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Manual | for Electricians

Power measurement and power meters

EN

IMPORTANT

- This entire document must be read carefully.
- This document must be kept for reference purposes.

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Document	
Document number / Version	401 / 06
Part number / Revision	- / -
Valid for	ALL
Publication date	27/04/2023
The latest version can be accessed at	https://documents.sonnen.de/s/manual-power-meter-en

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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.**
i	**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

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:

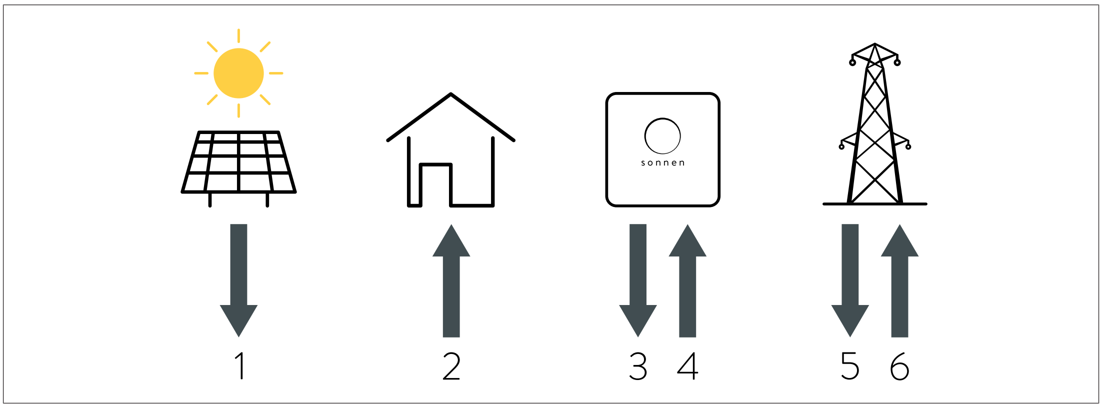


Illustration 1: Relevant energy flows

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.
- If the feed-in limit is activated, the intelligent charging management system may prevent the storage system from being charged even though the battery modules are not 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

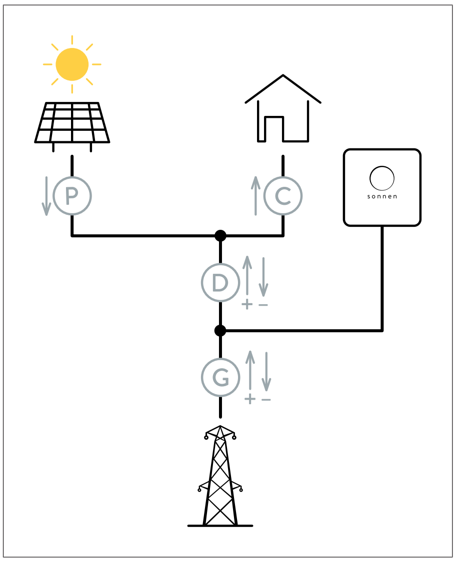


Illustration 2: Overview of all types of measurement points

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. 44]).

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.

Meter	Direction	Modbus ID	Channel	Measure-ment value	Edit
WM271 EM357 WM63-M/WM10	C - Consumption P - Production D - Difference G - Grid	1 2 3 4 ...	1 2	0 W	Add

Designation	Function
Meter	• By default, power meters WM271 and EM357 are used. Only in exceptional cases will a power meter of the type EM530, WM63-M or WM10 be used. ▶ 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, EM530, WM63-M or WM10 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.

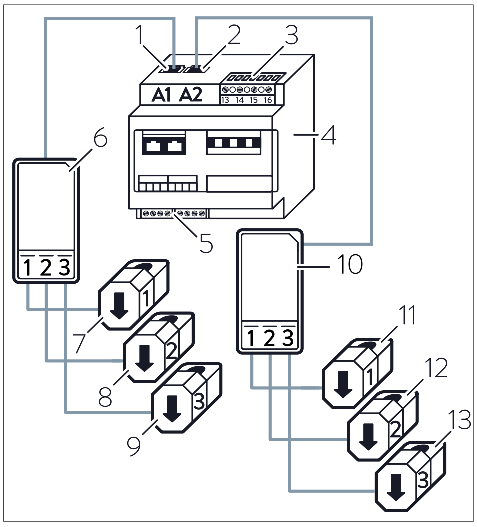
The Power meter page displays multiple measurement values for each individual measurement point, including the current active power (Total Power), apparent power (va_total) and reactive power (var_total).

4 WM271 power meter

The power meter WM271 records the energy flows on the respective measurement points.

The power meter and power measurement can be adapted and enhanced using different accessories (see Power measurement accessories [P. 52]).

4.1 Overview of the 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

4.2 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

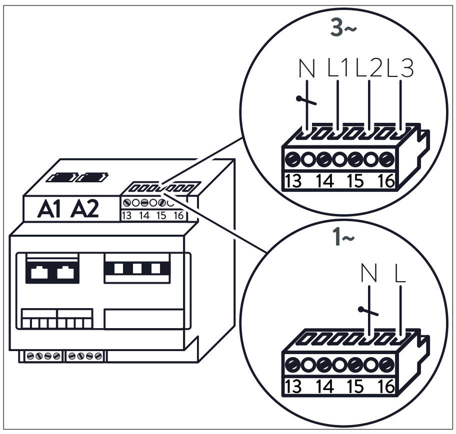


Illustration 3: Connection to the voltage measurement terminal strip at single-phase and three-phase mains

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.

4.3 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 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.

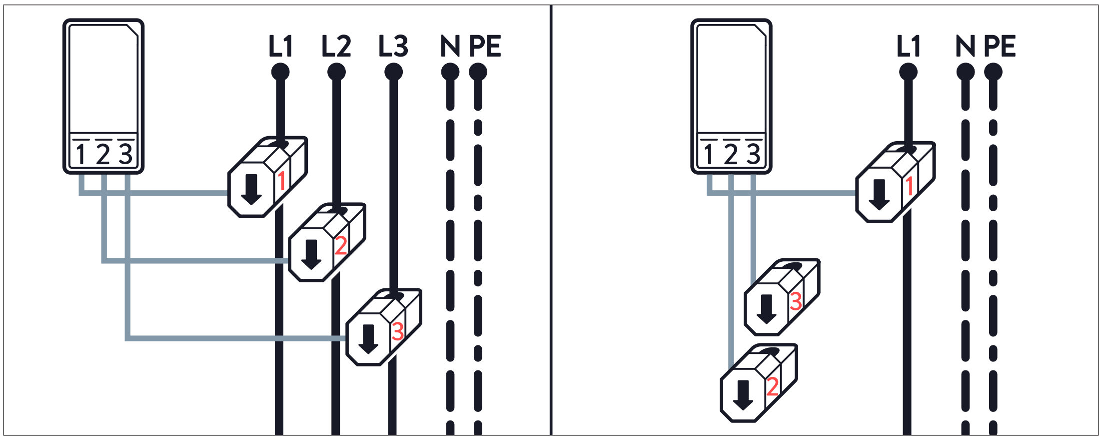


Illustration 4: Connecting the clamp-on current transformers for three-phase and single-phase measurement

4.4 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.

4.4.1 Clamp-on current transformers are mixed up

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

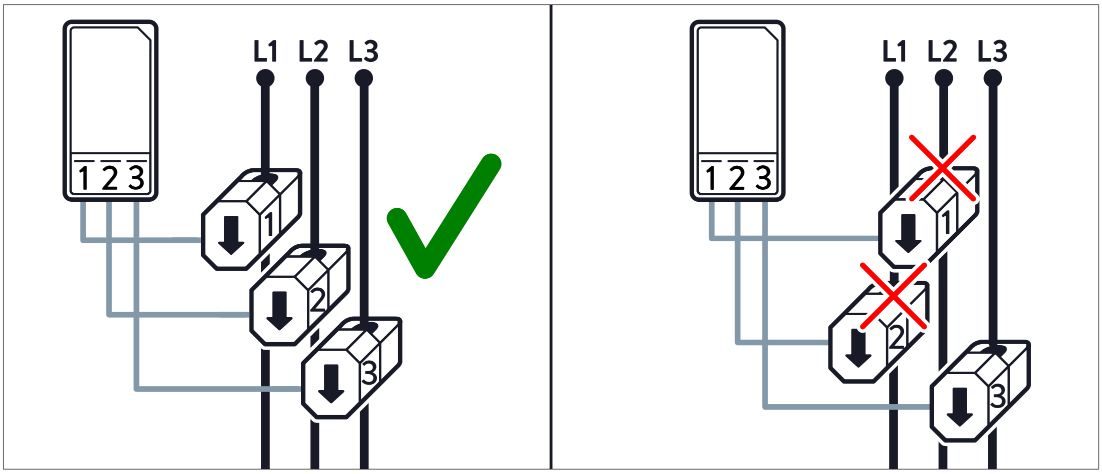


Illustration 5: Connecting the clamp-on current transformers - incorrect (right) and correct (left)

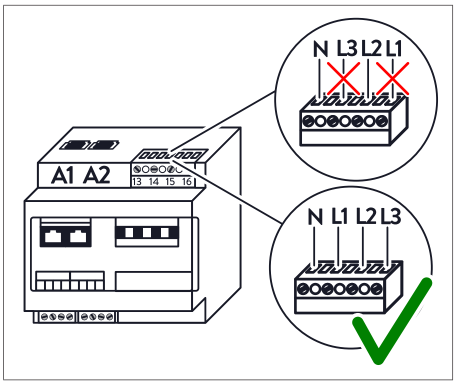


Illustration 6: Connection to the voltage terminal strip – incorrect (top) and correct (bottom)

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.

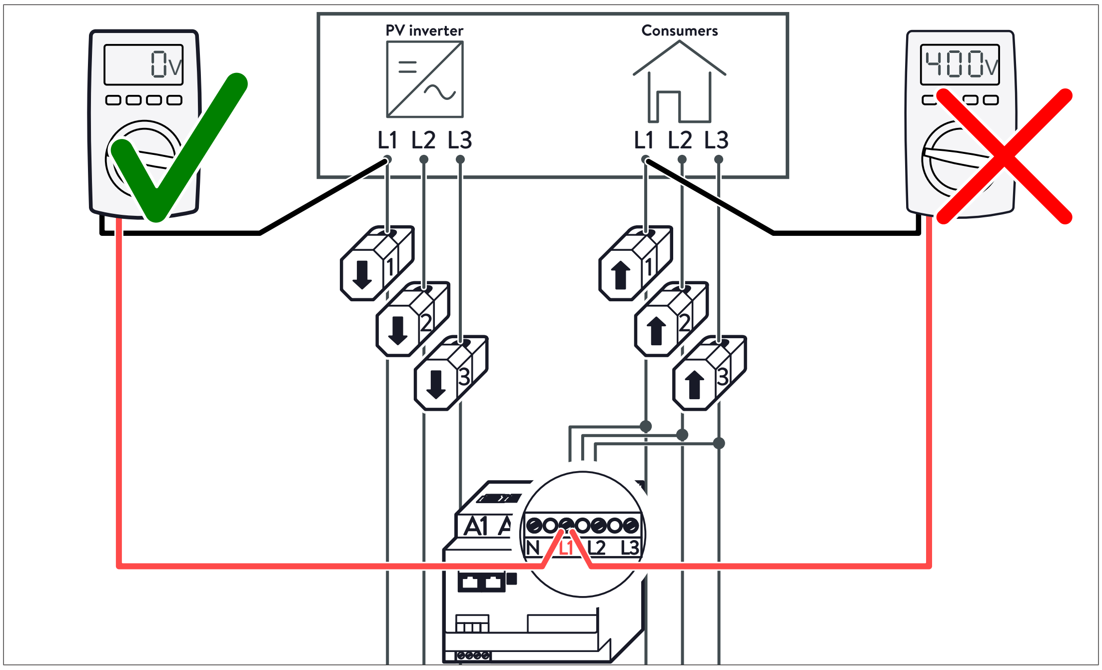


Illustration 7: Measuring phase L1 position

- ▶ 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).

