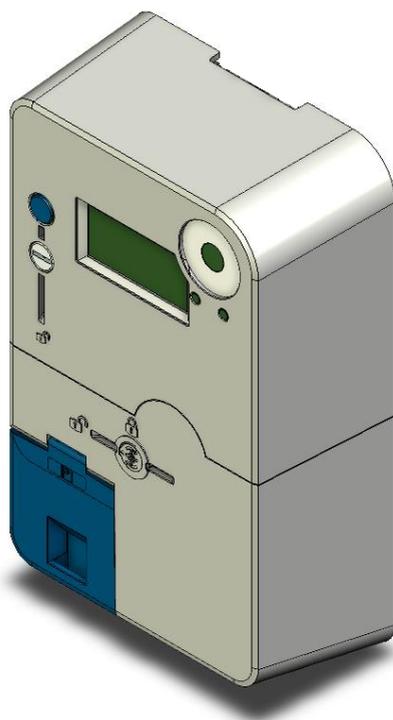


XS211
SINGLE PHASE RESIDENTIAL
CELLULAR POWER METER

Datasheet



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Sagemcom Energie & Télécom SAS

Headquarters: 250, route de l'Empereur

92848 Rueil-Malmaison Cedex - FRANCE

Tél. : +33 (0)1 57 61 10 00 - Fax : +33 (0)1 57 61 10 01

www.sagemcom.com

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1. INTRODUCTION

Purpose

The XS211 Datasheet targeted audience is the professionals working with the meter – during the installation and operating phases.

Safety Information

1.1.



This marking indicates the presence of a danger.
It shall be accompanied by a second marking indicating the nature of the danger.



This marking is used to indicate the presence of dangerous voltages.
Interfaces showing this marking shall be accessible only to maintenance personnel and users who have been given safety instructions regarding the restrictions on access and precautions that must be taken. The access shall be protected and controlled by the authority responsible for the installation and operation of the Meter.



This marking indicates that instructional guidance is provided in this document.
Provided information must be carefully read before any physical actions on concerned interfaces.

1.3.

CE Marking



The CE marking attests to the conformity of the product with the international technical regulations and harmonized European standards that apply when the product is released on the market, in particular in accordance with the European Measurement Instrument Directive (MID) 2014/32/EU and the Radio Equipment Directive (RED) directive 2014/53/EU.

2. PRODUCT DESCRIPTION

General overview

The XS211 meter is a single-phase direct meter. It offers measurements of different parameters and a large range of functionalities including a radio cellular interface for connection with central system and a customer local interface.

Measurements

The XS211 performs the following measurements:

- Imported and exported active energy measurement in compliance with the standard EN 50470-3 Class B.
- Imported and exported reactive energy on the four (4) quadrants: QI, QII, QIII and QIV in compliance with the standard IEC 62053-23 Class 2.
- Instantaneous active exported power (W)
- Instantaneous voltage
- Instantaneous current
- Instantaneous active imported power (W)
- Instantaneous power (W): P (average over the integration period)

All these data are displayed on the front panel LCD but are also remotely available via a radio cellular network.

Functionalities

The meter offers the following interfaces and functionalities:

- Mains terminal power connector
- Energy Metering
- Two LED outputs related to Total Active and Total Reactive energy.
- LCD for local display of consumption and metering data
- Backlight to ease LCD reading under low light conditions
- One button to scroll LCD display
- One button for maintenance actions
- Customer power disconnection using one latching relay
- One Maintenance optical interface
- One radio cellular interface using internal antenna for remote communication with central system
- One wireless M-Bus interface using internal antenna for communication with M-Bus slave devices
- One customer local interface (P1 port), according to DSMR 5.0.2
- Management of Maximum Demand
- Local communication ensured by an optical interface (compatible with IEC 61107 probes)
- Anti-tamper functionalities
- Robustness against accidental short circuit

