EM133

TOU SMART ENERGY METER

SATEC EM133 is a Smart DIN Rail TOU Energy Meter. It is based on SATEC's best seller PM130 PLUS with an off-the-shelf LCD display (similar to the BFM136 display). The EM133 provides the full functionality of the PM130EH PLUS combined with 2 Digital Inputs, 1 Digital Output, IR (Infra Red) communication and battery backup for the real time clock. It is fully compatible with all PM130 PLUS modules.

The EM133 can serve any application from residential energy metering, through industrial energy and harmonic analysis through utility comprehensive substation automation. It provides multifunctional 3-phase power metering, revenue metering and basic power quality information. The EM133 features an internal real time clock (RTC), battery backup and onboard non-volatile memory for event and data logging. The device includes 16 set points and 4 counters that operate the built in 2 DI/ 1RO or the various analog and digital I/O add-ons.

The EM133 offers a wide range of network configurations and versatile voltage and current connections: 57 to 400V AC, up to 63A direct current measurement, connection of standard CTs (1A, 5A) and a wide range of remote CTs (split or solid cores).

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 per IEC 62053-22
➔ 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
➔ One–time easy programmable tariff calendar schedule
➔ Automatic daily energy and maximum demand profile log for total and tariff registers

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 90 days history storage capabilities
- 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

- Backup for 260 days

Inputs/Outputs

- Built-in 2 Digital Inputs and 1 form A solid state digital output
- Optional module 8 Digital Inputs
- Optional module 4 Digital Inputs and 2 digital outputs (Solid State or Electro Mechanical)
- Optional module 12 Digital Inputs and 4 digital outputs with optional Ethernet, RS-485 or CAN
- Optional module 4 Analog Outputs

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 2G/3G modem
- Optional CANopen port

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	$\geq 1M\Omega$
Burden with Aux. Power supply	$\leq 0.2VA$/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)	$2 \times I_N$ ($1.2 \times I_N$ for 100A model)
Over current	$50 \times I_N$ (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
➔ 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)
➔ 2.5KVAC r.m.s. @ 1mn, for other ports (below 40V)
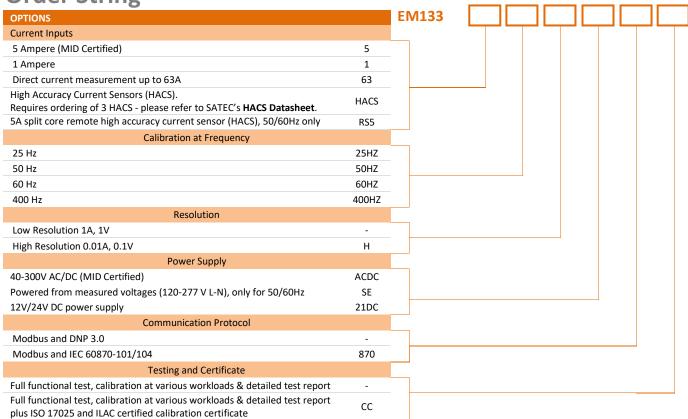
Atmospheric Environment

➔ 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
➔ EN 50470-3, class B or C (5A version)

Order String

OPTIONS		EM133 ☐ ☐ ☐ ☐ ☐ ☐
Current Inputs		
5 Ampere (MID Certified)	5	
1 Ampere	1	
Direct current measurement up to 63A	63	
High Accuracy Current Sensors (HACS). Requires ordering of 3 HACS - please refer to SATEC's **HACS Datasheet**.	HACS	
5A split core remote high accuracy current sensor (HACS), 50/60Hz only	RS5	
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 (MID Certified)	ACDC	
Powered from measured voltages (120-277 V L-N), only for 50/60Hz	SE	
12V/24V DC power supply	21DC	
Communication Protocol		
Modbus and DNP 3.0	-	
Modbus and IEC 60870-101/104	870	
Testing and Certificate		
Full functional test, calibration at various workloads & detailed test report	-	
Full functional test, calibration at various workloads & detailed test report plus ISO 17025 and ILAC certified calibration certificate	CC	

Expansion Module (Max. 1 module per instrument, can be ordered separately)	
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)	ETH
Communication: PROFIBUS	PRO
Communication: RS232 (for DIN rail enclosure)	RS232D
Communication: RS232/422/485	RS232
Communication: 2G/3G GSM Modem (Doesn't support 870 protocol)	T3G
Communication: 2G/3G CDMA Modem (Doesn't support 870 protocol)	T3C
Communication: CAN Bus (EM133 only, doesn't support 870 protocol)	CAN
Communication: RF (available in certain regions only – contact your SATEC partner for available options)	RF-x-y
4 Digital Inputs (Dry Contact) / 2 Relay Outputs 250V / 5A AC	DIOR
4 Digital Inputs (Dry Contact) / 2 SSR Outputs 250V / 0.1A AC	DIOS
8 Digital Inputs (Dry Contact - Not Compatible with EM133-AR)	8DI
12 Digital Inputs (Dry Contact) / 4 Relay Outputs 250V/5A AC	12DIOR-DRC
12 Digital Inputs (125VDC) / 4 Relay Outputs 250V/5A AC	12DIOR-125V
12 Digital Inputs (250VDC) / 4 Relay Outputs 250V/5A AC	12DIOR-250V
12DIOR-DRC with Ethernet	12DIOR-DRC-ETH
12DIOR-125V with Ethernet	12DIOR-125V-ETH
12DIOR-250V with Ethernet	12DIOR-250V-ETH
12DIOR-DRC with RS-485	12DIOR-DRC-485
12DIOR-125V with RS-485	12DIOR-125V-485
12DIOR-250V with RS-485	12DIOR-250V-485
12DIOR-DRC with CANopen	12DIOR-DRC-CAN
12DIOR-125V with CANopen	12DIOR-125V-CAN
12DIOR-250V with CANopen	12DIOR-250V-CAN

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