sonnen

energy is yours

Instructions | for electricians power measurement and power measuring devices

EN

IMPORTANT

?? Read this document carefully before installation / operation.

?? Retain this document for future reference.

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1 Information about the document

This document serves as a supplement to the installation instructions for the storage system used. The standard measurement concept with a power meter is described in the respective installation instructions. This document contains, among other things, the following additional information on the subject of performance measurement:

- Information on the standard measurement concept and on other measurement concepts with which the storage system can be operated.
- Information on using multiple power meters.

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

1.1 Audience of this document

This document is intended for authorized electricians. The actions described may only be carried out by authorized electricians.

1.2 Explanation of symbols

⚠ DANGER	Extremely dangerous situation where failure to heed the safety instruction will result in death or serious injury.
⚠ WARNING	Dangerous situation in which non-observance of the safety instruction can lead to death or serious injury.
⚠ CAUTION	Dangerous situation in which non-observance of the safety instructions can lead to minor injuries.
NOTICE	Indicates actions that can lead to damage to property.
	Important information without danger to people or property.

icon(s)	importance
	action step
1st 2nd 3rd ...	Action steps in a defined order
u	requirement
•	count

Table 1: Additional symbols

2 safety instructions

Electrical work may have to be carried out to implement the measurement concepts described in this document. Please note:

⚠ DANGER

Working on the electrical distributor

Danger to life from electric shock!

?? De-energize the affected circuits.

?? Secure against being switched on again.

?? determine the absence of tension.

?? Execution of electrical work only by authorized electricians.

⚠ DANGER

Electrical work on the storage system

Danger to life from electric shock!

?? De-energize the storage system.

?? De-energize the affected circuits.

?? Secure against being switched on again.

?? Wait 5 minutes so that the internal energy stores can discharge.

?? determine the absence of tension.

?? Execution of electrical work only by authorized electricians.

3 energy flows

3.1 Overview of energy flows

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

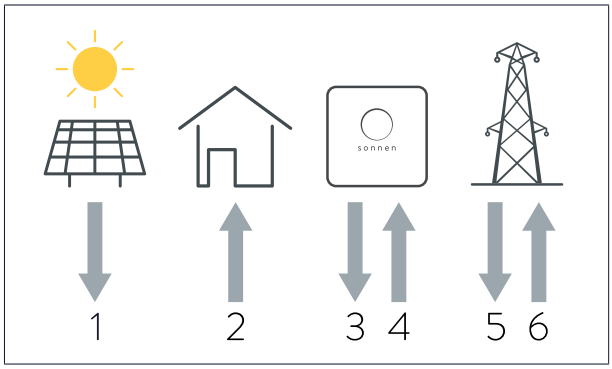


Fig. 1: Relevant energy flows

1 - Generation: Electrical energy that is generated by a generation system (e.g. PV system, wind turbine, etc.).

2 - Consumption: Electrical energy that is required for the operation of electrical consumers in the house.

3 - discharge: Electrical energy released by the storage system.

4 - charge: Electrical energy stored in the storage system battery. 5 - reference: Electrical energy obtained from the public power grid. 6 - Infeed: Electrical energy that is fed into the public power grid.

Remarks

- Discharging/charging as well as feed-in/consumption not at the same time appear.
- The charge/discharge is recorded internally in the storage system.

3.2 Connection of energy flows

The following relationship exists between the energy flows:

3.2.1 Case 1: consumption > production

If consumption is higher than production, there is adeficitof electrical energy. In this case, the battery of the storage system is discharged to compensate for as much of the deficit as possible. If the deficit cannot be fully offset by discharging the battery modules, the remaining deficit is covered by drawing electricity from the public grid.

In general:

Consumption = Generation + Discharge + Import *(Formula 1: General formula for consumption > production)* The following must be observed when unloading:

- The battery of the storage system can only be discharged if the battery modules are not completely discharged (up to the discharge limit).
- The storage system cannot always be discharged at full capacity. The discharge can e.g. B. through that*BMS* be throttled to avoid damaging the battery modules.

3.2.2 Case 2: Generation > Consumption

If production is higher than consumption, there is a excess of electrical energy. In this case, as much of this surplus as possible is used to charge the battery of the storage system. If not all of the surplus can be loaded into the battery modules, the remaining excess electrical energy is fed into the public power grid.

In general:

Generation = consumption + charge + feed-in *(Formula 2: General formula for generation > consumption)*

The following must be observed when charging the storage system:

- The storage system battery can only be charged if the battery modules are not yet fully charged.
- If a feed-in limitation is activated, the charging management may prevent the storage system from being charged even though the battery modules are not fully charged.
- The storage system cannot always be charged at full capacity. The charge can e.g. B. through that *BMS* be throttled to avoid damaging the battery modules.

3.3 Measurement Points

The energy flows described in the section Overview of Energy Flows [p. 7] described energy flows can be recorded by power measurements at different measuring points.

3.3.1 Measuring point types

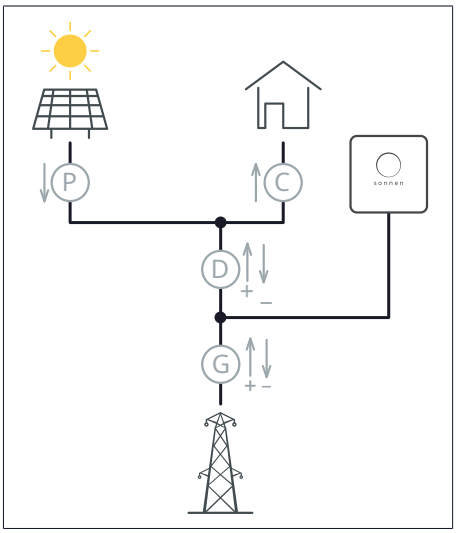


Fig. 2: Overview of all types of measuring points

A power measurement does not have to be carried out at all measuring points. For example, it is sufficient to measure at the measuring points C and P. The remaining energy flows are calculated by the storage system controller using the formulas in the section on the relationship between energy flows [p. 7] calculated.

The measurement concepts CP, GP and DP are possible (see measurement concepts [p. 27]).

There is four different types of measuring points:

Mesp point P (production)

An this A generation is recorded at a measuring point. The direction of energy flow is only in one direction (away from the producer). The generator (e.g. inverter of the PV system) can show self-consumption that is not taken into account at this measuring point.

Measuring point C (consumption)

A consumption of electrical energy is recorded at this measuring point. The direction of energy flow is only in one direction (towards consumers).

Measuring point D (difference/difference)

At this measuring point, the difference between consumption and production is recorded. The direction of energy flow can be in either direction. Energy flows towards consumers correspond to a deficit and are recorded as positive measured values. Energy flows in the direction of the public power grid/storage system correspond to a surplus and are recorded as negative measured values.

Measuring point G (grid/network connection)

At this measuring point, the purchase from or feed into the public power grid is recorded. The direction of energy flow can be in either direction. Purchase from the public power grid is recorded as a positive measured value. Feeding into the public power grid/storage system is recorded as a negative measured value.

3.3.2 Configure measuring points

The metering points can be configured on the Power Meter Configuration page of the Commissioning Wizard or on the Meter Setup page of the storage system's web interface.

Delete measuring point

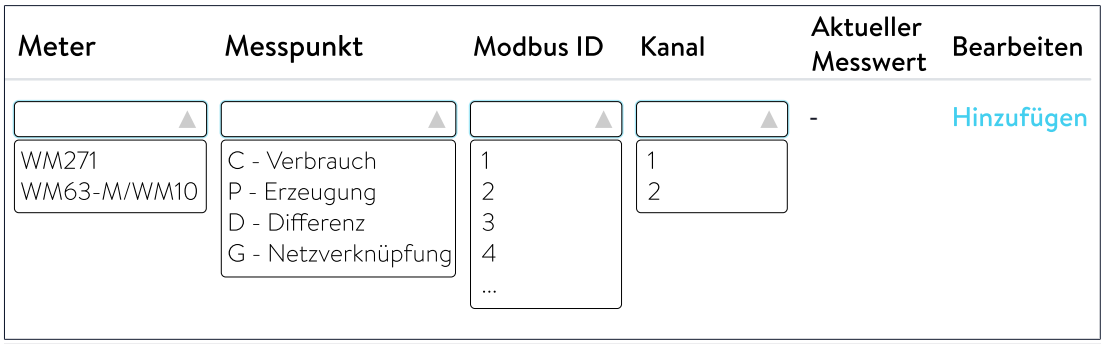
A button is displayed next to the configured measurement points *Extinguish* displayed.

?? Click the button *Extinguish* next to the line to select the appropriate one

to remove the measuring point.

