers x 8 tariffs, 4 seasons x 4 types of days, 8 tariff changes per day
- One–time easy programmable tariff calendar schedule
- Automatic daily energy and maximum demand profile log for total and tariff registers
- Display and communicate this period, last period and previous period for daily, weekly, monthly and quarterly consumption
- Cost calculation
- CO2

Water and Gas measurement

- Direct connection to pulse output water and gas meters
- Setting of multiplication factors and units
- Display of consumption in real values

Harmonic Analyzer

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

Real-time Waveform Capture (via PC)

- Real-time “scope mode” waveform monitoring capability
- Simultaneous 6-channel 8-cycle waveform capture at a rate of 64 samples per cycle

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 long-term event and data recording for at least 45 days history storage capabilities in 15 minute intervals
- Event recorder for logging internal diagnostic events and setup changes
- Two data recorders; programmable data logs on a periodic basis; automatic daily energy and maximum demand profile log

Display

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

Real-time Clock

- With backup battery

Inputs/Outputs

- Built-in 2 Digital Inputs and 1 form A solid state digital output
- Optional module 4 Digital Inputs and 2 digital outputs (Solid State or Electro Mechanical)
- Optional module 4 Analog Outputs
- Optional module 12 Digital Inputs and 4 digital outputs (+ Ethernet or RS485)

Communications

- Standard 2-wire RS-485 communication port
- Built-in IR communication port
- Optional multipurpose RS-232/422/485 port
- Optional 10/100Base T port
- Optional PROFIBUS port
- Optional RF module (available in certain regions only)
- Optional GPRS modem

Communication protocols

- Modbus RTU
- SATEC ASCII
- DNP 3.0
- IEC 60870-5-101 (option)
- IEC 60870-5-104 (option)

Meter Security

- 3 levels Password security for protecting meter setups and accumulated data from unauthorized changes

Upgradeable Firmware

- Easy upgrading device firmware through a serial or Ethernet port.

Software Support

- Includes comprehensive Power Analysis Software (PAS) for configuration and data acquisition
- Optional ExpertPower™ client for communicating with the SATEC proprietary ExpertPower™ Internet services

Specifications

VOLTAGE INPUTS	
Voltage Connections	3 phases, 1 Neutral
Voltage Ratings	Direct voltage connection: ➔ 220 to 400V (L-N) ➔ 380 to 690V (L-L) ➔ Range 0-800VAC Via PT (Power Transformer): ➔ 57.7 to 120V (L-N) ➔ 100 to 207V (L-L) ➔ Range 0-250VAC
Starting Voltage	0.2% U_N
Input Impedance	≥ 1MΩ
Burden with Aux. Power supply	≤0.2VA/phase
Overload withstand	4000 VAC (L-G) for 1 min.
Impulse Voltage	6kV
Terminal Blocks	4 Sealed, pitch 7-10mm 2.5 to 4 mm²
CURRENT INPUTS	
Current Connections	3 galvanic isolated inputs
Current Ratings	Choice of 4 options: ➔ ../5A CT connection ➔ ../1A CT connection ➔ Direct up to 100A ➔ Remote CT (40mA)
Starting Current	0.2% I_N
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	4000 VAC (L-G) for 1 min.
Terminal Blocks	6 Sealed, pitch 7-10mm 4 to 16 mm²
AUXILIARY POWER SUPPLY	
Rated Input	40-300 V AC/DC
Insulation Dielectric withstand	4000 VAC for 1 min.
Output power	4W
Terminal Blocks	2 Sealed, pitch 7-10mm 2.5 to 4 mm²