4.4.2 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. 18]). 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.

4.5 Programming of the WM271

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

4.5.1 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

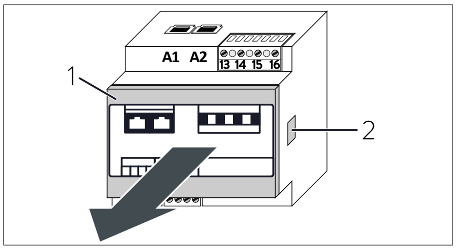


Illustration 8: Removing the front cover

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

▶ Remove the front cover (1).

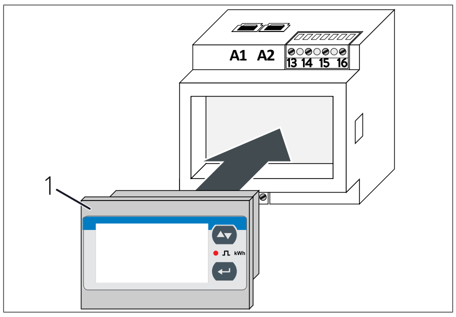


Illustration 9: Inserting the touch display

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

▶ Supply the power meter with energy.

4.5.2 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 10: Touch display

▶ Press for 3 seconds.

The **PASS ?** screen appears.

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

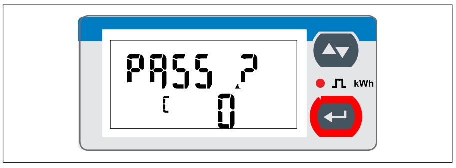


Illustration 11: Password entry screen

▶ Press for 3 seconds.

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

4.5.3 Operating the touch display in the programming mode

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

Navigation on the touch display

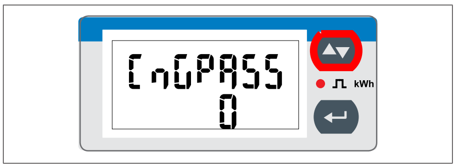


Illustration 12: CnGPASS screen

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

Changing values in the programming menu

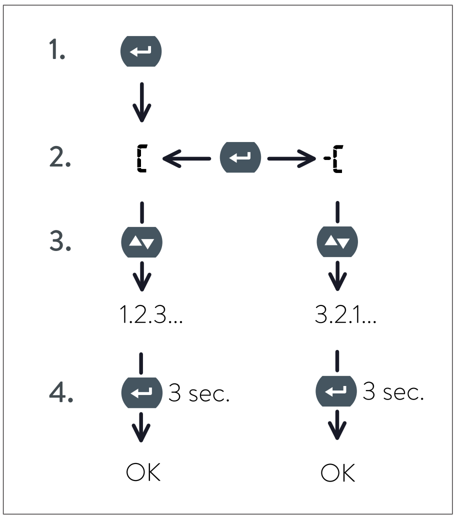


Illustration 13: Procedure for changing values

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:

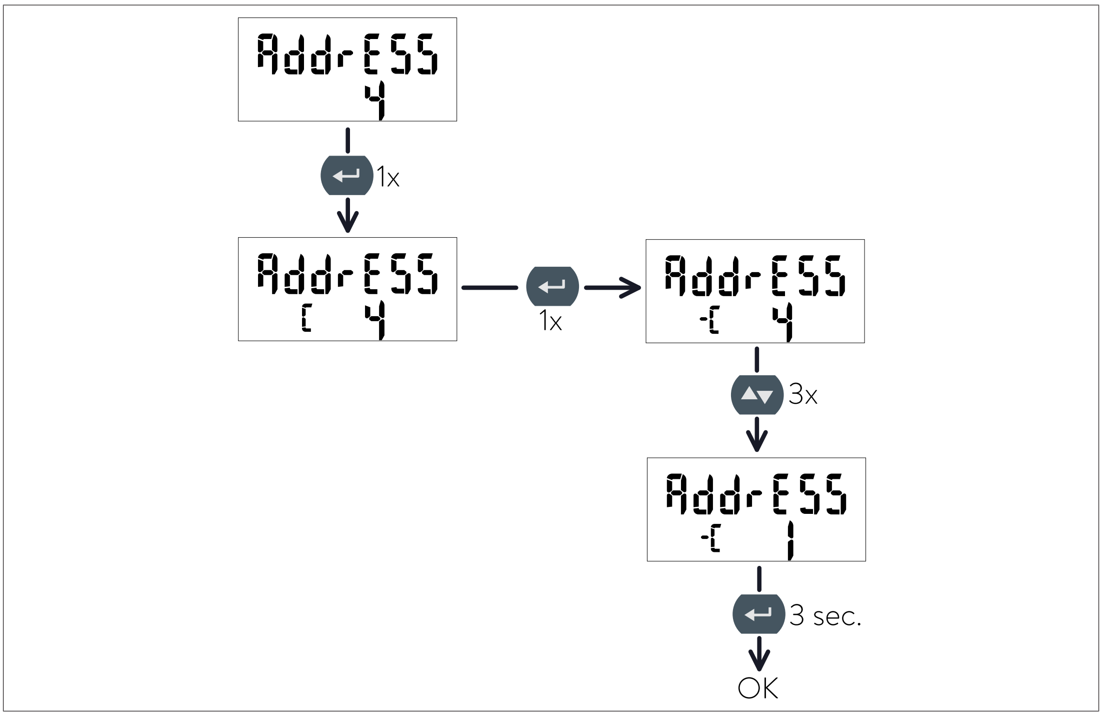


Illustration 14: Example - Changing the address from 4 to 1

4.5.4 Leaving the programming mode

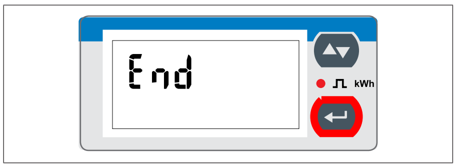


Illustration 15: End screen

- Navigate to the **End** screen.
- Press ↵ to leave the programming mode.

The power meter is in display mode.

4.6 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. 16].

4.6.1 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. 11]).

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

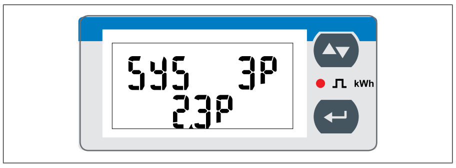


Illustration 16: SYS page

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.

4.6.2 Address programming page

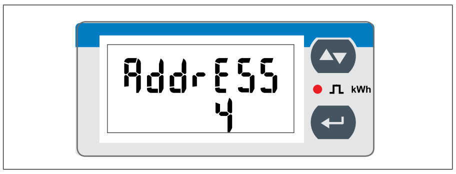


Illustration 17: AddrESS page

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

Each Modbus device must have a unique address.

4.6.3 Easy Connection (EC) programming page

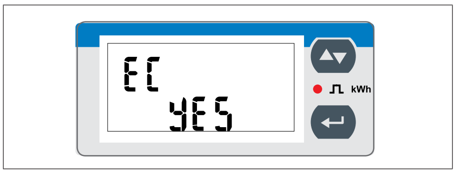


Illustration 18: EC page

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.

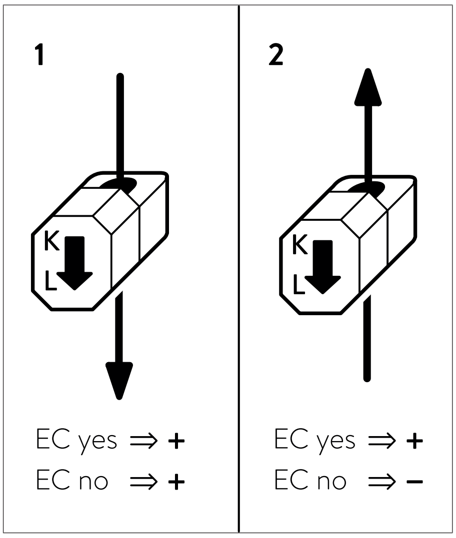


Illustration 19: Case 1 (left): the energy flow in the conductor s from K to L | Case 2 (right): the energy flow in the conductor is from L to K

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.

4.7 Using more than one power meter

The measurement concepts described in section Measurement concepts [P. 44] 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.

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. 52]).

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. 38].

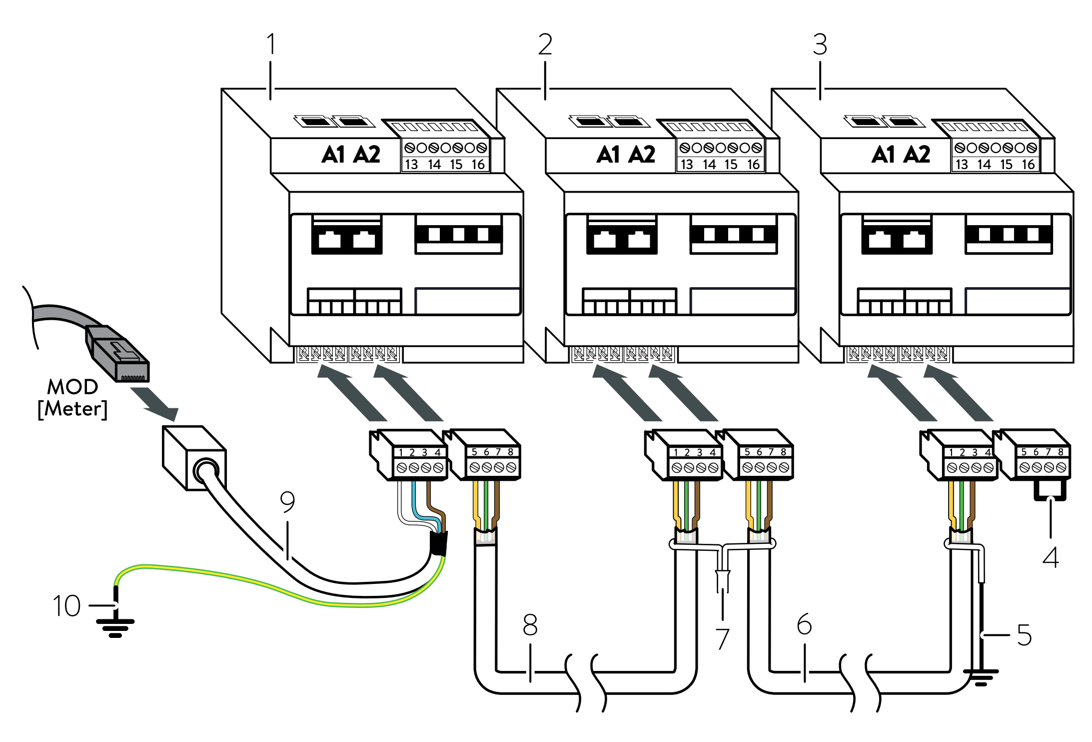
4.7.1 Connecting the communication line

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



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

4.7.2 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:

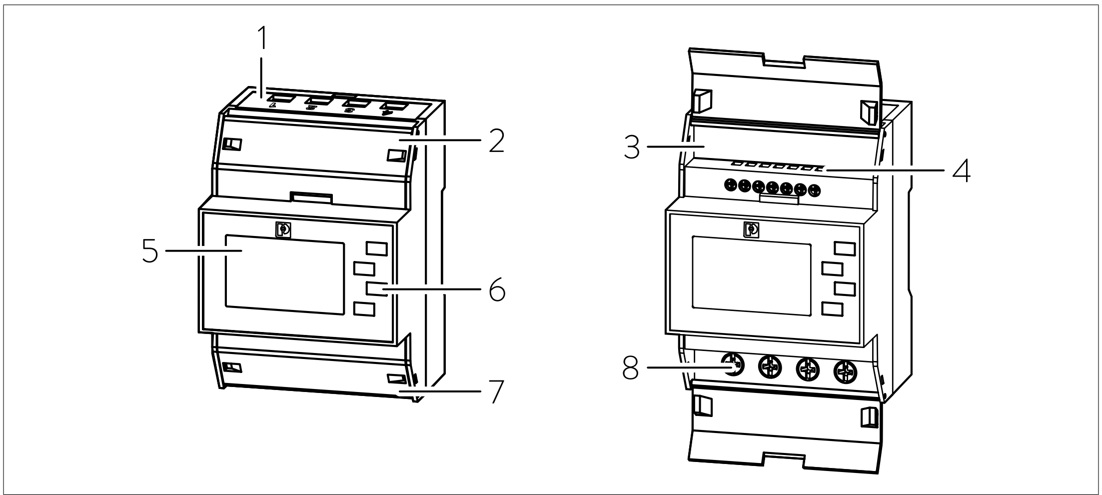
- ▶ Change the Modbus address as described in the section Programming of the WM271 [P. 15].