Add measurement point

Using the blank line and the button *Add to* Further measuring points can be configured and added under the existing measuring points.



designation	function
meter	• The power meter WM271 is used as standard. A power meter of the type WM63-M or WM10 is only used in exceptional cases. ?? Select the power meter used at this measurement point.
measuring point	• Selection of the type of measuring point. The available measuring points h depend on the chosen old measurement concept. ?? Select the appropriate measuring point type.
Modbus ID	• Selection of the Modbus address (also referred to as Modbus ID) of the meter.

designation	function
	?? Select the address of the power meter. The selected one The address must match the address set (default: 4) on the power meter.
channel	• The power meter WM271 has the measurement channels A1 and A2. A measuring point can be recorded with each measuring channel. If measurement channel A1 is used for the measurement point: ?? Select 1. If measurement channel A2 is used for the measurement point: ?? Choose 2. If the power meter WM63-M or WM10 is used: ?? Select 1.

3.4 Control energy flows

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

via the web interface of the storage system

?? Log in to the storage system's web interface as an installer (https://finde-meine.sonnenbatterie.de) on.

On the Dashboard page there is an overview of the current energy flows from section Overview of Energy Flows [p. 7]. The powers shown are active powers.

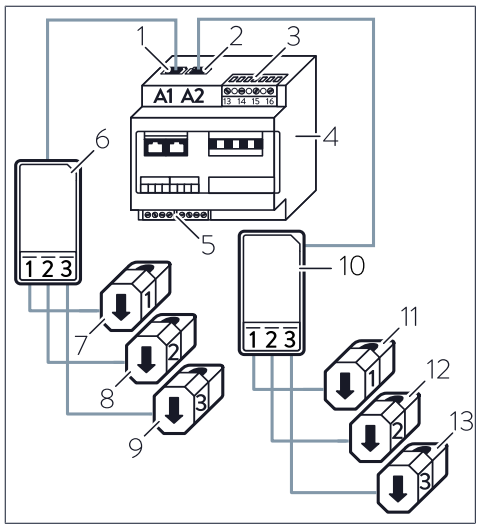
On the Measuring devices page, several measured values (each in watts) are displayed for the individual measuring points, including the current active power (total power), apparent power (va_total) and reactive power (var_total).

4 WM271 power meter

The WM271 power meter is used to record the energy flows at the respective measurement points.

The power meter and the power measurement can be adapted and supplemented with various accessories (see Power measurement accessories [p. 35]).

4.1 Power meter overview



1 A1 - entrance Generation (Channel
2 1) A2 - input Consumption (Channel
3 2) terminal block voltage
4 measurement power meter
5 Terminal block Modbus
6 Transducer interface generation *KSW*
7 Generation - L1 *KSW* Generation - L2
8th *KSW* Generation - L3 converter
9 interface Consumption *KSW*
10 Consumption - L1 *KSW* Consumption
11 - L2 *KSW* Consumption - L3
12
13

4.2 Electrical connection

- The power meter WM271 can be used with both a single-phase and a three-phase power grid.
- The lines connected to the voltage measurement terminal block of the power meter must be protected by suitable circuit breakers. There is no need to install additional circuit breakers if the lines are already secured in accordance with the applicable regulations and standards.

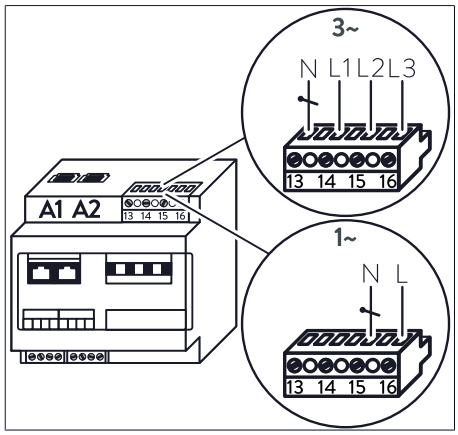


Fig. 3: Connection to the terminal block span ntion measurement for single and three-phase m power grid

Three-phase connection

For a three-phase power grid:

?? Connect the individual wires as in shown in the upper part of the figure.

Single phase connection

For a single-phase power grid:

?? Connect the individual wires as shown below shown in the lower part of the figure.

4.3 Connection of the converter interfaces and KSW

- The converter interfaces are connected to inputs A1 or A2 on the power meter. The inputs for generation and consumption must not be mixed up under any circumstances!
- In the case of storage systems with a direct PV connection, no converter interface with clip current transformers is used by default to measure the generation of the PV system. The generation input (A1) remains free on the WM271 power meter.
- Each converter interface has three *KSW*. The number of *KSW* at the converter interface cannot be changed.
- With the help of *KSW* the current current strength of the respective phase is recorded.

At a monophasic Therefore, only the folding current transformer of the relevant phase may be connected to the measuring point. The two others *KSW* allowed in this case not be connected.

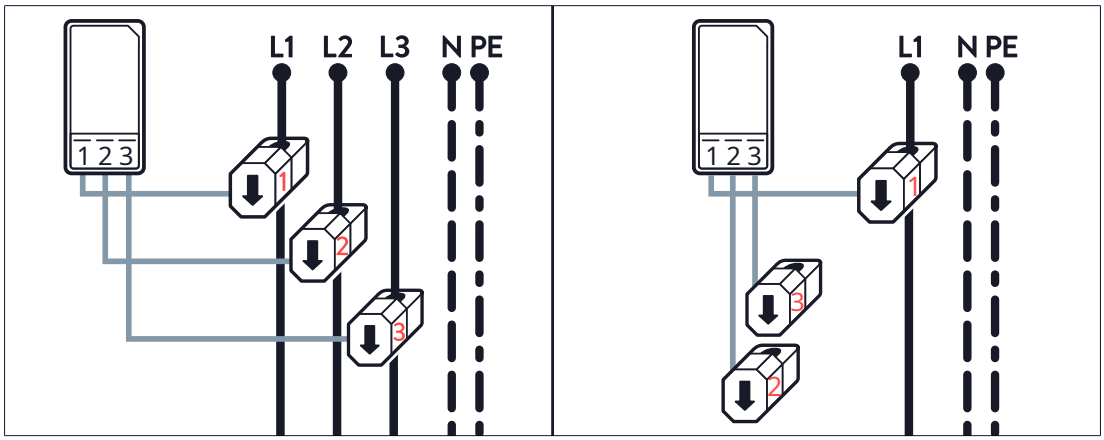


Fig. 4: KSW connection for three-phase and single-phase measurement

4.4 Common mistakes when connecting the KSW

When connecting the folding current transformer, the following mistakes can be made:

- The *KSW* are installed in the wrong place within the electrical wiring in the home.
- The phase assignment of the *KSW* will be swapped.
- The measurement direction of the *KSW* will be swapped.

The last two errors and their possible effects are described in more detail below.

4.4.1 Folding current transformer swapped

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

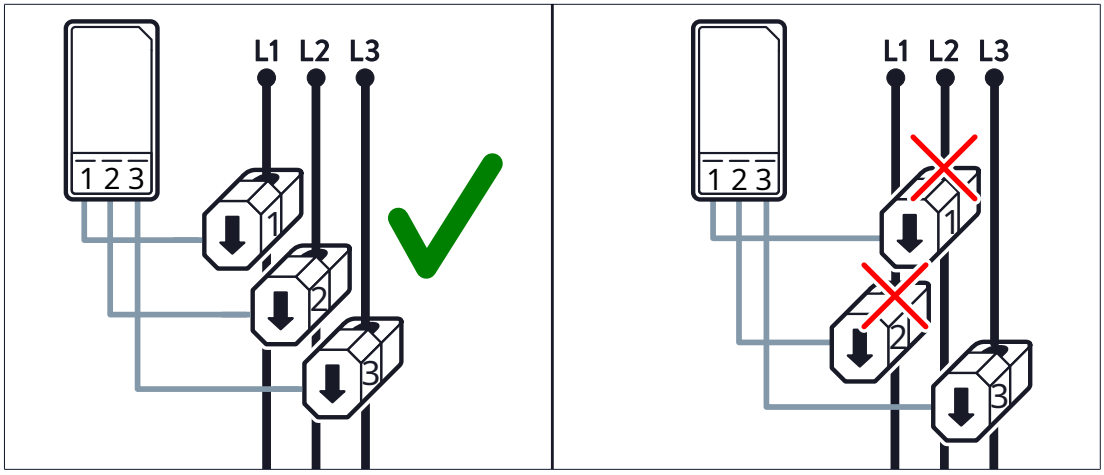


Fig. 5: Connection of the KSW - incorrect (right) and correct (left)

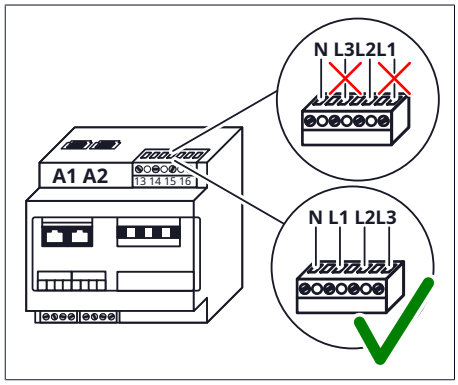


Fig. 6: Connection to the voltage measurement terminal block - wrong (above) and correct (below)

The current current at the respective measuring point is measured via the folding current transformer, the current voltage via the voltage measurement terminal strip. The power is the product of the current current and the current voltage.

