sonnen

Manual for Electricians

Power measurement and power meters

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EN

IMPORTANT

→ This entire document must be read carefully.

→ This document must be kept for reference purposes.

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Table of contents

1 Information about this document

This document is a supplement to the installation instructions for the storage system used. The standard measurement concept is described in the relevant installation instructions. This document contains, among other things, the following on the subject of power measurement:

- Information about the standard measurement concept and on further measurement concepts that can be used to operate the storage system.
- Further information on the power meters.
- Information about using multiple power meters.

→ Always observe the respective installation instructions for the storage system, in particular the safety instructions.

1.1 Target group of this document

This document is intended for licensed electricians. The actions described here must only be performed by licensed electricians.

1.2 Explanation of symbols

⚠ DANGER	Extremely dangerous situation leading to certain death or serious injury if the safety information is not observed.
⚠ WARNING	Dangerous situation leading to potential death or serious injury if the safety information is not observed.
⚠ CAUTION	Dangerous situation leading to potential injury if the safety information is not observed.
NOTICE	Indicates actions that may cause material damage.
ⓘ INFO	Important information not associated with any risks to people or property.

Symbol	Meaning
→	Work step
1. 2. 3. ...	Work steps in a defined order
✓	Condition
•	List

1.3 Change history

Version / Date	Changes compared to the previous version
08 / 26/03/2026	Added power meter SU103 [P. 29]. Added power meter Janitza [P. 45]. Removed power meter WM63-M.

2 Safety

Electrical work may need to be carried out in some cases in order to implement the measurement concepts described in this document. Please note:

⚠ DANGER

Work on the electrical distributor

Danger to life due to electrocution!

→ Disconnect the relevant electrical circuits.

→ Secure against anyone switching on the device again.

→ Check that the device is disconnected from the power supply.

→ Only licensed electricians are permitted to carry out electrical work.

⚠ DANGER

Electrical work on the storage system

Danger to life due to electrocution!

→ Switch off the storage system to electrically isolate it.

→ Disconnect the relevant electrical circuits.

→ Secure against anyone switching on the device again.

→ Wait five minutes so the capacitors can discharge.

→ Check that the device is disconnected from the power supply.

→ Only licensed electricians are permitted to carry out electrical work.

3 Energy flows

3.1 Overview of energy flows

The following energy flows are relevant for the energy management of the storage system:

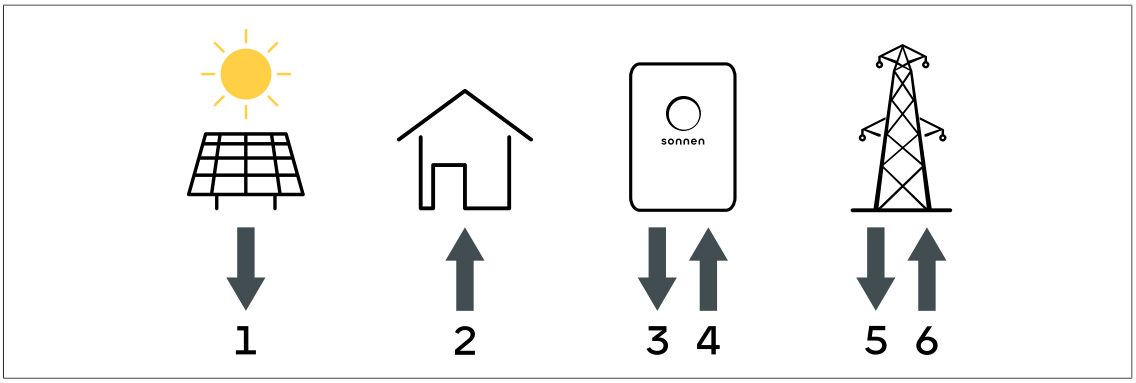


Illustration 1: Relevant energy flows

1 - Production: Electrical energy that is generated by an electrical system (e. g. PV system, wind turbine, etc.).

2 - Consumption: Electrical energy that is required to operate electrical consumers in the building.

3 - Discharge: Electrical energy that is delivered by the storage system.

4 - Charge: Electrical energy that is stored in the battery of the storage system.

5 - Usage: Electrical energy that is taken from the public electricity grid.

6 - Feed-in: Electrical energy that is fed into the public electricity grid.

Notes

- Discharge/charge and feed-in/usage **cannot occur at the same time.**
- Charge/discharge is recorded inside the storage system.

3.2 Relationship between energy flows

The energy flows relate to each other as follows:

3.2.1 Case 1: consumption > production

If consumption is higher than production, there is an electrical energy **deficit**. In this case the battery of the storage system is discharged in order to compensate as much as possible for the deficit. If the entire deficit cannot be covered by discharging the battery modules, the remainder of the deficit is covered by the public electricity grid.

In general the following applies:

```
Consumption = Production + Discharge + Usage
```

(Formula 1: General formula when consumption > production)

The following must be observed during discharging of the storage system:

- The battery of the storage system can only be discharged if the battery modules are not yet fully discharged (to the discharge limit).
- Discharging the storage system with full power is not always possible. For example, the BMS may reduce discharging in order to prevent damage to the battery modules.

3.2.2 Case 2: production > consumption

If production is higher than consumption, there is an electrical energy **surplus**. In this case as much of the surplus is used as possible in order to charge the battery of the storage system. If the surplus exceeds the amount needed to fully charge the battery modules, the remainder of the electrical energy surplus is fed into the public electricity grid.

In general the following applies:

```
Production = Consumption + Charge + Feed-in
```

(Formula 2: General formula when production > consumption)

The following must be observed during charging of the storage system:

- The battery of the storage system can only be charged if the battery modules are not yet fully charged.
- Charging the storage system with full power is not always possible. For example, the BMS may reduce charging in order to prevent damage to the battery.

3.3 Measurement points

The energy flows set out in section Overview of energy flows [P. 7] can be recorded through power measurements taken at various measurement point.

3.3.1 Types of measurement points

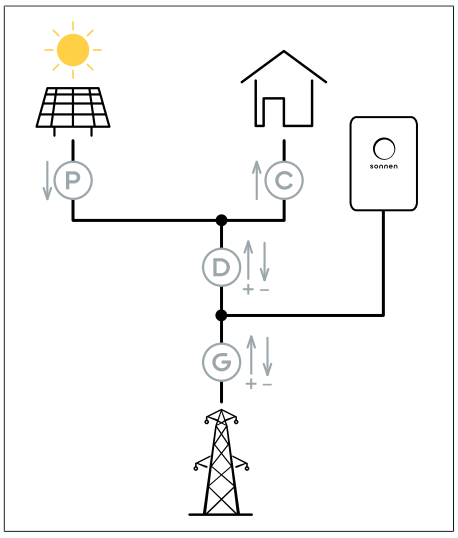


Illustration 2: Overview of all types of measurement points

A power measurement does not have to be taken at all measurement points. For example, it is sufficient to take readings at measurement points C and P. The rest of the energy flows are calculated by the storage system controls using the formulas from section Relationship between energy flows [P. 7].

The following measurement concepts are possible: CP, GP and DP (see Measurement concepts [P. 11]).

There are four different types of measurement points:

Measurement point P (Production)

Production is recorded at this measurement point. The energy only flows in one direction (away from producer). The generator (e. g. inverter of the PV system) may have self-consumption, which is not taken into account at this measurement point.

Measurement point C (Consumption)

Consumption of electrical energy is recorded at this measurement point. The energy only flows in one direction (to consumers).

Measurement point D (Difference)

The difference between consumption and production is recorded at this measurement point. The energy can flow in both directions. Energy flows to consumers correspond to a deficit and are recorded as positive measurement values. Energy flows to the public electricity grid / storage system correspond to a surplus and are recorded as negative measurement values.

Measurement point G (Grid)

Usage from or feed-in to the public electricity grid is recorded at this measurement point. The energy can flow in both directions. Energy taken from the public electricity grid is recorded as positive measurement values. Energy fed into the public electricity grid / storage system is recorded as negative measurement values.

3.3.2 Configuring the measurement points

The measurement points can be configured in the commissioning assistant on the Configuration page or on the web interface of the storage system on the Powermeter Setup page.

Deleting measurement point

A ***Delete*** button is displayed next to the configured measurement points.

→ Press die ***Delete*** button next to the line to remove the corresponding measurement point.

Adding measurement point

Further measurement points can be configured and added by using the empty line and the ***Add*** button below the existing measurement points.

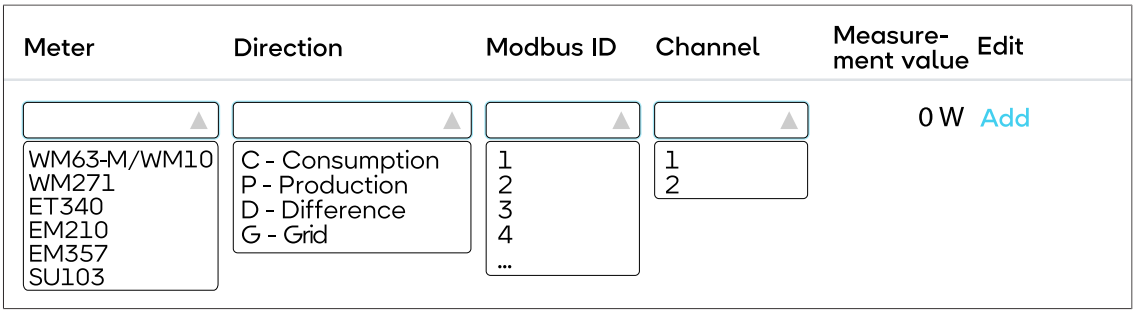


Illustration 3: Add measurement point page

Designation	Function
Meter	→ Select the power meter used at this measurement point. → Select WM63-M/WM10 when using the EM530 power meter if it is not available for selection.
Direction	• Selection of the type of measurement point. The measurement points available for selection depend on the selected measurement concept. → Select the applicable type of measurement point.
Modbus ID	• Selection of the Modbus address (also referred to as Modbus ID) of the power meter. → Select the address of the power meter. The selected address must match the set address on the power meter.
Channel	• One measurement point can be recorded with each channel. • The WM271 power meter has the two measurement channels (A1 and A2). If channel A1 is used for this measurement point: → Select 1. If channel A2 is used for this measurement point: → Select 2.

- All other power meters have one measuring channel each.

If an EM357 or EM530 type power meter is used:
→ Select 1.

3.4 Checking energy flows

The energy flows currently measured in the building can be checked as follows:

Via the web interface of the storage system

→ Log onto the web interface of the storage system (https://find-my.sonnen-batterie.com) as installer.

The Dashboard page provides an overview of the current energy flows from section Overview of energy flows [P. 7]. The power readings displayed are measurements of the active power.

The Power meter page displays multiple measurement values for each individual measurement point, including the current active power (Total Power), apparent power (va_total) and reactive power (var_total).

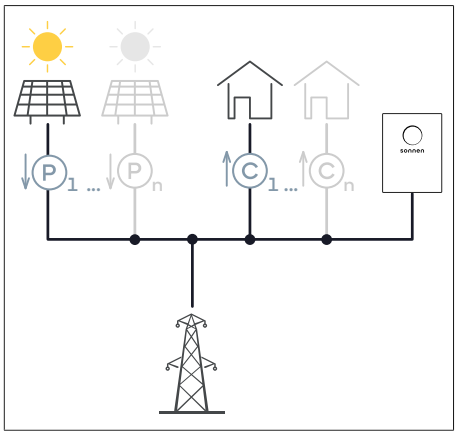
4 Measurement concepts

The storage system manages energy on the basis of a number of power measurement concepts. These measurement concepts use different points to measure power. The individual measurement concepts can be implemented independently of the power meters used.

4.1 The CP measurement concept

INFO

This measurement concept is also designated as **Consumption Measurement** in the commissioning assistant/on the web interface of the storage system.



In this concept the production is measured at point P1 and the consumption is measured at point C1.

Further measurement points (P2 to Pn as well as C2 to Cn) can be integrated into the system.

In this case the total consumption and the total production result from the sums of the individual measured values.

P1, ..., Pn (Production)
Recording the production
C1, ..., Cn (Consumption)
Recording the consumption

The following applies:

```
Cges = C1 + C2 + ...
Pges = P1 + P2 + ...
```

- The power taken from or fed into the public electricity grid is not measured, it is calculated.
- Charging is triggered when there is a PV surplus. Discharging is triggered when there is a power deficit (consumption > production).

4.1.1 Calculating the energy flows

- Usage/feed-in is not measured, it is calculated.
- Usage is calculated using formula 1 (see Relationship between energy flows [P. 7]).

The following applies:

```
Usage = Consumption – Production – Discharge
```

(Formula 3: general formula when consumption > production - solved for usage)

Feed-in is calculated from formula 2 (see Relationship between energy flows [P. 7]) as follows:

```
Feed-in = Production – Consumption – Charge
```

(Formula 4: General formula when production > consumption - solved for feed-in)

4.1.2 Implementing the CP measurement concept

Proceed as follows when implementing this measurement concept:

1. Connect the clamp-on current transformers to measurement point C (consumption). Ensure that the arrows of all connected clamp-on current transformers are pointing towards the consumer.
2. Connect the clamp-on current transformers to measurement point P (production). Ensure that the arrows of the connected clamp-on current transformers are pointing away from the producer. **Please note:** When using a storage system with a direct PV connection (e. g. sonnenBatterie hybrid), the power measurement of the connected producer takes place inside the storage system. I. e. no measurement point P must be installed, if the generator is connected directly to the storage system. Nevertheless, a measurement point P must always be installed for any further electrical producers.
3. If more than one power meter are used: ► Proceed as described in section Using more than one power meter [P. 42].
4. Run the CA to the Choosing the measurement concept page. Select the **CP measurement concept**.
5. Run the CA until you reach the Configuration page.
6. Add the individual measurement points with the correct settings (see Configuring the measurement points [P. 9]).
7. Run the commissioning assistant right to the end.

4.1.3 Example: Implementation of the CP measurement concept

The example shown in the following figure displays the implementation of the **CP** measurement concept.

- Measurement point P1 records the production of an PV system.
- Measurement point P2 records the production of an CHP unit.
- Measurement point C records the consumption in the building.