5 EM357 power meter

> The power meter and power measurement can be adapted and enhanced using different accessories (see Power measurement accessories [P. 52]).

- 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



1 AC cable connection area

2 Top flap

3 Communication shield

4 Communication line connection area

5 Display

6 Keys

7 Bottom flap

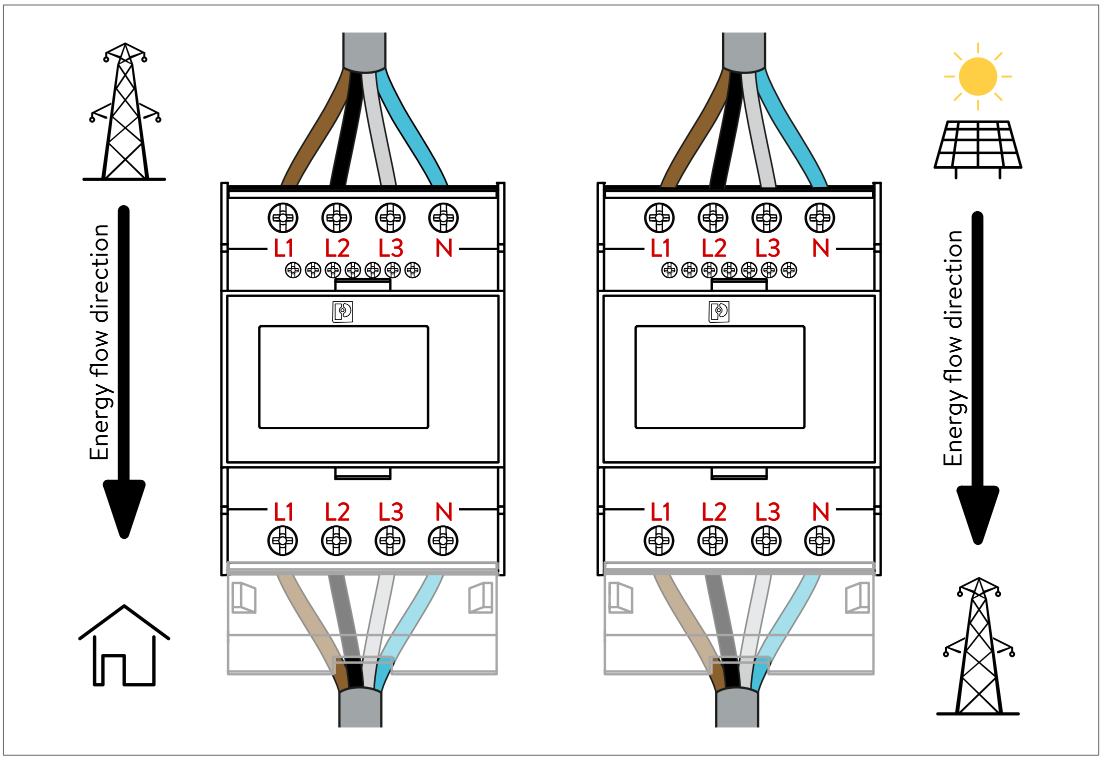
8 AC cable connection area

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).

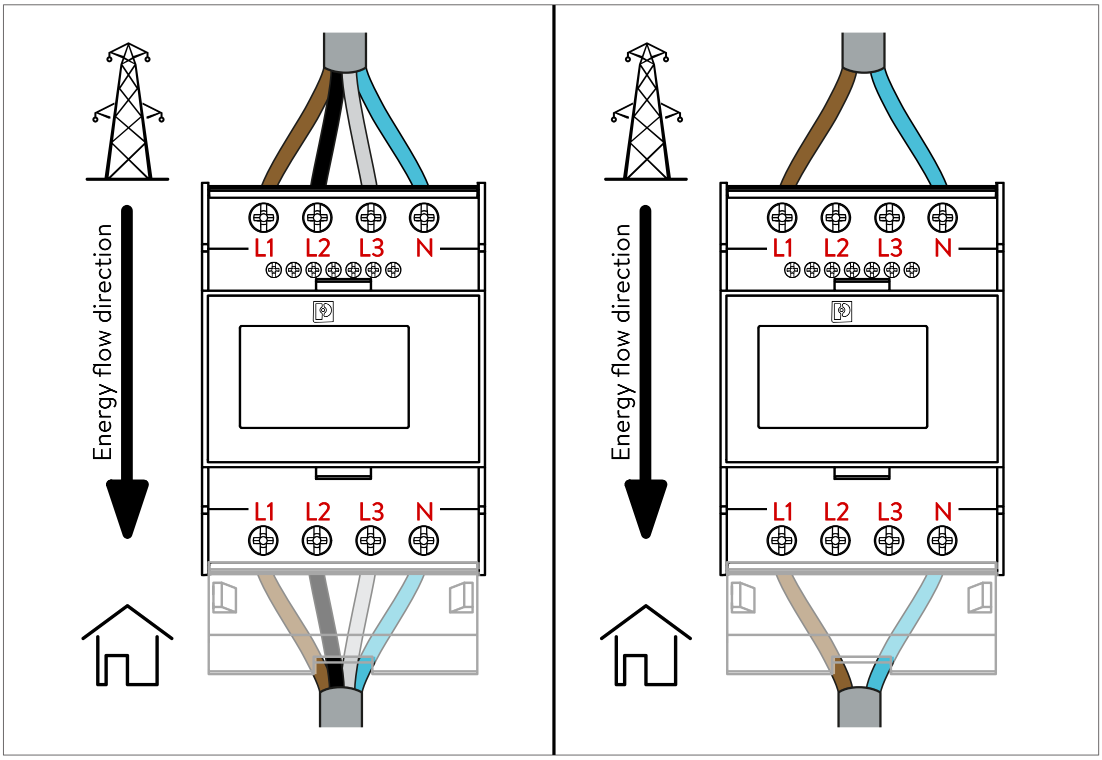
Connection with two measurement points

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:



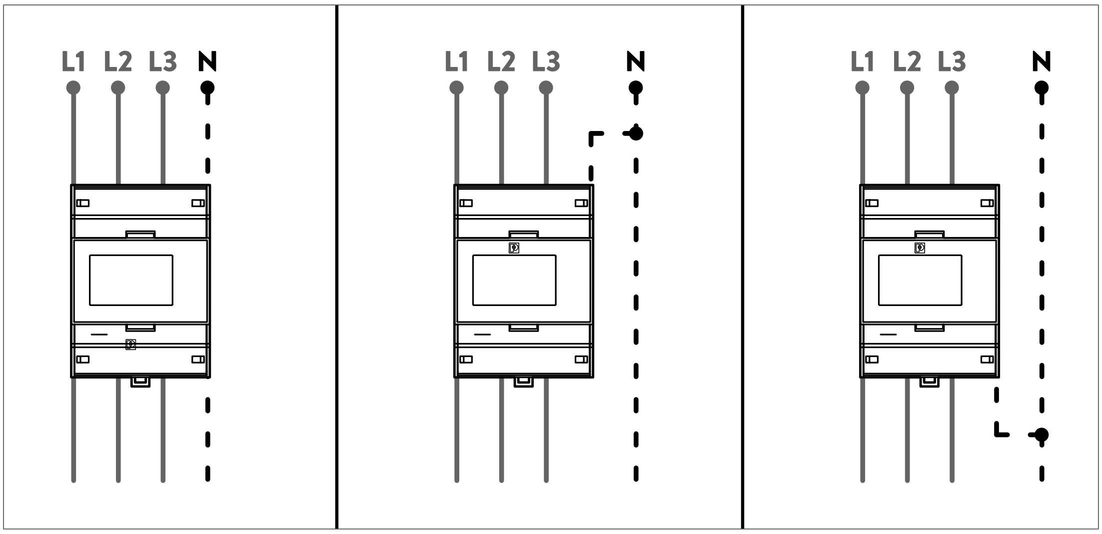
Connection with one measurement point

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:

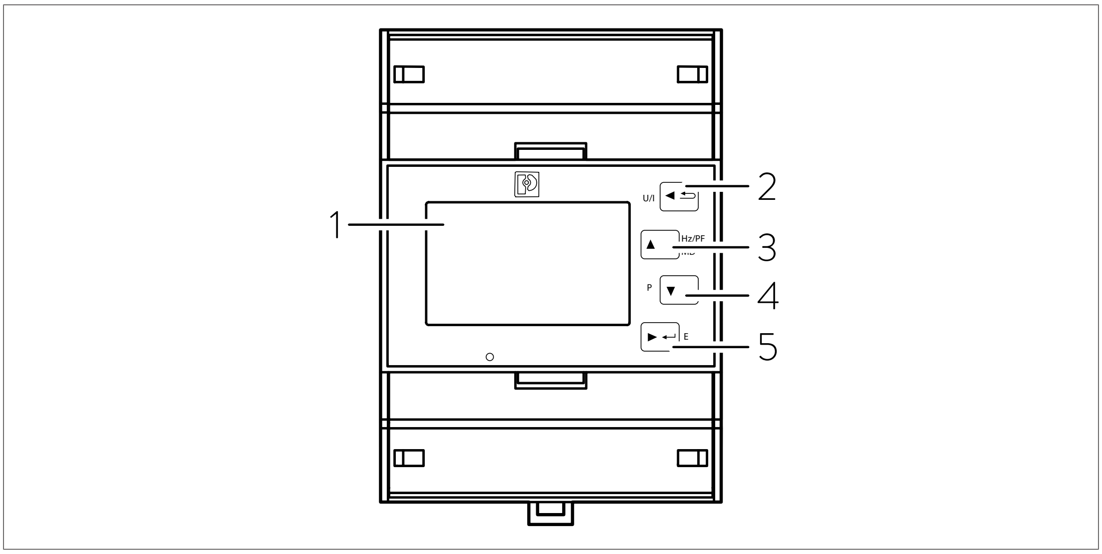


Other options for N-conductor connection

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



5.3 Changing the default Modbus address



1	LCD screen	4	Down key
2	Left/ESC key	5	Right/enter key
3	Up 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. 44] 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.

> Additional power meters can be obtained from sonnen to take readings at more measurement points (see Power measurement accessories [P. 52]).

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.