The power recorded at clamshell current transformer 1 results from the current at *KSW* 1 multiplied by the voltage at input L1 of the voltage measurement terminal strip. The power recorded at clamshell current transformer 2 results from the current at *KSW* 2 times the voltage at input L2, etc.

Check phasing

If measurement deviations occur, the phasing of the individual phases (L1, L2, L3) can be measured as described below.

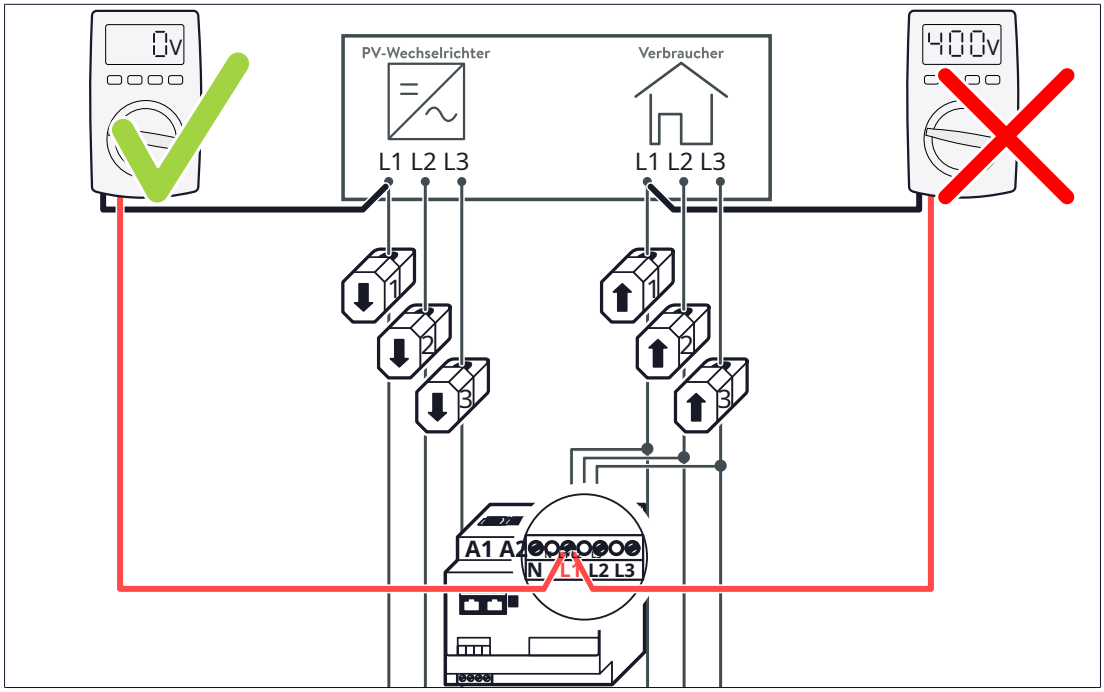


Fig. 7: Measure phase position of phase L1

?? Voltage from terminal L1 of the power meter to the line with *KSW*1 measure (see figure).

?? Voltage from terminal L2 of the power meter to the line with *KSW*2 measure. ??

Voltage from terminal L3 of the power meter to the line with *KSW*3 measure.

?? The voltage measurement in all paths (e.g. consumption and generation path) execute.

ð If a voltage of 400 V is measured here, the phases have been reversed.

Example of incorrect implementation

• The voltage measurement terminal strip is wired correctly.

• The two folding current transformers 1 and 2 have been swapped.

• An ohmic load with a consumption of 1000 watts is connected to L1.

• The folding current transformers are used as measuring point C (consumption).

In this example there is a phase shift between current and voltage measurement 120°. This has the following effects:

• Although the actual active power is 1000 W, only one Wi performance of approx. 500 watts displayed (due to P=U·I·cos(120°) and cos(120°)=-0.5).

• The sign of the active power reverses.

• Although no reactive power actually occurs, a reactive power from approx. 866 var displayed (due to Q=U·I·sin(120°) and sin(120°)≈0.866).

4.4.2 Measuring direction of the folding current transformers wrong

If the Easy Connection (EC) function on the power meter WM271, positive and disabled is, negative power values can be recorded (see Progr Connection (EC) [p. 18]). Inbacking side Easy this case, care must be taken to ensure that the folding current transformer is ss the measuring direc- correctly connected.

Example of incorrect implementation

At measuring point G (grid connection), all three folding current transformers are installed in the wrong measuring direction. This has the following effects:

- A purchase of electrical energy is recorded although it is actually being fed into the public power grid, and vice versa.
- The storage system is discharged although charging should actually take place, and vice versa.

4.5 Programming WM271

The power meter WM271 can be programmed using a touch display.

4.5.1 Mount the touch display

Requirement:

u The power meter is voltage-free to mount the touch display.

Tools:

- Touch display for power meter WM271
- Slotted screwdriver | 5.5mm max

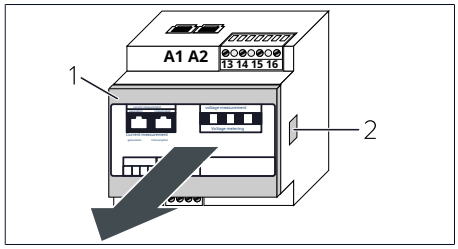


Fig. 8: Remove front cover

?? Press on the fastening clips (2). both sides of the power meter. To do this, use a small screwdriver.

?? Remove the front cover (1).

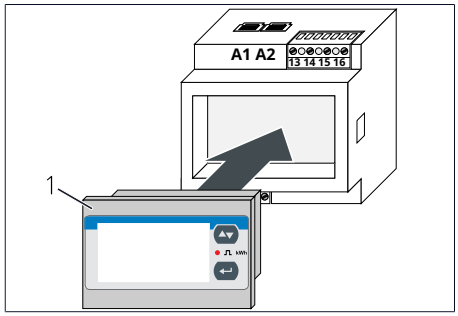


Fig. 9: Insert touch display

?? Place the touch display (1) in the power gauge on.

?? Power supply to the power meter produce.

4.5.2 Switch to programming mode

After installing the touch display, the power meter is in display mode. Values are shown on the display that cannot be changed.

To be able to change values must be in the progra mming mode can be changed. Walk To do this, follow these steps before:

Fig. 10: Touch display

?? push en and hold for 3 seconds.

The display page PASSPORT ? appears.

The correct password must be entered here. The password "0" is set by default.

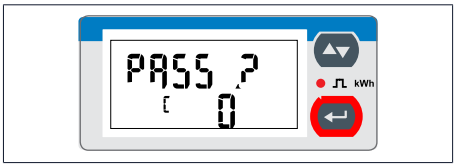


Fig. 11: Password input screen

?? Press and hold for 3 seconds.

The display page CnGPASS appears. The power meter is in programming mode.

4.5.3 Operating the touch display in programming mode

The touch display can be controlled by the buttons and to be served.

Navigation on the touch display

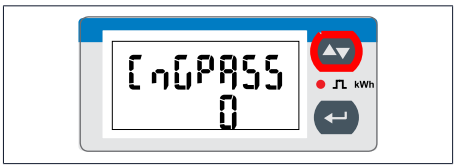


Fig. 12: CnGPass display page

Starting from the display side CnGPASS can be navigated to the desired programming page by pressing the button.

Change values in programming mode

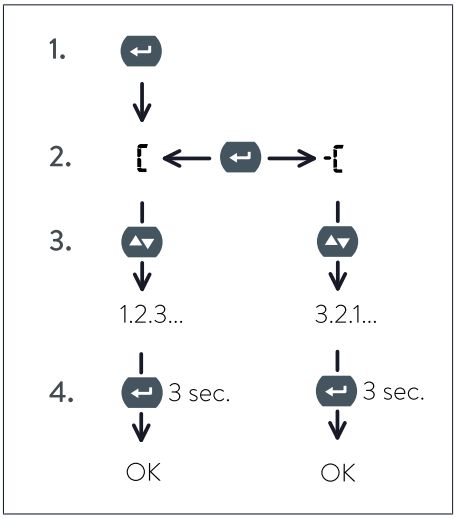


Fig. 13: Procedure for changing values

1. By pressing the button will change of the desired value possible. The character appears on the touch display.
2. The sign can be changed by pressing the key again. When selected the value increases, at decreases.
3. The desired value can be set by pressing the button (repeatedly).
4. By pressing and holding (about 3 seconds) the button the set value is exceeded taken.