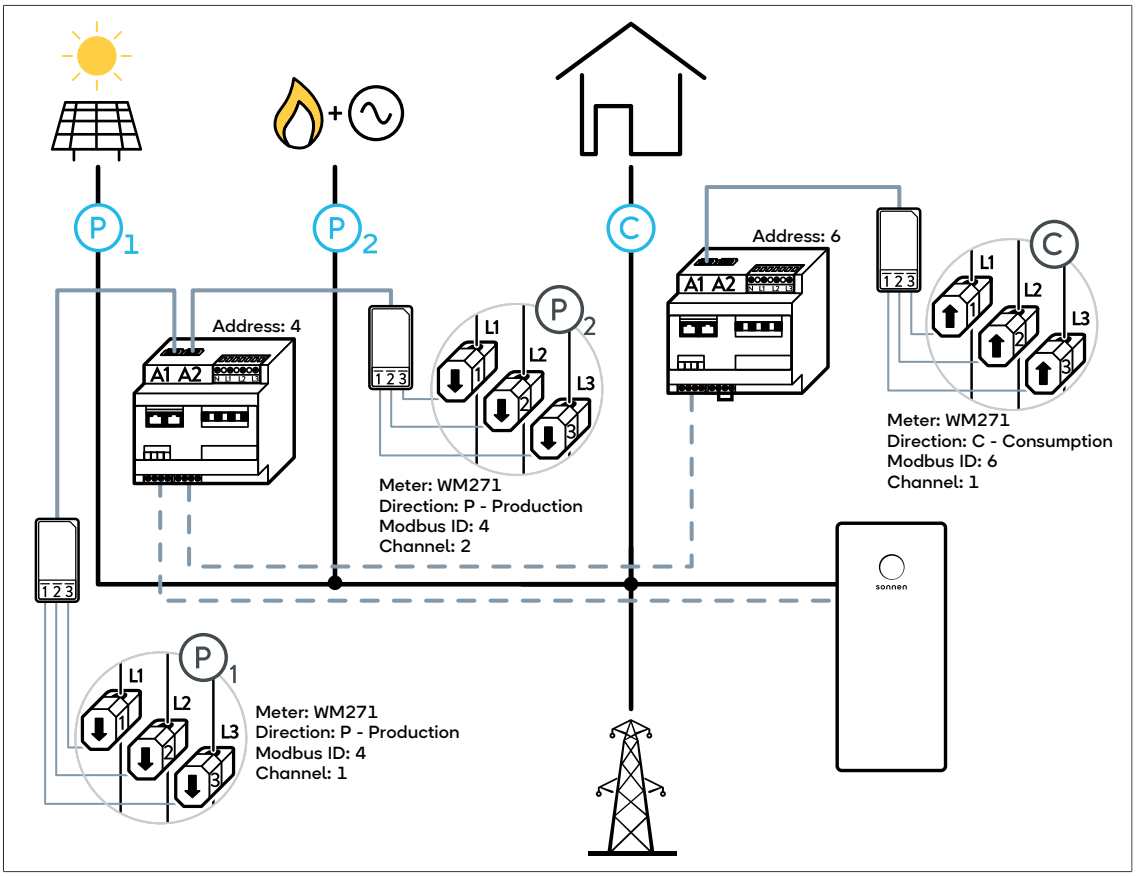
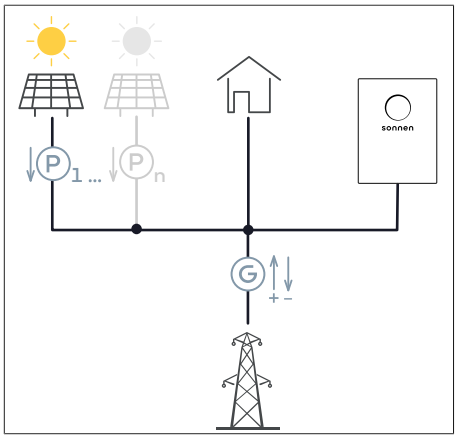


Illustration 4: Example for the implementation of the CP measurement concept - The circles show the connection of the clamp-on current transformers at the three measuring points

4.2 The GP measurement concept

INFO

This measurement concept is also designated as **Grid Measurement** in the commissioning assistant/on the web interface of the storage system.



In this measurement concept, the power consumed is measured at point P1. Further measurement points (P2 to Pn) can be integrated into the system.

In this case the total production results from the sums of the individual measured values.

P1, ..., Pn (Production)
Recording the production
G (Grid)
Recording the power taken from or fed into the public electricity grids

The following applies:

```
Pges = P1 + P2 + ...
```

- The power taken from or fed into the public electricity grid is measured at point G. The power consumed is not measured, it is calculated.
- Charging or discharging of the storage system is triggered by the measurement values at measurement point G. Positive values indicate usage and discharging of the storage system.
- Negative measurement values indicate feed-in to the public electricity grid and charging of the storage system.

4.2.1 Calculating the energy flows

- Consumption is not measured, it is calculated.

Case 1: Consumption > Production

In this case consumption is calculated using formula 1.

```
Consumption = Production + Discharge + Usage
```

(Formula 1: General formula when consumption > production)

Case 2: Production > Consumption

Consumption is calculated from formula 2 (see Relationship between energy flows [P. 7]) as follows:

```
Consumption = Production – Charge – Feed-in
```

(Formula 8: General formula when production > consumption - solved for consumption)

4.2.2 Implementing the GP measurement concept

Proceed as follows when implementing this measurement concept:

1. Connect the clamp-on current transformers to measurement point G (Grid). Ensure that the arrows of all connected clamp-on current transformers are pointing towards the consumer.
2. The **EC** function must be **deactivated** on the power meter responsible for measuring power at measurement point G (see Easy Connection (EC) programming page [P. 41]).
3. Connect the clamp-on current transformers to measurement point P (production). Ensure that the arrows of the connected clamp-on current transformers are pointing away from the producer. **Please note:** When using a storage system with a direct PV connection (e. g. sonnenBatterie hybrid), the power measurement of the connected producer takes place inside the storage system. I. e. no measurement point P must be installed, if the generator is connected directly to the storage system. Nevertheless, a measurement point P must always be installed for any further electrical producers.
4. If more than one power meter are used: ▶ Proceed as described in section Using more than one power meter [P. 42].
5. Run the CA to the Choosing the measurement concept page. Select the **GP measurement concept**.
6. Run the CA until you reach the Configuration page.
7. Add the individual measurement points with the correct settings (see Configuring the measurement points [P. 9]).
8. Run the commissioning assistant right to the end.

4.2.3 Example: Implementation of the GP measurement concept

The example shown in the following figure displays the implementation of the **GP** measurement concept.

- Measurement point P1 records the production of an PV system.
- Measurement point P2 records the production of an CHP unit.
- Measurement point G records the power taken from or fed into the public electricity grid.

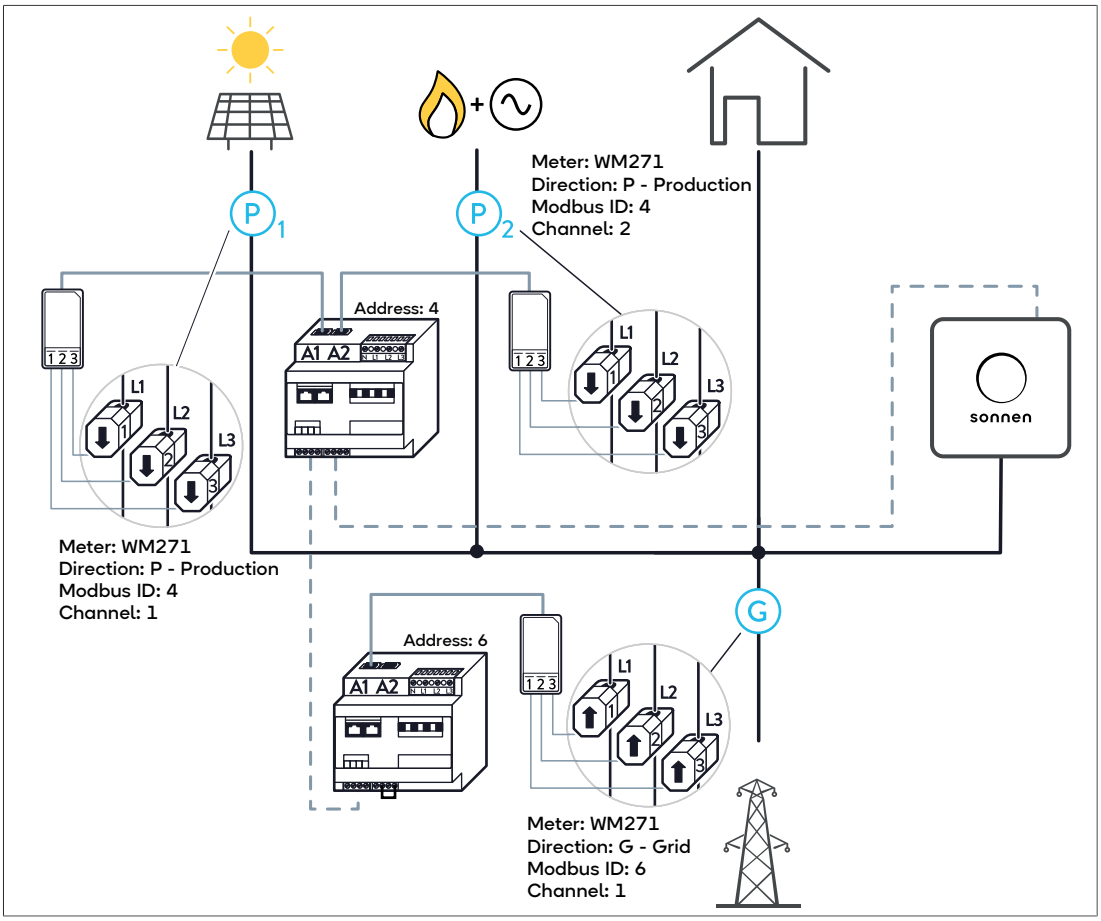
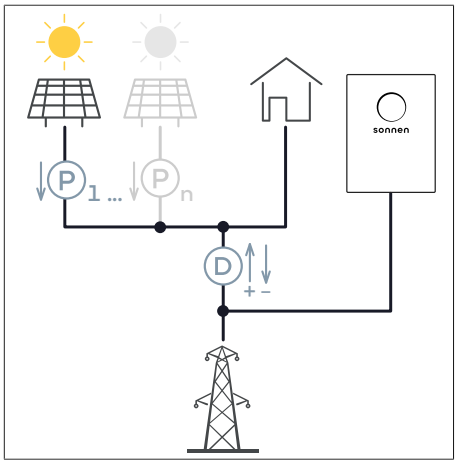


Illustration 5: Example for the implementation of the GP measurement concept - The circles show the connection of the CTs at the three measurement points

4.3 The DP measurement concept

INFO This measurement concept is also designated as **Differential Measurement** in the commissioning assistant/on the web interface of the storage system.



In this measurement concept, the power consumed is measured at point P1.

Further measurement points (P2 to Pn) can be integrated into the system.

In this case the total production results from the sums of the individual measured values.

The following applies:

```
Pges = P1 + P2 + ...
```

- At measurement point D, the difference between production and consumption is recorded.
- The power consumed is not measured, it is calculated.
- In the same way, the power taken from or fed into the public electricity grid is not measured, it is calculated.
- Charging or discharging of the storage system is triggered by the measurement values at measurement point D. Positive values indicate usage and discharging of the storage system. Negative measurement values indicate feed-in to the public electricity grid and charging of the storage system.

4.3.1 Calculating the energy flows

- The difference between consumption and production is measured at measurement point D.

The following applies:

```
Difference = Consumption – Production
```

(Formula 5: Difference)

Since production at measurement points P1, ..., Pn is also measured, consumption can be calculated from this formula.

Case 1: Consumption > Production

In this case the difference is a positive value. This corresponds to a deficit. Electrical energy flows towards the consumer. Using the difference in formula 1 (see Relationship between energy flows [P. 7]) yields the following:

```
Difference = Discharge + Usage
```

(Formula 6: Difference - used in the general formula when consumption > production)

Case 2: Production > Consumption

In this case the difference is a negative value. This corresponds to a surplus. Electrical energy flows towards the public electricity grid / storage system. Using the difference in formula 2 (see Relationship between energy flows [P. 7]) yiels the following:

```
Difference = – Charge – Feed-In
```

(Formula 7: Difference - used in the genera formula when production > consumption)

4.3.2 Implementing the DP measurement concept

Proceed as follows when implementing this measurement concept:

1. Connect the clamp-on current transformers to measurement point D (difference). Ensure that the arrows of all connected clamp-on current transformers are pointing towards the consumer.
2. The **EC** function must be **deactivated** on the power meter responsible for measuring power at measurement point D (see Easy Connection (EC) programming page [P. 41]).
3. Connect the clamp-on current transformers to measurement point P (production). Ensure that the arrows of the connected clamp-on current transformers are pointing away from the producer. **Please note:** When using a storage system with a direct PV connection (e. g. sonnenBatterie hybrid), the power measurement of the connected producer takes place inside the storage system. I. e. no measurement point P must be installed, if the generator is connected directly to the storage system. Nevertheless, a measurement point P must always be installed for any further electrical producers.
4. If more than one power meter are used: ▶ Proceed as described in section Using more than one power meter [P. 42].
5. Run the CA to the Choosing the measurement concept page. Select the **DP measurement concept**.
6. Run the CA until you reach the Configuration page.
7. Add the individual measurement points with the correct settings (see Configuring the measurement points [P. 9]).
8. Run the commissioning assistant right to the end.

5 EM357 power meter

INFO The power meter and power measurement can be adapted and enhanced using different accessories (see Power measurement accessories [P. 50]).

- The EM357 power meter is a direct meter.
- An EM357 power meter represents one measurement point.
- The maximum measurable amperage is 100 A.

5.1 Overview of power meter

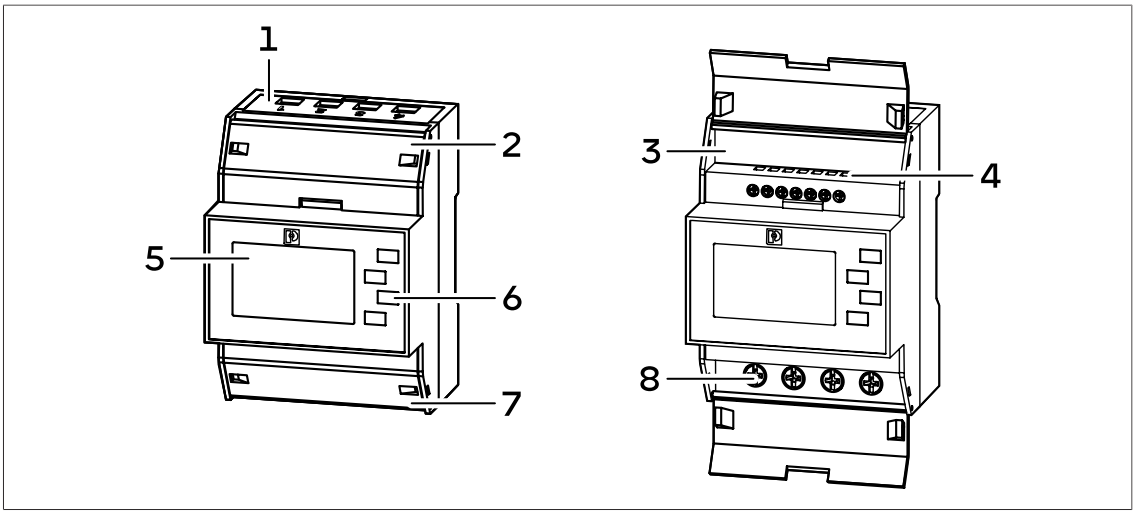


Illustration 6: Components of the EM357 power meter

1	AC cable connection area	5	Display
2	Top flap	6	Keys
3	Communication shield	7	Bottom flap
4	Communication line connection area	8	AC cable connection area

5.2 Electrical connection

- The EM357 power meter can be used in both single-phase and three-phase mains.
- The power meter must be protected by fault protection with max. 100 A on the AC side. If this is already done, for example, by the SMCB switch of the on-site connection, no additional MCB switch has to be installed.
- The direction of energy flow runs from top to bottom (see arrows on the front of the power meter) in a standard installation (which can be read from the display).

