



Operating instructions | for operators
sonnenBatterie 10
with sonnenModule 3 or sonnenModule 4

EN

IMPORTANT

- ▶ Read this documentation carefully before installation / operation.
- ▶ Retain this document for reference purposes.

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1 Information about this document

This document describes the operation of the sonnenBatterie 10.

- ▶ Read this document in its entirety.
- ▶ Keep this document in the vicinity of the sonnenBatterie.

1.1 Target group of this document

This document is intended for customers who have purchased the storage system.

1.2 Designations in this document

The following designations are used in this document:

Complete designation	Designation in this document
sonnenBatterie 10	Storage system
sonnenProtect 4000	sonnenProtect
Authorised electrician	Installer
Customer who purchased the storage system	Operator

1.3 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

Table 1: Additional symbols

2 Safety

2.1 Proper use

The sonnenBatterie 10 is a battery storage system which can be used to store electrical energy. Improper use poses a risk of death or injury to the user or third parties as well as damage to the product and other items of value.

The following points must be observed at all times in order to ensure **proper use**:

- The transport and storage conditions must be observed.
- The storage system must only be used at a suitable installation location.
- The storage system must be fully installed in accordance with the installation instructions.
- The storage system must be installed by an authorised electrician. Country-specific regulations concerning electrical installations must be observed at all times.
- The interfaces of the storage system must be connected in accordance with the product documentation.
- Only use the storage system in its original state - without any unauthorised modifications - and when it is in proper working order.
- Repairs to the storage system must be carried out by an authorised service technician only.

Especially the following uses are not permissible:

- Operation in flammable environments or areas at risk of explosion.
- Operation in locations at risk of flooding.
- Outdoor operation.
- Operation of the battery modules outside of its storage system.
- Bypassing, blocking or tampering with protective devices.

Danger due to electrical voltage



The storage system contains live electrical parts, which poses a risk of electrical shock.

The storage system inverter also contains components with internal stored energy, which carry voltage even after the storage system is switched off.



Therefore:

- ▶ Do not open the storage system.



Operating the storage system

- The storage system may only be operated as described in the product documentation.
- This device can be used by children from the age of eight (8) years old and individuals with impaired physical, sensory or mental capabilities or individuals with limited knowledge and/or experience of working with the device, as long as they are supervised or have been trained to safely use the device and understand the resulting risks of doing so. Children must not play with the device.



Failure to comply with the conditions of the warranty and the information specified in this document invalidates any warranty claims.

2.2 Intended use of the sonnenProtect

The sonnenProtect 4000 is an backup power unit designed to supplement the sonnenBatterie 10. The sonnenProtect - in conjunction with the appropriate storage system of the sonnen GmbH - serves to supply power in the event of a power failure.

Improper use poses a risk of death or injury to the user or third parties as well as damage to the product and other items of value.

The following points must be observed at all times in order to ensure **proper use**:

- Only operate the sonnenProtect together with the right storage system.
- The sonnenProtect must be installed by an authorised electrician.
- The sonnenProtect must only be used in its original state without any user modifications and only when in perfect working order.
- The sonnenProtect must only be connected to the storage system as described here.
- The interfaces of the sonnenProtect and the storage system must be connected in accordance with the product documentation.
- Generators (e. g. a PV system) must never be connected to the output of the sonnenProtect.
- The sonnenProtect must only be installed and used at suitable installation location.
- The transport and storage conditions must be observed.
- All repairs on the sonnenProtect must be performed by authorised service technicians only.

Especially the following uses are not permissible:

- Operation in flammable environments or areas at risk of explosion.
- Operation in locations at risk of flooding.
- Bypassing, blocking or tampering with protective devices.

Danger due to electrical voltage inside the sonnenProtect



The sonnenProtect contains live electrical parts, which poses a risk of electrical shock. The storage system inverter also contains capacitors which carry voltage even after the storage system is switched off. As the sonnenProtect is connected to the inverter of the storage system, this means that the voltage from the inverter also flows into the sonnenProtect.

Therefore:

- ▶ Do not open the sonnenProtect.

Operating the sonnenProtect

- The sonnenProtect must only be operated as described in the product documentation.
- This device can be used by children from the age of eight (8) years old and individuals with impaired physical, sensory or mental capabilities or individuals with limited knowledge and/or experience of working with the device, as long as they are supervised or have been trained to safely use the device and understand the resulting risks of doing so. Children must not play with the device.

2.3 Qualified electricians

Installation and commissioning must be performed by authorised electricians only. Installation by unqualified and/or unauthorised persons may cause injury and/or component damage.

