



GB

<b>Code</b>	<b>Model</b>
<b>ECSEM581MID</b>	<b>MPRO DC Modbus MID</b>

A single-phase DC energy meter rated for 1000V and 100A, powered by an auxiliary supply, is designed to measure accumulated energy and display voltage, current, and power on a backlit LCD. The meter supports Modbus RTU communication for remote reading. It is intended exclusively for DC electrical systems and cannot be used in AC applications

MID certification concerns active energy only.

User instructions.

### Safety instructions

- Read this manual carefully BEFORE installing the instrument.
- This device must be installed indoor only by a professional electrician fitter according to local applicable installation standards.
- Do not plug in or unplug this product when the power supplying is ON. Its use is only permitted within the limits shown and stated in the installation instructions. The device and the equipment connected can be destroyed by loads exceeding the values stated.
- Any type of intervention on the products, including cases in which they cease to function or present defects, can be dangerous for the operator's safety and relieves the Manufacturer from all civil and criminal liability.

### Front of the energy meter

- LCD display with green backlight. The backlight turns on when a button is pressed and turns off 40 seconds after the last pressure.
- Four push-button keys:



**UP key.** This key is mainly used for two functions:

- To increase the value of a parameter (or the value of a digit of a parameter). In case of multi value parameter, it selects the next value.
- To select the next page in a menu.



**DOWN key.** This key is mainly used for two functions:

- To decrease the value of a parameter (or the value of a digit of a parameter). In case of multi value parameter, it selects the previous value.
- To select the previous page in a menu



**MENU/ESC key.** This key is mainly used for two functions:

- To change the menu
- To cancel the modification of a parameter



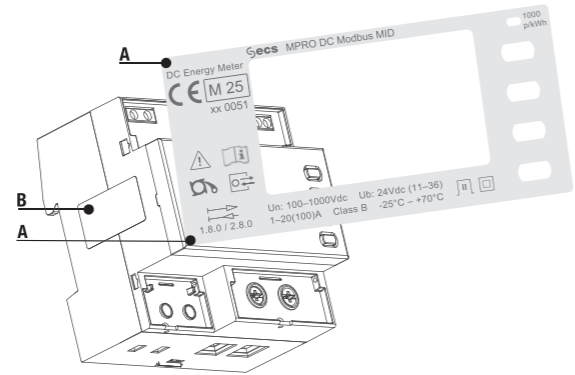
**OK key.** Depending on the active page, it can be used:

- to confirm the modification of a parameter (or the modification of one digit of a parameter)
- to answer to a question

- Metrological LED with non-modifiable constant: 1000 pulses per kWh, in accordance with EN IEC 62052-11: 2021+A1:2022 § 5.8

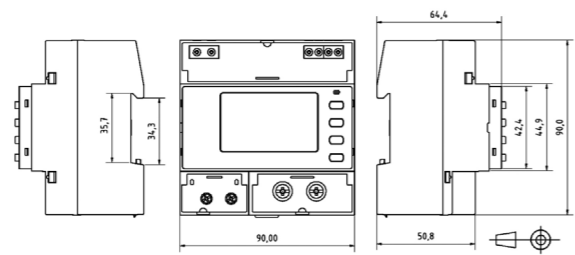
- Protective class II equipment - Reinforced insulation
- Backstop (Energies cannot decrease)
- Bidirectional Communication. The symbol is placed near the communication terminal.
- Oversvoltage Category II (the symbol is laser printed in the proximity of the Current and Voltage terminals) above 480V
- Oversvoltage Category III (the symbol is laser printed in the proximity of the Current and Voltage terminals) up to 480V

### MID certified

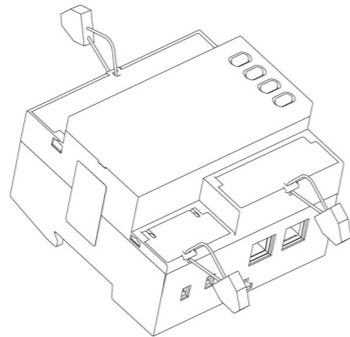


- A) Device code and certification data indications
- B) Safety-sealing between upper and lower housing part