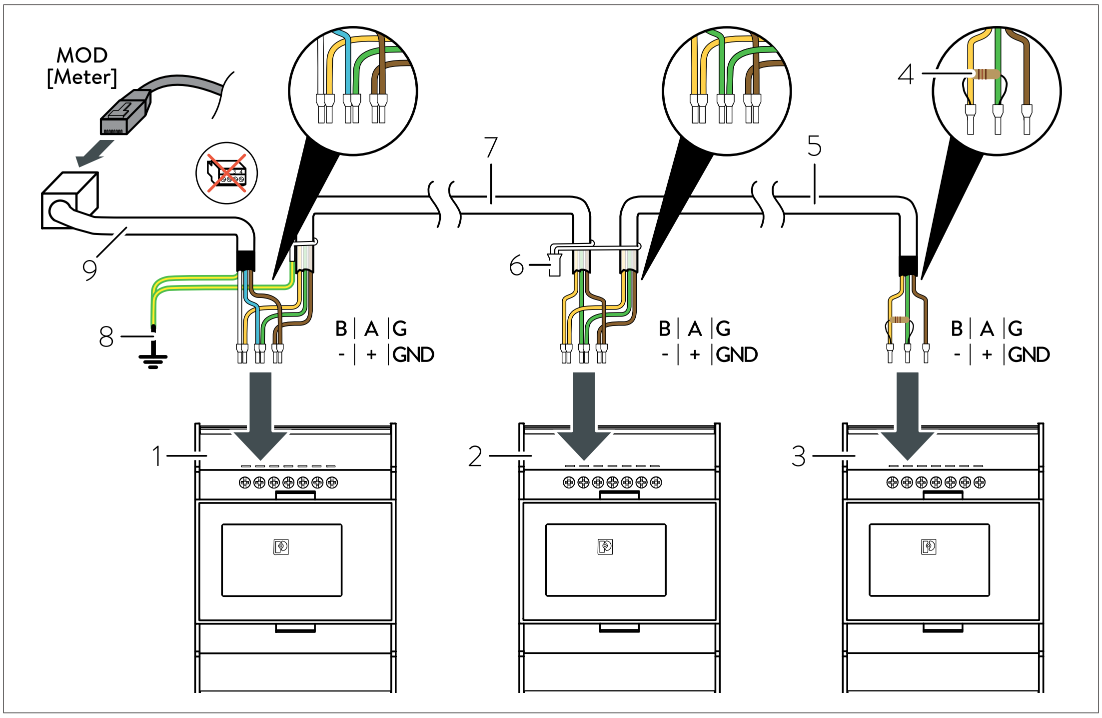
- The use of different power meters (e.g. EM357 and EM530) is described in section Combining different power meters [P. 38].

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**.



1	Power meter 1 (EM357-EE, ID 1, preprogrammed)	4	Terminating resistor
		5	Communication line
2	Power meter 2 (EM357-EE, ID 9, manually set)	6	Screen connection
		7	Communication line
3	Power meter 3 (EM357-EE-MOD, ID 10, preprogrammed)	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.

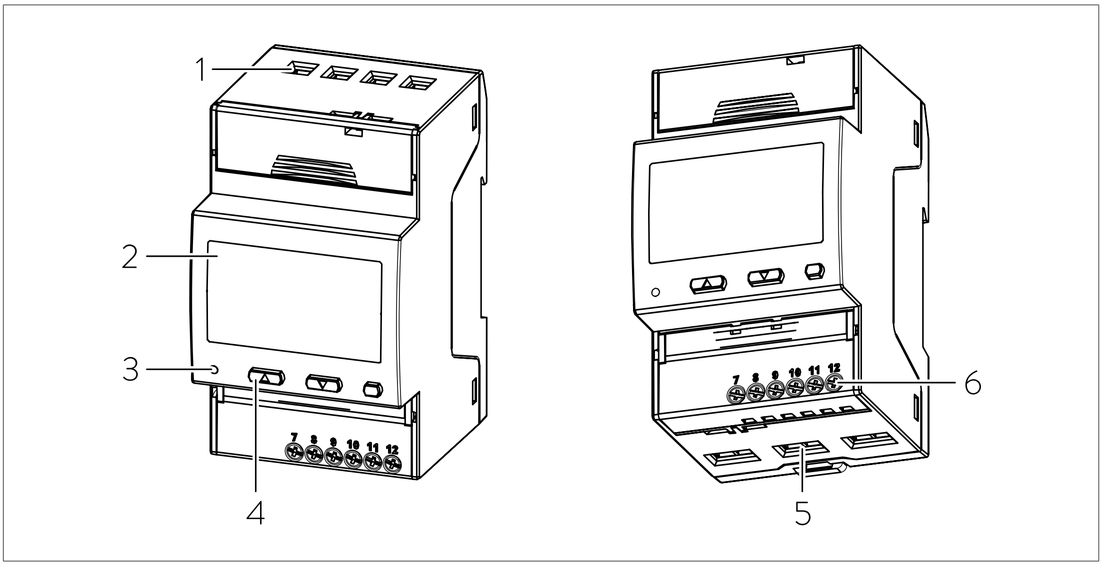
To change the default Modbus addresses (EM357-EE: 1; EM357-EE-MOD: 10):

- ▶ Change the Modbus address on the power meter as described in the section Changing the default Modbus address [P. 24].

6 EM530 power meter

- The EM530 power meter is a transformer meter.
- An EM530 power meter represents one measurement point.

6.1 Overview of 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. 29].

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. 44]).

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. 29]).

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. 29]).

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. 52] 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. 29]).

Electrical connection with one measurement point

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.

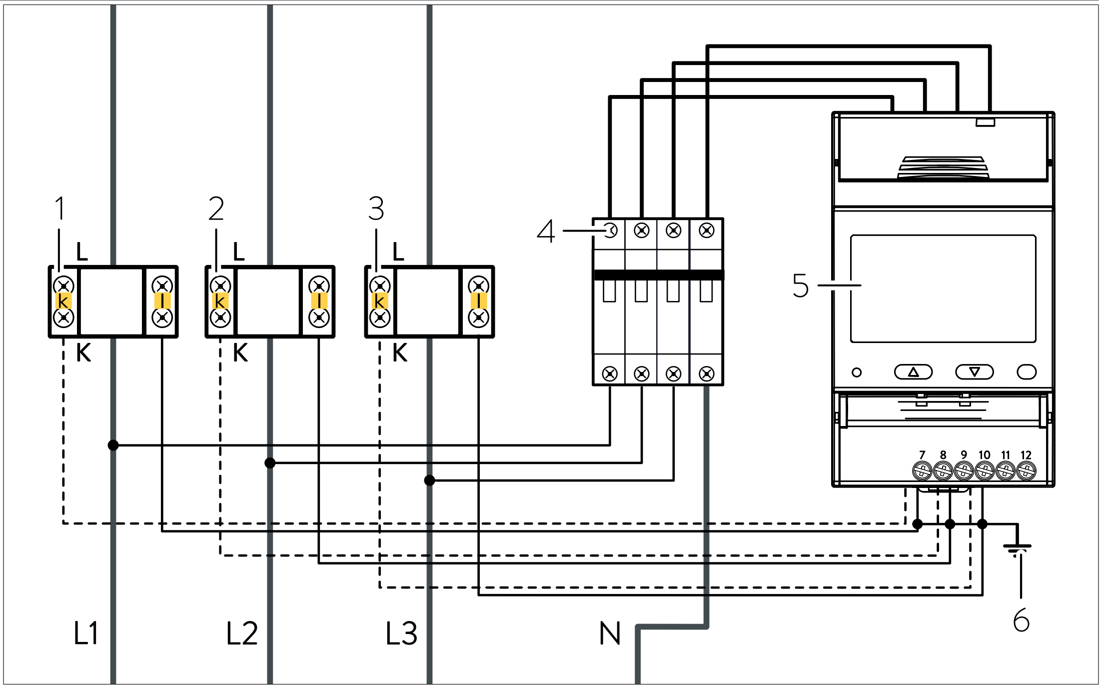
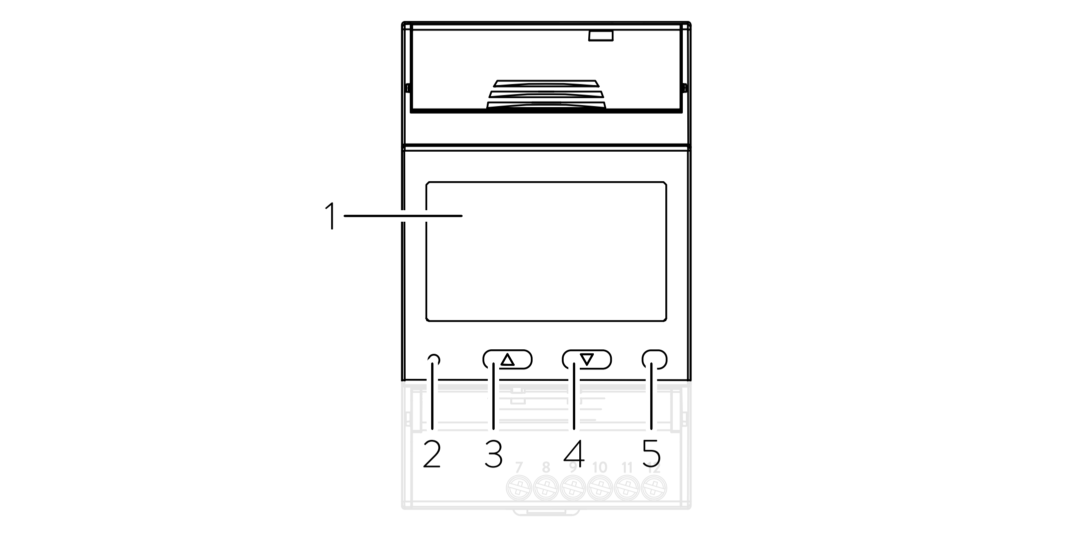


Illustration 20: Connection for measuring a measurement point with the EM530 power meter and current transformers

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



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

Switching to setting mode

- ▶ Press the enter key on the power meter.

The MEnu 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. 44] 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.

Additional power meters can be obtained from sonnen to take readings at more measurement points (see Power measurement accessories [P. 52]).

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.

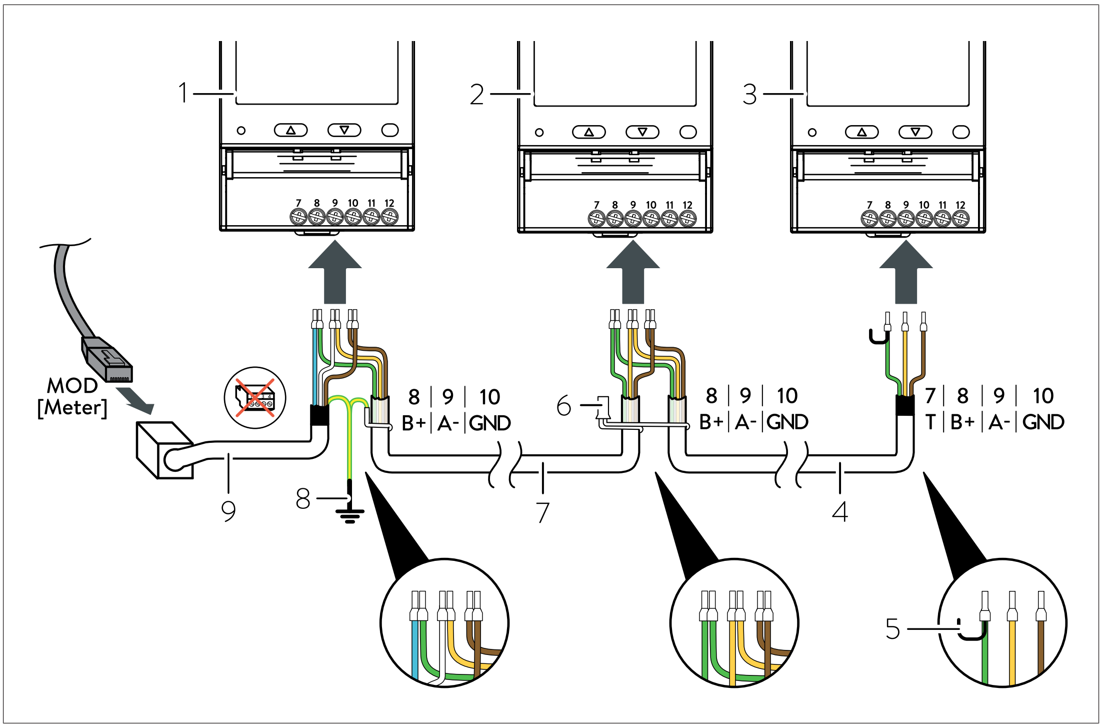
- The use of different power meters (e.g. EM357 and EM530) is described in section Combining different power meters [P. 38].