Connection with two measurement points

When measurement points C (consumption) and P (production) are to be measured with two power meters (e.g. for sonnenBatterie 10), the AC lines are connected as follows in three-phase mains:

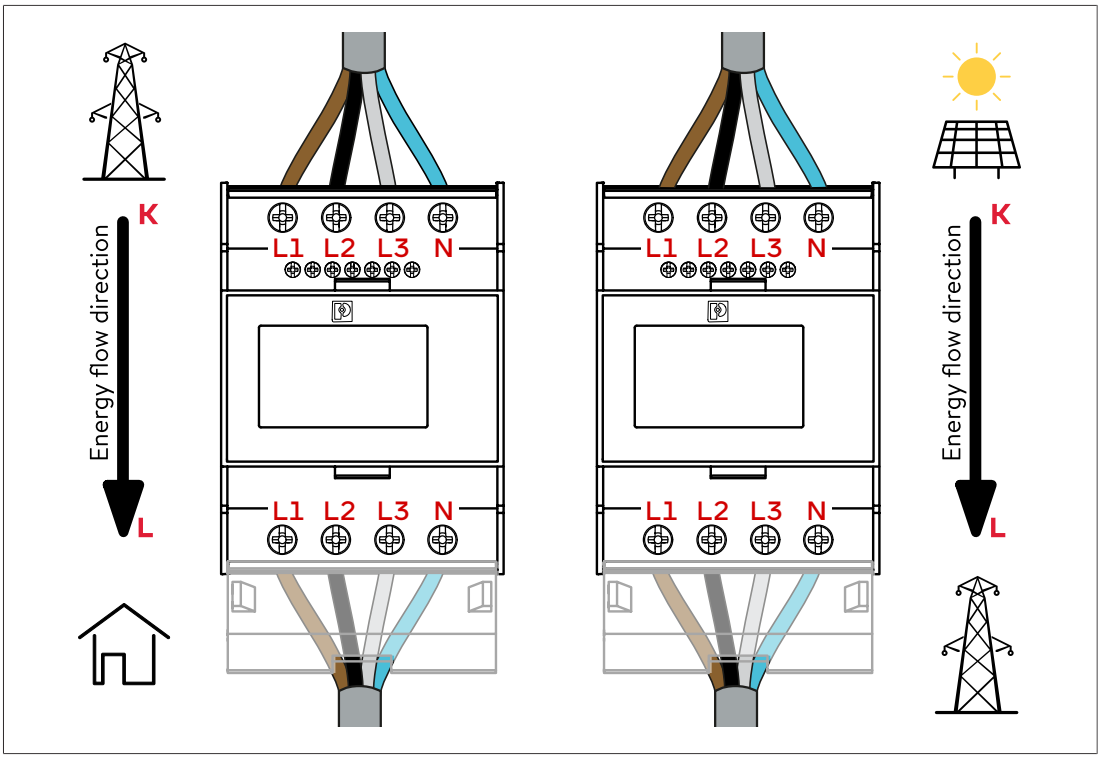


Illustration 7: Connection of EM357 power meter at two measurement points

Connection with one measurement point

If only measurement point C (consumption) is required (e.g. for sonnenBatterie hybrid 9.53), the AC lines are connected as follows in single or three-phase mains:

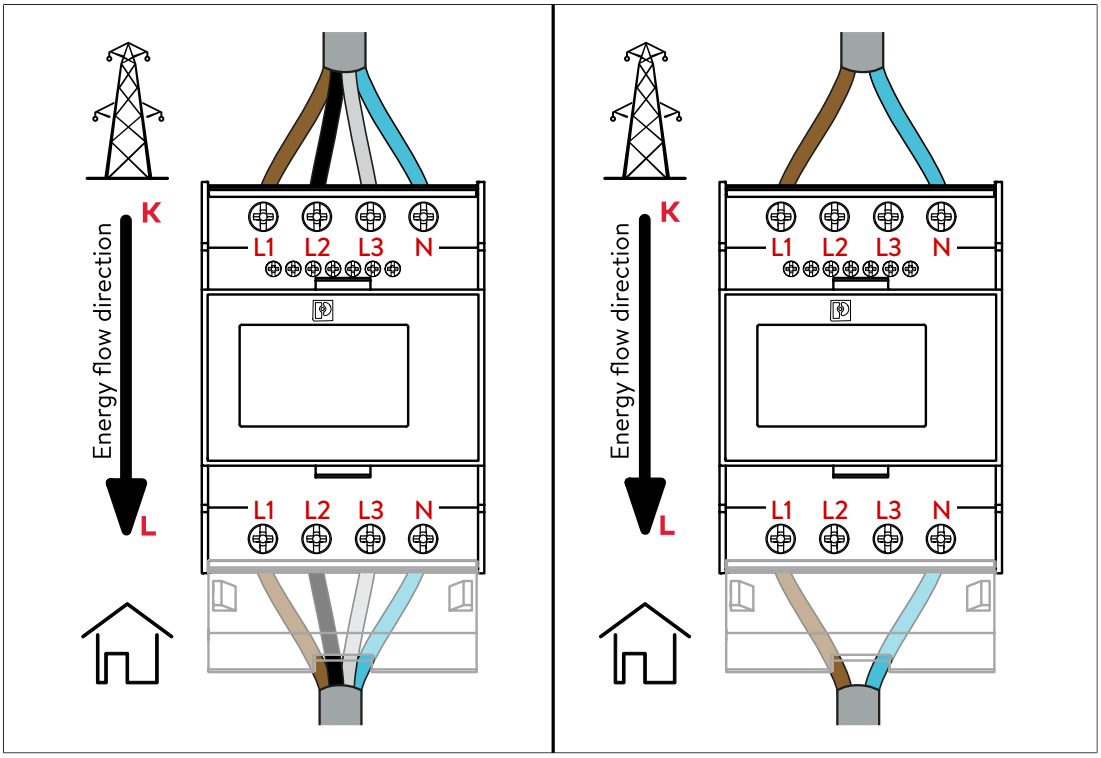


Illustration 8: Connection of EM357 power meter at one measurement point

Other options for N-conductor connection

In addition to the N-conductor connection shown in the figure on the left (routed through the power meter), there are two other options:

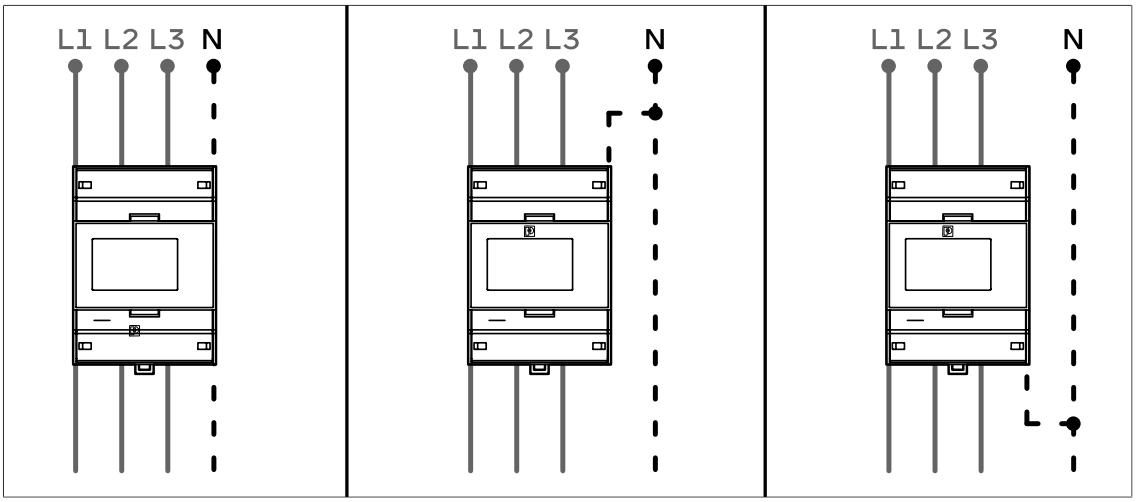


Illustration 9: Variants for connecting the N-conductor

5.3 Changing the default Modbus address

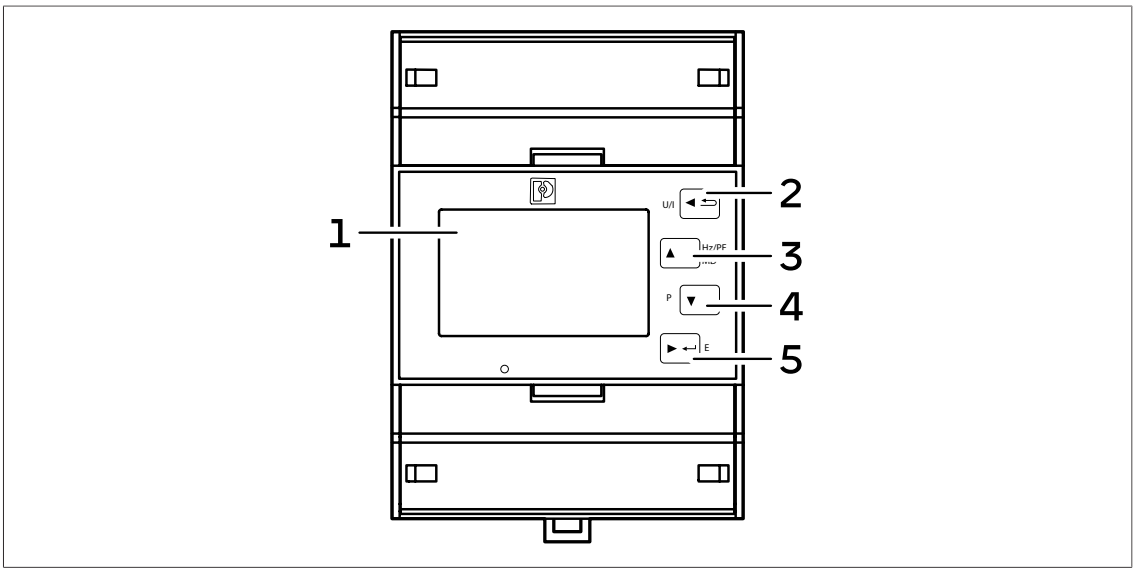


Illustration 10: Overview of display and keys on the EM357 power meter

1 LCD screen
2 Left/ESC key
3 Up key
4 Down key
5 Right/enter key

Switch to setting mode

To switch to setting mode:

→ Press enter key for at least three seconds.

PASS appears on the display.

→ Enter the password (the default is '1000').

→ Press enter key for at least three seconds.

If the password is correct, the setting mode is opened.

The display **PASS Err** appears if the password is incorrect.

Changing the Modbus address

To change the default Modbus address:

→ Press the down key until the display **SEt Addr** appears.

→ Press enter key for at least three seconds.

The value flashes when it is in edit mode.

→ Press the up or down key to change the value.

→ Press the enter key to save the set value.

The value is saved. The next setting value flashes automatically.

→ Press enter key for at least three seconds.

The power meter is still in setting mode.

Exiting setting mode

→ Press the ESC key to return to display mode.

If no operation is performed for more than 60 seconds, the power meter automatically returns to display mode.

5.4 Using more than two EM357 power meters

The concepts described in section Measurement concepts [P. 11] sometimes allow for more than one power meter to be connected. The following describes what to keep in mind when using more than two EM357 power meters.

INFO

Additional power meters can be obtained from sonnen to take readings at more measurement points (see Power measurement accessories [P. 50]).

Maximum number of channels which can be used

Within one power measurement, **maximum six measurement channels** can be used; otherwise the storage system may not be able to be controlled properly.

Since each power meter represents one channel, a maximum of six power meters can be used.

- The use of different power meters (e.g. EM357 and EM530) is described in section Combining different power meters [P. 46].

5.4.1 Connecting the communication lines

NOTICE

Communication lines too long

→ The Ethernet line connected to the storage system must not exceed a maximum length of **100 m**.

→ The Modbus line connected to the storage system must not exceed a maximum length of **150 m**.

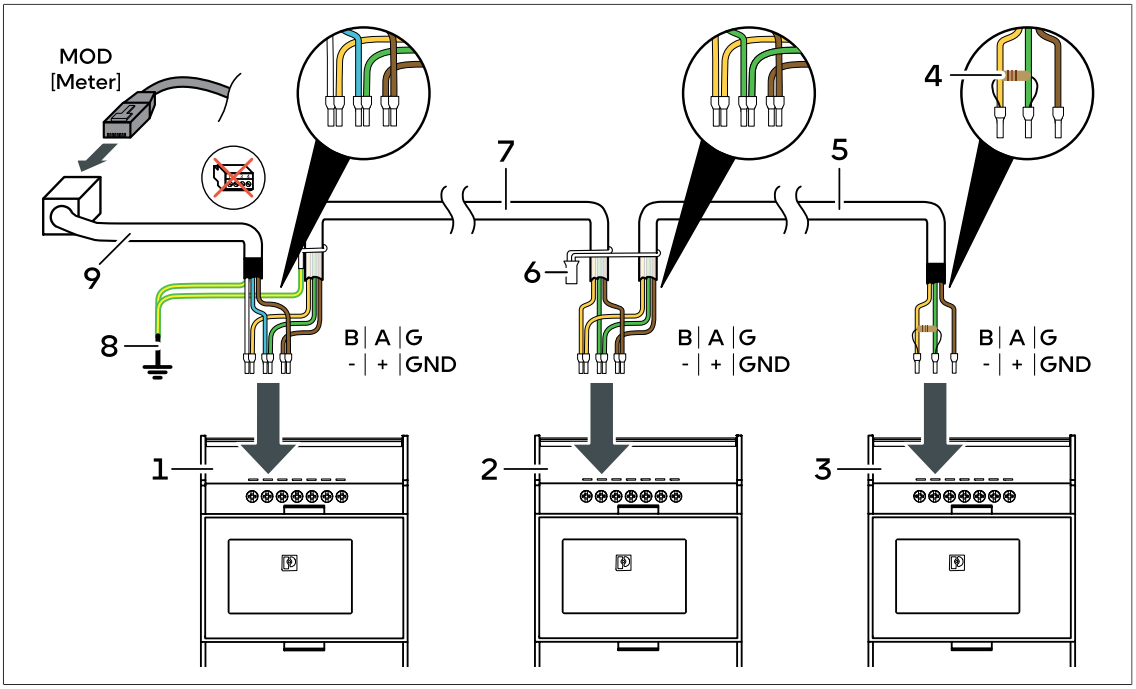


Illustration 11: Connection of communication lines for three EM357 power meters

1 Power meter 1 (EM357-EE, ID 1, preprogrammed)
2 Power meter 2 (EM357-EE, ID 9, manually set)
3 Power meter 3 (EM357-EE-MOD, ID 10, preprogrammed)
4 Terminating resistor (1 kOhm +/-5 %)
5 Communication line
6 Screen connection
7 Communication line
8 Screen connection to earthing system
9 Communication line with RJ-45 coupling

→ Connect the power meters as shown in the figure above.

Note:

→ Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.

→ Attach the terminating resistor to the end of the last communication line.

→ Connect the screens of the individual communication lines between the power meters to each other.

→ Ensure, that the screen of the existing communication line is not connected to the screen of the additional communication line. The screen of the existing communication line is grounded separately instead.

→ Earth the screen of the communication line on the last power meter.

5.4.2 Defining addresses

Each power meter must be assigned a unique Modbus address in order for communication between the power meters and the storage system to function properly. The following must be observed:

- A Modbus address must not be used more than once.
- A number between 4 and 40 can be selected for the Modbus address.

To change the default Modbus addresses (EM357-EE: 1; EM357-EE-MOD: 10):

→ Change the Modbus address on the power meter as described in the section Changing the default Modbus address [P. 21].

6 EM530 power meter

- The EM530 power meter is a transformer meter.
- An EM530 power meter represents one measurement point.
- If the EM530 power meter is not available for selection, WM63-M/WM10 must be selected in the commissioning assistant.