Technical features

Technical Characteristics		
Electrical Characteristics		
Reference Voltage		
Type of network supported	Single phase	
Mono-phase electricity network	230V	IEC 60038:1983
Nominal value	230 V	IEC 60038:1983
Minimum Value	195.5 (-15%)	
Maximum Value	264.5V (+15%)	
Reference Currents		
Reference value	Iref = 5 A	IEC 62053-21
Maximum current	I _{max} = 100A	EN 50470-3
Minimum current	I _{min} = 250 mA	
Starting current	I _{start} = 20 mA	
Accuracy		
Active imported and exported energy	+/- 1%	EN 50470-3 Class B IEC 62053-21 Class 1
Reactive energy	+/- 2%	IEC 62053-23 Class 2
Real-time clock	Standalone <= 15 s/month at 23°C System resync <= 7s/month at 23°C	IEC 62054-21
Operating reserve		
If Un is set to 230 Vac, the meter is not affected by power cuts lasting less than 300 ms.		
Frequency		
Nominal value	50 Hz	IEC 62052 -11
Operational frequency range	47 Hz to 53 Hz (+/- 6%)	
Maximum frequency range	42.5 Hz to 57.5 Hz (+/- 15%)	
Self-consumption / Voltage circuits (Global consumption practically balanced between the active phases)		
Max, all interfaces fully loaded	Less than 6W / 10VA	
Average, P1 on	Less than 1.5W / 3.5 VA	
Average, P1 off	Less than 1W / 2.5VA	
Self-consumption / Current circuits (Per phase)		
At I _{max} = 100A	Less than 5W / 5VA	

Mechanical Characteristics		
Weight	910 g	
Dimensions	230 X 140 X 71.2 mm	
Mechanical requirements standard	IEC 62052-11	
Environmental conditions		
Temperature Range		
Nominal	- 40°C to + 70°C	
Maximum operating range	- 40°C to + 70°C	
Storage and transportation	- 40°C to + 70°C	
Humidity (non condensing)		
Nominal	≤ 95 % at +40 °C	
Maximum operating range	≤ 95 % at +40 °C	
Storage and transportation	≤ 95 % at +40 °C	
Meter protective class		
IP class	IP54	IEC 60529
	IK02	EN 50102
Protective class	Class II	
Indoor usage	IEC 62052-11	
Fire protective class	5-VB	EN 62368-1
		UL94 standard / 60695-11-20
Electromagnetic Environment		IEC 62053-21
Radio meters	<p>This equipment generates radio frequency signals in the 700 MHz, 800MHz, 900MHz and 1800MHz bands.</p> <p>To reduce radio frequency exposure, a minimum distance of 25 cm between the product and the people is recommended.</p>	
Immunity against	<p>Voltage dips and short interruptions</p> <p>Electrostatic discharge</p> <p>Radiated RF electromagnetic fields</p> <p>Electrical fast transients / bursts</p> <p>Conducted disturbances, induced by RF fields</p> <p>Surges</p> <p>Continuous magnetic fields of external origin</p> <p>Power frequency magnetic fields of external origin</p> <p>Oscillatory waves</p>	
Other	Radio interference suppression	
Certification	MID, RED	
Marking	CE	

Functionalities		
Metering		
Imported and exported active Energy and Power	5(100) A Class 1 0,25 – 5 (100) A Class B	IEC 62053-21 EN 50470-3
Imported and exported reactive Energy and Power	Class 2	IEC 62053-23
Apparent Power and Energy		EN 50470-1
Visual indicators and display		
LCD	Local display of consumption and metering data	
LED	2 LEDs on the front panel	
Communication & Signal ports		
Optical Port	Local communication from 9600 to 19200 bps	IEC 62056-21
P1 Port	RJ12 block interface	P1 Companion Standard in accordance with latest version of <i>Industry Recommendation for Customer Local Interface for Meters</i> (Sw. Branschrekommendation för lokalt kundgränssnitt för elmätare)
P2 Port	Wireless M-Bus	EN 13757-4
P3 Port	Radio cellular communication port	
Latching relay – Breaker		
UC3 (Breaker)	EN 62055-31	
Auxiliary relay		
Monostable (2A)		
Time Of Use (TOU)		
Tariff Management		
Tariffs	8	
Seasons	12	
Weeks	12	
Days	30	