### Dimensions



### Sealable terminal cover



### Wiring

#### Modbus protocol

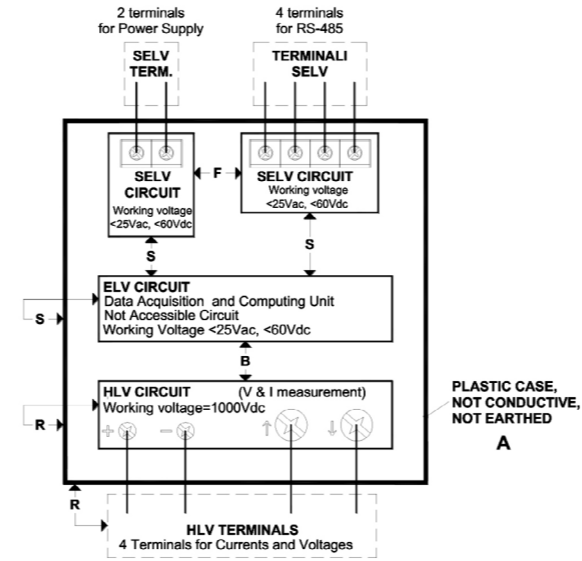
The Modbus protocol operates on a master/slave structure:

- Reading
- Writing

The communication method is RTU (Remote Terminal Unit) with hexadecimal.

## Electrical Safety (IEC 62052-31:2023)

### Insulation between parts (IEC 62052-31:2023 Annex B § B.2)



The Energy Meter is suitable for use on both impedance grounded networks and not grounded networks (EN IEC 62052-11:2021+A11:2022 § 6.5.1)

**The external surface of the plastic case is accessible**  
**No other part is accessible**

- Legend:
- B** = Basic Insulation
  - S** = Supplementary Insulation
  - R** = Reinforced Insulation
  - F** = Functional Insulation
  - A** = Accessible Part

**Use:** Indoor (EN IEC 62052-11:2021+A11:2022 §3.4.1)  
**Pollution degree 2** (IEC 62052-31:2023 §3.6.12)  
**Comparative Tracking Index (CTI)** (IEC 60112) = Material Group IIIa  
**Working Voltage** (IEC 62052-31:2023 § 3.3.7) = 1000 Vdc  
**Maximum transient Overvoltage** = 6000 V (IEC 61010-1)  
**Maximum Current I<sub>max</sub>** 100 A (IEC 62052-31:2023 § 3.3.11)  
**Maximum Overload Current I<sub>ov1</sub>** 150 A (IEC 62052-31:2023 § 3.3.12)  
**Protective class II equipment** (IEC 62052-31:2023 § 3.6.8) Reinforced Insulation.

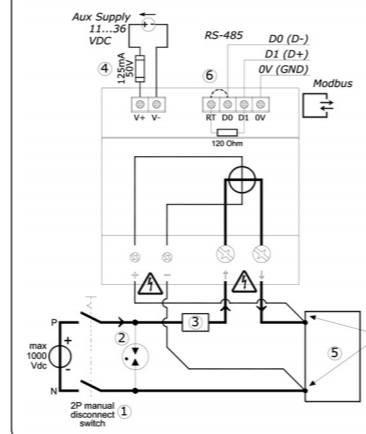
**Oversvoltage Category II** (IEC 62052-31:2023 § 3.6.8 - Source: IEC 60664-1:2007)  
**Oversvoltage Category III** (IEC 62052-31:2023)

### Mitigation of residual risks

Read this manual before installing the Energy Meter and apply all what is recommended to reduce risks. Besides that, to mitigate the residual risks, follow what is written below.