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

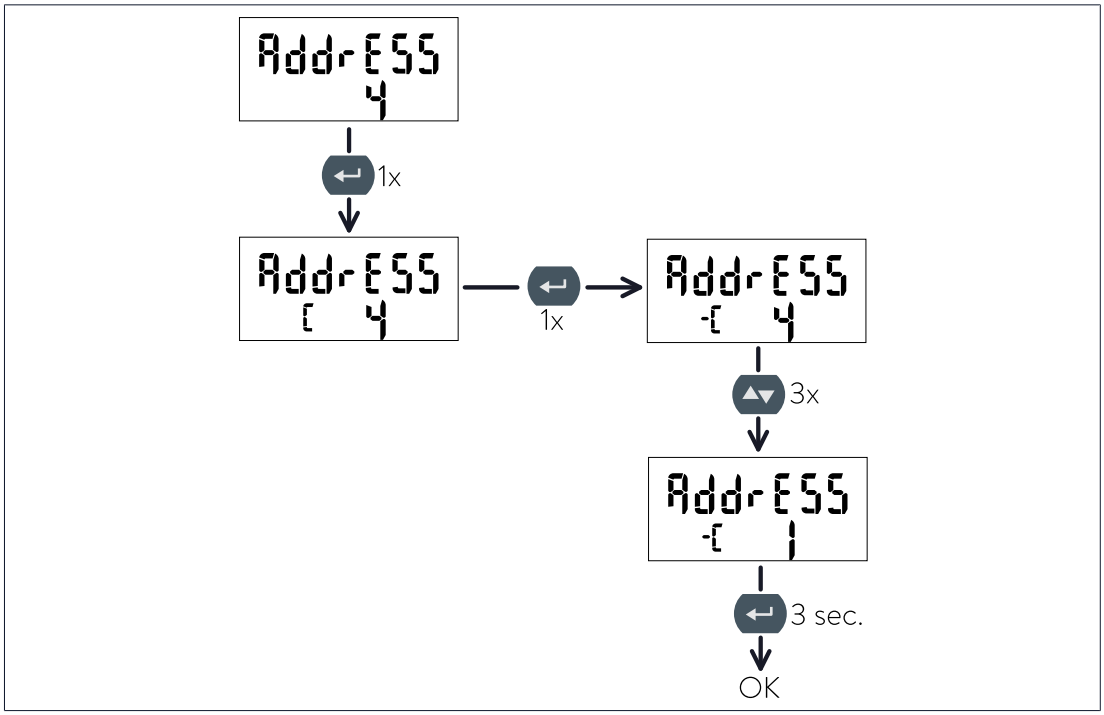


Fig. 14: Example - changing the address from 4 to 1

4.5.4 Exit programming mode

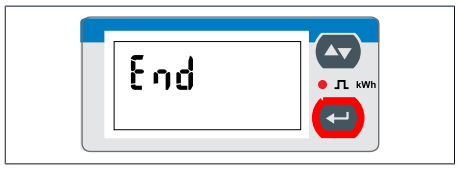


Fig. 15: Display page End

?? Navigate to the display page End.

?? Press to enter programming mode leaving.

The power meter is in display mode.

4.6 Description of programming pages

All relevant programming pages are described below. The programming pages that are not described have no relevance for the performance measurement of the memory system and should not be changed.

The values of the respective programming pages can be changed, as described in the section Operating the touch display in programming mode [p. 16] described.

4.6.1 Programming page SYS

The setting on this programming page depends on whether the power meter is on ein three- or single-phase power grid connected (see Electrical connection [p. 11]).

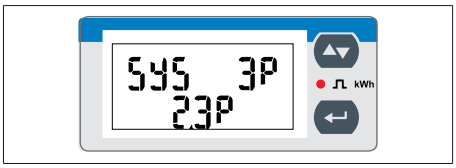
presets

The performance m eating utensils, the are supplied as part of the accessories for the storage i.e h, are depending on h storage syst system and the country variant is already preset.

• With 3-phase storage systems, three-phase configured power meters are supplied.

• In the case of 1-phase storage systems, power meters are preset to three phases for the Germany sales region and single phase for all other sales regions.

Change measurement mode



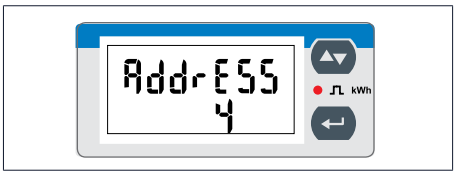
With a three-phase connection:

?? Choose 3P/2.3P With single-phase connection: ?? Choose 1P/6.1P.

Fig. 16: Display page SYS

The other measurement modes - selectable on this programming page - are not relevant and should not be selected.

4.6.2 Programming page Address

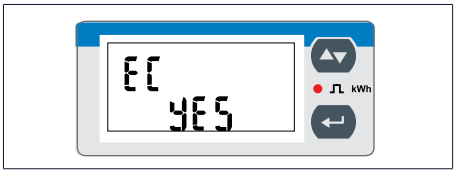


The Modbus address of the power meter can be set on this programming page (default setting: 4).

Each Modbus participant must have a unique address!

Fig. 17: Display page AddrESS

4.6.3 Easy Connection (EC) programming 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.

Fig. 18: Display page EC

By default, the feature is Easy Connection disabled.

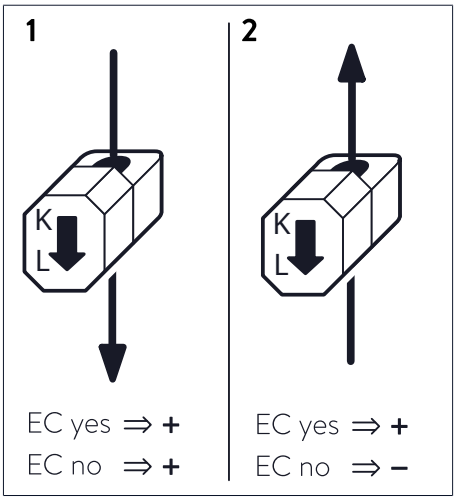


Fig. 19: Case 1 (left): The energy flow direction in the conductor runs from K to L | Case 2 (right): The direction of energy flow in the conductor is from L to K

Easy Connection enabled

When Easy Connection is activated (EC yes), it does not matter whether the energy flow in the conductor runs from K to L (case 1) or vice versa (case 2). The power meter always calculates with positive values (amounts).

Easy Connection disabled (default)

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

4.7 Using multiple power meters

The measurement concepts [p. 27], some of the concepts for power measurement allow the connection of several power measurement devices. The following describes what needs to be considered when using multiple power meters.

A second generation measuring device with the preset Modbus address 6 can be obtained from sonnen for measuring a second generation system (see Power measurement accessories [p. 35]).

Maximum number of usable channels

Within a performance measurement maximum six measurement channels be used, otherwise the storage system controller may not function properly.

The resulting maximum number of power meters that can be used therefore depends on the use of the individual channels. If both channels (for generation and consumption) are used on each power meter, a maximum of three power meters can be used.

4.7.1 Connecting communication lines

NOTICE

Too long communication lines

?? The Ethernet cable connected to the storage system can be as long as from 100 meters not exceed.

?? The Modbus line connected to the storage system can be as long as from 150 meters not exceed.

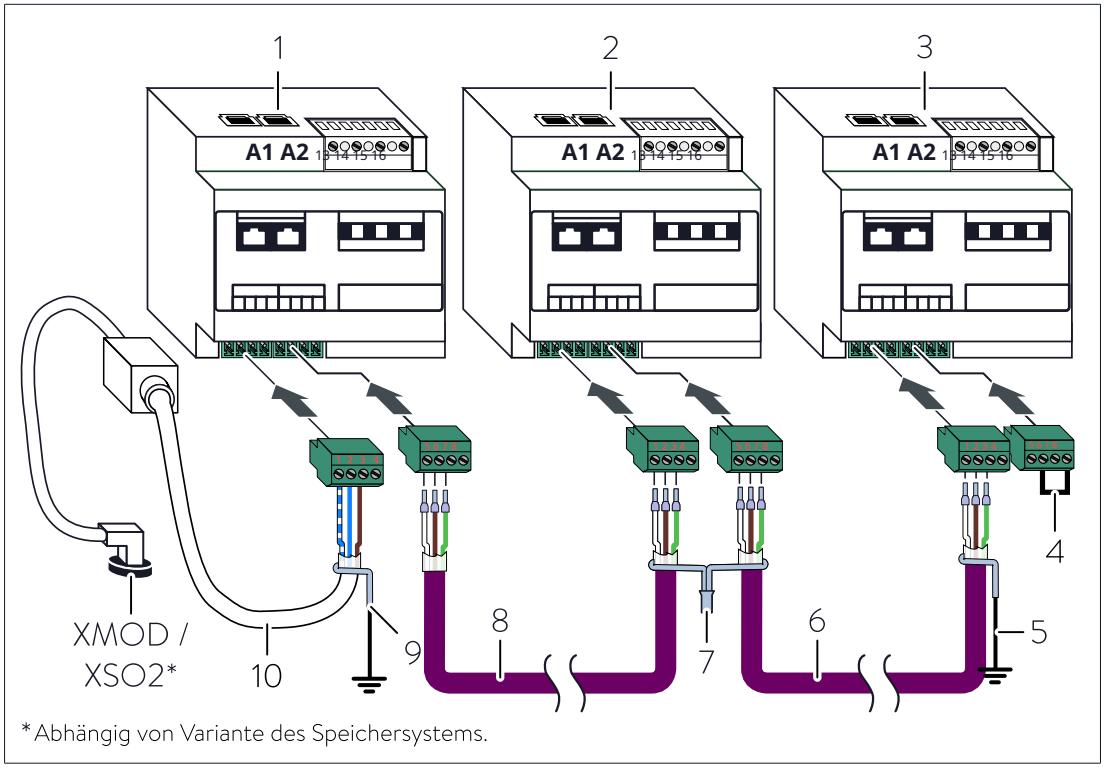


Fig. 20: Exemplary representation for the connection of three power meters of the type WM271 via communication line

1	power meter 1 (ID 4, pre-programmed)	5	Connection screen with grounding system
2	Power meter 2 (ID 6, pre-programmed)	6	communication line
3	Power Meter 3 (ID 7, set manually)	7	connection of the screen
4	Wire jumper for Modbus termination	8th	communication line
		9	Connection screen to grounding
		10	system Existing communication line
		XMOD/ XSO2	Modbus socket on the storage system

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

Note:

?? Use the UNITRONIC® BUS LD line as communication lines (6, 8).
2x2x0.22 (manufacturer: Lapp) or a patch cable (Cat 6 | shielded). NOTICE! Only use a patch cable as a communication line if the line length is max. 15 m.