6.1 Overview of power meter

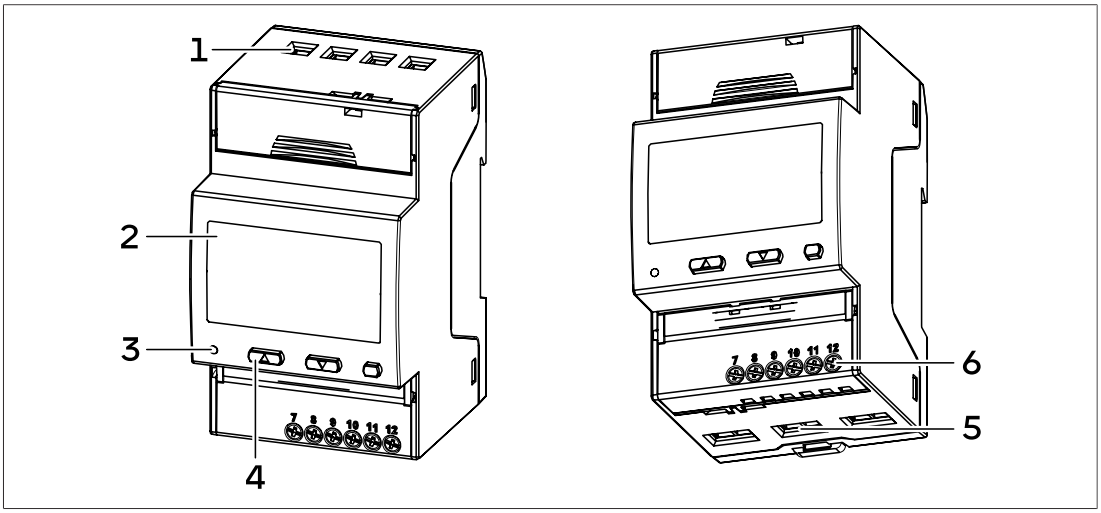


Illustration 12: Components of the EM530 power meter

1	Voltage inputs	4	Keys
2	Display	5	Transformer connection area
3	LED	6	Modbus connection area

Default Modbus address: 1

If two or more power meters are being used, the default Modbus address will need to be changed on the second and all other power meters:

→ Change the Modbus address on the power meter as described in the section Programming the power meter [P. 26].

The following needs to be taken into account when selecting the Modbus address:
- A Modbus address must not be used more than once.
- A number between 4 and 40 can be selected for the Modbus address.

Default measurement mode: A

The measurement mode determines how the energy flow directions of the measurement values are accounted for. This means that the measurement mode to be used depends on the measurement concept being used (see the section Measurement concepts [P. 11]).

If the CP measurement concept (consumption measurement) is being used:

→ The default measurement mode A can be used.

If the GP measurement concept (grid measurement) or DP measurement concept (difference measurement) is being used:

→ Set the power meter to measurement mode C (see Programming the power meter [P. 26]).

Default transformer ratio: 1

The transformer ratio depends on the transformers being used:

→ Set the transformer ratio as appropriate for the selected current transformer (see Programming the power meter [P. 26]).

6.2 Electrical connection

- The EM530 power meter can be used for three-phase electricity grids.
- The power meter must be protected by suitable miniature circuit breakers on the AC side. Additional miniature circuit breakers do not have to be installed if the lines are already protected in accordance with the applicable regulations and standards.
- The EM530 power meter can be used instead of the WM271 if the purpose is to measure lines that exceed the maximum possible external diameter or the maximum measurable current of the WM271 clamp-on current transformers (see Power measurement accessories [P. 50] for maximum measurable values).

Selecting current transformers

- Current transformers for the EM530 power meter are not sold by sonnen. This means that current transformers that correspond to the local conditions can be purchased.

→ Select current transformers with a secondary current of 5 A and the desired accuracy class.

→ Set the transformer ratio as appropriate for the selected current transformer (see Programming the power meter [P. 26]).

Electrical connection with one measurement point

INFO The transformers shown here and their connection are an example of a type of current transformer. Take note of the description of the item in question.

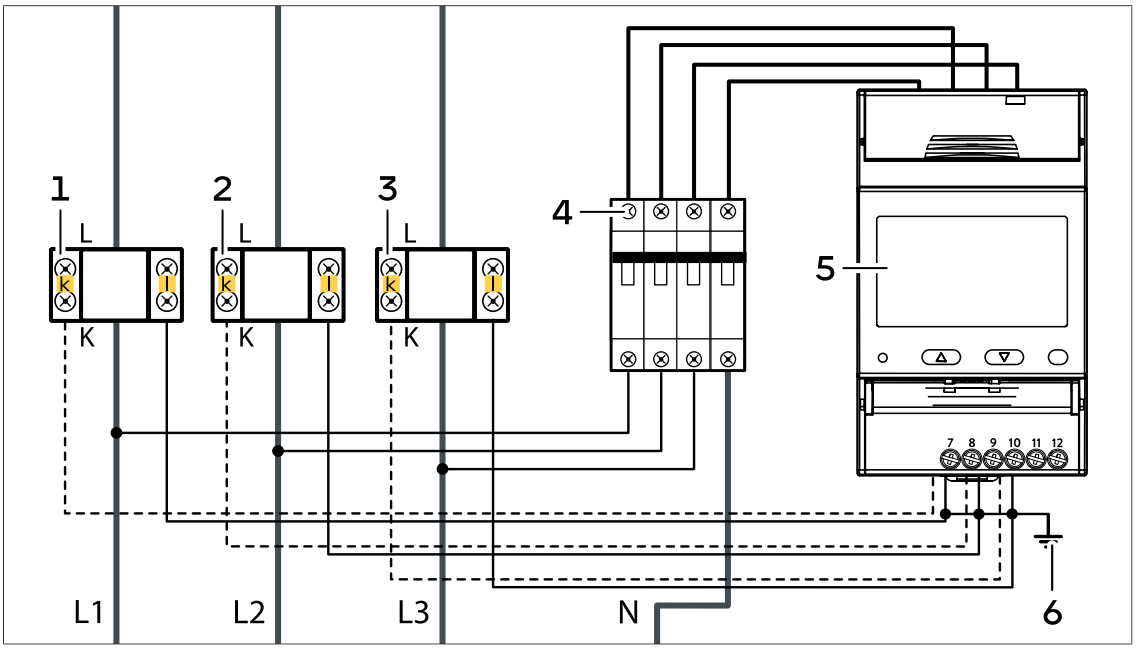


Illustration 13: Connection for measuring a measurement point with the EM530 power meter and current transformers

1	L1 current transformer	4	B6 miniature circuit breaker
2	L2 current transformer	5	Connection to earthing system
3	L3 current transformer	6	EM530 power meter

→ Connect the power meter and current transformer as shown in the illustration above.

6.3 Programming the power meter

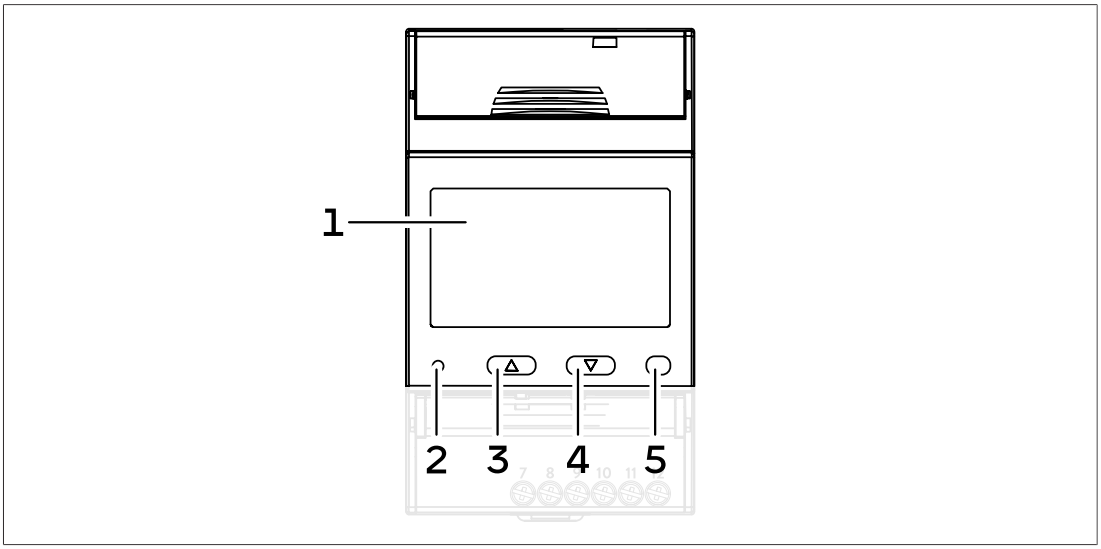


Illustration 14: Overview of display and keys on the EM530 power meter

1 LCD screen
2 LED
3 Up key
4 Down key
5 Enter key

Switching to setting mode

→ Press the enter key on the power meter.

The ME**nu** appears on the display. The menu item **SEttinG** is underlined.

→ Press the enter key again.

Changing the Modbus address

To change the default Modbus address:

→ In the **SEttinG** menu, press the down key until **RS485** appears on the display.

→ Press the enter key.

AddrESS appears on the display. The Modbus address that is currently set flashes.

→ Press the up key until the desired value appears.

→ Press the enter key.

→ Select **SAVE** by pressing the enter key again.

→ Confirm the PARITY, BAUDRATE and STOP items that follow on the display by pressing the select key for each of them (do not change the values).

Setting the transformer ratio

The transformer ratio is calculated using the following formula: max. amperage of transformer divided by 5. Example: transformer amperage is 100 A. 100 : 5 = 20.

To change the default transformer ratio:

→ In the **SEttinG** menu, press the down key until **Ct rAt** appears on the display.

→ Press the enter key.

Ct rAtio appears on the display. The current ratio that is currently set flashes.

→ Press the up key until the desired value appears.

→ Press the enter key.

→ Select **SAVE** by pressing the enter key again.

Setting the measurement mode

→ In the **SEttinG** menu, press the down key until **MEASurE** appears on the display.

→ Press the enter key.

MEASurE appears on the display. The measurement method that is currently set is displayed.

→ Press the up key until the desired value appears.

→ Press the enter key.

→ Select **SAVE** by pressing the enter key again.

Exiting setting mode

→ Press **back** in each menu and confirm using the enter key.

6.4 Using more than one EM530 power meter

The concepts described in the section Measurement concepts [P. 11] sometimes allow for more than one power meter to be connected. The following describes what to keep in mind when using more than two EM530 power meters.

INFO

Additional power meters can be obtained from sonnen to take readings at more measurement points (see Power measurement accessories [P. 50]).

Maximum number of channels which can be used

Within one power measurement, **maximum six measurement channels** can be used; otherwise the storage system may not be able to be controlled properly.

Since each power meter represents one channel, a maximum of six power meters can be used.

- The use of different power meters (e.g. EM357 and EM530) is described in section Combining different power meters [P. 46].

6.4.1 Connecting the communication lines

NOTICE

Communication lines too long

→ The Ethernet line connected to the storage system must not exceed a maximum length of **100 m**.

→ The Modbus line connected to the storage system must not exceed a maximum length of **150 m**.

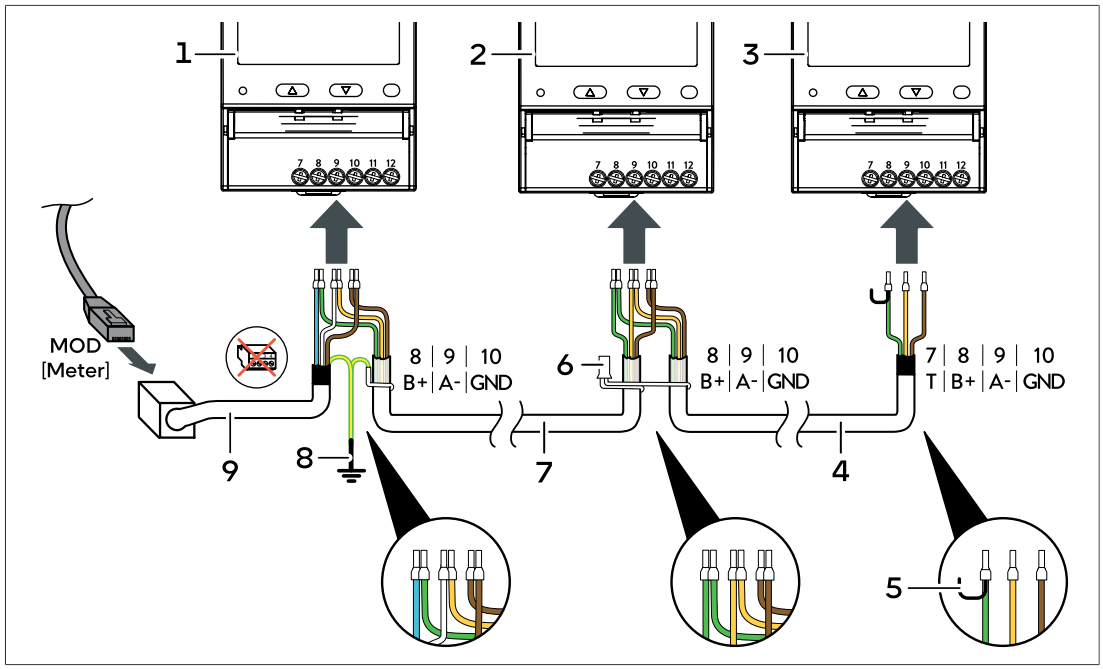


Illustration 15: Connection of communication lines for three EM530 power meters

1	Power meter 1 (ID 1, preprogrammed)	6	Screen connection
2	Power meter 2 (ID 2, manually set)	7	Communication line
3	Power meter 3 (ID 3, manually set)	8	Screen connection to earthing system
4	Communication line	9	Communication line with RJ-45 coupling
5	Jumper for Modbus termination		

→ Connect the power meters as shown in the figure above.

Note:

→ Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.

→ Connect a jumper between pins 7 and 8 on the last power meter.

→ Connect the screens of the individual communication lines between the power meters to each other.

→ Ensure, that the screen of the existing communication line is not connected to the screen of the additional communication line. The screen of the existing communication line is grounded separately instead.

→ Earth the screen of the communication line on the last power meter.

6.4.2 Defining Modbus addresses

Each power meter must be assigned a unique Modbus address in order for communication between the power meters and the storage system to function properly. The following must be observed:

- A Modbus address must not be used more than once.
- A number between 4 and 40 can be selected for the Modbus address.

If two or more power meters are being used, the default Modbus address will need to be changed on the second and all other power meters:

→ Change the Modbus address on the power meter as described in the section Programming the power meter [P. 26].

7 SU103 power meter

- The SU103 power meter is a transformer meter.
- The power meter can be connected via Modbus TCP (LAN) or Modbus RTU (RS485).
- A power meter represents one measurement point.

INFO Refer to the installation instructions included in the sonnenMeter SU103 packaging for safety instructions and further information.