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**.



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	Jumper for Modbus termination	9	Communication line with RJ-45 coupling
5	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.

▶ 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. 29].

7 WM10 and WM63-M power meter

The power meter and power measurement can be adapted and enhanced using different accessories (see Power measurement accessories [P. 52]).

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 every WM10 or WM63-M power meter uses a measurement channel, no more than six power meters can be used.

7.1 Presets

The production and consumption measurement devices are preset. All values can be changed on the power meter.

The default values are:

Production meter:	address 4
Consumption meter:	address 5
Measurement mode:	three-phase

If more than two power meters are used, the preset Modbus addresses must be changed on all additional power meters:

▶ Set a Modbus address for each power meter as described in section AddrESS programming page [P. 37].

When selecting the Modbus address, 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. Modbus addresses 1 to 3 must not be used.

7.2 Selecting the current transformer for WM10

- The current transformers for power meter WM10 are not sold by sonnen.

▶ 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 Ct rAtio programming page (Transformer ratio) [P. 37]).

7.3 Connecting the WM10 power meter

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**.

Like the WM271 power meter, the WM10 power meter uses external current transformers. Using the WM10 power meter instead of the WM271 is recommended when measurements are to be taken on lines that exceed the maximum possible outer diameter or exceed the maximum amperage that can be measured by the clamp-on current transformers of the WM271 (for maximum measurable values, see Power measurement accessories [P. 52]).

External current transformers can be purchased for the WM10, which suit the individual and specific circumstances on site.

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.

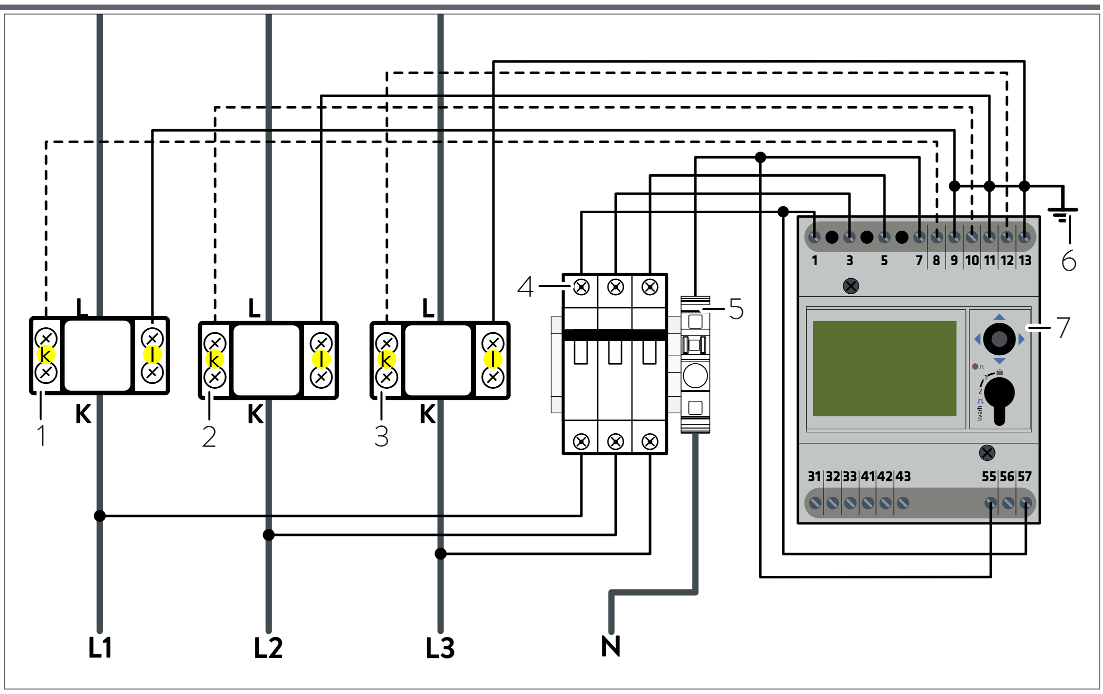


Illustration 21: Connecting the WM10 and current transformers

1	L1 current transformer	5	Series fuse (315 mA slow-blow)
2	L2 current transformer	6	Connection to earthing system
3	L3 current transformer	7	WM10 power meter
4	B6 miniature circuit breaker		

- ▶ Connect the power meter and current transformers as shown in the figure above.

7.3.1 Connecting two WM10 power meters

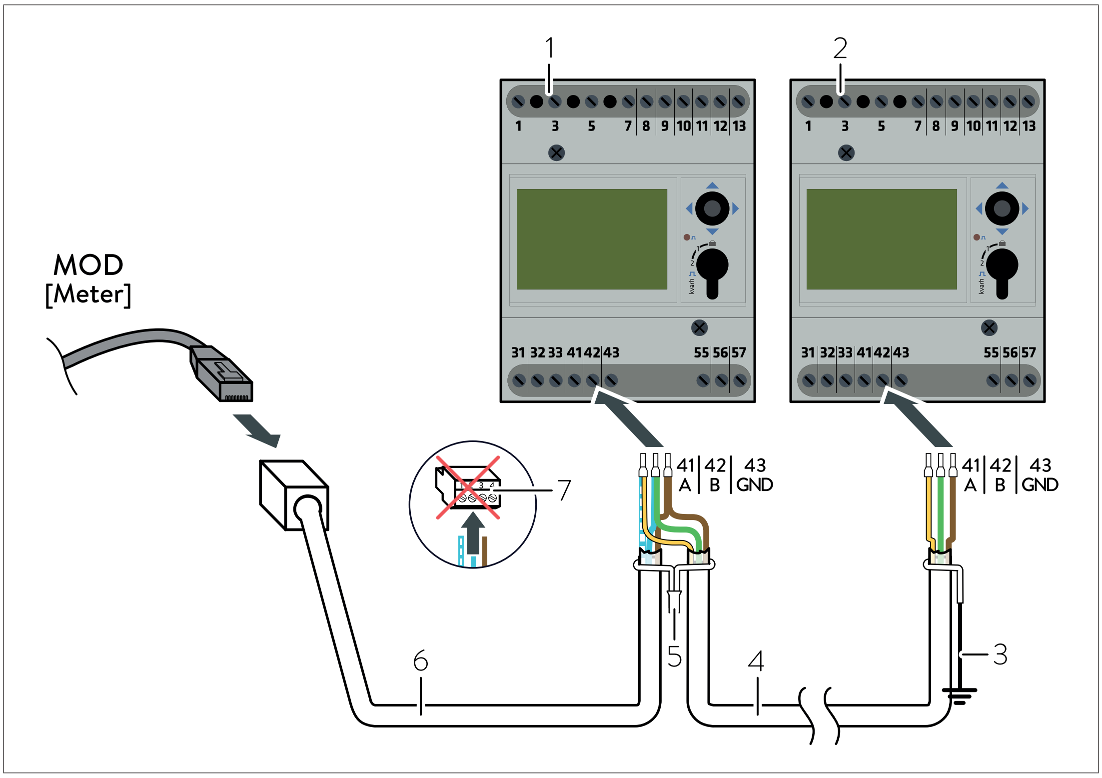


Illustration 22: Connecting the communication line when two WM10 power meters are used

1 Power meter 1 (ID 4, preprogrammed)

2 Power meter 2 (ID 5, preprogrammed)

3 Screen connection to earthing system

4 Communication line

5 Screen connection

6 Communication line with RJ45 coupling

7 Pre-assembled connector on communication line with RJ45 coupling (not used)

- ▶ Connect the power meters as shown in the figure above.
- ▶ Remove the pre-assembled connector if you are using the pre-configured communication line with RJ45 coupling from the scope of delivery for the storage system.
- ▶ Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.
- ▶ Use suitable wire end ferrules when connecting the communication lines.
- ▶ 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.

7.4 Connecting the WM63-M power meter

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**.

The WM63-M power meter is a direct measurement device, which means that no external current transformers are used. The power lines are connected directly to the power meter.

7.4.1 Connecting two WM63-M power meters

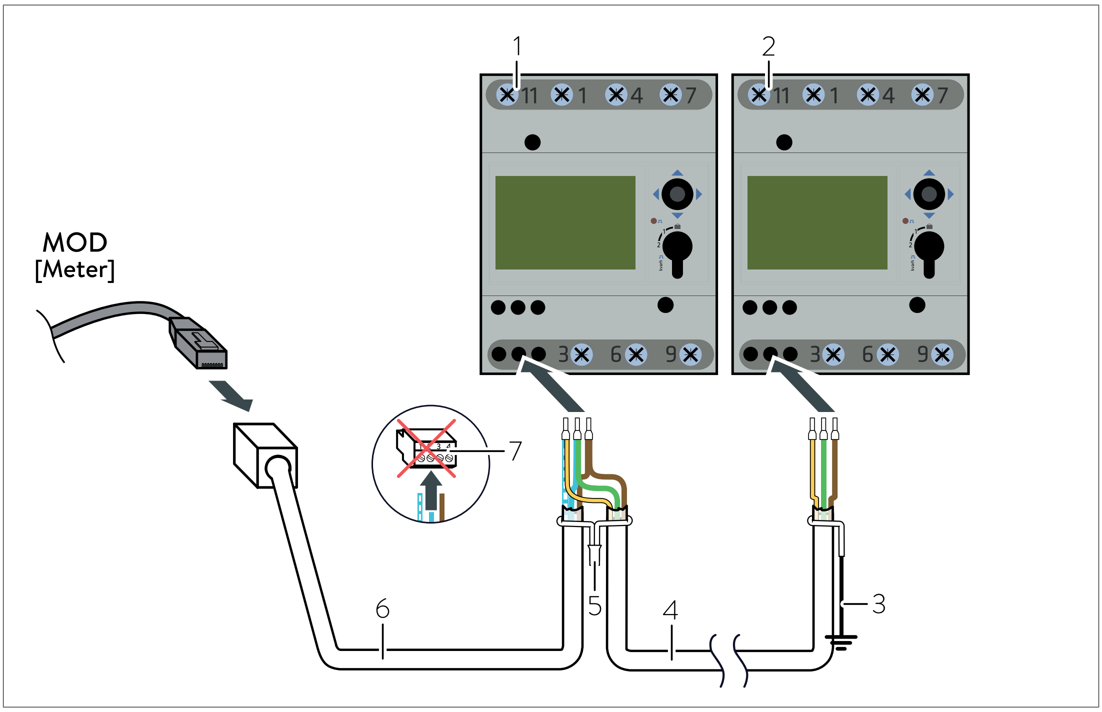


Illustration 23: Connecting the communication line when two WM63-M power meters are used

1 Power meter 1 (ID 4, preprogrammed)
2 Power meter 2 (ID 5, preprogrammed)
3 Screen connection to earthing system
4 Communication line
5 Screen connection
6 Communication line with RJ45 coupling
7 Pre-assembled connector on communication line with RJ45 coupling (not used)

- Connect the power meters as shown in the figure above.
- Remove the pre-assembled connector if you are using the pre-configured communication line with RJ45 coupling from the scope of delivery for the storage system.
- Use cable UNITRONIC® BUS LD 2x2x0.22 (Manufacturer: Lapp) or a patch cable (Cat 6/screened) as the communication lines.
- Use suitable wire end ferrules when connecting the communication lines.
- 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.

7.5 Programming the WM10 / WM63-M

7.5.1 Selecting the programming mode

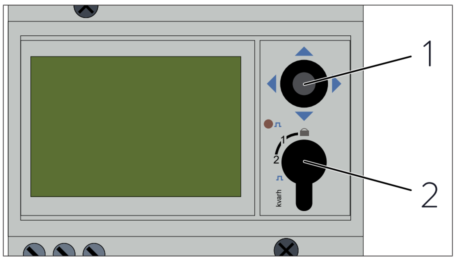


Illustration 24: Joystick and switch of the WM10

- Twist the switch (2) left to position **2**.
- Press the joystick (1) in the middle position for at least three seconds.