?? Make sure that the last power meter has Modbus on the terminal block a jumper wire (4) is fitted between pins 6 and 8.

If this is not the case:

?? Install a jumper wire between pins 6 and 8 on the Modbus of the last power meter.

?? Remove the jumpers, if present, on the Modbus terminal block of the remaining technical power meters.

?? Connect the screen of the individual communication lines (6, 8) between the Power meters (1, 2, 3) with each other.

?? Make sure that the screen of the existing communication line (10) does not is connected to the shield of the communication line (9). Instead, the screen of the existing communication line (10) is grounded individually.

?? Ground the communication line shield at the last power meter (5).

4.7.2 Defining Modbus addresses

In order for the communication between the power meters and the storage system to work, each power meter must be assigned a unique 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. The Modbus addresses 1 to 3 must not be used.

If the default Modbus addresses (default power meter: 6; generation meter: 4) need to be changed:

preset, e.g. e.g.:

ID 4, pre-programmed

?? Set a Modbus address on each power meter as in section Programming WM271 [p. 15] described.

5 Power meter WM10 and WM63-M

The power meter and the power measurement can be adapted and supplemented with various accessories (see Power measurement accessories [p. 35]).

5.1 Preferences

The power measurement devices producer and consumption are preset in the factory. All values can be changed on the measuring device.

The default values are:

1. Generation meter:	address 4
Consumer meter:	address 5
2. Generation meter:	address 6
Measurement mode:	3-phase

5.2 Choose current transformer for WM10

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

?? Choose current transformers with a secondary current of 5 A and the desired accuracy class.

?? Set the transformer ratio according to the selected current transformers (see Programming page Ct rAtio (converter ratio) [p. 23]).

5.3 Programming WM10 / WM63-M

5.3.1 Select programming mode

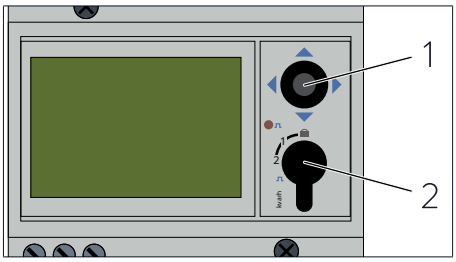


Fig. 21: Joystick and switches on the WM10 power meter

?? Turn the switch (2) to the left to the Switch position "2".

?? Press the joystick (1) for at least 3 minutes utes down in the middle position.

The menu Passport ? appears.

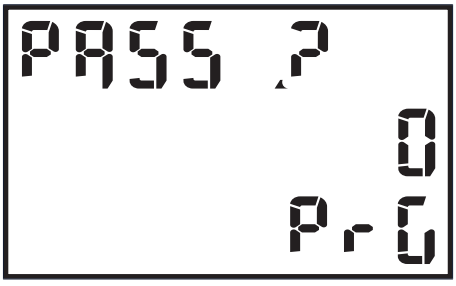


Fig. 22: display page Password

The correct password must be entered here. The password "0" is set by default.

?? Press the joystick in the middle position downward.

The power meter is in programming mode.

5.3.2 Programming page SYS

Fig. 23: SYS display page (default: 3P)

?? Push the joystick to the left several times until the display shows SYS appears.

?? Confirm the setting by pressing of the joystick in the center position.

Fig. 24: Setting 1-phase measurement

?? Push the joystick down until the display 1p appears.

?? Confirm the setting by pressing of the joystick in the center position.

The power meter is now set to 1-phase measurement.

5.3.3 Programming page Ct rAtio (converter ratio)

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

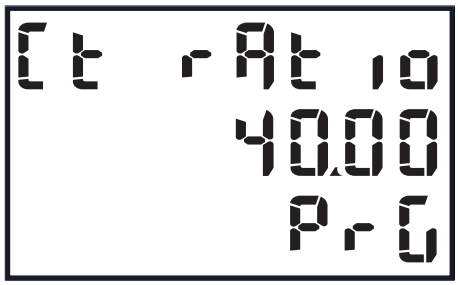


Fig. 25: Ct rAt io display page, set to a conversion ratio of 40

?? Push the joystick to the left until the show Ct ratio appears.

?? Confirm the setting by pressing of the joystick in the center position.

?? Enter the new converter ratio, e.g. B. 20 as in the figure below.

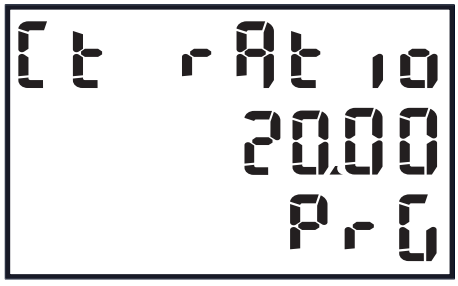


Fig. 26: Ct rAt io display page, set to a conversion ratio of 20

?? Confirm the setting by pressing of the joystick in the center position.

The new converter ratio is now set.

5.3.4 AddrESS programming page

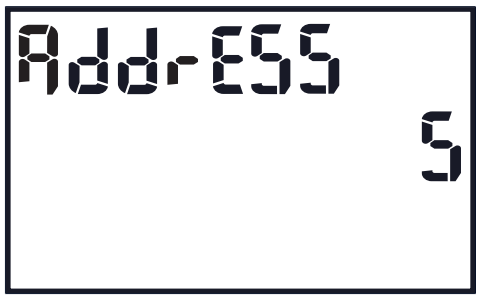


Fig. 27: Display page AddrESS

?? Push the joystick left until the display Address appears (address 5 is an example).

?? Press the joystick in the center lung.

?? Keep pushing the joystick up or below until the desired address appears.

?? Press the joystick in the center lung.

The new address is programmed.

5.3.5 Exit programming mode

Fig. 28: Display page End

?? Push the joystick left until the display End appears.

?? Press the joystick in the center lung.

Programming is complete, the power meter is in display mode.

?? Turn the switch on the power meter switches to switch position 0.

5.4 Example: Connection of power meter WM10

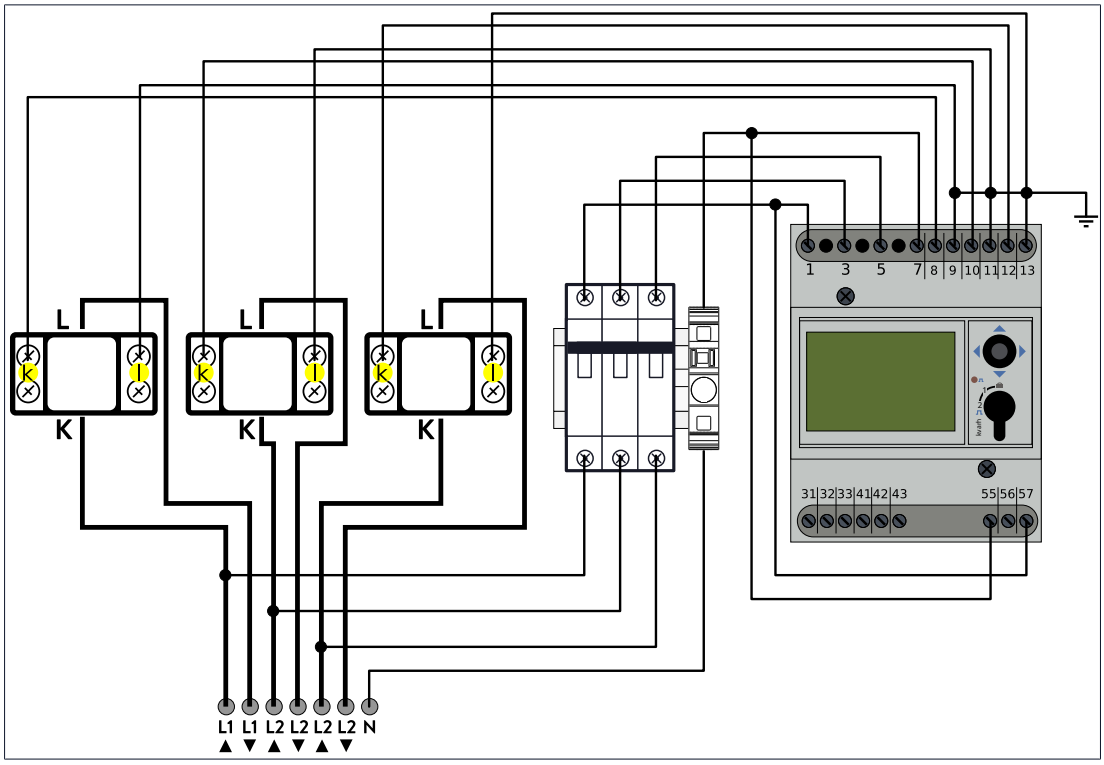


Fig. 29: Connection WM10 with Modbus converter

The representation of the current transformers is an example of one type of current transformer. Please note the respective item description.