7.1 Overview of power meter

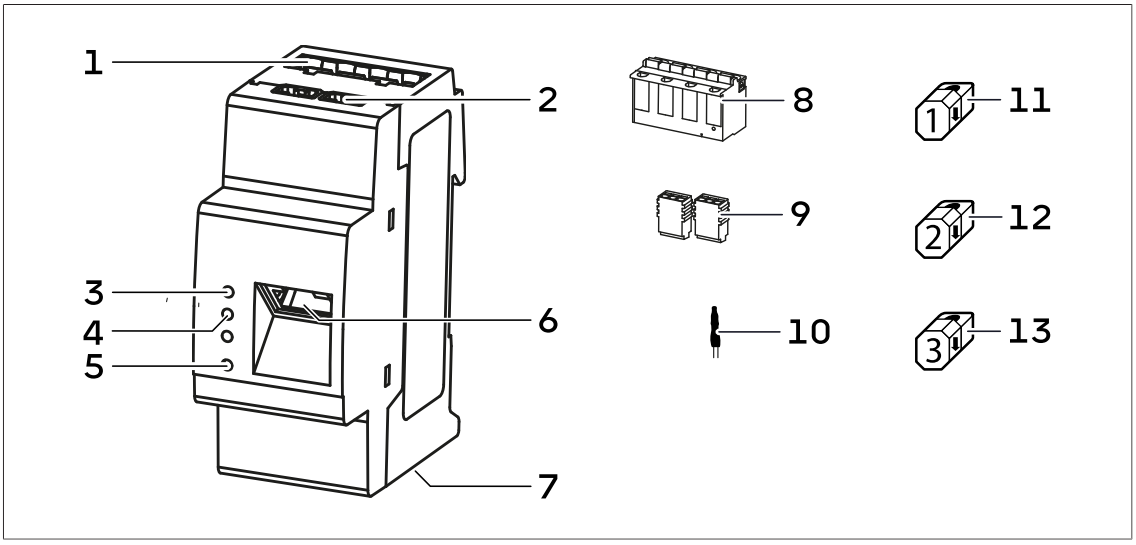


Illustration 16: Components of the SU103 power meter

1	Voltage inputs	8	Power supply connector
2	Modbus RTU connection area	9	RS-485 connector for RTU Modbus connection
3	Status LED	10	Terminating resistor for RS-485 connector
4	Network LED		
5	Button	11	CT - L1
6	Modbus TCP connection area	12	CT - L2
7	Clamp-on current transformer (CT) connection terminal	13	CT - L3

Preset RTU Modbus address

Each SU103 power meter has a preset RTU address between 1 and 230. This is indicated on the type plate and the sticker on the power meter packaging ('RTU').

If two or more power meters with RTU are used:

→ Before installation, ensure that the power meters have different Modbus addresses.

If the power meters to be used happen to have the same Modbus address:

→ Contact sonnen Service.

Preset TCP Modbus address

Each power meter has a preset TCP Modbus ID of 1.

7.2 Electrical connection

- The SU103 power meter can be used with both single-phase and three-phase mains.

- The lines connected to the voltage inputs of the power meter must be protected by suitable circuit breakers. Additional circuit breakers are not required if the lines are already protected in accordance with the applicable regulations and standards.
- The SU103 power meter can be used instead of the WM271 or EM530 if space is very limited (space requirement per SU103 = 2 MW).

Connecting the clamp-on current transformers (CT)

ⓘ INFO	Always use the supplied clamp-on current transformers, as these have been calibrated together with the respective power meter. Replacing the clamp-on current transformers can lead to measurement deviations.

→ Please note the information in the section Common errors when connecting the clamp-on current transformers [P. 35]. This information also applies to the clamp-on current transformers of the SU103.

Electrical connection with one measurement point

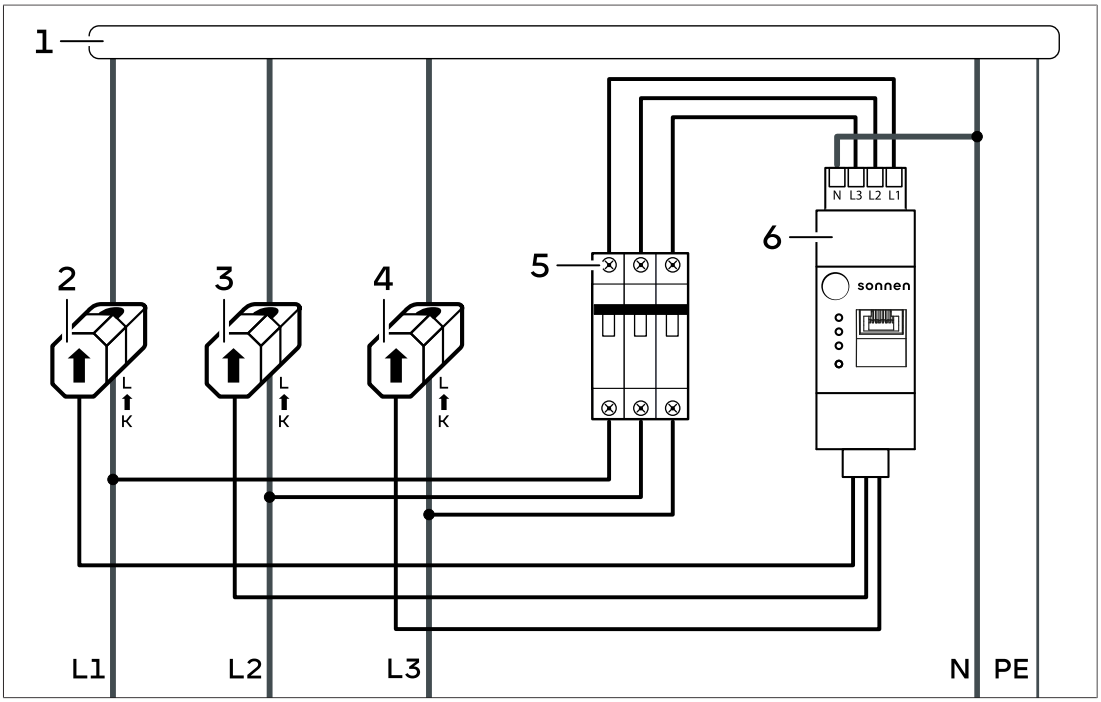


Illustration 17: Connection for measuring a measuring point with SU103 power meter

1 Consumer
2 Clamp-on current transformer - L1
3 Clamp-on current transformer - L2
4 Clamp-on current transformer - L3
5 B6 miniature circuit breaker
6 SU103 power meter

Connecting the clamp-on current transformer

→ First connect the CT to the power meter and then to the line.

→ Open the current transformer for L1, place it around the cable, and close it again until it audibly clicks into place. Note the direction of the arrow on the CT!

→ Repeat this step for all necessary phases.

Connecting lines to voltage inputs

→ Connect lines L1, L2, L3, N to the power meter (permissible cable cross-sections: 0.20 ... 2.50 mm^2).

NOTICE! Ensure that the phases are correctly assigned.

→ Ensure that the power meter can be switched off by means of a freely accessible meter fuse or an additional switch.

→ Ensure that the voltage inputs (L1, L2, L3) are fused with 16 A type B.

7.3 Configuring the measurement points

The measurement points can be configured in the commissioning assistant on the Configuration page or on the web interface of the storage system on the Powermeter Setup page.

Add TCP measurement point

→ Select ***Select new meter*** in the **Power Meter Details TCP** section.

Illustration 18: Add TCP Power Meter

The power meters found in the network are displayed here.

If the power meter is not displayed:

→ Select ***Custom IP*** to add the power meter using the IP address.

Illustration 19: Configure TCP measurement point

Designation	Function
Meter	→ Select ‚SU103‘.
Direction	Selection of the type of measurement point. The measurement points available for selection depend on the selected measurement concept. → Select the applicable type of measurement point.
IP	The IP address is displayed here.
Port	The port must always be set to ‘502’.
Modbus ID	The TCP Modbus ID of the SU103 power meter is always ‘1’.
Channel	No display when using SU103 power meter.
Measurement value	Displays the value currently measured by the power meter in watts.
Light bulb symbol	Helps with identification if several SU103s are connected via TCP. → Click the icon to make all LEDs on the respective power meter flash. The LEDs will flash until the icon is clicked again.
Trash can symbol	Deletes the selected measurement point.

7.4 Using multiple SU103 power meters

The following describes what needs to be taken into account when using multiple SU103 power meters.

INFO Additional power meters can be obtained from sonnen to take readings at more measurement points (see Power measurement accessories [P. 50]).

Maximum number of channels which can be used

Within one power measurement, **maximum six measurement channels** can be used; otherwise the storage system may not be able to be controlled properly.

Since each power meter represents one channel, a maximum of six power meters can be used.

Connecting TCP Modbus communication lines

To connect multiple power meters via TCP Modbus, each must be connected to a switch/router that is located in the same network as the storage system.

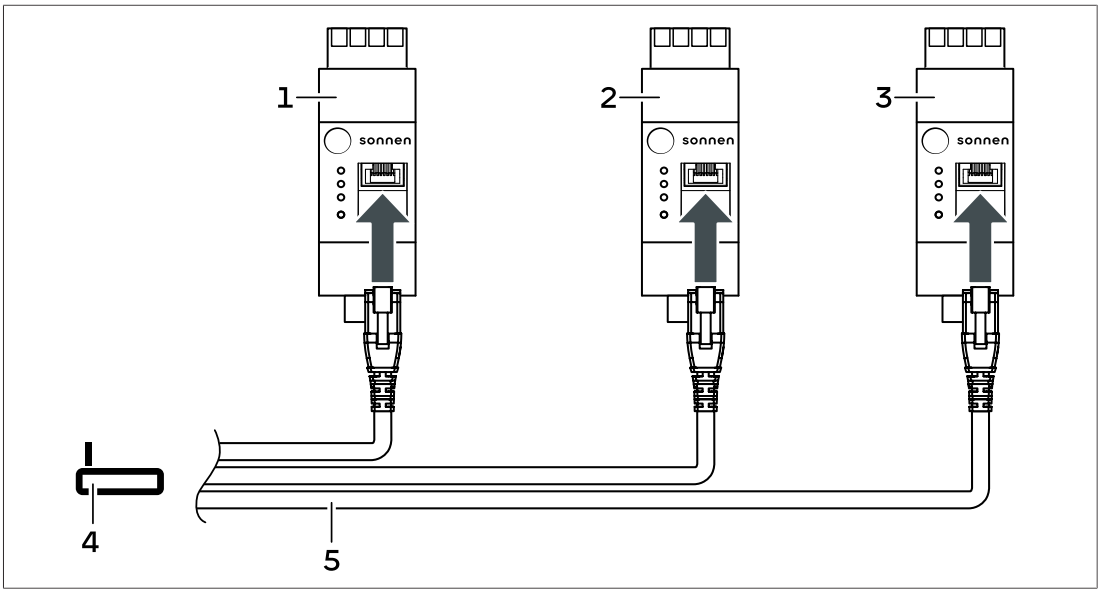


Illustration 20: Connection of communication line for TCP Modbus with three SU103 power meters

1 Power meter 1
2 Power meter 2
3 Power meter 3
4 Switch/Router
5 Patch cable

Connecting RTU Modbus communication lines

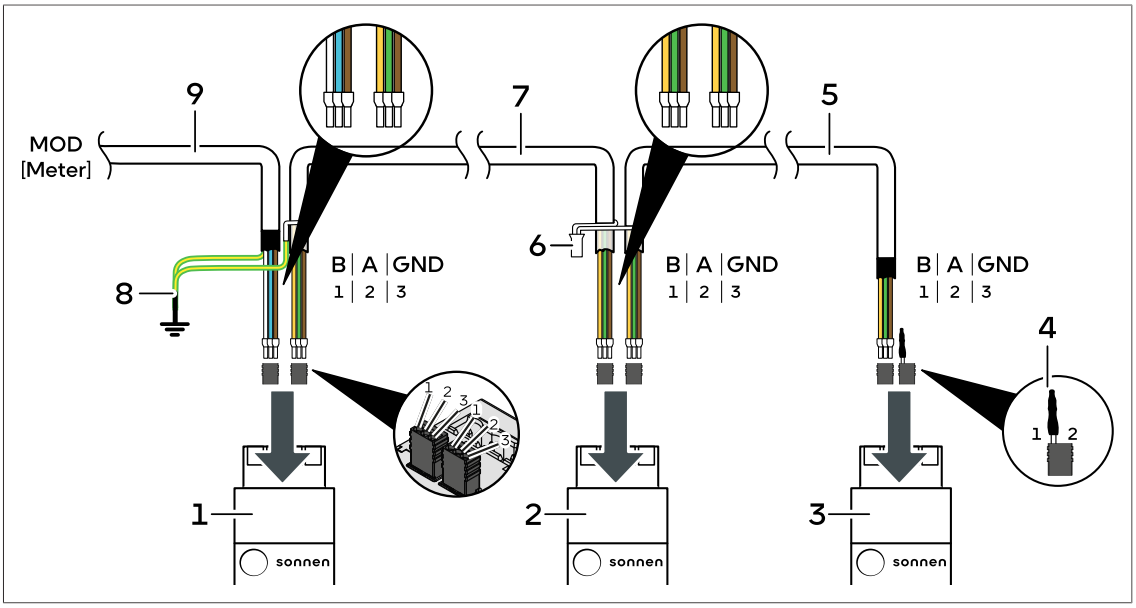


Illustration 21: Connection of communication line for RTU Modbus with three SU103 power meters

1 Power meter 1 (ID = ‚RTU‘)
2 Power meter 2 (ID = ‚RTU‘)
3 Power meter 3 (ID = ‚RTU‘)
4 Terminating resistor for Modbus termination
5 Communication line
6 Screen connection
7 Communication line
8 Screen connection to earthing system
9 Communication line

→ Connect the power meters as shown in the figure above.

Note:

→ Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.

→ On the last power meter, connect the terminating resistor supplied between pins 1 and 2.

→ Connect the screens of the individual communication lines between the power meters to each other.

→ Ensure, that the screen of the existing communication line is not connected to the screen of the additional communication line. The screen of the existing communication line is grounded separately instead.

→ Earth the screen of the communication line on the last power meter.

8 WM271 power meter

- The power meter WM271 is a transformer meter.
- An WM271 power meter can represent two measurement points.

INFO The power meter and power measurement can be adapted and enhanced using different accessories (see Power measurement accessories [P. 50]).

8.1 Overview of the power meter

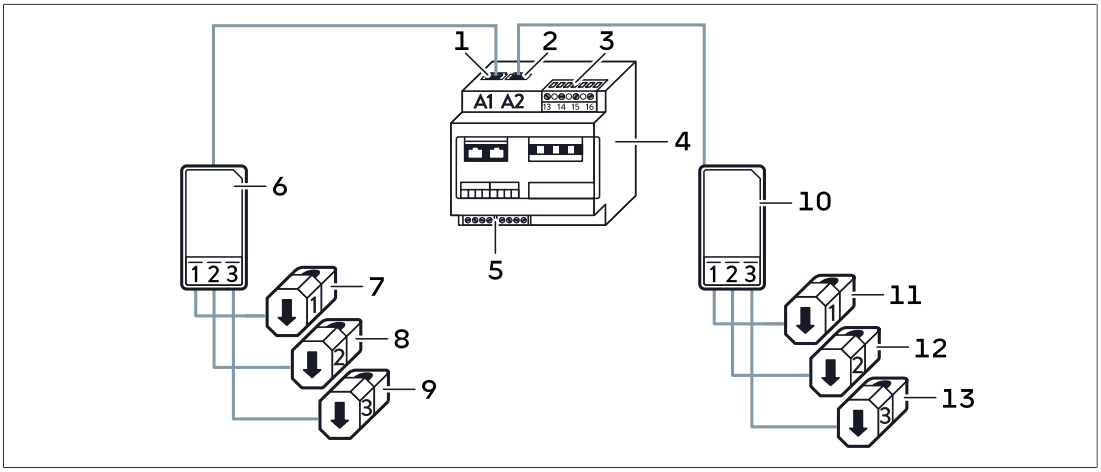


Illustration 22: Components of the WM271 power meter

1 A1 - Input for **Production** (Channel 1)
2 A2 - Input for **Consumption** (Channel 2)
3 Terminal strip for voltage measurement
4 Power meter
5 Modbus terminal strip
6 Transformer interface for production
7 CT for production - L1
8 CT for production - L2
9 CT for production - L3
10 Transformer interface for consumption
11 CT for consumption - L1
12 CT for consumption - L2
13 CT for consumption - L3

8.2 Electrical connection

- The power meter WM271 can be used in a single-phase as well as a three-phase mains.
- The lines connected to the voltage measurement terminal strip must be protected by suitable miniature circuit breakers. Additional miniature circuit breakers do not have to be installed if the lines are already protected in accordance to the relevant, currently applicable regulations and standards

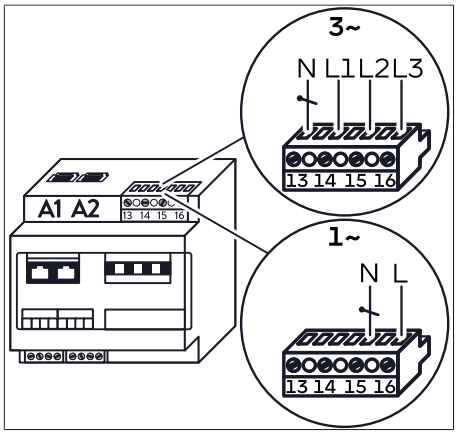


Illustration 23: Connection to the voltage measurement terminal strip at single-phase and three-phase mains

Three-phase connection

In the case of a three-phase mains:

→ Wire the individual strands as shown in the top part of the figure.