- Installation (and uninstallation): The disconnecter must be easy to identify and to operate and must be close to the Meter. It must be in "OFF" position (open circuits) from the beginning to the end of the installation or of the uninstallation. The Energy Meter, the disconnecter and the

#### Wiring diagram



- ① Bipolar disconnecter 1000Vdc, >100A  
The disconnecter must be clearly labelled and must be easily accessible by the installer
- ② Gas-filled surge arrester or varistor, UL 1449 or VDE/IEC 61051-1/2 approved. Operating voltage ≥ 1000 Vdc, Clamping voltage ≤ 2500Vdc, Peak Current ≥ 70 kA
- ③ Fuse certified according to IEC 60269-6. Fast Acting. Operating current 100 A. Voltage rating ≥1000 Vac. Interrupting rating 100Ka
- ④ Cartridge fuse 5X20mm, certified according to IEC 60127-2. Medium Acting. Operating current 125 mA. Voltage rating ≥ 50 Vac. Interrupting rating ≥20 A.  
The installer is responsible for coordinating the rating and the characteristics of the supply side overcurrent protection. The devices must be correctly sized with respect to the installation voltage, the maximum overcurrent applicable to the meter and the fault current available. The following parameters are to be taken into consideration:  
 - Maximum current = 100A  
 - Maximum Overload current = 150A  
 Maximum Voltage= 1000Vdc
- ⑤ 2 wires electrical load.
- ⑥ Apply the jumper to activate the 120Ω termination (usually applies to the first and last device connected to the RS-485 loop)

overload current and voltage protection devices must be easily identifiable, must be installed in an adequate cabinet (IP51 and V1) and it must be easy to intervene on them whenever appropriate. Inside the cabinet, do not install any other device with a flammability class worse than V1.

- OperatingConditions: The following rules must be observed during installation and operation
  - The cover of the cabinet where the Energy Meter is installed must be closed.
  - The terminal covers of the Energy Meter must be closed.
  - It is strictly forbidden to apply a voltage greater than 1000Vdc. It is strictly forbidden to apply a current >100A (rms).
  - No intervention is allowed on the wires connected to the Energy Meter, including the SELV circuit wires. To operate on the wires, the Energy Meter must be disconnected from dangerous voltages.
  - Despite the Energy Meter, the cabinet and all other devices mounted inside the cabinet must have a flammability class = V1, a fire in the vicinity of the cabinet cannot be 100% excluded. In this case, do not use water to extinguish the fire, but preferably sand extinguishers or equivalent.
- Maintenance: For this Energy meter, no maintenance, repair or replacement of parts is authorized. Such interventions are to be considered prohibited. In case of malfunction, it must be replaced.

### Commissioning

- Recommendations
- Check the following before putting it into service:
  - Make sure that no dangerous voltages are connected to the SELV terminals.
  - Check that the main page appears on the display (see menu description) and not the Phase Sequence Error page.

### Maintenance

- Make sure that no voltage is applied to the instrument.
- Only dry cleaning is allowed with a natural fiber cloth (for example cotton or linen) or synthetic fabric that does not leave residual fibers that can remain on the surface of the Energy Meter or that can penetrate into the Energy Meter.

- For this Energy meter, no maintenance, repair or replacement of parts is foreseen. Such interventions are to be considered prohibited. In case of malfunction, it must be replaced.

### Diagnostic messages

If any of the following conditions occur, one of the following messages appears when you turn the device on.

**Negative Voltage**  
 In case the device detects that the measured voltage is negative (+ and - connections are inverted), this message appears on the display, thus suggesting the installer to change the polarity. Alternatively, the operator can press the OK key, and the message disappears.

**Unrecoverable internal errors**  
 In case one of these two messages appears on the display, the Energy Meter is no longer usable, and must be replaced, because it has detected an important and unrecoverable internal error.

**Fail Error N.02** means that the Active Energy registers have been considered no longer reliable, and consequently have been reset.  
**Fail Error N.03** means that the relevant parameters for the quality of the measurements (including calibrations) are no longer reliable.

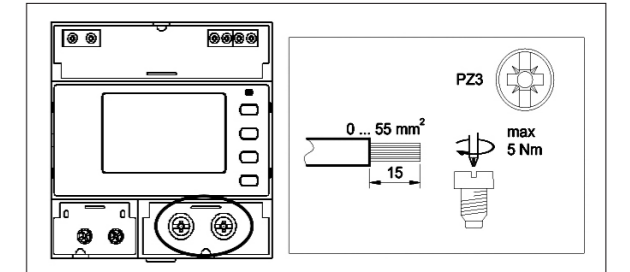
### Cable section - Cable stripping length - Screwdriver type - Maximum terminal screw torque

For each group of terminals, find below the suggested cable, the suggested stripping length, the maximum tightening torque and the screwdriver to use.