?? Connect the power meter and current transformers according to the above figure on.

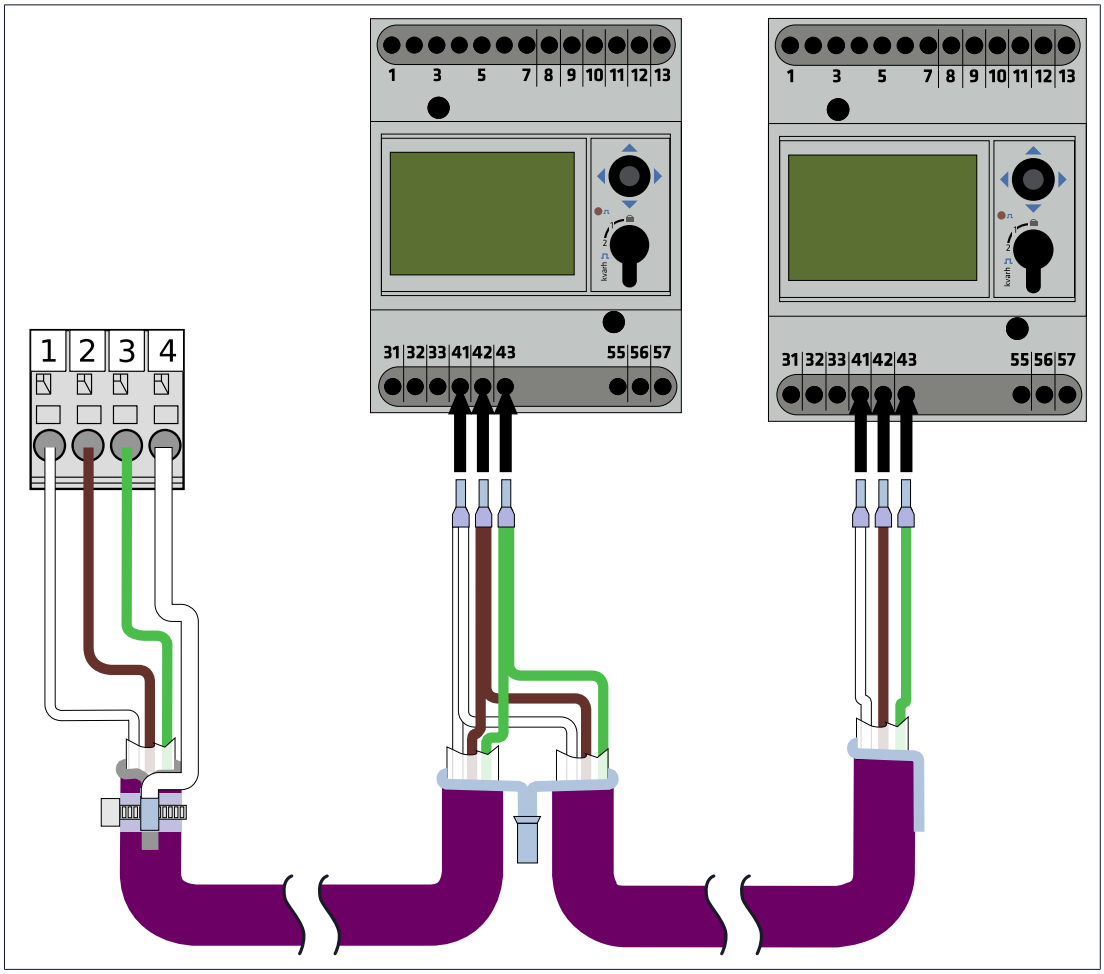


Fig. 30: Communication line connection for two power meters of type WM10

?? Connect the communication line according to the above figure. loading pay attention there at the Specifications in section tt Connect communication lines [p. 19].

5.5 Example: Connection of power meter WM63-M

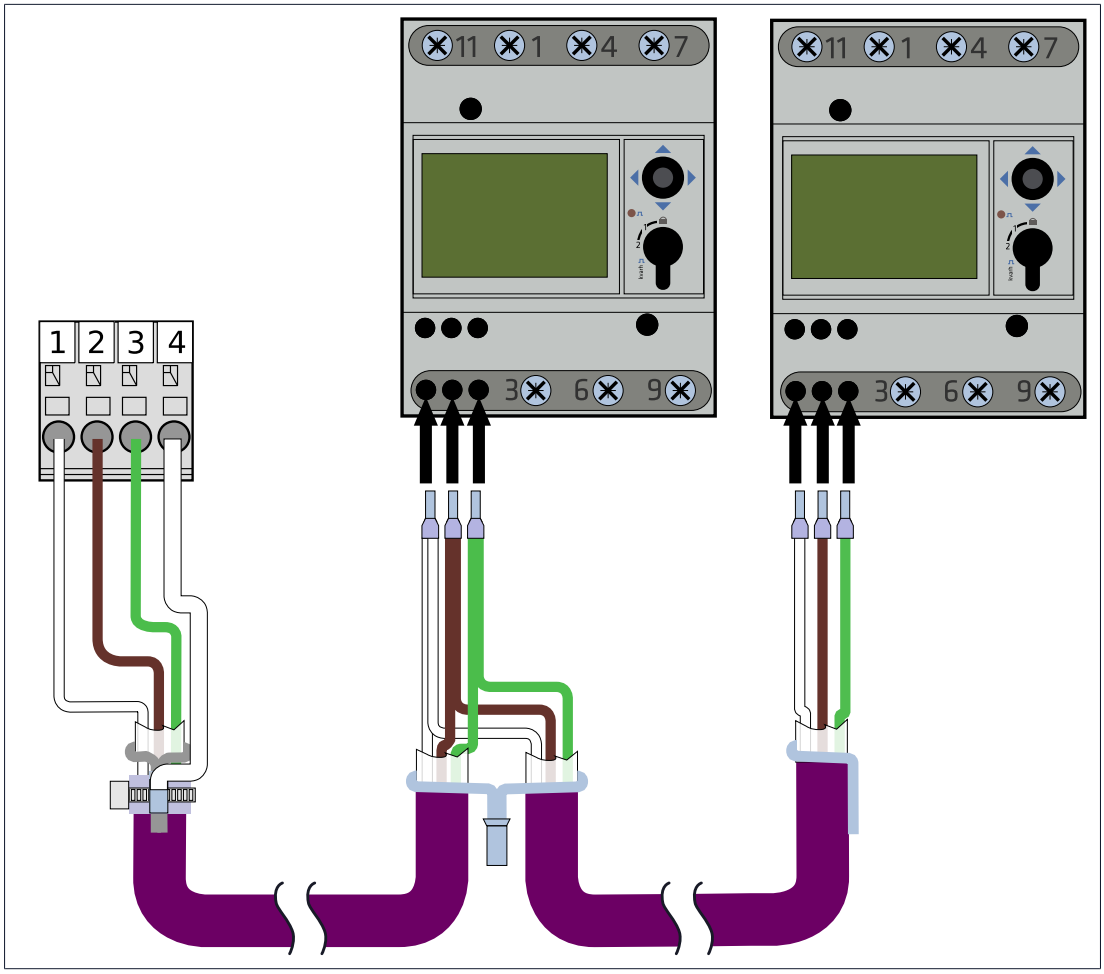


Fig. 31: Communication line connection for two power meters of type WM63-M

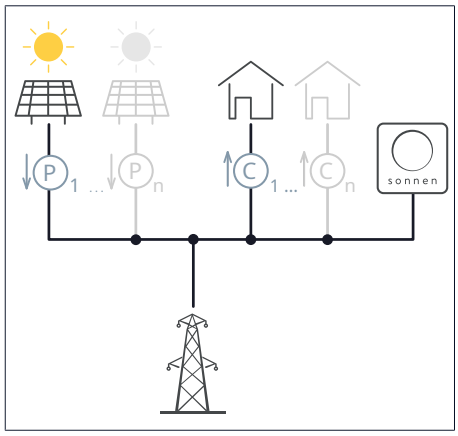
?? Connect the communication line according to the above figure. loading observe the specifications in section Connecting communication lines [p. 19].