People who meet the following requirements are generally considered authorised electricians:

- The electrician must be a person with a technical knowledge or sufficient experience to enable him/her to avoid dangers which electricity may create.
- The electrician must have successfully complete sonnen GmbH certification training for the product.

2.4 Handling battery modules



The battery modules compatible with the storage system are protected by multiple protective devices and are safe when used properly. Improper use or a fault may cause the battery cells inside the battery modules to be damaged.

This can have the following effects:



- High heat generation on the surface of the battery cells.
- Leaking of electrolyte, vapours and/or smoke.
- The escaping electrolyte may ignite and cause an explosive flame.
- Irritation to skin, eyes and mucous membranes due to steam or smoke from burning battery modules.

In order to ensure **proper use**:

- ▶ Do not open the battery modules.
- ▶ Do not inflict mechanical damage (pierce, deform, disassemble, etc.) on the battery modules or otherwise modify them.
- ▶ Do not heat the battery modules. Keep them away from sources of ignition and operate them only within the permissible temperature range.
- ▶ Do not allow the battery modules to come into contact with water (except to extinguish a fire involving the storage system).
- ▶ Do not short-circuit the battery modules.
- ▶ Never continue to use the battery modules if they are damaged in any way.
- ▶ Do not deep-discharge the battery modules or charge them using external chargers.
- ▶ Do not operate battery modules outside of the storage system.
- ▶ Remove metal jewellery when handling battery modules.
- ▶ Do not place any tools or metal objects on the battery modules.

2.5 Conduct in the event of a fault or fire

If contents are escaping:

1. Leave or do not enter the room in which the storage system and battery modules are located.
2. Avoid contact with the escaping electrolyte. If contact occurs, rinse the affected area thoroughly with water. In the case of irritation of the skin, eyes or mucous membranes, consult a doctor.

3. Contact the sonnen service team (+44 3301 114559).

A fire may occur even with electrical devices that are designed with care. A nearby fire can also cause the storage system to ignite. This may also lead to the contents of the battery modules being released.

If the battery modules or storage system is on fire:

1. Leave or do not enter the room in which the storage system and battery modules are located.
2. Avoid contact with escaping smoke or steam. If contact occurs, rinse the affected area thoroughly with water. In the case of irritation of the skin, eyes or mucous membranes, consult a doctor.
3. Contact the fire services.
4. Contact the sonnen service team (+44 3301 114559).

There is a danger of electrocution when extinguishing a fire while the storage system is switched on. In the event of a fire in the vicinity of the product or in the storage system itself, proceed as follows before beginning any extinguishing measures:

- ▶ Switching the storage system off [P. 16]. The battery modules will continue to carry voltage.
- ▶ Switch off the mains fuses in the building.
- ▶ Only firefighters with appropriate personal protective equipment are permitted to enter the room where the storage system is located.

If the storage system or mains fuses cannot be safely switched off:

- ▶ Observe the minimum distances applicable for the specific extinguishing means used. The storage system works with a nominal voltage of 230 V (AC) and 205 V (DC).

Extinguishing agents

- A storage system fire can be extinguished using conventional extinguishing agents.
- Water is recommended as an extinguishing agent in order to cool the battery modules and therefore prevent thermal runaway in battery modules which are still intact.

Information on the battery modules

- A single battery module has a nominal voltage of 102.4 V (DC).
- Two battery modules each are connected in series, resulting in a working voltage of 204.8 V (DC).
- The battery modules do not contain metallic lithium.

2.6 Symbols on the product



Warning: electrical voltage. Wait five minutes after switching off (capacitor de-energising time).



Warning: flammable materials.



Warning: hazards due to batteries.



Warning: product is heavy.



CE mark. The product meets the requirements of the applicable EU directives.



WEEE mark. The product must not be disposed of in household waste; dispose of it through environmentally friendly collection centres.



Observe the documentation. The documentation contains safety information.