Single-phase connection

In the case of a single-phase mains:

→ Wire the individual strands as shown in the lower part of the figure.

8.3 Connecting the transformer interfaces and clamp-on current transformers

- The transformer interfaces are connected to inputs A1 or A2 on the power meter. The inputs for production and consumption must never be switched!
- In the case of storage systems with direct PV connection, no transformer interface with clamp-on current transformers (CT) is used as standard to measure PV system production. The production input (A1) remains free on power meter WM271.
- Each transformer interface has three CT. The number of CT on the transformer interface cannot be changed.
- The lines between the CTs and the transformer interface can be extended to a maximum of 30 m (cable cross-section: min. 1.5 mm²).
- The current amperage for the phase in question is recorded using the CT.

With a **single-phase** measurement point, therefore, only the clamp-on current transformer for the relevant phase is connected. The other two CT must **not** be connected in this case.

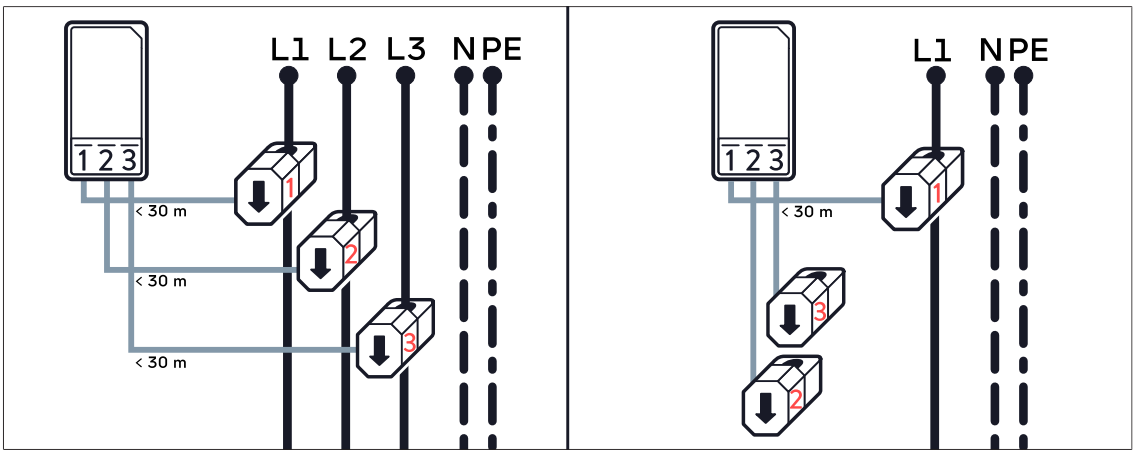


Illustration 24: Connecting the clamp-on current transformers for three-phase and single-phase measurement

8.4 Common errors when connecting the clamp-on current transformers

The following errors are common when connecting the clamp-on current transformers:

- The CT are installed at the wrong point inside the electrical wiring of the building.
- The CT (phases) are mixed up.
- The measurement direction of the CT is incorrect.

These last two errors and their potential consequences are described in the following.

8.4.1 Clamp-on current transformers are mixed up

Power measurement only works if the current and voltage of the same phase are measured.

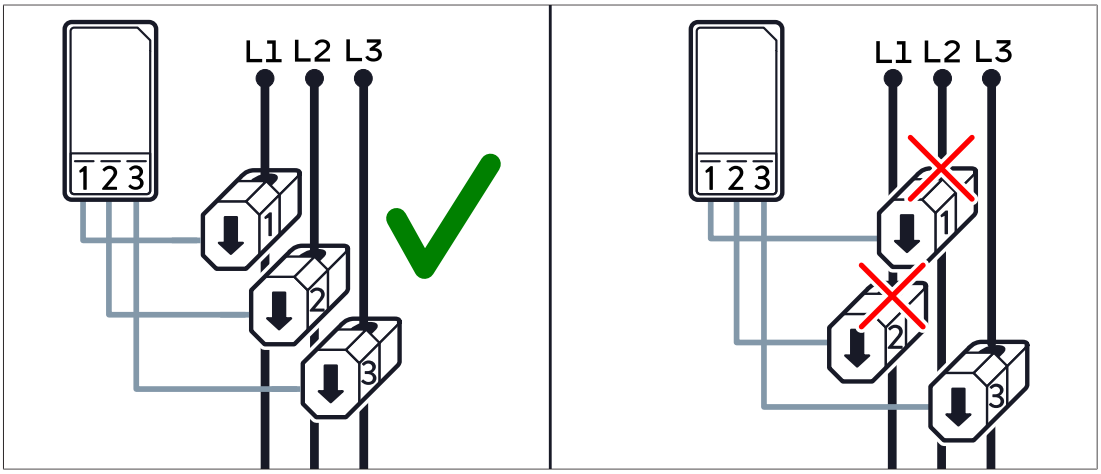


Illustration 25: Connecting the clamp-on current transformers - incorrect (right) and correct (left)

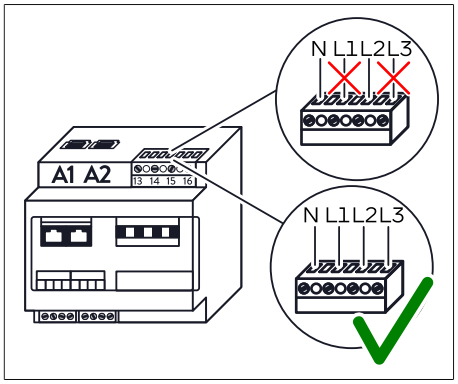


Illustration 26: Connection to the voltage terminal strip – incorrect (top) and correct (bottom)

The current at the relevant measurement point is measured using the clamp-on current transformer, while the current voltage is measured via the voltage measurement terminal strip. The power is calculated as the product of the current times the voltage.

The power recorded at clamp-on current transformer 1 is the result of the current at CT 1 multiplied by the voltage at input L1 of the voltage measurement terminal strip. The power recorded at clamp-on current transformer 2 is the result of the current at CT 2 multiplied by the voltage at input L2, and so on.

Checking the phase position

If there are deviations in the measurements, the positions of the individual phases (L1, L2, L3) can be measured by proceeding as follows.

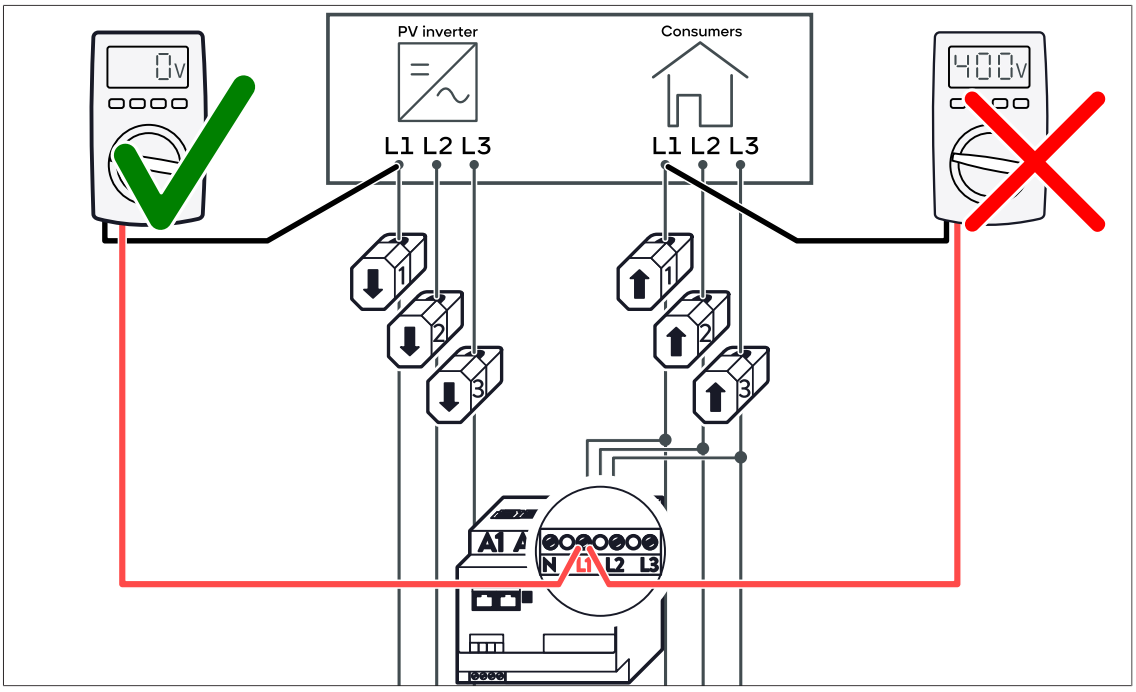


Illustration 27: Measuring phase L1 position

→ Measure the voltage from connection L1 of the power meter to the line with CT 1 (see figure).

→ Measure the voltage from connection L2 of the power meter to the line with CT 2.

→ Measure the voltage from connection L3 of the power meter to the line with CT 3.

→ Measure the respective voltage on all paths (e.g. consumption and production path).

⇨ If a voltage of 400 V is measured here, phases have been switched.

Example of incorrect implementation:

- The voltage measurement terminal strip is wired correctly.
- Clamp-on current transformers 1 and 2 are mixed up.
- An ohmic consumer with a consumption of 1000 watts is connected at L1.
- The clamp-on current transformers are used as measurement point C (consumption).

In this example, the phase between current and voltage measurement is offset by 120°. This has the following consequences:

- An active power reading of approx. 500 watts is displayed, even though the actual active power is 1000 watts (because P=U·I·cos(120°) and cos(120°)=-0.5).
- The positive/negative sign in front of the active power reading is reversed.
- A reactive power reading of approx. 866 Var is displayed, even though there is actually no reactive power (because Q=U·I·sin(120°) and sin(120°)≈0.866).

8.4.2 Measurement direction of clamp-on current transformers is incorrect

If the Easy Connection (EC) function is **deactivated** on the WM271 power meter, positive and negative power readings can be recorded (see Easy Connection (EC) programming page [P. 41]). In this case it is important to ensure that the measurement direction of the clamp-on current transformers is correct.

Example of incorrect implementation

All three clamp-on current transformers are installed at measurement point G (Grid) with the incorrect measurement direction. This has the following consequences:

- Usage of energy is recorded, even though energy is actually being fed into the public electricity grid, and vice versa.

- The storage system is discharged, even though it should actually be charged, and vice versa.

8.5 Programming of the WM271

The power meter WM271 can be programmed with the help of a touch display.

8.5.1 Mounting the touch display

Prerequisite:

✓ The power meter must be disconnected from the voltage supply in order to mount the touch display.

Tools:

- Touch display for WM271 power meter
- Screwdriver | max. 5.5 mm

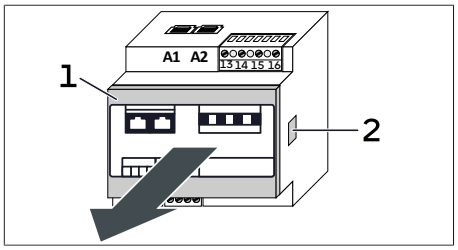


Illustration 28: Removing the front cover

→ Press the clips (2) on both sides of the power meter. You might use a small screwdriver.

→ Remove the front cover (1).

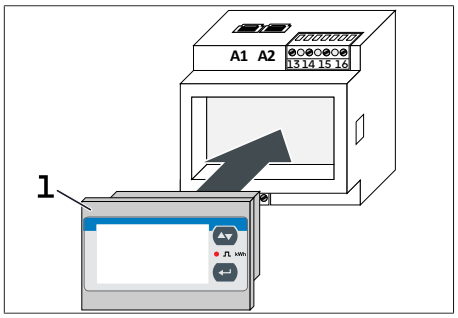


Illustration 29: Inserting the touch display

→ Insert the touch display (1) into the power meter.

→ Supply the power meter with energy.

8.5.2 Switching to the programming mode

The power meter is in display mode after the touchscreen is mounted. Values are shown on the display but cannot be changed.

Switch to the programming mode to change the values. Proceed as follows:

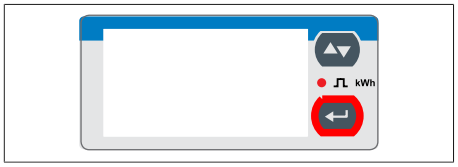


Illustration 30: Touch display

→ Press ↵ for 3 seconds.

The **PASS ?** screen appears.

The correct password needs to be entered. The default password is ‘0’.

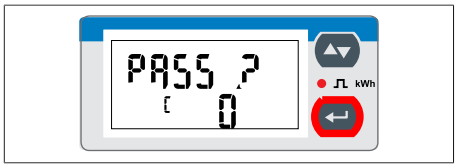


Illustration 31: Password entry screen

→ Press ↵ for 3 seconds.

The **CnGPASS** screen appears. The power meter is now in programming mode.

8.5.3 Operating the touch display in the programming mode

The touch display can be operated by the two keys ▲▼ and ↵.

Navigation on the touch display

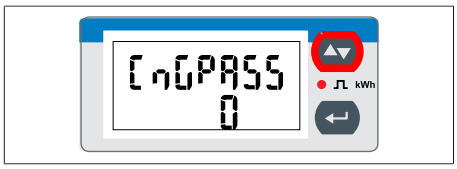


Illustration 32: CnGPASS screen

You can navigate from the **CnGPASS** screen to the desired programming page by pressing the ▲▼ key.

Changing values in the programming menu

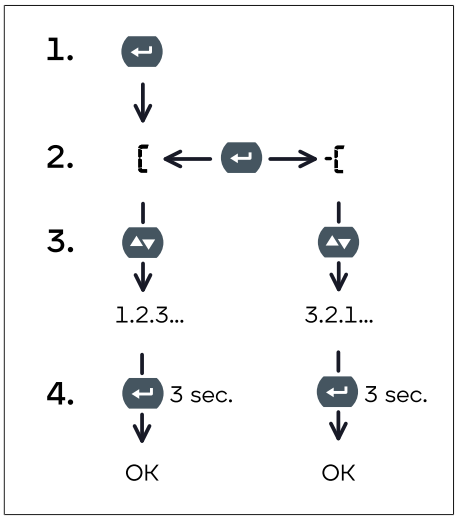


Illustration 33: Procedure for changing values

1. Press the ↵ key to change the desired value. The [sign appears on the touchscreen.
2. Press the ↵ key again to change the sign. Select [to increase the value and -[to decrease the value.
3. Press the ▲▼ key (multiple times) to set the desired value.
4. Hold down the ↵ key (for approx. three seconds) to apply the set value.