6 measurement concepts

The energy management of the storage system works with different measurement concepts. The different measurement concepts use different measurement points for the performance measurements. The individual measuring concepts can be implemented independently of the measuring devices used.

6.1 Measuring concept CP (Standard DE)

This measurement concept is also called in the commissioning wizard/on the web interface of the storage system consumer measurement designated.



With this measurement concept, generation is recorded at measurement point P1 and consumption at measurement point C1.

Further measuring points (P2 to Pn and C2 to Cn) can be integrated into the system.

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

P1, ..., Pn (production)

Registration of generation

C1, ..., Cn (Consumption)

Registration of consumption

The following applies:

Ctotal = C1 + C2 + ... Ptotal

= P1 + P2 + ...

- The purchase from or feed into the public power grid is not measured but calculated.

- The charge is released when there is an excess of PV generation. The discharge is released in the event of a power deficit (consumption > generation).

6.1.1 Calculation of the energy flows

- Purchase and feed-in are not measured but calculated.

- The reference results from Formula 1 (see the relationship between the energy flows [p. 7]). The following applies:

Reference = Consumption - Generation - Discharge

(Formula 3: General formula for consumption > generation - converted according to purchase)

Feed-in results from Formula 2 (see the relationship between the energy flows [p. 7]), which, converted according to the feed-in, reads as follows:

Feed-in = generation - consumption - charge

(Formula 4: General formula for generation > consumption - converted to feed-in)

6.1.2 Implement CP measurement concept

Proceed as follows when implementing this measurement concept:

1. Attach the folding current transformers to the measuring points C (consumption). Make sure that the arrows of all connected folding current transformers point in the direction of the consumer.
2. Attach the folding current transformers to the measuring points P (generation). Make sure that the arrows on the folding current transformers point away from the generator. Note: When using a storage system with a direct PV connection (e.g. sonnenBatterie hybrid), the power of the generator connected is measured in the storage system. i.e. no measuring point P needs to be installed if the generator is connected directly to the storage system. However, a measuring point P must always be installed for any additional electrical generators.
3. If multiple power meters are used: Proceed as described in Using multiple power meters [p. 19] described.
4. Run the *IBN assistant* to the Power Measurement Selection page. Select the Measurement concept CP out.
5. Run the *IBN assistant* to the Power Measurement Configuration page.
6. Add the individual measuring points with the correct settings (see Configuring measuring points [p. 9]).
7. Complete the startup wizard.

6.1.3 Exemplary implementation of the measurement concept CP

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

- Measurement point P1 records the generation of a PV system.
- Measuring point P2 records the generation of a combined heat and power plant.
- Measuring point C records consumption in the house.

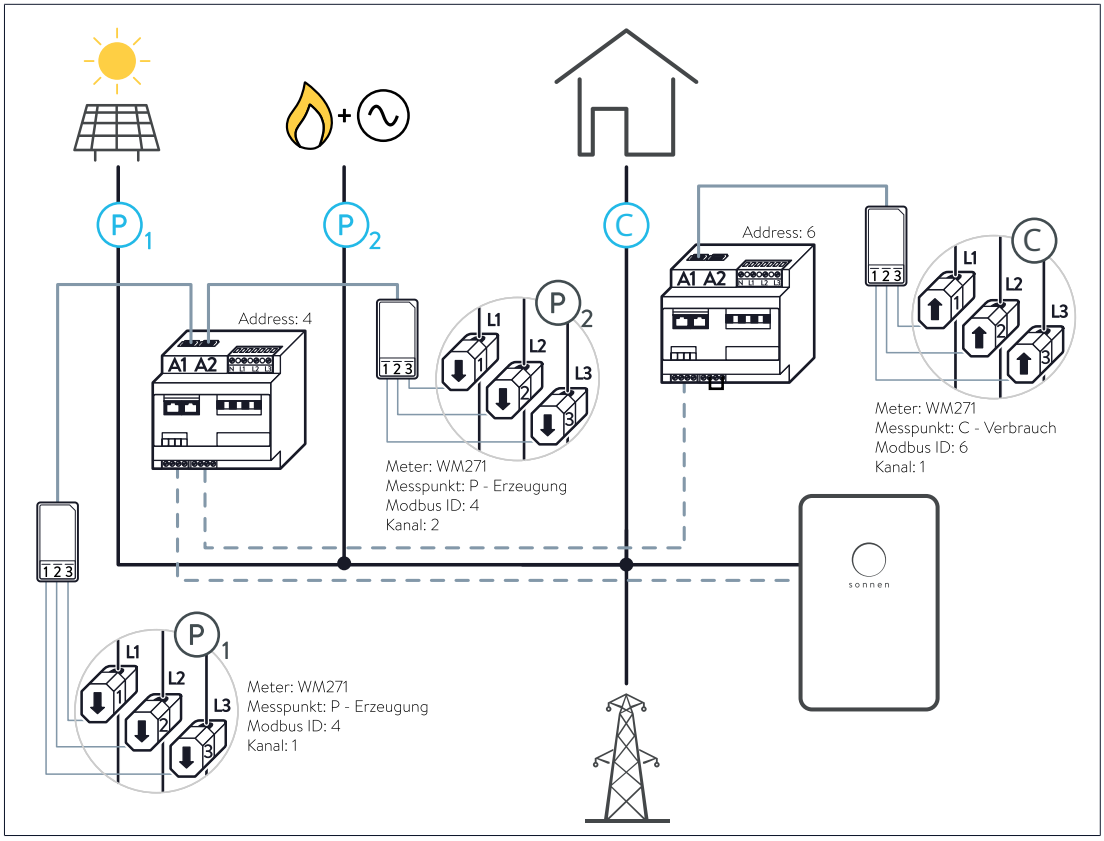
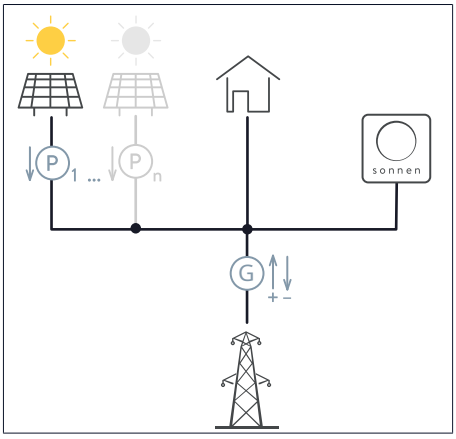


Fig. 32: Example of the implementation of the CP measuring concept - The circles in the picture show the connection of the KSW to the three measuring points

6.2 Measurement Concept GP

This measurement concept is also called in the commissioning wizard/on the web interface of the storage system mesh link measurement designated.



With this measurement concept, generation is recorded at measurement point P1. Additional measuring points (P2 to Pn) can be integrated into the system.

In this case, the total generation results from the sum of the individual measured values.

P1, ..., Pn (production)

Registration of generation

G (grid)

Recording of the purchase from or feed into the public power grid

The following applies:

Ptotal = P1 + P2 + ...

- At measuring point G, the import from or feed into the public power grid is measured. The consumption is not measured, but calculated.
- The charging or discharging of the storage system is released via the measured values at measuring point G. Positive measured values mean that the storage system is being used and discharged.
- Negative measured values mean feeding into the public power grid and charging the storage system.

6.2.1 Calculation of the energy flows

- Consumption is not measured but calculated.

Case 1: consumption > production

In this case, the consumption is calculated using formula 1.

Consumption = Generation + Discharge + Import *(Formula 1: General formula for consumption > production)*

Case 2: generation > consumption

The consumption results from the formula 2 (see connection of the energy flows [p. 7]), which, converted according to the consumption, reads as follows:

Consumption = generation - charge - feed-in *(Shape el 8: Al General formula for generation > consumption - converted according to consumption)*

6.2.2 Implement measurement concept GP

Proceed as follows when implementing this measurement concept:

1. Attach the folding current transformers to measuring point G (grid connection). Make sure that the arrows of all connected folding current transformers point in the direction of the consumer.
2. Make sure that the power meter that is responsible for measuring the power at measuring point G has the function EC disabled (see Easy Connection (EC) programming page [p. 18]).
3. Attach the folding current transformers to the measuring points P (generation). Make sure that the arrows on the folding current transformers point away from the generator. Note: When using a storage system with a direct PV connection (e.g. sonnenBatterie hybrid), the power of the generator connected is measured in the storage system. i.e. no measuring point P needs to be installed if the generator is connected directly to the storage system. However, a measuring point P must always be installed for any additional electrical generators.
4. If multiple power meters are used: Proceed as described in Using multiple power meters [p. 19] described.
5. Run the *IBN assistant* to the Power Measurement Selection page. Select the Measurement concept GP out.
6. Run the *IBN assistant* to the Power Measurement Configuration page.
7. Add the individual measuring points with the correct settings (see Configuring measuring points [p. 9]).
8. Complete the startup wizard.

6.2.3 Exemplary implementation of measurement concept GP

The example shown in the following figure shows the implementation of the measurement concept gp

- Measurement point P1 records the generation of a PV system.
- Measuring point P2 records the generation of a combined heat and power plant.
- Measuring point G records the purchase from or the feed-in to the public power grid.