Contracts	
Number of contracts managed	1
Number of Load Profiles managed	2
Anti-tamper	
Terminal cover	Opening survey and storage of terminal cover events
Detection	Local Programming, reverse energy
Fraud protection	Ultrasonic welding of main & terminal meter covers
Magnetic Field Handling	Magnetic Field Detection and Immunity (up to 500mT)
Alarms	
Anti-tamper alarm, Low Battery, Voltage dip alarm, Memory Alarms, and other according to the meter configuration.	

Physical Design

2.3.1. Meter Dimensions

The meter comes with a short or a long terminal cover. It has the following dimensions. All values are in millimetres.

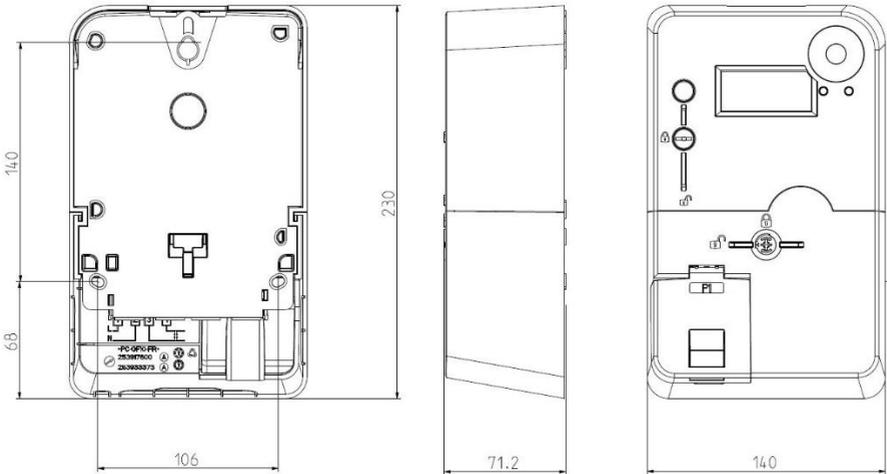


Figure 1 – Views with terminal cover

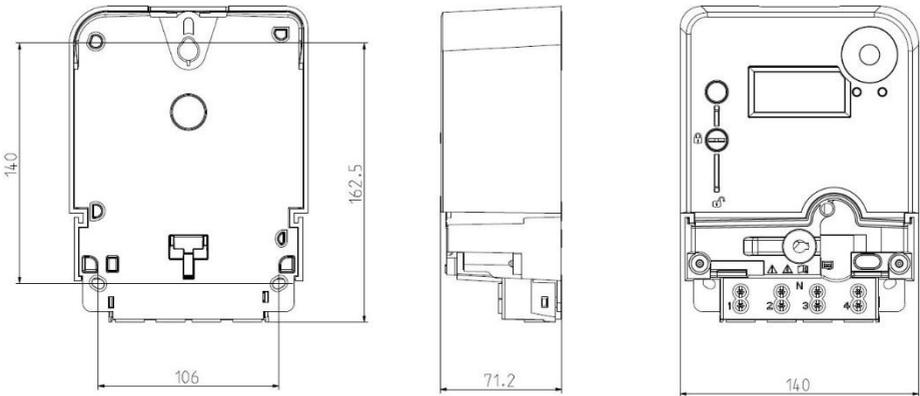


Figure 2 – Views without terminal cover

2.3.2. Casing Sealing

The integrity and the inviolability of the meter are ensured by 2 ultrasonic seals.