For example, the address of the WM271 can be changed as follows:

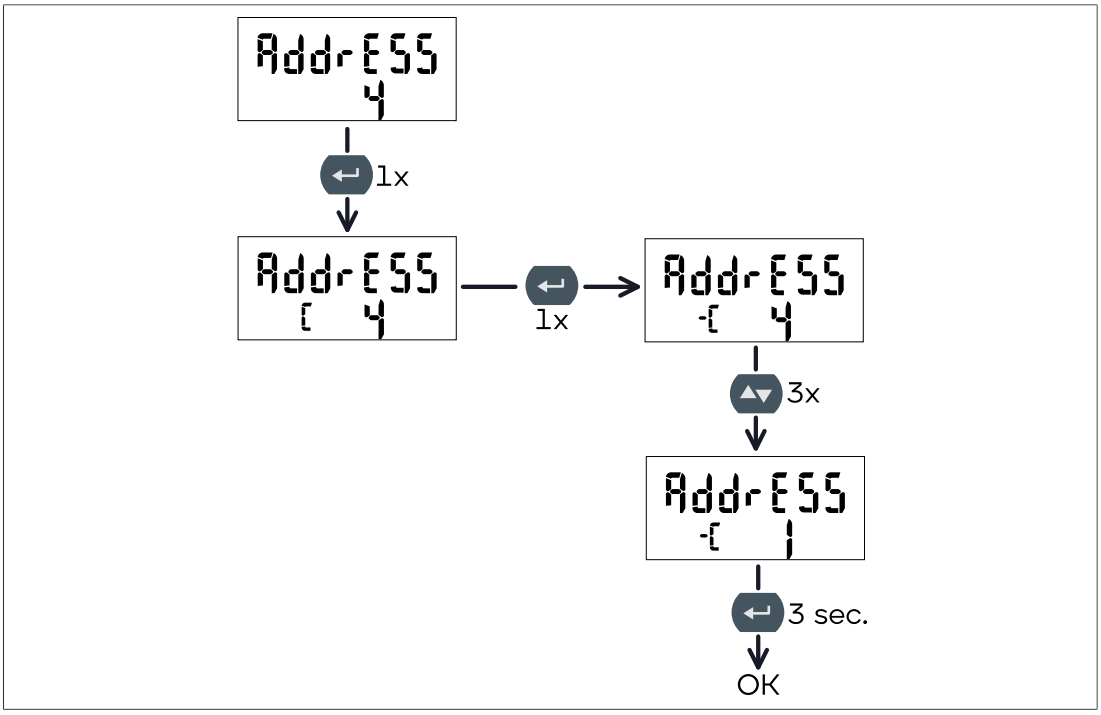
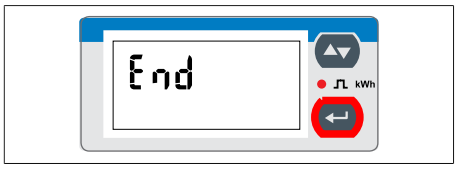


Illustration 34: Example - Changing the address from 4 to 1

8.5.4 Leaving the programming mode



→ Navigate to the **End** screen.

→ Press ↵ to leave the programming mode.

Illustration 35: End screen

The power meter is in display mode.

8.6 Description of the programming pages

All relevant programming pages are described in the following. The programming pages not described here are not important and should not be changed.

The values for the programming pages described here can be changed as explained in section Operating the touch display in the programming mode [P. 39].

8.6.1 SYS programming page

The configuration of the programming page depends on whether the power meter has been connected to a **three-phase or single-phase network** (see Electrical connection [P. 34]).

Presets

The power meters, which are part of the storage system accessory are pre-set depending on the storage system and country variant.

- For 3-phase storage systems, three-phase configured power meters are included.
- For single-phase storage systems, power meters for the Germany sales region are three-phase and one-phase for all other sales regions.

Changing measurement mode

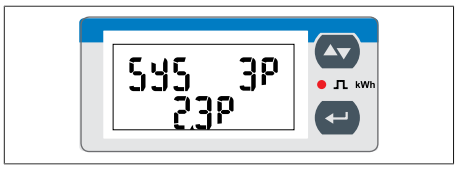


Illustration 36: SYS page

For a three-phase connection:

→ Select **3P/2.3P**.

For a single-phase connection:

→ Select **1P/6.1P**.

The other measurement modes, which can be selected on this programming page, are not important and should not be selected.

8.6.2 Address programming page

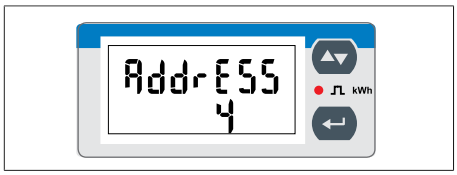


Illustration 37: AddrESS page

The Modbus address of the power meter (Default 4) can be set on this programming page.

Each Modbus device must have a unique address.

8.6.3 Easy Connection (EC) programming page

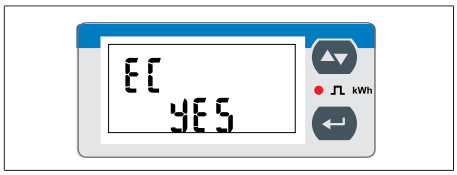


Illustration 38: EC page

The Easy Connection (EC) function can be activated/deactivated on this programming page. This function can be used to set whether the energy flow direction is taken into account or not.

The Easy Connection function is **deactivated** by default.

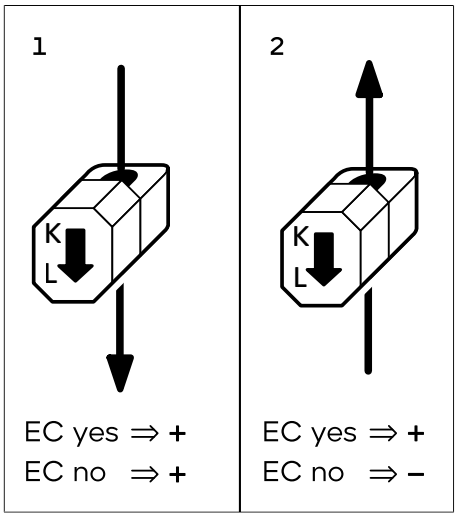


Illustration 39: Case 1 (left): the energy flow in the conductor s from K to L | Case 2 (right): the energy flow in the conductor is from L to K

Easy Connection activated

If the Easy Connection function is activated (EC yes), it does not matter whether the energy in the conductor is flowing from K to L (case 1) or vice versa (case 2). The power meter always uses positive values (amounts) in its calculations.

Easy Connection deactivated (Default)

If the Easy Connection function is deactivated (EC no), the energy flow direction determines the positive or negative sign in front of the power reading. If the energy in the conductor is flowing from K to L (case 1), the power reading is positive. In the opposite case 2, the reading is negative.

8.7 Using more than one power meter

The measurement concepts described in section Measurement concepts [P. 11] sometimes allow for more than one power meter to be connected. The following describes what needs to be taken into account when using multiple WM271 power meters.

INFO

To measure a second production system, a second production meter can be purchased from sonnen with Modbus address 6 preset (see Power measurement accessories [P. 50]).

Maximum number of channels which can be used

Within one power measurement, **maximum six measurement channels** can be used; otherwise the storage system may not be able to be controlled properly.

The resulting number of maximum power meters which can be used depends on the use of the individual channels. If both channels (for production and consumption) are used on each power meter, no more than three power meters can be used.

- The use of different power meters (e.g. WM271 and EM530) is described in section Combining different power meters [P. 46].

8.7.1 Connecting the communication line

NOTICE

Communication lines too long

→ The Ethernet line connected to the storage system must not exceed a maximum length of **100 m**.

→ The Modbus line connected to the storage system must not exceed a maximum length of **150 m**.

Connection of three WM271 power meters

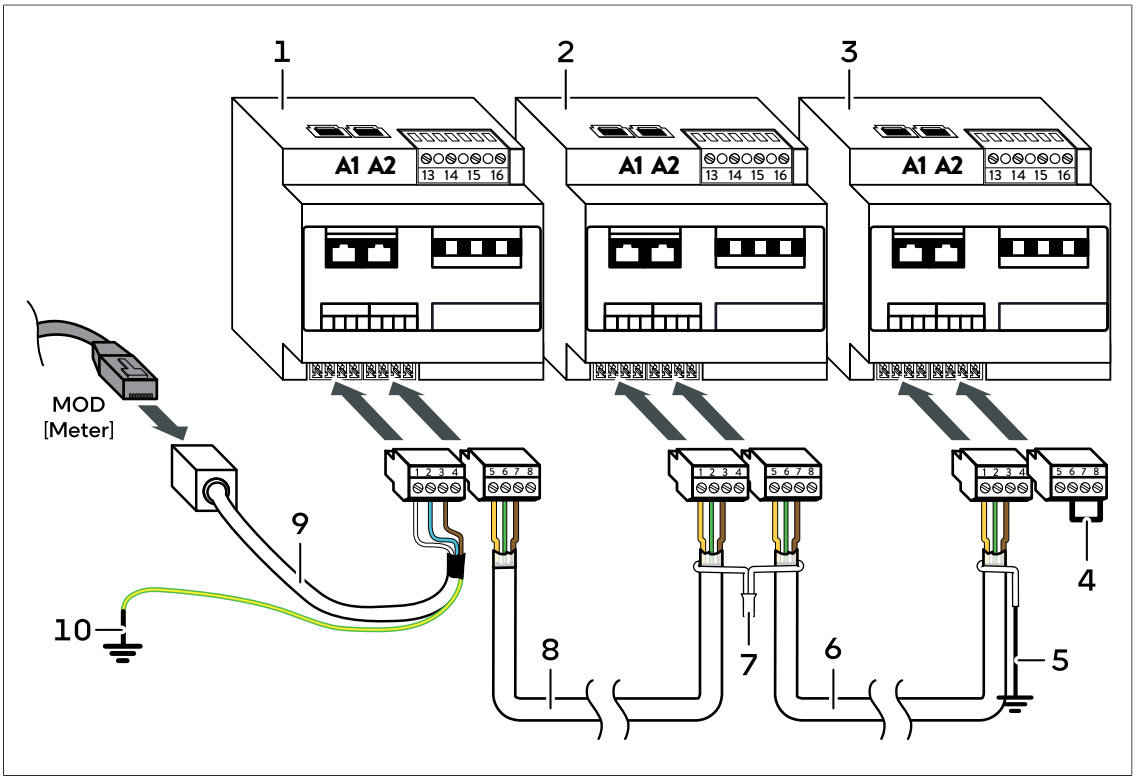


Illustration 40: Connection of communication lines for three WM271 power meters

1 Power meter 1 (ID 4, preprogrammed)
2 Power meter 2 (ID 6, preprogrammed)
3 Power meter 3 (ID 7, manually set)
4 Jumper for Modbus termination
5 Screen connection to earthing system
6 Communication line
7 Screen connection
8 Communication line
9 Communication line with RJ-45 coupling
10 Screen connection to earthing system

→ Connect the power meters as shown in the figure above.

Note:

→ Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.

→ Ensure that a jumper is connected to the Modbus terminal strip for the last power meter between pins 6 and 8.

If this is not the case:

→ Install a jumper between pins 6 and 8 on the Modbus terminal strip for the last power meter.

→ Remove the jumpers, if any, on the Modbus terminal strip for the rest of the power meters.

→ Connect the screens of the individual communication lines between the power meters to each other.

→ Ensure, that the screen of the existing communication line is not connected to the screen of the additional communication line. The screen of the existing communication line is grounded separately instead.

→ Earth the screen of the communication line on the last power meter.

8.7.2 Defining addresses

Each power meter must be assigned a unique Modbus address in order for communication between the power meters and the storage system to function properly. The following must be observed:

- A Modbus address must not be used more than once.
- A number between 4 and 40 can be selected for the Modbus address.

If the preset Modbus addresses (standard power meter: 4; production meter: 6) need to be changed:

→ Change the Modbus address as described in the section Programming of the WM271 [P. 38].

9 UMG / Janitza UMG power meters

These power meters have been added for sonnenPro storage systems because they offer the necessary functions. Their use for other sonnen storage systems is not recommended (although technically possible).

10 Combining different power meters

The use of different power meters is suitable when measuring points of the power measurement require an individual current transformer solution.

10.1 Example: connecting the WM271 and EM357 power meters

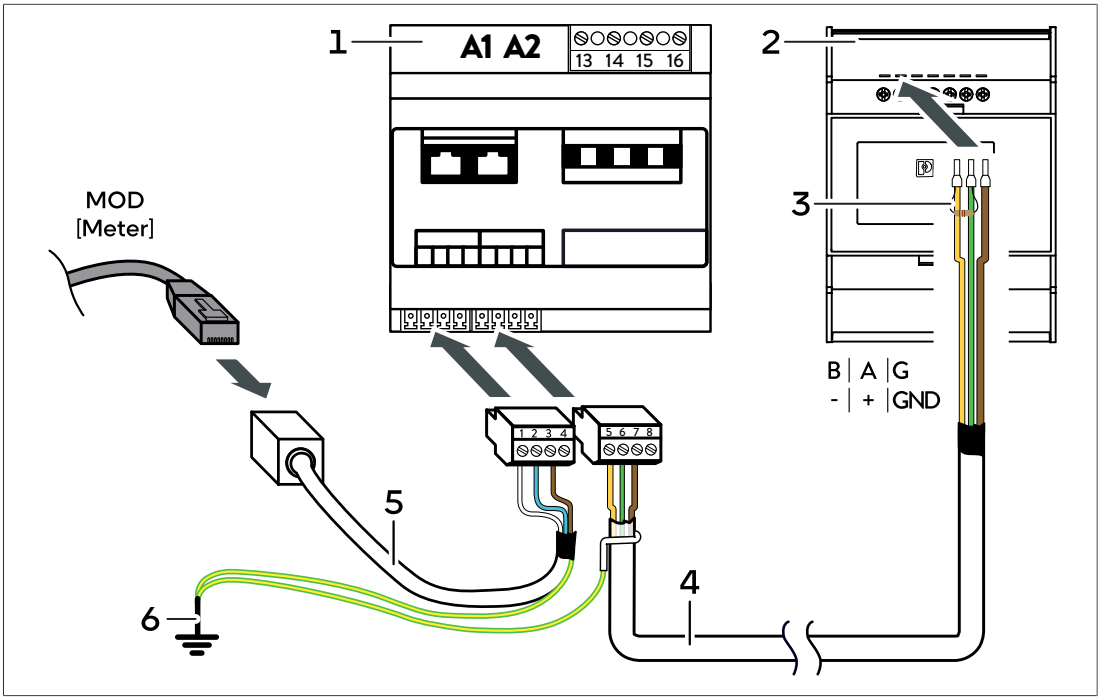


Illustration 41: Exemplary connection of the communication line for WM271 and EM357

1 WM271 power meter (ID 4, preprogrammed)
2 EM357 power meter (ID 1, preprogrammed)
3 Terminating resistor
4 Communication line
5 Communication line with RJ-45 coupling
6 Screen connection to earthing system

Configuring measurement points in the commissioning assistant

The above power measurement can be set as follows in the commissioning wizard. The measurement concept and the measurement point types depend on the actual installation. The illustration depicts an example mains linking measurement.