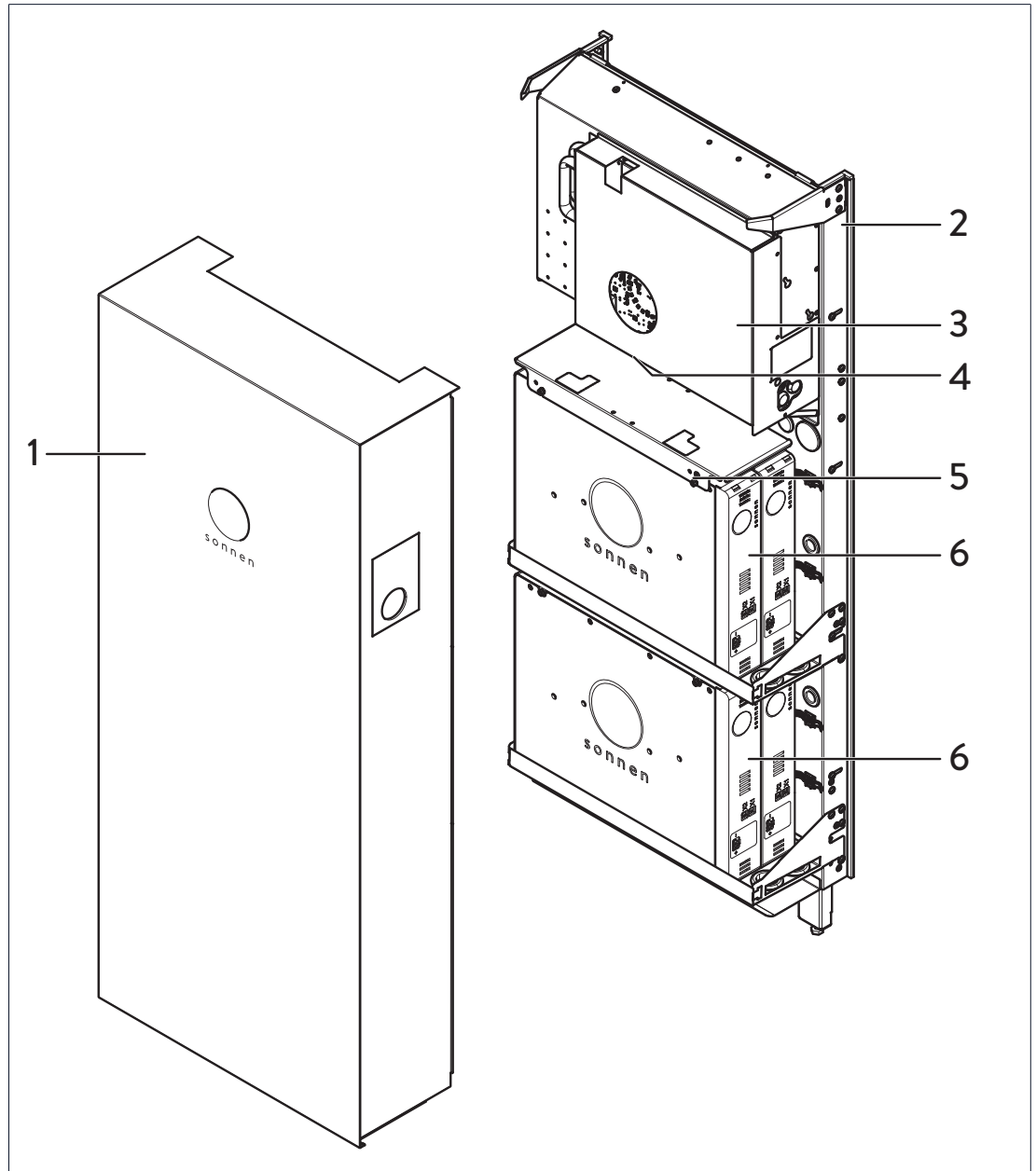
Protective earthing. Labelling earthing points.

3 Product description

3.1 System components

The storage system consists of multiple components that are packed individually. The storage system is set up directly at the installation location. The components are described in the following.

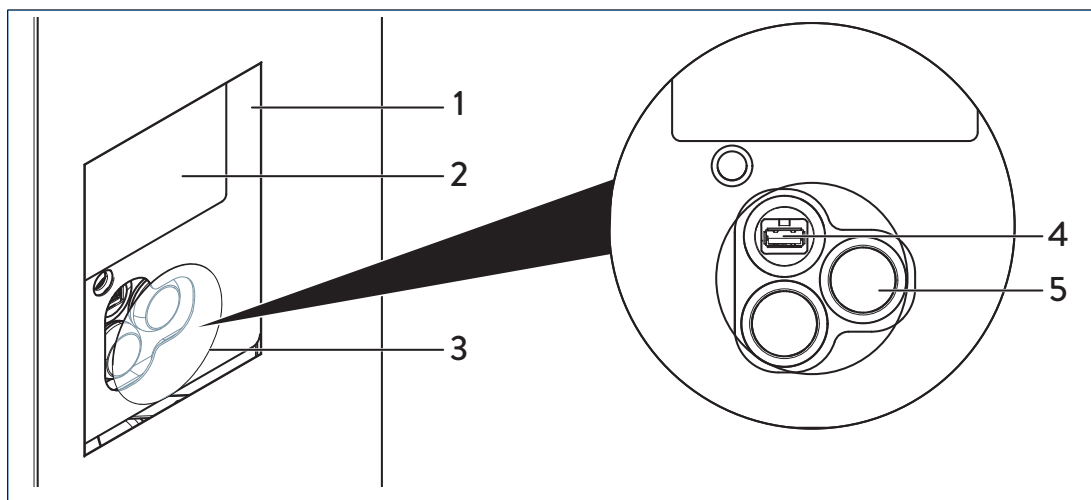
Overview of storage system



No.	Designation	Function
1	Cover	Cover for the storage system.
2	Mounting frame	Mounting frame with integrated bracket for securing it to the wall and for compensating for uneven surfaces.
3	Power module	Power module with integrated inverter and switch panel.
4	Cable entry point	Sealed entry point for cables to be routed into the storage system from the back.