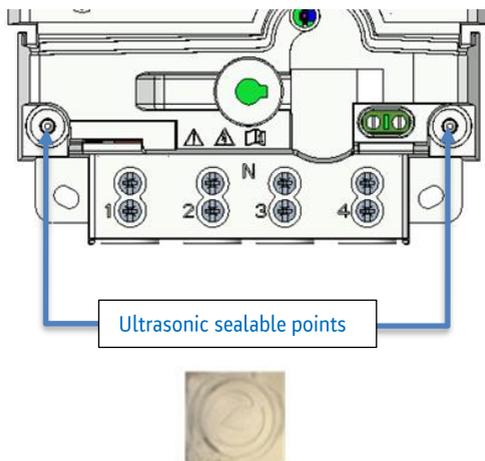


Figure 3 – Location of the casing sealing

2.3.3. Terminal Cover Sealing

The integrity and the inviolability of the power terminals of the meter are ensured by one screw seal.

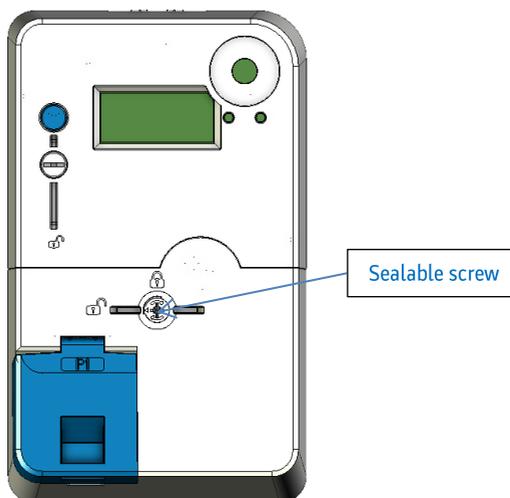


Figure 4 – Location of the sealable screw

This part covers at least the terminal block (power connector) and the auxiliary relay. The terminal block cannot be accessed once the terminal cover is placed and sealed.

The customer interface can be accessed once the terminal cover is placed and sealed. Once sealed, any terminal cover opening attempt results in permanent and visible traces or damages. The opening of the terminal cover is detected whether the meter is powered or not.

The terminal cover has precut shapes for the passage of cables.

2.3.4. Power terminals

The meter is equipped with four main terminals to connect the meter to the grid. Each main terminal has two fixing captive type screws. The power terminals are BS type, according to the British standard BS7856:2017. They are numbered (1; 2; 3; 4) and the letter "N" is used to recognize the neutral conductor (see figure 5).

The power terminal accepts cables with a minimum section of 4mm² and a maximum section of 35mm².

The dimension of the power terminals is shown on the figures below.

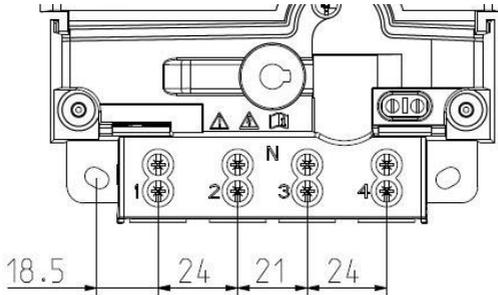


Figure 5 – Front view of the power terminals

2.3.5. Connection diagram

The meter can be connected on a single-phase network with two wires.

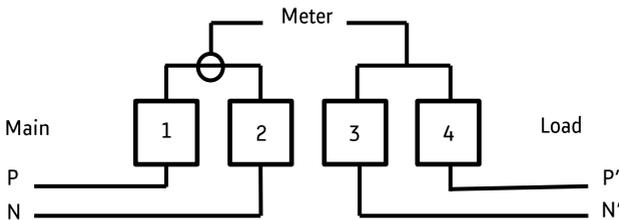


Figure 6 – Power connection diagram

The connection diagram is also marked inside the terminal cover, in accordance with the EN50470-1 standard.

3. FUNCTIONALITIES

Metering Functions

The main function of the XS211 is the metering function. It measures and computes all the values described in this chapter. The values can be absolute or incremental.

All the meters are calibrated and checked in metrology accuracy according to the MID standard (MID Directive 2014/32/EU module B and D). This calibration and these metrology checks are performed once during the manufacturing process. All meters are made of precision integrated circuits.