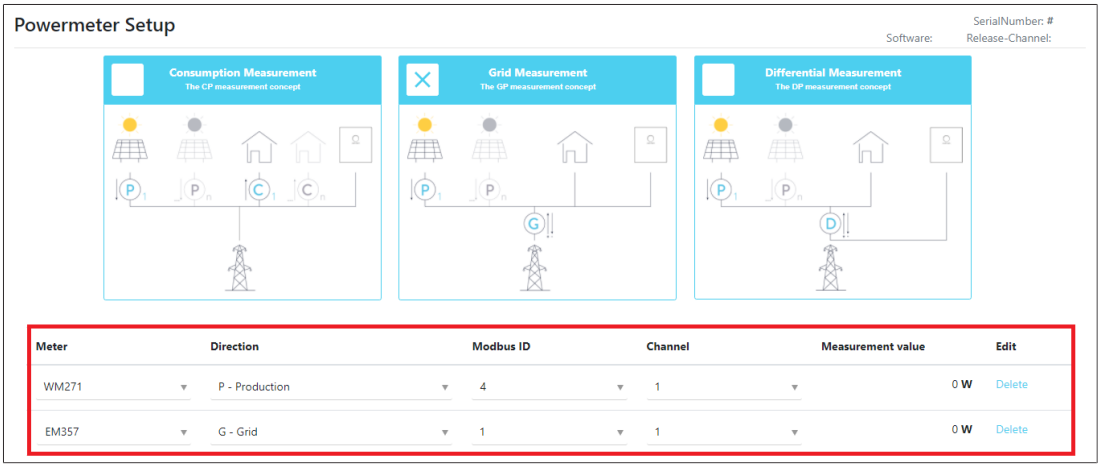


Illustration 42: Example: Measurement device set-up when using the WM271 and EM357 power meters

10.2 Example: connecting the WM271 and EM530 power meters

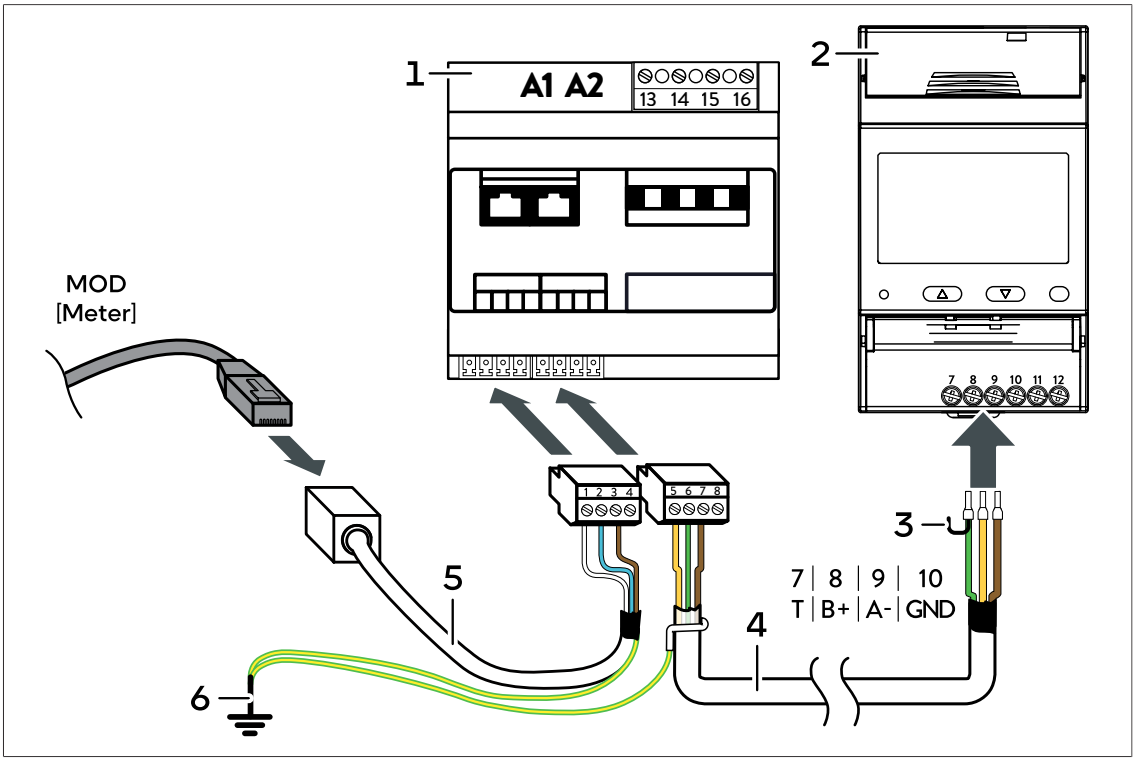


Illustration 43: Example connection of the communication lines for the WM271 and EM530

1 WM271 power meter (ID 4, preprogrammed)
2 EM530 power meter (ID 1, preprogrammed)
3 Jumper for Modbus termination
4 Communication line
5 Communication line with RJ-45 coupling
6 Screen connection to earthing system

Configuring measurement points in the commissioning assistant

The above power measurement can be set as follows in the commissioning wizard. The measurement concept and the measurement point types depend on the actual installation. The illustration depicts an example mains linking measurement.

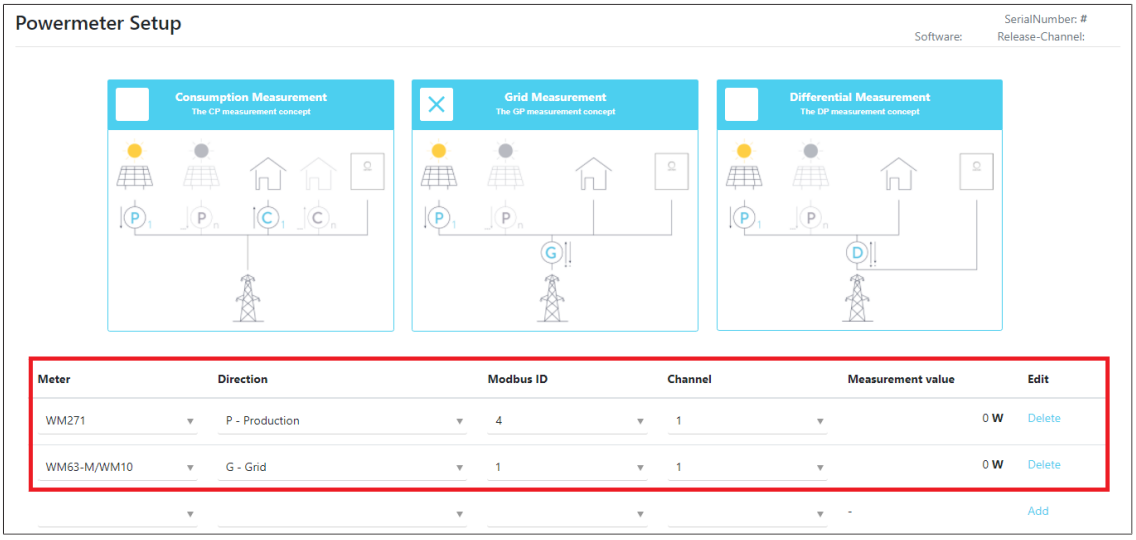


Illustration 44: Example: Measurement device set-up when using the WM271 and EM530 power meters

10.3 Example: connecting the EM357 and EM530 power meters

In this example, different power meters are used for the following reasons:

There is not enough space at the first measurement point to install a transformer meter with current transformers, so the EM357 direct meter is used.

The lines on which the second measurement point are to be installed have an external diameter that is too large to be measured with the EM357 direct meter. The EM530 power meter with individually suited current transformers is therefore used at this measurement point.

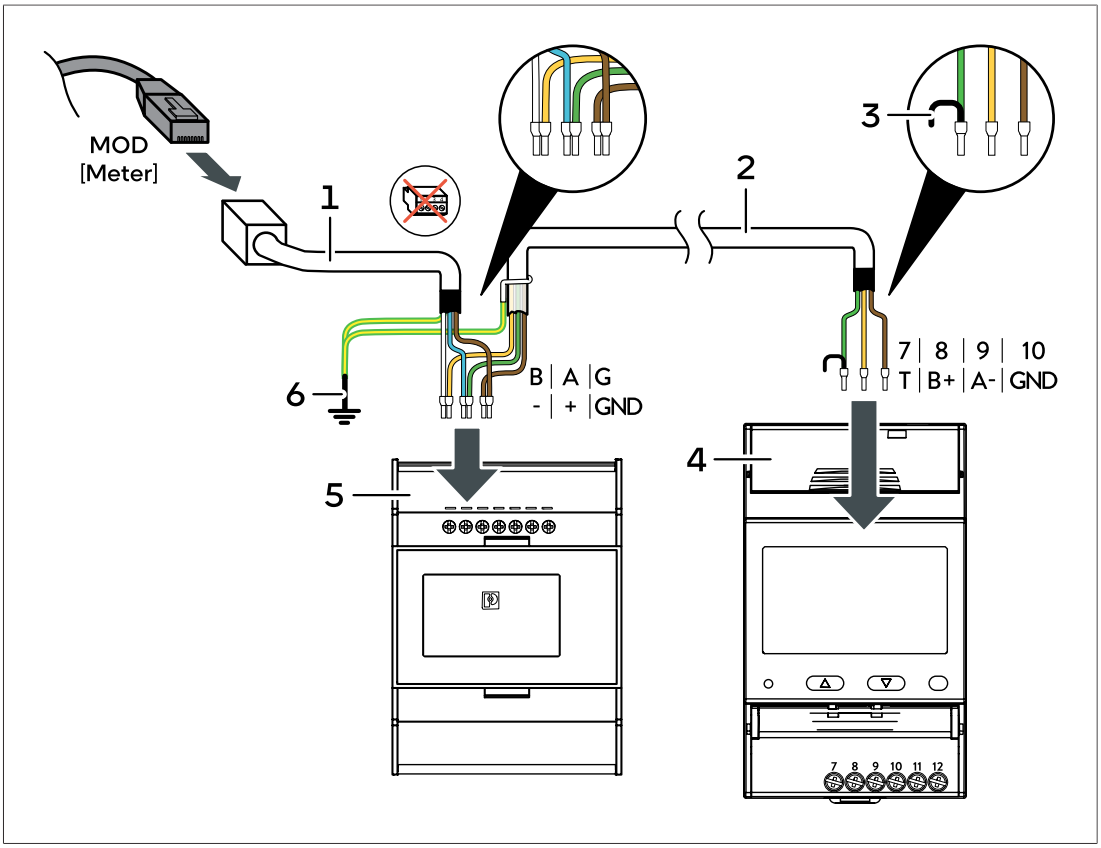


Illustration 45: Example connection of the communication lines for the EM357 and EM530

1 Communication line with RJ-45 coupling
2 Communication line
3 Jumper for Modbus termination
4 EM530 power meter (ID 2, manually set)
5 EM357 power meter (ID 1, preprogrammed)
6 Screen connection to earthing system

Configuring measurement points in the commissioning assistant

The above power measurement can be set as follows in the commissioning wizard. The measurement concept and the measurement point types depend on the actual installation. The illustration depicts an example mains linking measurement.

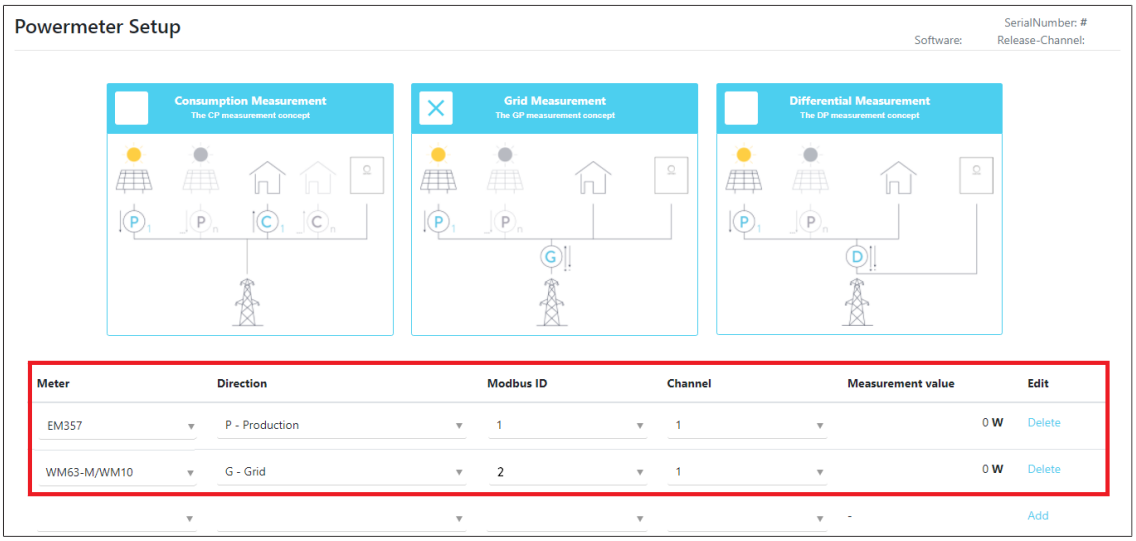


Illustration 46: Example: Measurement device set-up when using the EM357 and EM530 power meters

11 Power measurement accessories

Designation	Use	Item number
EM357 power meter (direct measurement)		
EM357 (EM357-EE)	• For single- or three-phase measurement • Preprogrammed to Modbus ID 1 • Max. measurable current: 100 A	1002221
EM357 (EM357-EE-MOD)	• For single- or three-phase measurement • Preprogrammed to Modbus ID 10 • Max. measurable current: 100 A	1002222
EM530 power meter (transformer measurement)		
EM530	• Preprogrammed for consumption measurement (measurement mode A) • For three-phase measurement • Preprogrammed to Modbus ID 1	1002426
SU103 power meter (transformer measurement)		
SU103	• For single- or three-phase measurement • Preprogrammed to random Modbus (RTU) ID between 1 and 230 • Preprogrammed to Modbus (TCP) ID 1 • Max. measurable current: 63 A	4002192
WM271 power meter[1] (transformer measurement)		
WM271	• Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 4	1001710
WM271	• Preprogrammed for single-phase measurement • Preprogrammed to Modbus ID 4	1001711
WM271 Second production meter	• Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 6	30459
Transformer 60 A *(included in standard scope of delivery)*	• 3-phase / three clamp-on current transformers • Max. outer diameter of cable: 9.6 mm • Max. measurable current: 60 A	21028
Transformer 100 A	• 3-phase / three clamp-on current transformers • Max. outer diameter of cable: 15.7 mm • Max. measurable current: 100 A	11215
Transformer 200 A	• 3-phase / three clamp-on current transformers • Max. outer diameter of cable: 15.5 mm • Max. measurable current: 200 A	11216
Transformer 400 A	• 3-phase / three clamp-on current transformers • Max. outer diameter of cable: 20.5 mm • Max. measurable current: 400 A	11659
Display	• Required for programming	11452
UMG / Janitza UMG power meters		
UMG 604-Pro / UMG 96-EL / 96-PA-MID	• Exclusively for sonnenPro storage systems • Network-based power measurement	no distribution by sonnen

[1] Cannot be used for sonnenBatterie 10 hybrid.

List of abbreviations

AC

Alternating current

BMS

Battery management system

CA

Commissioning assistant

CHP

Combined heat and power station

CT

Clamp-on current transformers

DC

Direct current

EC

Easy Connection

MCB

Miniature circuit breaker. Overcurrent safety device that protects the lines from damage caused by overheating as a result of excessive current.

PV

Photovoltaics

SMCB

Selective miniature circuit breaker or main miniature circuit breaker. This special circuit breaker meets selectivity requirements for upstream and downstream overcurrent protective devices and is used upstream of the electricity meter.

https://documents.sonnen.de/s/manual-power-meter-en

sonnen GmbH • Am Riedbach 1 • D-87499 Wildpoldsried