BUILT IN COMMUNICATION	
Communication Type	RS-485
Max. Baud Rate	115.2 kb/s
Isolation	4000 VAC (L-G) for 1 min.
Max. Cable Length	1000 m
Protocols	MODBUS RTU/ASCII DNP 3.0 IEC 60870 -5-101 (option) IEC 60870 -5-104 (option)
Terminal Blocks	3 Sealed, pitch 7-10mm 2.5 to 4 mm²
INFRA RED COMMUNICATION	
Baud rate	Up to 19.200 kb/s
Protocols	MODBUS RTU/ASCII
ADD-ON MODULES	
Max. # of Modules	1
Available Modules	RS-232; PROFIBUS; ETHERNET; Digital I/O; Analog Outputs
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 and IEC 62052-11
MECHANICAL	
Enclosure	DIN Rail mount Complies with EN50022
Dimensions [W×H×D]	125 × 90 × 75mm
Enclosure Material	Reinforced Polycarbonate
TEMPERATURE	
Operational	-25°C to 60°C
Storage	-30°C to 85°C

Standards Compliance specifications

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

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)
- 2.5KVAC r.m.s. @ 1mn, for other ports (below 40V)

Atmospheric Environment

- Operational ambient temperature range: -25°C to +60 °C
- Long-term damp heat withstand according to IEC 68-2-3 <95% (non-condensing), +40 °C
- Transport and storage temperature range: –30°C to +85 °C
- IEC 60068-2-6: Vibration
- Frequency range: 10Hz to 150Hz
- Transition frequency: 60Hz
- Constant movement amplitude 0.075mm, f<60Hz
- Constant acceleration 9.8 m/s^2 (1g), f > 60Hz
- Additional Transport vibration and shocks:
- Longitudinal acceleration: 2.0 g
- Vertical acceleration: 1.2 g
- Transversal acceleration: 1.2 g
- Enclosure protection: IP20

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

Order String

EM133-AR ☐☐☐☐☐☐☐

OPTIONS	
Current Inputs	
5 Ampere	5
1 Ampere	1
Direct current measurement up to 100A	100
High Accuracy Current Sensors (HACS). Requires ordering of 3 HACS - please refer to SATEC's **HACS Datasheet**.	HACS
Calibration at Frequency	
25 Hz	25HZ
50 Hz	50HZ
60 Hz	60HZ
400 Hz	400HZ
Resolution	
Low Resolution 1A, 1V	-
High Resolution 0.01A, 0.1V	H
Power Supply	
40-300V AC/DC	ACDC
Communication Protocol	
Modbus and DNP 3.0	-
Modbus and IEC 60870-101/104	870
Expansion Module (Max. 1 module per instrument, can be ordered separately)	
Analog Output: ±1mA	AO1
Analog Output: 0-20mA	AO2
Analog Output: 0-1mA	AO3
Analog Output: 4-20mA	AO4
Analog Output: 0-3mA	AO5
Analog Output: ±3mA	AO6
Analog Output: 0-5mA	AO7
Analog Output: ±5mA	AO8
Communication: Ethernet (TCP/IP)	ETH
Communication: PROFIBUS	PRO
Communication: RS232/422/485	RS232
Communication: GPRS	GPRS
Communication: RF (see note)	RF-x
Digital Input (Dry Contact) / Relay Output 250V / 5A AC	DIOR
Digital Input (Dry Contact) / SSR Output 250V / 0.1A AC	DIOS
12 Digital Inputs (Dry Contact)/4 Relay Outputs 250V/5A AC	12DIOR-DRC
12 Digital Inputs (250VDC) / 4 Relay Outputs 250V/5A AC	12DIOR-250V
12DIOR-DRC with Ethernet	12DIOR-DRC-ETH
12DIOR-250V with Ethernet	12DIOR-250V-ETH
12DIOR-DRC with RS-485	12DIOR-DRC-485
RF Accessories (see note)	
Concentrator - ROW	CON-ROW
Concentrator External for 2 x ETC2002	CON-EXT
Repeater	REP
Antenna 1: without cable (module or concentrator)	AN-1
Antenna 2: with 2M cable (module or concentrator)	AN-2
Antenna 3: external for concentrator only	AN-3
Antenna 4: external for module or concentrator	AN-4

Note: The RF module and accessories are available in certain regions only. Please consult your local supplier.