

1. Scope

This document applies to the PowerMeter+ with LAN and RS485 communication interfaces.

2. Connection and set-up

⚠ DANGER



Danger of death by electric shock.

Live components carry potentially fatal voltages.

- Before starting any installation or maintenance work, switch off the power to the distribution board and secure to prevent it being switched on again accidentally.
- Make sure that the conductors to be connected to the meter are voltage-free.
- All installation and maintenance work on this unit must be carried out by a trained and authorised electrician.

The PowerMeter+ is supplied with power via outer conductor L1. At least the outer conductor L1 and neutral conductor N need to be connected for the unit to switch on.

3. Intended use

The PowerMeter+ is a measuring device that measures electrical values at the point of connection and makes them available via LAN or RS485.

This product is NOT an active electrical energy meter as defined by EU Directive 2004/22/EC (MID); it must only be used for internal accounting purposes. The data that the PowerMeter+ collects about the energy generated by your system may differ from the data from the main energy meter.

As it is classified as overvoltage category III, the PowerMeter+ must only be connected in the sub-distribution board or consumer unit, downstream of the electricity supply company's energy meter.

The PowerMeter+ is suitable for indoor use only.

The PowerMeter+ is approved for use in the EU Member States and the USA. Do not use the PowerMeter+ if it is damaged and then use only as described in the documentation provided. Any other use or the use of damaged units may result in injury or damage to property.

For safety reasons, the product (including the software) must NOT be modified and components must NOT be installed that are not expressly recommended or sold by SolarMax produktion GmbH for this product. Any use of the product other than as described in the Intended use section shall be

regarded as contrary to the intended use. Unauthorised changes, conversions or repairs and opening of the product are prohibited.

The enclosed documentation is part of the product and must be read, followed and then retained in a place that is accessible at all times.

4. Items supplied

- 1 x PowerMeter+ EM400 or EM420 or EM410
- 1 x installation instructions
- 2 x connector for RS485 interface

Please contact your dealer if you identify any damage or if the delivery is incomplete.

Additional materials required (not supplied):

- For the LAN connection:
1 x network cable
- For operation with current transformers:
3 x current transformers and current transformer connecting cables

5. Safety instructions

⚠ DANGER



Danger of death by electric shock.

Live components carry potentially fatal voltages.

- Only use the PowerMeter+ in a dry environment and keep it away from liquids.
- Install the PowerMeter+ only in approved enclosures or distribution boards downstream of the electricity supply company's meter so that the connections for the outer and neutral conductors are located behind a cover or guard to prevent accidental contact.
- The enclosure or distribution board must be accessible only with a key or suitable tool in order to limit access to authorised personnel.
- Before starting any installation or maintenance work, switch off the power to the distribution board and secure to prevent it being switched on again accidentally.
- Before cleaning, switch off the power to the PowerMeter+ and only use a dry cloth to clean.
- Maintain the prescribed minimum distances between the network cable and mains voltage installation components or use suitable insulation.

NOTICE

Avoid damage to or destruction of the PowerMeter+

- Do not connect an ISDN cable to the PowerMeter+'s network connection.

Damage to or destruction of the PowerMeter+ by voltage surges on the network cable

If network cables are installed outside the building, voltage surges can be caused by lightning strike, for example.

- If installed outside the building, the network cable must be protected with suitable overvoltage protection.
- Protect your solar installation with inverters using suitable overvoltage protection.

Damage to or destruction of the PowerMeter+ by improper use

- Do not operate the PowerMeter+ outside the specified technical tolerances.

6. Technical data

Interfaces	LAN (10/100 Mbit) RS485 (half-duplex, max. 115200 baud)
Protection class	II
IP code	IP2X
Connection cross section in line with EN 60204	10-25 mm ² * *Mechanical: 1.5-2.5 mm (e.g. for connecting external current transformers)
Tightening torque for screw terminals	2.0 Nm
Weight	0.3 kg
Dimensions	88x70x65 mm
Ambient temperature in operation	-25 °C...+45 °C
with reduced measuring current I _N at 32 A	-25 °C...+55 °C
Ambient temperature during transportation / storage	-25 °C...+70 °C
Relative humidity (non-condensing)	Up to 75 % as an annual average, up to 95 % on up to 30 days/year
Max. altitude during operation	2000 m above sea level
Mains power supply	
Starting current	< 25 mA
Supply voltage / frequency	110 V AC ±10 % / 60 Hz ± 5% or 230 V AC ±10 % / 50 Hz ± 5%
Internal consumption P _{max}	5.0 W
Measuring current circuit for measurement category III	
Limit current I _N / phase	63 A
Rated voltage	max. 230/400 V AC
Frequency range	50/60 Hz ± 5 %