The **Pass ?** screen appears.

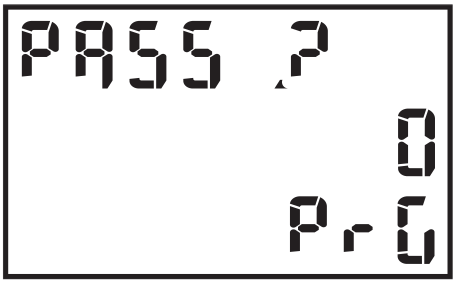


Illustration 25: Password entry screen

Enter the correct password here. The default password is **0**.

- Press the joystick in the middle position.

The power meter is now in programming mode.

7.5.2 SYS programming page

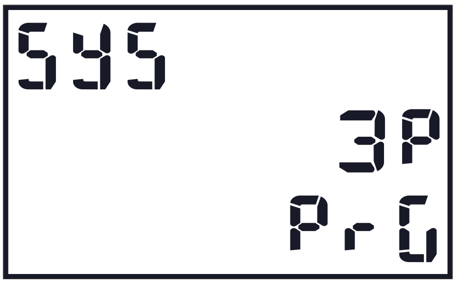


Illustration 26: SYS screen (Default: 3P)

- Press the joystick multiple times until the **SYS** screen appears.
- Confirm the setting by pressing the joystick in the middle position.

Illustration 27: One-phase setting

- Press the joystick down until **1P** appears.
- Confirm the setting by pressing the joystick in the middle position.

The one-phase measurement setting is now applied.

7.5.3 Ct rAtio programming page (Transformer ratio)

The transformer ratio of the current transformers is set on this programming page. The transformer ratio is calculated using the following formula: max. amperage of transformer divided by 5. Example: Transformer amperage is 100 A. 100 : 5 = transformer ratio of 20.

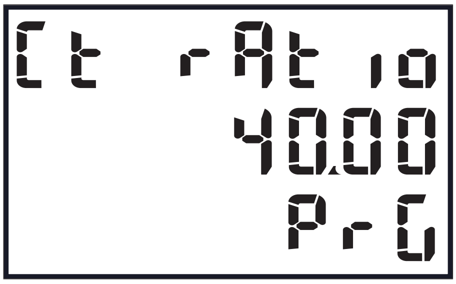


Illustration 28: Ct rAtio screen, set to transformer ratio 40

- ▶ Press the joystick left until the display shows the **Ct rAtio** page.
- ▶ Confirm the setting by pressing the joystick in the middle position.
- ▶ Enter the new transformer ratio, e. g. 20 as shown in the following Figure.

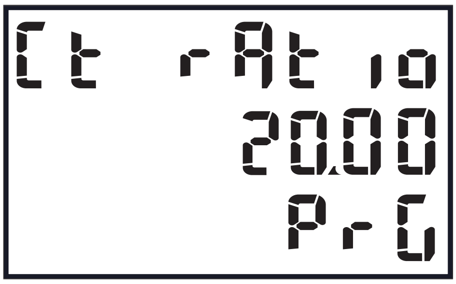


Illustration 29: Ct rAtio screen, set to transformer ratio 20

- ▶ Confirm the setting by pressing the joystick in the middle position.

The new setting is applied.

7.5.4 AddrESS programming page

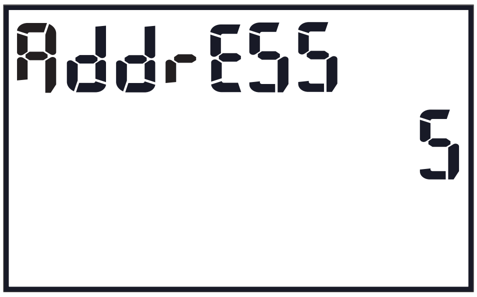


Illustration 30: AddrESS screen

- ▶ Press the joystick left until the display shows the **AddrESS** page (address 5 is just an example).
- ▶ Press the joystick in the middle position.
- ▶ Press the joystick up or down until the desired address is displayed.
- ▶ Press the joystick in the middle position.

The new address is programmed.

7.5.5 Exiting programming mode

Illustration 31: End screen

- ▶ Press the joystick left until the **End** display appears.
- ▶ Press the joystick in the middle position.

Programming mode closes. The power meter is now in standard mode.

- ▶ Turn the switch on the power meter to position 0.

8 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.

8.1 Example: connecting both the WM271 and the WM10 power meter

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

The lines on which the first measurement point is to be installed can be measured using the clamp-on current transformers that are included as standard with the storage system, which means the WM271 power meter can be used for this measurement point.

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 clamp-on current transformers available for the WM271 power meter. The WM10 power meter with suitable current transformers is therefore used at this measurement point.

This means that the WM10 power meter is used instead of using the measurement channel at connection A2 of the WM271 power meter for measuring a measurement point.

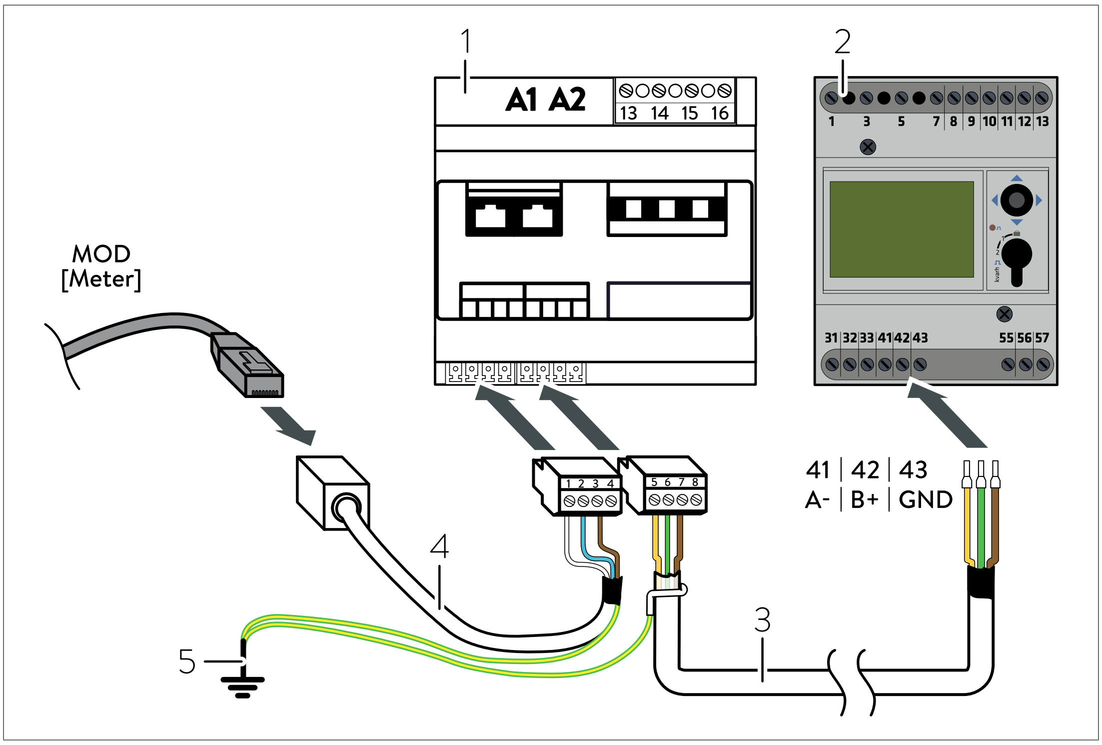


Illustration 32: Exemplary connection of the communication line for WM271 and WM10

1 WM271 power meter (ID 4, preprogrammed)

2 WM10 power meter (ID 5, preprogrammed)

3 Communication line

4 Screen connection to earthing system

5 Communication line with RJ-45 coupling

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.

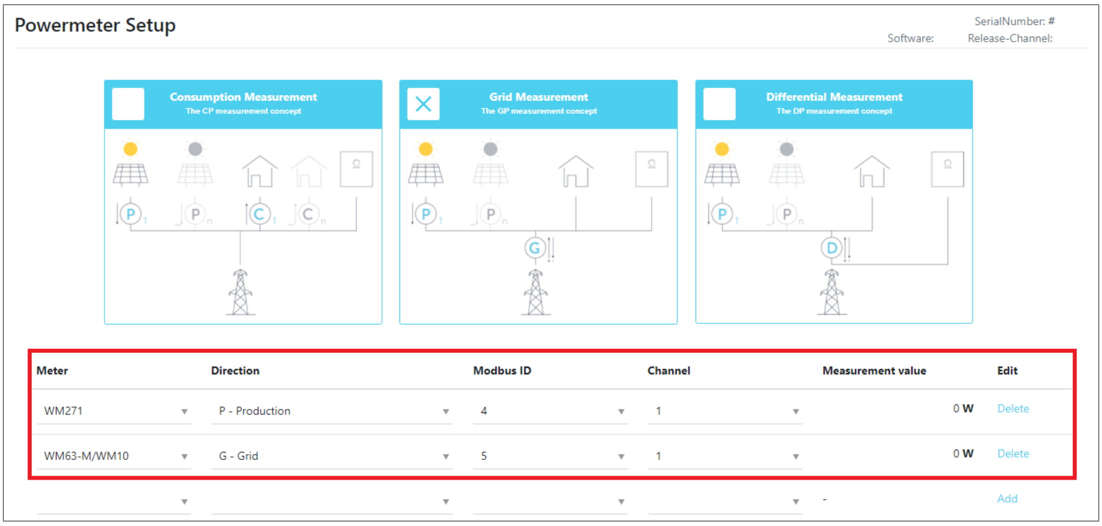


Illustration 33: Example: Measurement device set-up when using the WM271 and WM10 power meters

8.2 Example: connecting the WM271 and EM357 power meters

As shown in the example in the previous section [P. 38], an EM357 power meter can be used instead of the WM10.

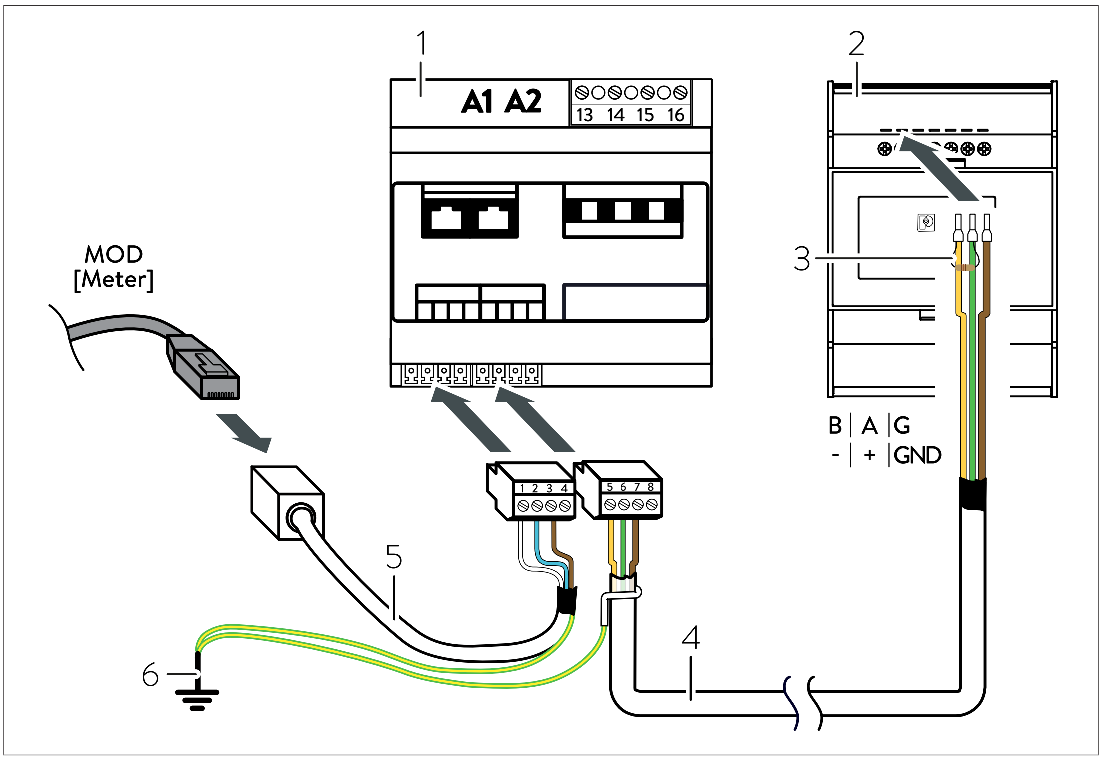


Illustration 34: Exemplary connection of the communication line for WM271 and EM357

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.