Wires compliant with IEC 60332-1-2 if section ≥ 0.5 mm<sup>2</sup>, or to IEC 60332-2-2 for smaller sections. Alternatively, they must have a flammability rate UL 2556 VW-.

#### Current terminals

- Cable section Area: 0 ... 55mm<sup>2</sup> (\*)
- Screwdriver: Pozidriv PZ3
- Maximum tightening torque: 5 Nm
- Suggested stripping length: 15 mm

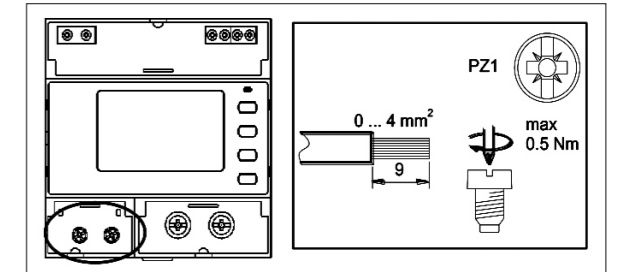


(\*) The minimum section of the cable depends on the external current limiter in series to the current circuit. In case current limiter for 100 A (maximum current applicable to the current terminals), the following characteristic of the cable are mandatory:

- Copper wire
- Nominal Voltage ≥= 1000 V
- PVC insulated (or better), suitable for ambient temperature up to 75°C
- Minimum diameter
  - In case of bare wire: 7.448 mm (cross section 42.4 mm<sup>2</sup>), corresponding with AWG ≤= 1
  - In case of stranded wire, the minimum diameter depends on the stranding composition. For example, with 817 wires AWG 30, the diameter is 8.33 mm (cross section 54.5 mm<sup>2</sup>)

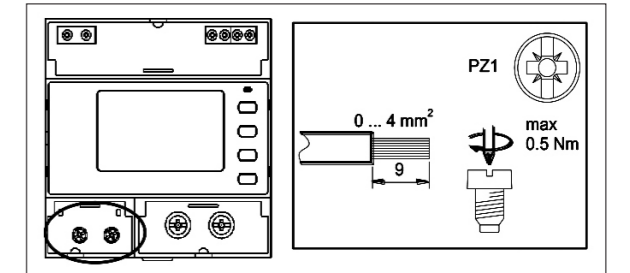
#### Voltage Terminals

- Cable section Area: 0 ... 4 mm<sup>2</sup>
- Screwdriver: Pozidriv PZ1
- Maximum tightening torque: 0.5 Nm
- Suggested stripping length: 9 mm
- Suggested cables: AWG 12 ... AWG18