7. Operation of the PowerMeter+ at ambient temperature of 55 °C

The following conditions apply to operation of the PowerMeter+ at ambient temperatures up to 55 °C:

- The PowerMeter+ must not be run continuously at ambient temperatures of 55 °C

⚠ DANGER



Danger of death by electric shock or fire

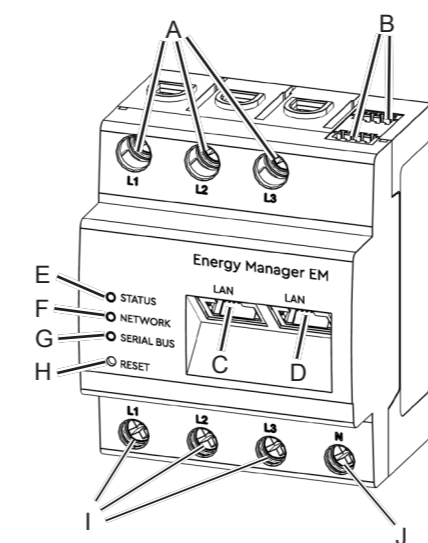
Live components carry potentially fatal voltages.

- Fuse protection must not exceed 32 A. External current transformers should be used for higher currents.
- The PowerMeter+ must be connected with cables that are at least 10 mm² in cross section and no less than 1 m long.

8. Available version

LLRR: 2 x LAN and 2 x RS485 interface (only with suitable RS485 cable)

9. Product description



A	Outer conductor L1, L2, L3 outputs
B	2 x RS485 connection
C	LAN connection
D	LAN connection
E	Status LED
F	Network LED
G	Serial bus LED for RS485 bus
H	Reset button
I	Outer conductor L1, L2, L3 inputs
J	Neutral conductor N

10. RS485 interface

Note the following points when connecting external devices to the RS485 interface of the PowerMeter+:

Requirement for the cable:

- Nominal voltage/wire insulation:
300 V RMS
- Cable cross section: 0.25 ... 1.5 mm²
- Cable type: Rigid or flexible
- Recommendation: Use AlphaWire standard cable, designation 2466C. Alternatively, a CAT5e cable can also be used.

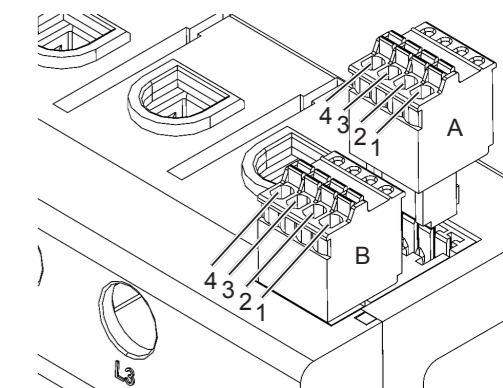
Requirement for cable installation:

- In the area for connecting the RS485 interface on the PowerMeter+, mechanical means must be provided to ensure that individual wires of the connecting cable are at least 10 mm away from live parts.
- The connecting cable must be run separately from the mains cables in the distribution board and on the permanent link.

Requirements for the remote station:

- The RS485 interface of the connected unit must meet the safety extra low voltage requirements.

Figure: Enlarged detail of the figure from above WITH connector



Connection diagram for RS485 connector:

Pin	Identification	Description
1A, 1B	VCC	Voltage output to supply external devices 9 V ± 10 % max. 280 mA
2A, 2B	GND	Ground
3A, 3B	A	RS485 A
4A, 4B	B	RS485 B

11. LED statuses

Status LED		
Colour	Status	Description
Orange	On (<10 s)	Device is starting
Green	Flashing slowly	
Green	On	
Green	On	Device ready-to-operate
Green	Flashing rapidly	Firmware update in progress
Orange	Flashes 2x	Confirmation that the network settings have been reset using the Reset button (see section „17. Reset the PowerMeter+'s network settings“) or confirmation that the device password has been reset (see section „18. Reset the PowerMeter+'s password“)
Red	On	Error - see section „20. Fault finding“
Red	Flashing	
Orange	On (>10 s)	

Network LED		
Colour	Status	Description
-	Off	No connection
Green	On	Link
Green	Flashing	Activity

Serial bus LED		
Colour	Status	Description
-	Off	No connection
Green	Flashing rapidly	Connection active
Green	Flashing slowly	Scanning active
Red	On	Error - overload at 9 V output
Orange	Flashing	Error - remote station not responding

12. Electrical connection for direct measurement

It must be ensured, by fitting a fuse, for example, that the maximum permitted current per phase is not exceeded.