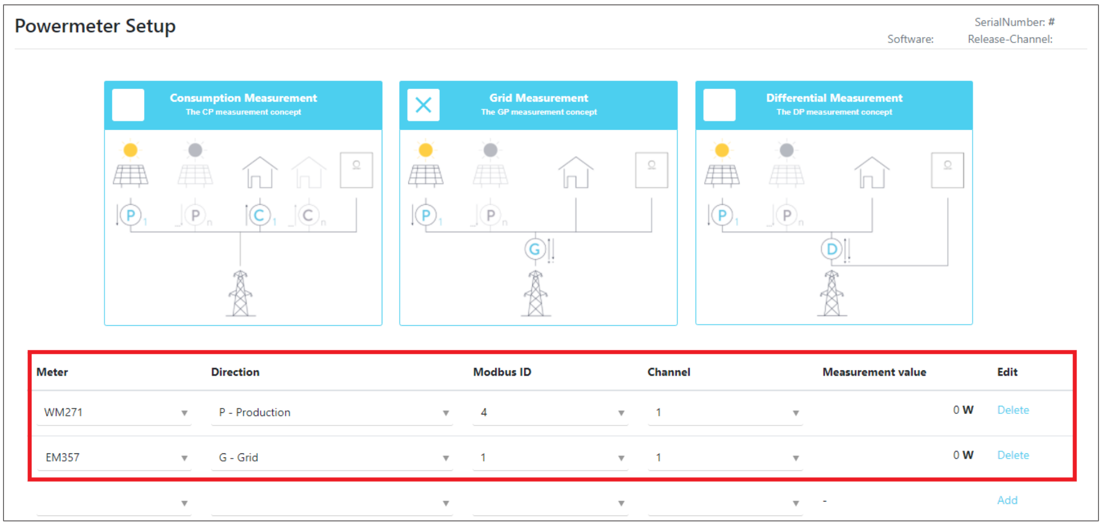


Illustration 35: Example: Measurement device set-up when using the WM271 and EM357 power meters

8.3 Example: connecting the WM271 and EM530 power meters

Similarly to the first example [P. 38], an EM530 power meter can be used instead of the WM10.

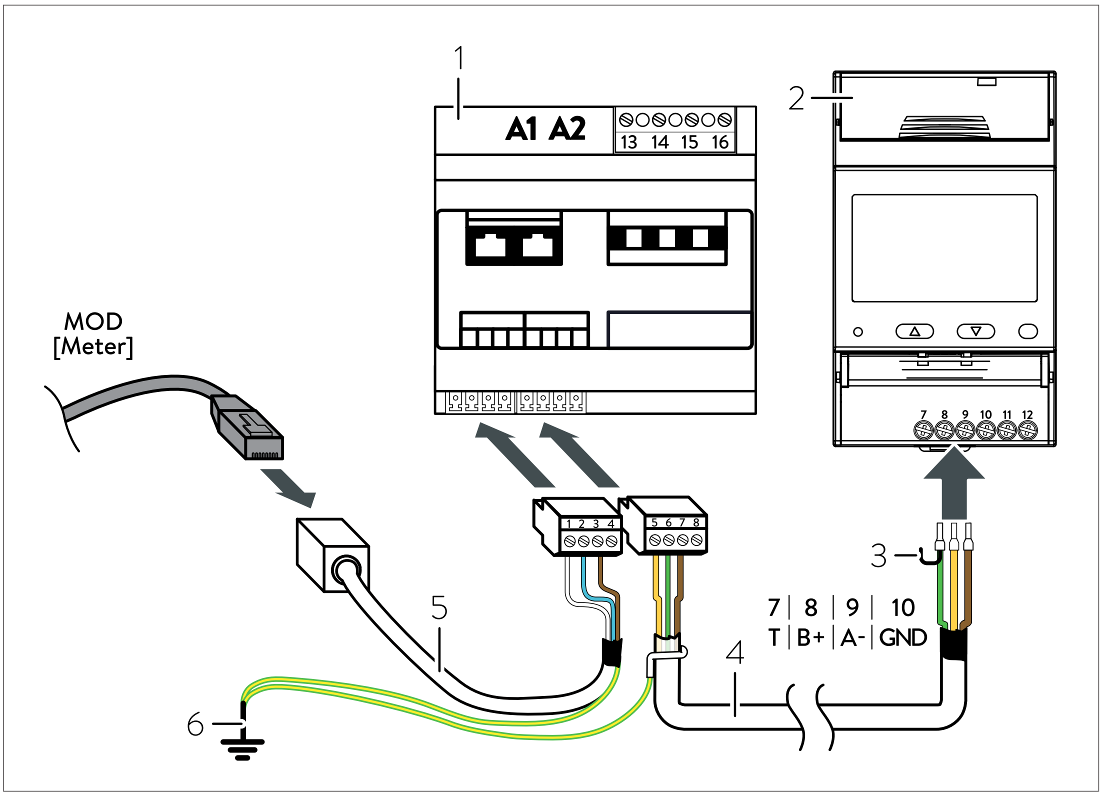


Illustration 36: Example connection of the communication lines for the WM271 and EM530

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.

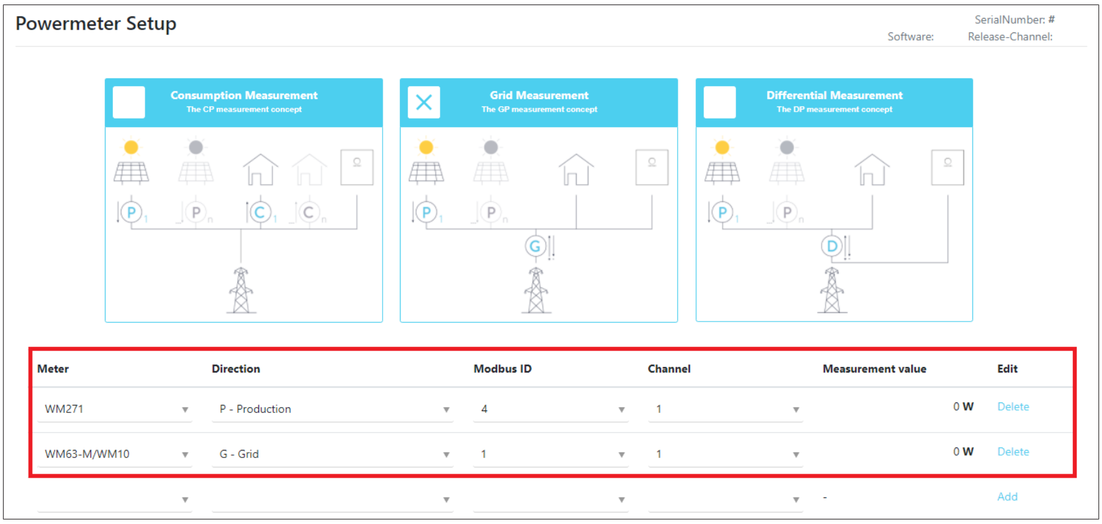


Illustration 37: Example: Measurement device set-up when using the WM271 and EM530 power meters

8.4 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.

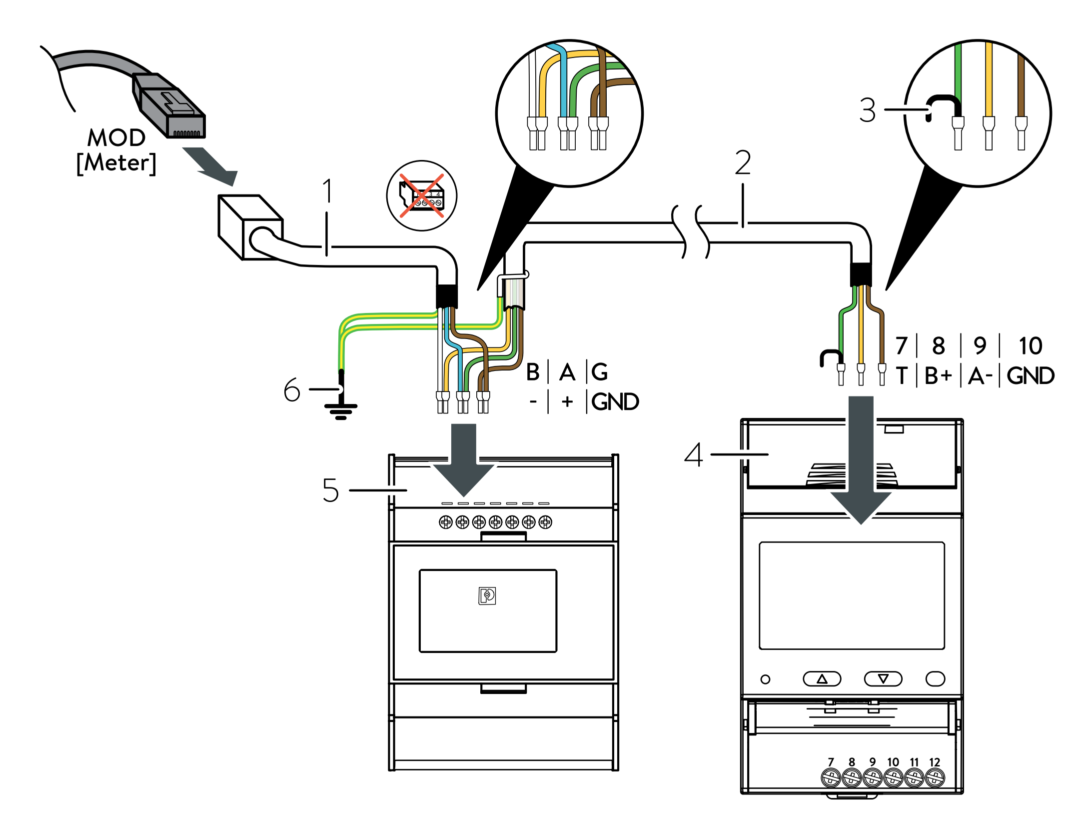


Illustration 38: Example connection of the communication lines for the EM357 and EM530

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.