This value is stored in the registers \hat{S}^+ and \hat{S}^- for respectively the imported and exported apparent energy and \hat{S} if no differentiation is made between \hat{S}^+ and \hat{S}^- .

Latching relay (breaker)

3.2.

3.2.1. Technical description

A latching relay is a system inside the meter allowing to supply or not power to the end user. One latching relay (also known as internal breaker) is available and proceeds on the phase and neutral wires.

3.2.2. Modes description

Several modes are available for the latching relay which can be configured.

Disconnection and reconnection can be requested:

- Remotely, via a communication channel: remote disconnect, remote reconnect
- 3.3. Manually, using the push button: manual disconnect, manual reconnect
- Locally, by a function of the meter (e.g. overpower): local disconnect, local reconnect.

Time Of Use (TOU)

3.3.1. Tariff & Contracts

The XS211 can manage 1 contract structure as specified in the table below:

Tariffs	8
Seasons	12
Weeks	12
Days	30
Switching times per day	11

Special days	30
--------------	----

Table 1 – Tariffs

Real Time Clock

3.4.1. RTC Accuracy

The meter embeds a real time clock (RTC). The RTC is clocked from a dedicated crystal.

It can be calibrated during manufacturing process to compensate initial deviations resulting in initial accuracy better than +/-3ppm.

The RTC feature is maintained even when the meter is not powered from the grid thanks to a dedicated battery. The RTC meets the accuracy requirements of the EN 62054-21.

3.4.2. RTC-dedicated internal power supply

The meter integrates an internal power source to keep the real time clock (RTC) running and detect terminal cover removal when not powered from the grid.

It automatically feeds the circuitries related to the RTC and to the terminal cover detection when the main power is down.

Memory Registers

3.5.

The meter memorizes various types of data:

- Configuration parameters
- States variables
- Measurement data
 - Energy registers resulting from metrology measurements
 - Load curves built by application layer
- Event logs

All these data are saved in an internal non-volatile memory, in compliance with the definition in the EN 50470-1 standard. This memory is of NOR FLASH type.

The energy registers which are incremented as a result of metrology measurements are recorded in the flash memory every hour so that the register can never be decremented.

The estimated lifespan of the memory component is > 20 years with a writing frequency of 1 minute. The frequency in the field is less than 1min for all the records types.

Metering Visual indicator

The meter has two light-emitting diodes (LED) as indicated on the next figures showing the energy consumption. The colour of both LED is orange.

3.6.

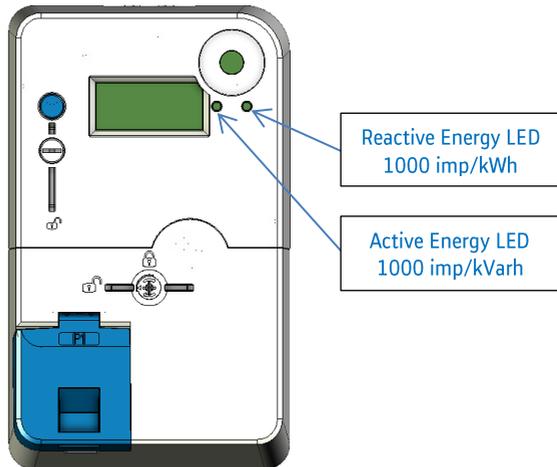


Figure 7 – Energy LEDs

3.7.

Button

The meter is equipped with a push button for LCD scrolling and breaker connection and a sealable push button for installation menu visible on the front panel.