1. Install the PowerMeter+ on a DIN rail. To do this, hook the PowerMeter+ onto the top edge of the DIN rail and press down until it latches into place.
2. Connect the conductors to the PowerMeter+. Do not exceed the permitted connection cross section and tightening torque for the screw terminals (see section „6. Technical data“):
 - For a three phase power network, connect the outer conductors L1, L2 and L3 and the neutral conductor N to the PowerMeter+ as shown in the connection diagram.
 - For a single phase power network, connect the outer conductor L1 and neutral conductor N to the PowerMeter+ as shown in the connection diagram.

The following figure contains a connection example.

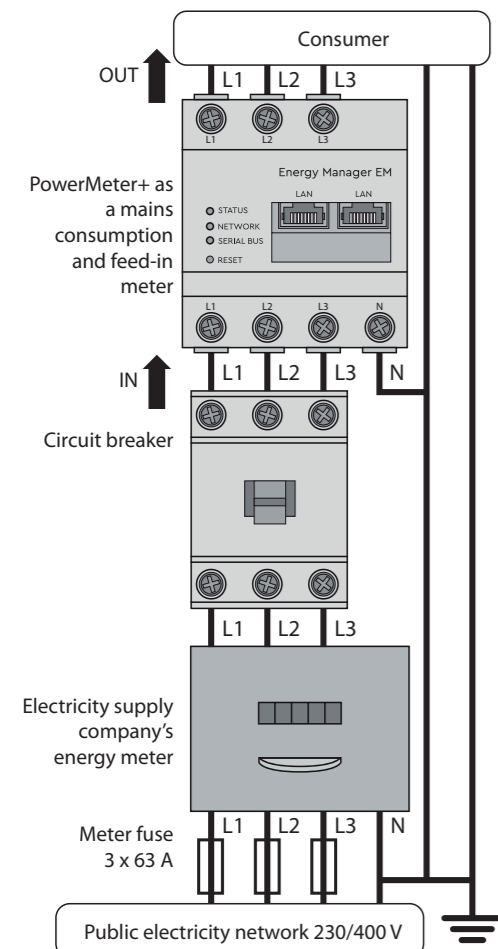
The end user must be able to isolate the PowerMeter+ from the power supply by means of a freely accessible meter fuse or an additional circuit-breaker.

NOTICE

Check correct allocation of the phases

- Make sure that the phases are all correctly allocated, otherwise the PowerMeter+ will return incorrect measured values.

Figure: Connection for direct measurement



Designation	Explanation
L1, L2, L3	Outer conductor
N	Neutral conductor
OUT	Meter output, consumer side
IN	Meter input, mains side

13. Electrical connection for indirect measurement with current transformers

1. Install the PowerMeter+ on a DIN rail. To do this, hook the PowerMeter+ onto the top edge of the DIN rail and press down until it latches into place.
2. Connect a current transformer to each outer conductor L1, L2 and L3.

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Danger of death by electric shock at the current transformer terminals

Due to the type of connection, there is a mains voltage of 230 V present at conductors k/s1 and I/s2.

- To prevent accidents, put up a notice with this information at this location on site.

3. Connect a cable for the secondary current measurement to terminals k/s1 and I/s2 on each current transformer. Do not exceed the permitted connection cross section for the PowerMeter+ (see section „6. Technical data“).
4. Connect the connecting cable for the current measurement to the PowerMeter+ and do not exceed the permitted tightening torque for screw terminals (see section „6. Technical data“).
5. Connect the connecting cable for the voltage measurement to the PowerMeter+ and do not exceed the permitted tightening torque for screw terminals (see section „6. Technical data“).
6. Connect the connecting cables for the voltage measurement to the outer conductors L1, L2 and L3.

The following figure contains a connection example.