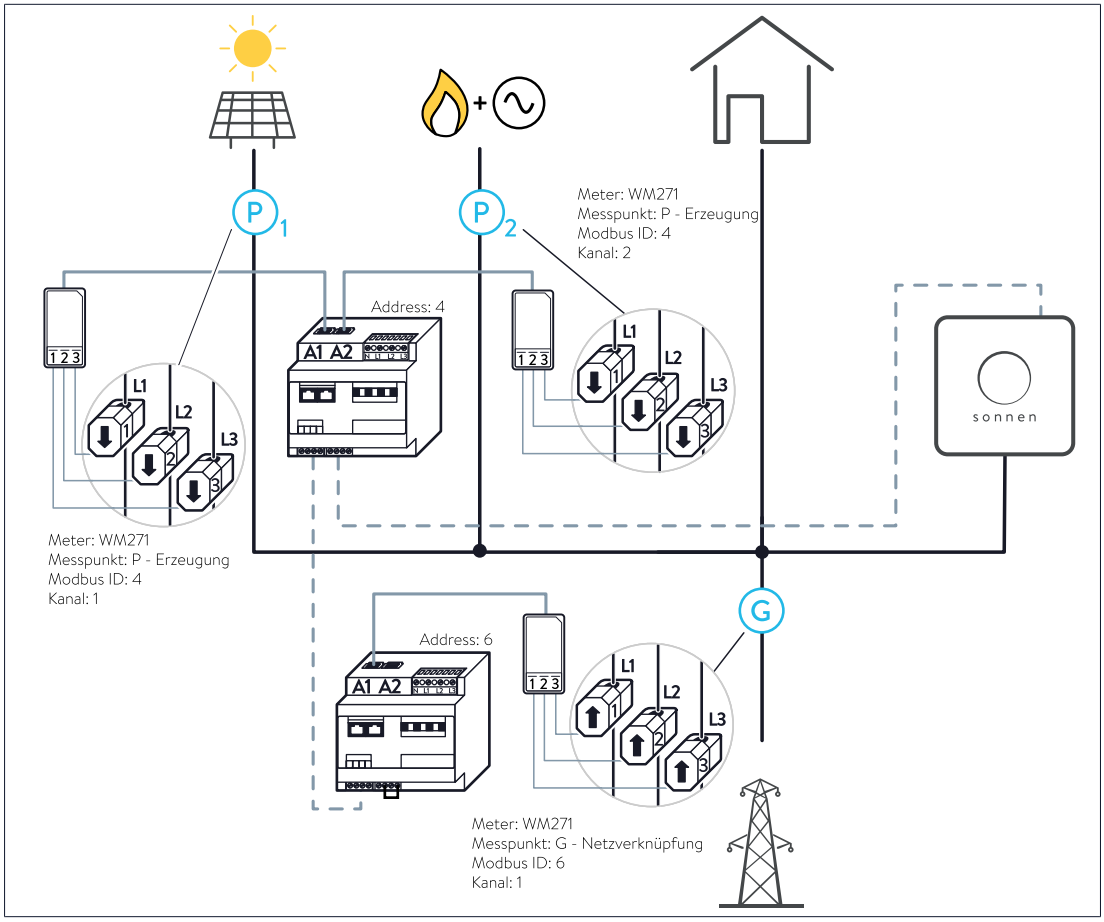
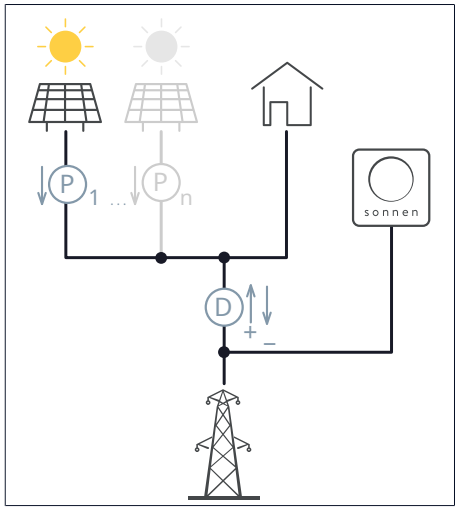


Fig. 33: Example of the implementation of the measurement concept GP - The circles in the picture show the connection of the KSW to the three measurement points

6.3 Measuring concept DP

This measurement concept is also called in the commissioning wizard/on the web interface of the storage system differential measurement designated.



With this measurement concept, generation is recorded at measurement point P1.

Additional measuring points (P2 to Pn) can be integrated into the system.

In this case, the total generation results from the sum of the individual measured values.

P1, ..., Pn (production)

Registration of generation

D (difference)

Registration of the difference between consumption and generation

The following applies:

Ptotal = P1 + P2 + ...

- At measuring point D, the difference between generation and consumption is recorded.
- Consumption is not measured but calculated.
- Likewise, the purchase from or the feed-in to the public power grid is not measured, but calculated.
- The charging or discharging of the storage system is released via the measured values at measuring point D. Positive measured values mean that the storage system is being used and discharged. Negative measured values mean feeding into the public power grid and charging the storage system.

6.3.1 Calculation of the energy flows

- At measuring point D, the difference between consumption and generation is measured. The following applies:

Difference = consumption - production

(Formula 5: difference)

Since the generation is also measured at the measuring points P1, ..., Pn, the consumption can be calculated from this formula.

case: consumption > production

in you In this case, the sign of the difference is positive. This corresponds to a deficit. Electrical energy flows in the direction of consumers. Inserting the difference into Formula 1 (see the relationship between the energy flows [p. 7]) results in:

difference = discharge + reference

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

Case 2: generation > consumption

In this case, the sign of the difference is negative. This corresponds to an excess. Electrical energy flows in the direction of the public power grid/storage system. Inserting the difference into formula 2 (see the relationship between the energy flows [p. 7]) results in:

Difference = - charge - feed-in

(Formula 7: Difference - used in the general formula for production > consumption)

6.3.2 Implement DP measurement concept

Proceed as follows when implementing this measurement concept:

1. Attach the folding current transformers to measuring point D (difference). Make sure that the arrows of all connected folding current transformers point in the direction of the consumer.
2. Make sure that the power meter responsible for measuring the power at measurement point D has the function EC disabled (see Easy Connection (EC) programming page [p. 18]).
3. Attach the folding current transformers to the measuring points P (generation). Make sure that the arrows on the folding current transformers point away from the generator. Note: When using a storage system with a direct PV connection (e.g. sonnenBatterie hybrid), the power of the generator connected is measured in the storage system. i.e. no measuring point P needs to be installed if the generator is connected directly to the storage system. However, a measuring point P must always be installed for any additional electrical generators.
4. If multiple power meters are used: Proceed as described in Using multiple power meters [p. 19] described.
5. Run the *IBN assistant* to the Power Measurement Selection page. Select the Measurement concept DP out.
6. Run the *IBN assistant* to the Power Measurement Configuration page.
7. Add the individual measuring points with the correct settings (see Configuring measuring points [p. 9]).
8. Complete the startup wizard.

7 Power measurement accessories

designation	use	item number
Power Meter WM271		
WM271	• For sonnenBatterie eco 8.0, hybrid 8.1, 10 or 10 performance • Pre-programmed for 3-phase measurement	30496
WM271	• For sonnenBatterie eco 8.2, eco 9.42, hybrid 9.53 or 10 • Pre-programmed for 1-phase measurement	30521
WM271 2. Producer counter	• Pre-programmed for 3-phase measurement • Preprogrammed to ID 6	30459
Converter 60 A *(In the standard scope of delivery included)*	• 3-phase / 3 folding current transformers • Max. outside diameter of cable: 9.6 mm	21028
Converter 100 A	• 3-phase / 3 folding current transformers • Max. outer diameter of cable: 15.7 mm	11215
Converter 200 A	• 3-phase / 3 folding current transformers • Max. outer diameter of cable: 15.5 mm	11216
Converter 400 A	• 3-phase / 3 folding current transformers • Max. outside diameter of cable: 20.5 mm	11659
screen	• Required for programming	11452
Power meter WM63		
WM63	• Generation measurement 1 • Pre-programmed for 3-phase measurement	30345
WM63	• Consumption measurement 1 • Pre-programmed for 3-phase measurement	30346
Power meter WM10		
WM10	• Generation measurement 2 • Pre-programmed for 3-phase measurement	30347
WM10	• consumption measurement 2 • Pre-programmed for 3-phase measurement	30348

The current transformers (push-through or folding current transformers) cannot be obtained from sonnen. Instead, obtain them in the desired design and accuracy class from a supplier of your choice (e.g. Müller + Ziegler GmbH & Co. KG). Note the required secondary current of 5 A.

List of abbreviations

AC

Alternating current [en] - AC voltage or alternating current

CHP

combined heat and power plant

BMS

battery management system

DC

Direct current [en] - DC voltage or direct current

EC

Easy connection

IBN assistant

Commissioning Assistant

KSW

folding current transformer

PV

Photovoltaic

Index

sonnen

energy is yours

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