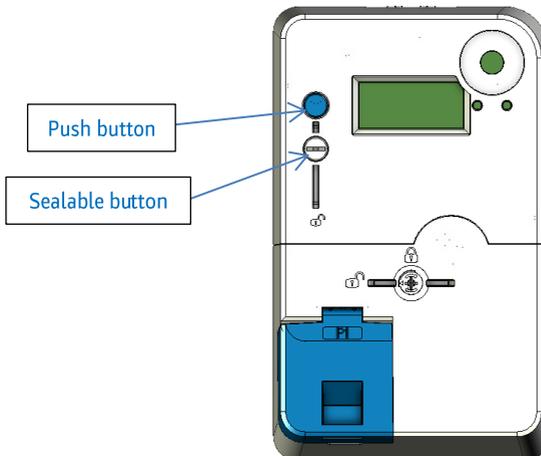


Figure 8 - Buttons

Communication protocols

3.8.1. P0 communication port

The P0 port is an optical port that is available on the front panel of the meter. It is located as shown in the next figure:

3.8.

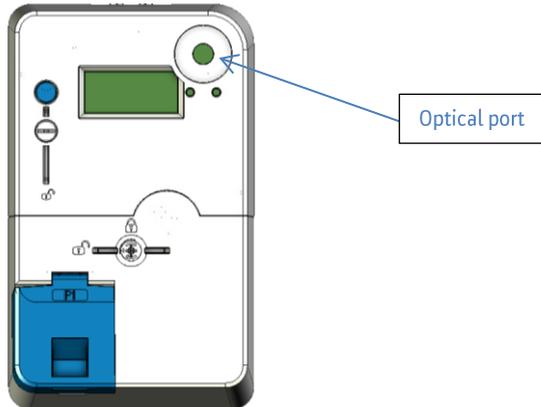


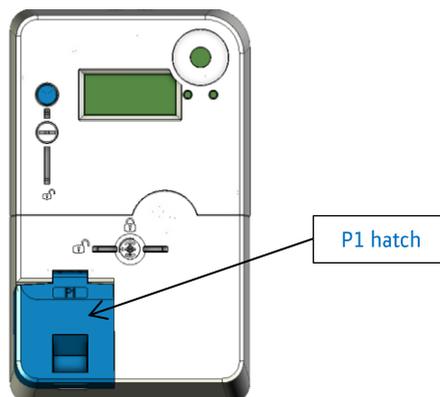
Figure 9 – Optical port

The meter can be read or programmed through its optical interface. An optical probe compliant with the international standard IEC 61107 can be used to establish a local connection with the meter.

The optical link uses a modified version of the protocol IEC 62056-31 (minimal link speed is 9600 bps).

3.8.2. P1 signal port

The P1 signal port is a serial data port according to DSRM 5.0.2. It is located behind a dedicated hatch.



Internal view:

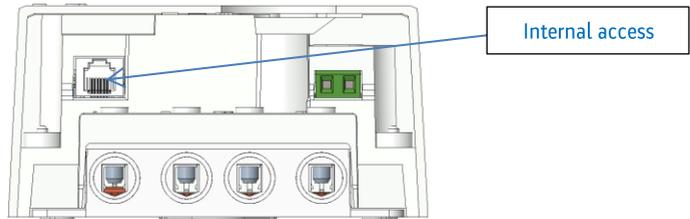


Figure 10 - P1 port

3.8.3. P2 Communication port

The P2 communication port is a Wireless M-Bus port also specified in EN 13757-4. The electronic and antenna of this port are completely integrated in the meter.

The meter is a radio equipment transmitting intentionally by using wireless M-Bus technology at 868MHz with a maximum power level of 15dBm.

The meter is a "Short Range Devices (SRD)", as per EN 300 220 standard suite definition.

The meter must satisfy the related essential requirements regarding the electromagnetic compatibility and radio spectrum matters (ERM).

The design of the meter is in conformance with the applicable requirements of the EN 300 220-1 and of the EN 300 220-2.

The radiating element (antenna) is implemented within the meter housing.

3.8.4. P3 Communication port

The communication port is based on a radio cellular modem (P3).

Remote communication uses HDLC DLMS COSEM and OBIS codes in compliance with IEC 62056-46, IEC 62056-53, IEC 62056-61 and IEC 62056-62.