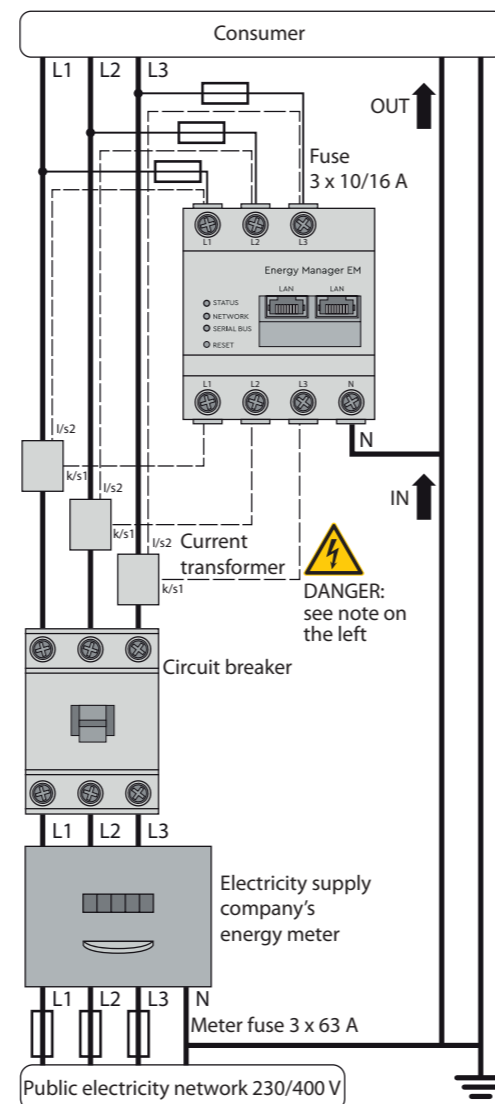
The end user must be able to isolate the PowerMeter+ from the power supply by means of a freely accessible meter fuse or an additional circuit-breaker.

NOTICE

Check correct allocation of the phases

- Make sure that the phases are all correctly allocated, otherwise the PowerMeter+ will return incorrect measured values.

Figure: Connection for indirect measurement with current transformers



Designation	Explanation
L1, L2, L3	Outer conductor
N	Neutral conductor
OUT	Meter output, consumer side
IN	Meter input, mains side

14. Set-up

Note: Only start up the PowerMeter+ with a PC / laptop.

1. Attach the cover or the contact guard of the sub-distribution board to the PowerMeter+.
2. Connect the network cable to the network connection of the PowerMeter+.
3. Connect the other end of the network cable to a router/switch or directly to the PC/laptop.
4. Restore the power to the sub-distribution board.
 - The LEDs on the PowerMeter+ light up during start-up.

15. Usage and configuration

The PowerMeter+ can be integrated directly into the battery storage system MAX.STORAGE and the datalogger MaxWeb XPN via the following preset IP address:

192.168.1.235

The user interface of the PowerMeter+ can also be reached via this IP address for further settings.

16. Start the user interface

Start the user interface using the IP address

1. Enter the PowerMeter+'s IP address in your browser's address line.
2. Press Enter
 - The PowerMeter+ user interface opens.

17. Reset the PowerMeter+'s network settings

- Use a pointed object to press the Reset button as follows:
1x short (0.5 second)
then, within 1 second: 1x long (between 3 and 5 seconds).

18. Reset the PowerMeter+'s password

- Use a pointed object to press the Reset button as follows:
1x long (between 3 and 5 seconds)
then, within 1 second: 1x short (0.5 second).

If the command was recognised correctly,

the Status LED flashes orange twice (see section „11. LED statuses“). The password is reset to the factory default (see rating plate on the device).

19. Restart the PowerMeter+

- Use a pointed object to press the Reset button for at least 6 seconds.

20. Fault finding

The status LED does not light up.

The PowerMeter+ is not being supplied with power.

- Make sure that at least the outer conductor L1 and the neutral conductor N are connected to the PowerMeter+.

The status LED lights up or flashes red.

An error has occurred.

- Restart the PowerMeter+ (see section „19. Restart the PowerMeter+“).
- Please contact your service engineer or installation engineer.

The network LED does not light up or the PowerMeter+ is not found on the network.

The network cable is not plugged into the network connection correctly.

- Make sure that the network cable is plugged into the network connection correctly.

The PowerMeter+ is not on the same local area network.

- Connect the PowerMeter+ to the same router/switch.

The serial bus LED flashes orange or red-green.

- Check the message under sensor settings on the web interface to identify which sensors are no longer responding. If necessary, test the wiring to the sensor or replace the sensor.

The PowerMeter+ returns unrealistic measured values.

The PowerMeter+ was not installed correctly.

- Check connections L1 to L3 again.
- The current transformers are not configured. Activate the current transformer on the web interface and set the correct transformer ratio.

The user interface cannot be started via the PowerMeter+'s current IP address.

Contact the network administrator.

21. Environmentally-friendly disposal

- Dispose of the PowerMeter+ in accordance with the electronic waste disposal regulations that apply on site.

22. Open source licenses

This product also contains open source software that was developed by third parties. This relates, in particular, to the GPL and LGPL licenses.

You will find the license text and associated notes on the PowerMeter+ user interface.

23. Contact

If you have technical problems, please contact your service engineer or installation engineer.

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