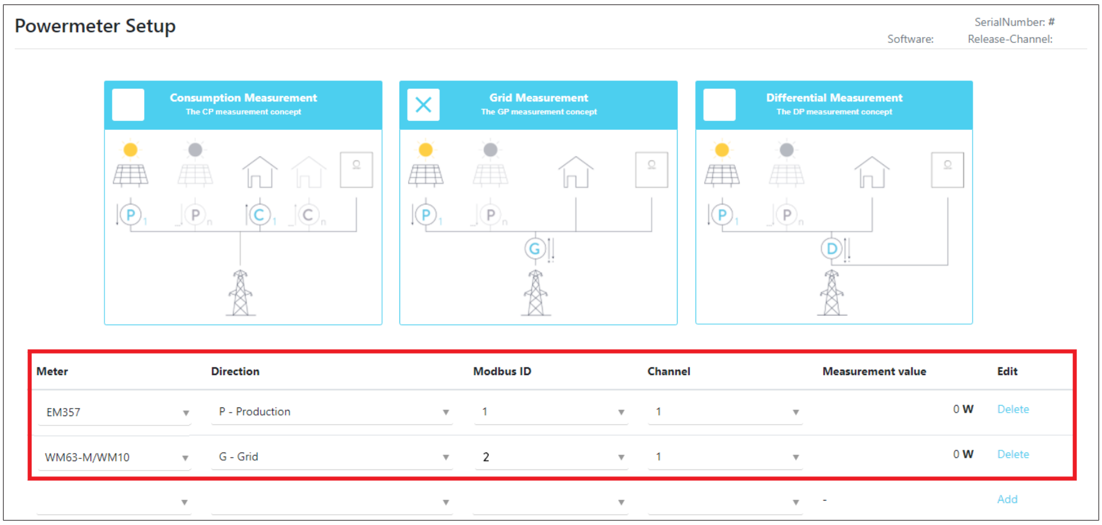


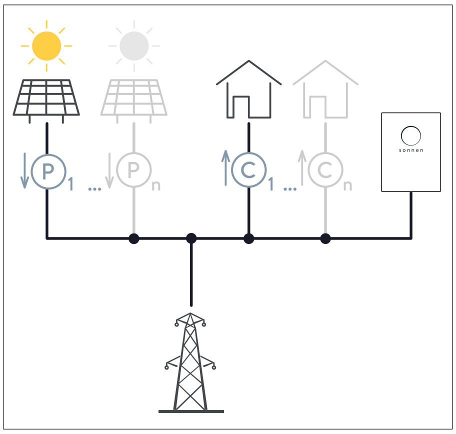
Illustration 39: Example: Measurement device set-up when using the EM357 and EM530 power meters

9 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.

9.1 The CP measurement concept (Standard for Germany)

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).

9.1.1 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)

9.1.2 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. 19].
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.

9.1.3 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.

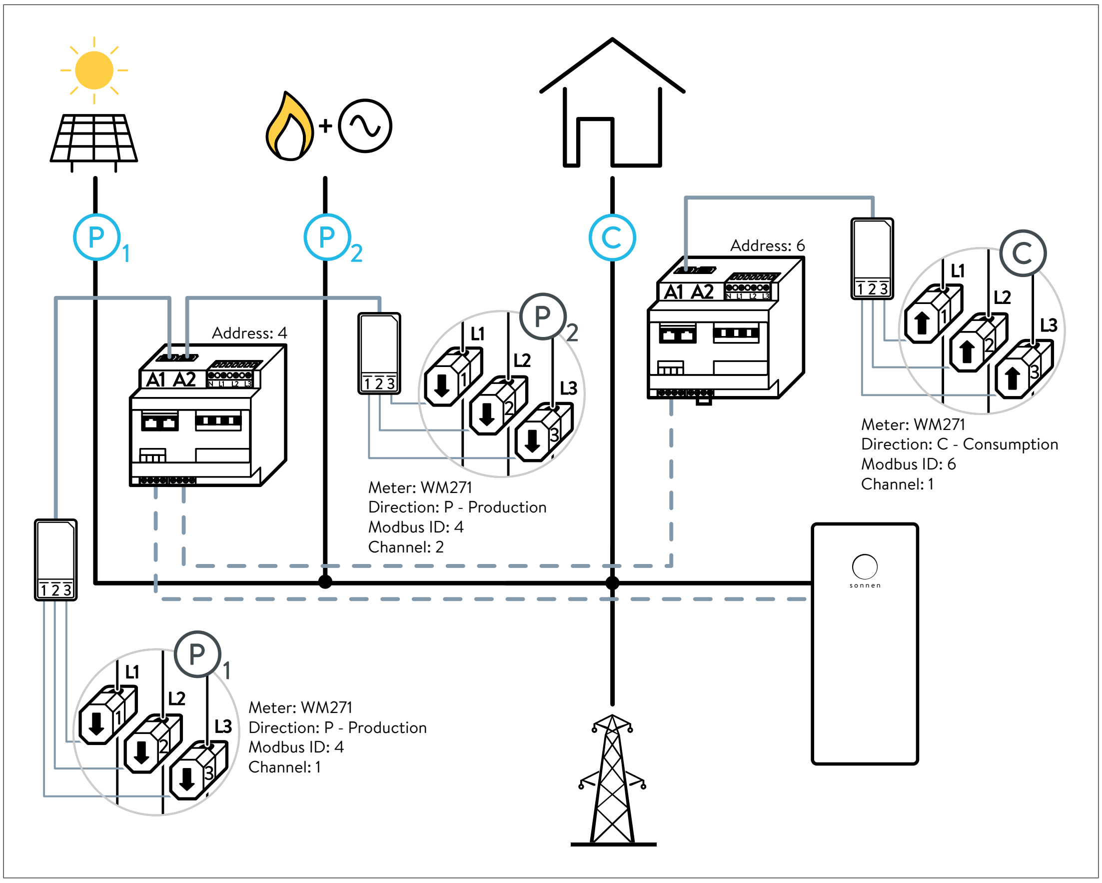
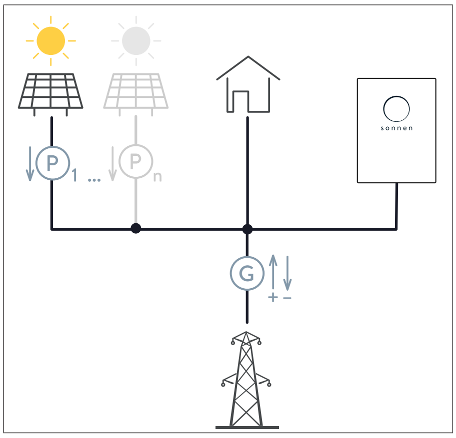


Illustration 40: Example for the implementation of the CP measurement concept - The circles show the connection of the clamp-on current transformers at the three measuring points

9.2 The GP measurement concept

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.

9.2.1 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)

9.2.2 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. 18]).
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. 19].
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.

9.2.3 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.

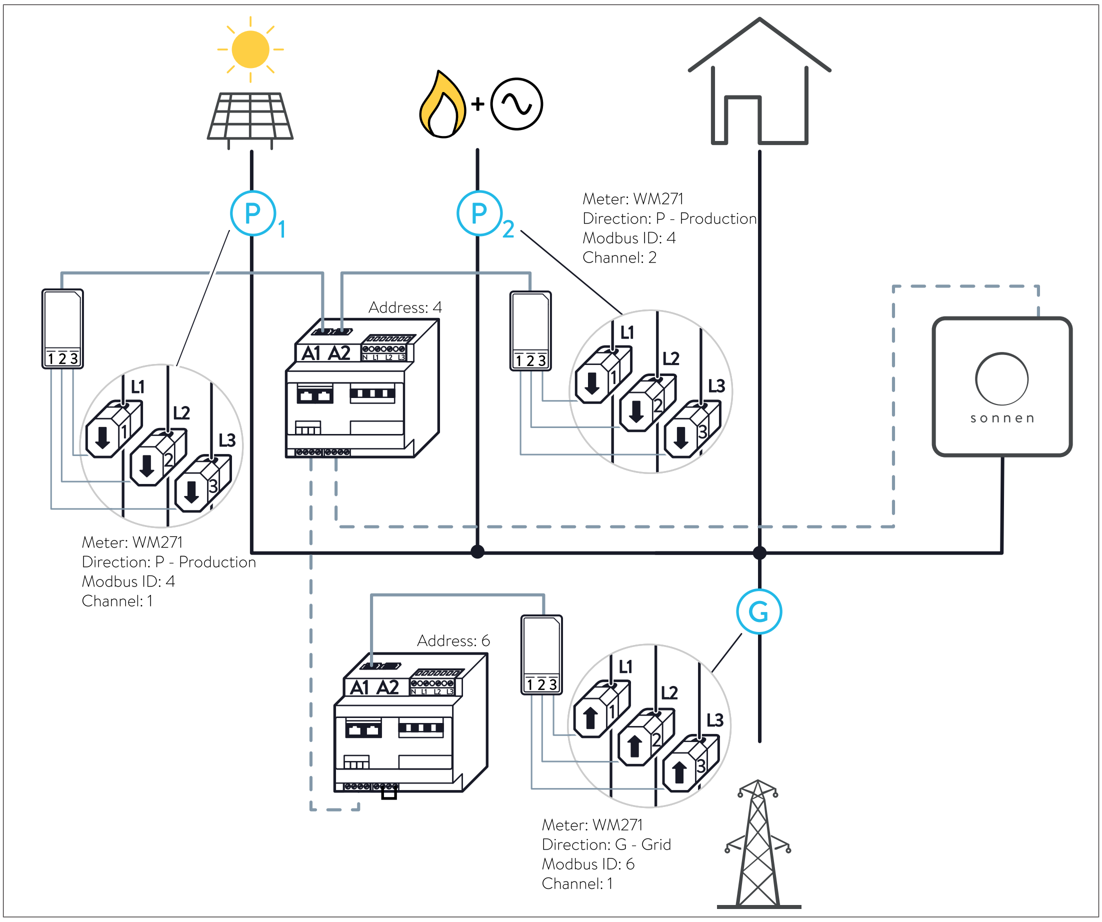
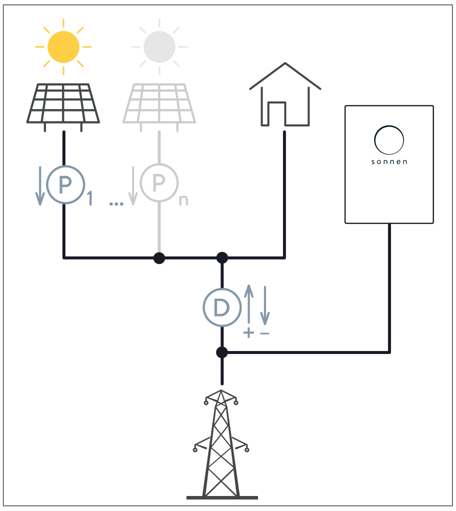


Illustration 41: Example for the implementation of the GP measurement concept - The circles show the connection of the CTs at the three measurement points

9.3 The DP measurement concept

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.

P1, ..., Pn (Production)

Recording the production

D (Difference)

Recording the difference between production and consumption

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.

9.3.1 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)

9.3.2 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. 18]).
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. 19].
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.

10 Power measurement accessories

Designation	Use	Item number
WM271 power meter (transformer measurement)		
WM271	• For sonnenBatterie eco 8.0, hybrid 8.1, 10 or 10 performance • Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 4	1001710
WM271	• For sonnenBatterie eco 8.2, eco 9.42, hybrid 9.53 or 10 • 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)*	• Three-phase / three clamp-on current transformers • Max. outer diameter of cable: 9.6 mm • Max. measurable current: 60 A	21028
Transformer 100 A	• Three-phase / three clamp-on current transformers • Max. outer diameter of cable: 15.7 mm • Max. measurable current: 100 A	11215
Transformer 200 A	• Three-phase / three clamp-on current transformers • Max. outer diameter of cable: 15.5 mm • Max. measurable current: 200 A	11216
Transformer 400 A	• Three-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
EM357 power meter (direct measurement)		
EM357 (EM357-EE)	• For sonnenBatterie hybrid 9.53, 10 or 10 performance • For single- or three-phase measurement • Preprogrammed to Modbus ID 1 • Max. measurable current: 100 A	1002221
EM357 (EM357-EE-MOD)	• For sonnenBatterie hybrid 9.53, 10 or 10 performance • 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

WM63 power meter (direct measurement)		
WM63	• Production meter • Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 4 • Max. measurable current: 65 A	30345
WM63	• Consumption meter • Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 5 • Max. measurable current: 65 A	30346

WM10 power meter (transformer measurement)		
WM10	• Production meter • Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 4	30347
WM10	• Consumption meter • Preprogrammed for three-phase measurement • Preprogrammed to Modbus ID 5	30348

The transformers (bar-type current transformers or clamp-on current transformers) cannot be purchased from sonnen. Purchase these in the desired design and accuracy class from a provider of your choice (such as Müller + Ziegler GmbH & Co. KG). Note that the required secondary current is 5 A.

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.

sonnen

energy is yours

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