To communicate with the AMM system, the meter uses the radio cellular network.

The meter is a radio equipment transmitting intentionally by using NB-IoT 2 or NB-IoT 1 depending on variants, and LTE Cat M1 technologies.

The supported frequency bands (and the related maximum transmitted power) are the following:

• LTE Band3	1800MHz	Tx = 1710MHz to 1785MHz	25.7dBm max
• LTE Band8	900MHz	Tx = 880MHz to 915MHz	25.7dBm max
• LTE Band20	800MHz	Tx = 832MHz to 862MHz	25.7dBm max
• LTE Band28	700MHz	Tx = 703MHz to 748MHz	25.7dBm max

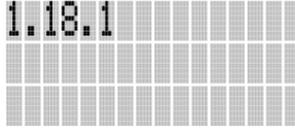
The meter is an "Evolved Universal Terrestrial Radio Access (E-UTRA) user equipment (UE)", as per EN 301 908 standard suite definition.

The meter must satisfy the related essential requirements regarding the electromagnetic compatibility and radio spectrum matters (ERM).

3.8.6. Line 1

3.8.6.1. ID area

The ID area displays the short OBIS code, or any other identifier, related to the value being displayed on the screen. The ID is aligned on the left of the ID area.

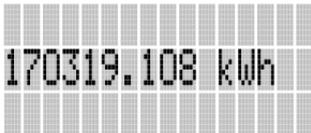


3.8.7. Line 2: Data and Unit areas

The Data area displays the value itself. The Unit area displays the unit of the value displayed, if applicable. In all screens, the data is aligned on the right of the Data area. The unit is aligned on the left of the Unit area.

3.8.7.1. Active Energy Register

It is possible to switch between five possible combinations of digits.



Unit: kWh
 Precision: 1 Wh
 6 digits + 3 digits in standard display
 Unsigned value

3.8.7.2. Active Power

Unit: kW
 Precision: 1 W
 6 digits + 3 digits
 Signed value

3.8.8. Line 3: Status area

The third line of the meter display is dedicated to status indicators and is refreshed every second, independently from the MMI state machine. Each indicator has a predefined position, detailed hereafter.

ICONS TRIGGER & BEHAVIOR			
1 - Phase presence indicator	Import	→	If any of the phase is connected then either of the import/export symbols is displayed depending on the direction of the energy flow. The phase rotation will be reflected by the blinking of all the arrows at the same time.
	Export	←	

ICONS TRIGGER & BEHAVIOR			
2 - Breaker ON		▽	This arrow is displayed whenever the end-user has disconnected the breaker manually through the item "Breaker switch" in normal mode. When this arrow is displayed, and the display is in idle mode, then it always ends up back to the screen described in tab 5 - Breaker Reconnect Mode
3 - Breaker status indicator		▽	Depending on the physical state of the breaker, the arrow will point to the relevant marking
4 - P1 Enabled		▽	This arrow is displayed whenever the P1 port is activated
5 - MID Indicator		▽	This arrow is displayed whenever the energy register that is displayed on screen is MID relevant
6 - Network registration status		▽	This arrow is displayed whenever the meter received a TCP acknowledgement as a result of any of the pushes that come first after a Power-on/resume: either push on installation or push on connectivity Unless there are signal reception issues, this icon shall be displayed in less than 5 minutes
7 - Signal quality			The displayed bars reflect the signal quality based on RSRP indicator as follows: NB1 & Cat M1 < -134 dBm => 0 bar -134 dBm to -120 dBm => 1 bar -120 dBm to -105 dBm => 2 bar -105 dBm to 0 dBm => 3 bars