#### Auxiliary Supply and Modbus terminals

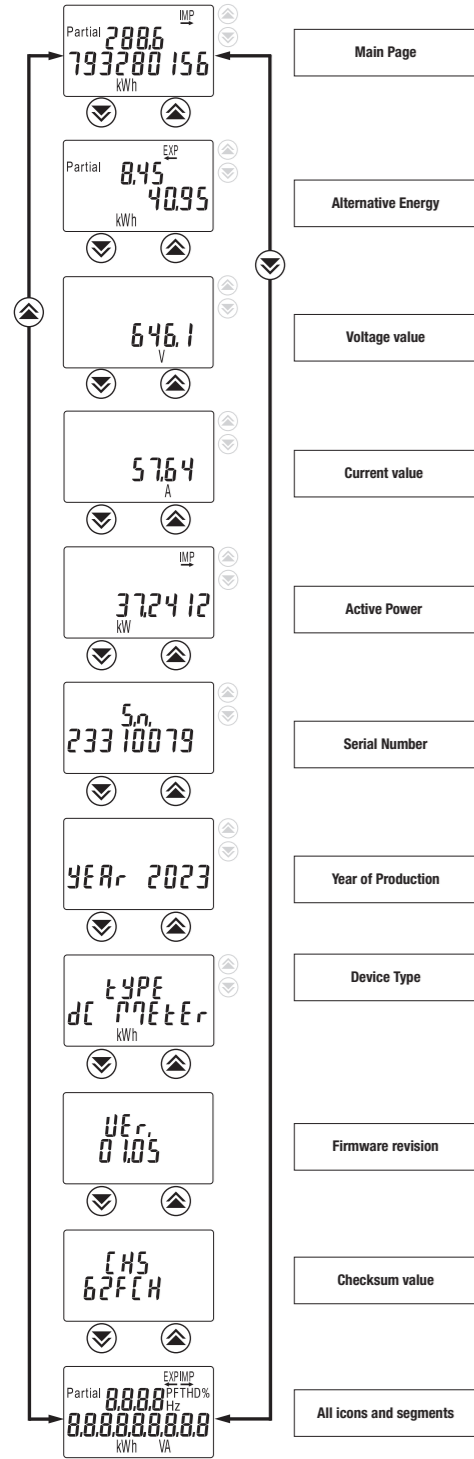
- Cable section Area: 0 ... 2.5 mm<sup>2</sup>
- Screwdriver: Pozidriv PZ0
- Maximum tightening torque: 0.5 Nm
- Suggested stripping length: 6 mm
- Suggested cables: AWG 14 ... AWG 22



# General Menu

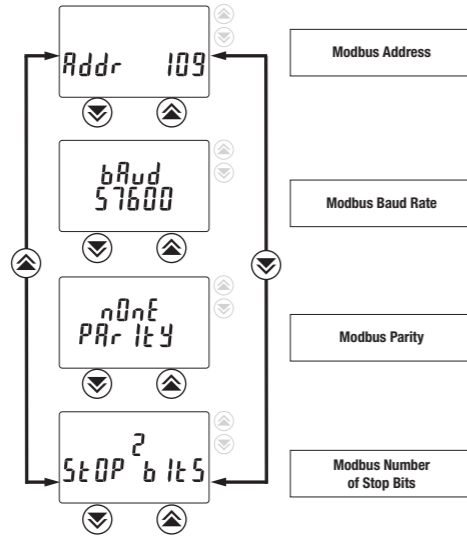
## Main menu

Starting from the Main Page, by using the UP and DOWN keys, it is possible to scroll the pages of the Main Menu.  
If the Imported Energy is displayed on the Main Page, the Exported Energy will appear on the second page and vice versa.  
The whole list of the pages of the Main menu is displayed below:

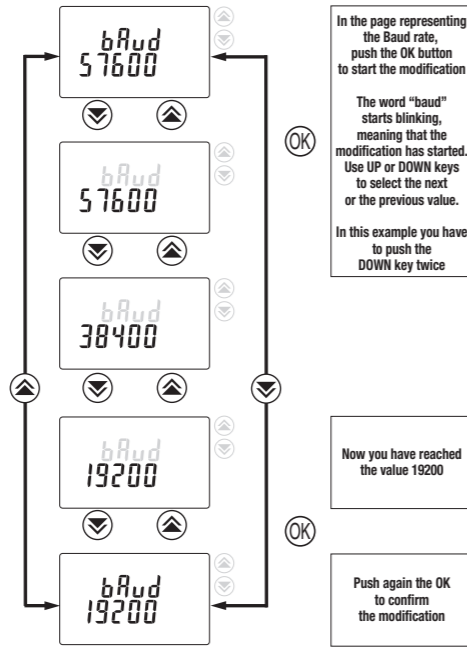


## Configuration menu

In all pages of the Main Menu, by pushing the MENU/ESC key it is possible to access to the Configuration menu.  
By using the UP and DOWN keys, it is possible to scroll the pages of the Configuration Menu



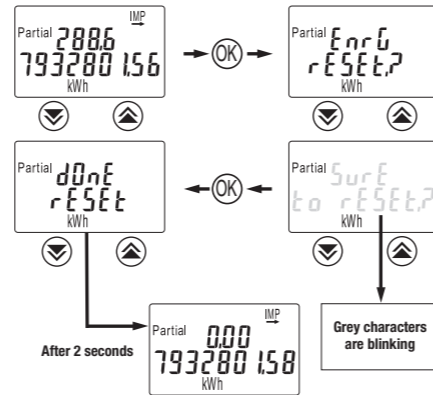
To go back to the Main Menu, push again the Menu/ESC key.  
To start the modification of a parameter, push the OK button.  
For example, suppose you want to modify the Baud rate from 57600 to 19200 baud.



If, during the procedure, you push the Menu/ESC key, the modification is cancelled.  
The same happens if you do not push any key for 40 seconds.

## Reset of partial energies

In the first two pages of the main menu, where the partial Energies are displayed, you can push the OK key to start the reset procedure.



# Technical data

Data in compliance with EN 62052-11:2021+A11:2022, EN 62052-31:2023, EN 50470-4:2023

General characteristics			
Housing	DIN 43880	DIN	5
Mounting	EN 60715	DIN rail	35 mm
Depth		mm	64,4
Weight		g	424
Operating features			
Connection	to single phase network - number of wires	-	2
Storage of energy values and configuration	Internal flash non volatile memory	-	☑
Approval			
Reference Voltage (Un1)		V	100
Reference Voltage (Un1)		V	800
Nominal Current (In)		A	20
Transition Current (Itr)		A	2
Minimum Current (Imin)		A	1
Maximum Current (Imax)		A	100
Starting Current (Ist)		A	0.080
Number of phases / number of wires		-	1 / 2
Certified Measures		kWh kWh	kWh
Accuracy			
- Active Energies (accord. to EN 50470-4:2023)		classe	B / 1
Supply Voltage and Power Consumption			
Auxiliary Voltage range		Vdc	14...31
Nominal Auxiliary Voltage range		W	≤ 0.056
Maximum Power Consumption (Voltage circuit)		W	≤ 12.6
Maximum Power consumption (Current circuit) @ Imax		W	≤ 12.6
Voltage Input Waveform		-	DC
Overload capability			
Current	Maximum	A	150
	temporary (10 ms)	A	3000
Measuring Features			
Voltage range		V	92 ... 946
Current range		A	1 ... 100
Measured Quantities		-	V, A, kWh, kW
Display features			
Display type	LCD with backlight	-	
Active Energy	7 digits + 2 decimal digits	kWh	0.01 ... 9999999.99
Voltage	3 digits + 1 decimal digit	V	90.0 ... 946.0
Current	2 digits + 2 decimal digits	A	0.00 ... 100.0
Active Power	2 digits + 2 decimal digits	kW	0.00 ... 22.08
Display refresh period		s	1
Optical metrological LED			
Front mounted red LED (meter constant)	proportional to active imp/exp Energy	imp/kWh	1000
Safety			
Utilization category		-	UC3
Overvoltage category		-	3 till 480V 2 till 1000V
Protective class		classe	II
DC voltage test		kV	6
Degree of pollution		-	2
Operational voltage		V	300
Housing material flame resistance	UL 94	classe	V0
Safety-sealing between upper and lower housing part		-	☑
Printed circuit board flammability class		-	V1
Material Group		-	IIa
IR Connectable Communication Modules			
For communication modules		-	☑
Embedded Modbus communication			
Physical interface	RS-485 - 3 wires	-	-, +, 0
Internal termination resistor		-	120 Ω
Baud rate	adjustable	bps	1200 ... 57600
Parity	adjustable: Odd, Even, None	-	☑
Stop Bit	adjustable	-	1, 2
Address	adjustable	-	1 ... 247
Isolation class	SELV	-	☑
Environmental conditions			
Storage temperature range		°C	-40 ... +85
Operating temperature range		°C	-25 ... +70
Mechanical environment		-	M1
Electromagnetic environment		-	E2
Installation	indoor only	-	☑
Altitude (max.)		m	≤2000
Humidity	yearly average, without condensation	-	≤75%
	on 30 days per year, without condensation	-	≤95%
IP rating	in built-in condition (front part)	-	IP51
	terminal block	-	IP20
Emission class compatibility CISPR 32		classe	B