Anti-Tamper

- Terminal cover opening/closing detection
A mechanism is used to detect the opening/closing of the terminal cover.
- Snapshot record
Timestamp and event type
- Main cover opening/closing detection
A mechanism is used to detect the opening/closing of the main cover.
- 3.9. ➤ Storage of terminal cover opening events
The meter manages a table which stores all events relating to the opening of the terminal cover.
- Storage of main cover opening events
The meter manages a table which stores all events relating to the opening of the main cover.
- Detection of local programming
The meter also manages a table which stores all events of local programming through the optical interface.
- Reverse Energy
A symbol on the display indicates the energy direction (imported or exported).
- Strong DC field detection
Indicate strong DC field has appeared or disappeared
- Tamper on phase and neutral wires
Tamper by inversion neutral/one phase:
 - The meter still works
 - A tamper event is detected in two ways:
 - Measure of the angle between phases voltage
 - Measure of exported energy on phase
 - A tamper event is recorded in a log

Note about magnetic field detection:

AC fields may be detected but the meter is not designed for such a purpose, therefore the detection efficiency is not guaranteed. Indeed, AC fields-based frauds require specific devices enabling to reproduce strong fields equivalent to DC fields and these devices are unlikely to be available for most customers.

4. INSTALLATION

Before installation

All installations of electrical devices must be done according to safety regulations and rules. The instructions detailed in this user guide must be carefully followed to prevent from any form of danger for the installation and for the installer.

The following safety instructions must be observed at all time:

- 4.1. The installation and commissioning must only be performed by a qualified and trained personnel, authorized to work on electrical installations. This User Manual must be carefully read and followed.
 - Local safety regulations must be observed.
 - During installation of the meter, the power must be off.
 - The power must be turned on only when the main parts under voltage are protected.
 - Do not touch any live part of the meter.
 - Any inappropriate behaviour not described in this document can lead to injuries or damage of the meter.
 - The personnel must ensure that all the external safety breakers are suitably dimensioned and in place. The building installation must include an appropriate overcurrent protective, short circuit and disconnect device (removable fuse gG type, Rated current 800A, Breaking capacity 20kA or with equivalents characteristics).
 - The personnel must be equipped with all required Personal Protective Equipment (PPE) and tools.

4.1. Mounting

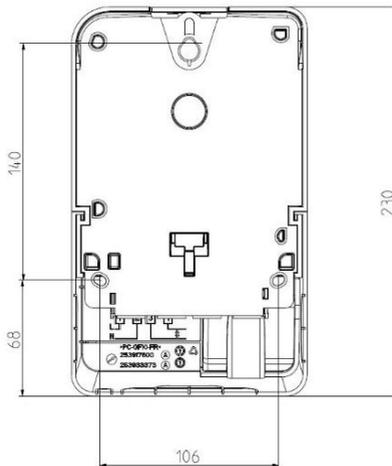


Figure 12 – Mounting bracket

The IP class is IP54.

In regard to safety standards, the meter is designed for indoor usage and the Over Voltage Category is OVC III. Should the meter be installed in an environment of overvoltage category OVC IV, then the it has to be combined with an overvoltage protection device (typically compliant with standard IEC/EN 61643) installed external to the meter and in accordance with national installation rules, making it possible to limit the OVC IV transient overvoltage levels received by the meter down to the levels of the OVC III or lower.

Mounting height must be inferior to 2 meters and the installation altitude must be up to 2000m.

The meter can be installed on mounting plate with three triangle points by using M5 screw type.

The stripped part of the conductor which is inserted shall be in contact within the power terminal and not outside. The stripping length shall be less than 19 mm and a minimum of 5 mm is preferred to ensure a robust wiring. The conductors are inserted in the power terminals and fastened by one PZ2 screw. The recommended installation torque for the mains screws is 2.35 N.m. The maximal screwing torque is 5 N.m.

No device inside equipment is intended to be replaceable.

5. GLOSSARY

COSEM	Companion Specification for Energy Metering
DIN	Deutsches Institut für Normung
DLMS	Device Language Message specification
DSMR5	Dutch Smart Meter Requirements 5.0
EN	European Standards
IEC	International Electrotechnical Commission
LCD	Liquid-crystal display
LED	Light-emitting diode
LTE	Long Term Evolution
OBIS	Object Identification System
TOU	Time Of Use