No.	Designation	Function
5	Battery screws	For securing the battery modules.
6	Battery modules	Storage of electrical power.

Overview of switch panel



No.	Designation	Function
1	Inspection window	Cover and protection for control elements on the switch panel.
2	Type plate	Technical data and other information for identifying the storage system.
3	Switch cover	Silicone cap that can be removed for operating the storage system.
4	USB socket	Socket for connecting a USB device.
5	ON/OFF switch	Switch for switching the storage system on and off.



Please note that the USB socket on the switch panel of the storage system is only intended for servicing purposes!

3.2 Type plate

The type plate for the storage system is located on the Power module and can be viewed from the outside through the inspection window. The type plate can be used to uniquely identify the Power module and thus the storage system. The information on the type plate is required for safe use and for service matters.

The following information is specified on the type plate:

- Item designation
- Item number
- Technical data of the storage system
- Initial password

3.3 Optional accessories

The following optional accessories can be added to the storage system in order to extend its functionality:

Designation	Description	Item number
Accessories for extending the sonnenBatterie 10		
Extension set	Second mounting frame with cover. For installation of up to six additional sonnenModule 3 battery modules or two additional sonnenModule 4 battery modules (see Installing the extension cabinet (optional)).	4000030 + 3000081
sonnenProtect 4000	Backup box for power supply to defined backup circuits in the event that the public electricity grid fails (see sonnenProtect 4000 (optional)).	3000083
Power meter WM271 and clamp-on current transformers	For integration of further measurement points in the power measurement (e.g. additional electrical generator for AC Microgrid).	30459 + 21028
Additional sonnen products for extending storage system functionality		
sonnenCharger	Charging station for electric vehicles for intelligent control by the storage system.	Different versions available

3.4 Function of the sonnen Eclipse

The sonnen Eclipse (light ring in the sonnen logo on the front of the storage system) indicates the current status of the storage system when it is switched on.

The following operating statuses may be indicated:

Colour	Mode	Operating status
White	Pulsing	Storage system is in normal operation.
Green	Pulsing	The connection to the public electricity grid is interrupted. If there is still no connection to the public electricity grid after about five minutes, the sonnen Eclipse switches off. For storage systems with backup power function only*: storage system is in backup operation.
Orange	Pulsing	No internet connection. For storage systems with backup power function only*: an overload has been detected in backup operation.
Red	Constant	Problem detected. ► Contact the installer of the storage system or the sonnen service team!

*Optional accessories sonnenProtect.

3.5 Activating the warranty

During first-time commissioning, the installer runs the commissioning assistant in order to configure all of the important settings for the storage system. Data is also entered for both the installer and the operator so that the storage system can be assigned to the customer and the installation is documented. The successful completion of the commissioning assistant is a prerequisite for the proper and optimal operation of the storage system.

If first-time commissioning has been successfully completed, you will receive an email with the current warranty conditions and data protection policy of sonnen GmbH. After confirming your data and the conditions, the manufacturer's warranty for your storage system is activated.



In exceptional cases it may not be possible to run the commissioning assistant online. If this occurs, **offline commissioning** will be performed instead. If offline commissioning has been performed, a commissioning report will be completed in writing by the installer and sent to sonnen. It is important for you to receive a copy of the completed and signed commissioning report. This copy then also serves as proof for activating the warranty.

4 Operating the storage system

⚠ DANGER

Opening of the storage system by unauthorised persons

Danger to life due to electrocution!

- ▶ The storage system must only be opened by authorised electricians.
- ▶ Electrical work on the storage system and the associated electrical distributor must only be carried out by authorised electricians.

NOTICE

Storing objects on or under the storage system

Damage to the storage system due to insufficient ventilation!

- ▶ Do not cover the air vents on the top or bottom of the system.
- ▶ Observe the minimum distances around the storage system: Top: 15 cm, bottom: 10 cm, left: 5 cm, right: 15 cm.
- ▶ Do not place any objects on the cover of the storage system.
- ▶ Do not place any objects under the storage system.



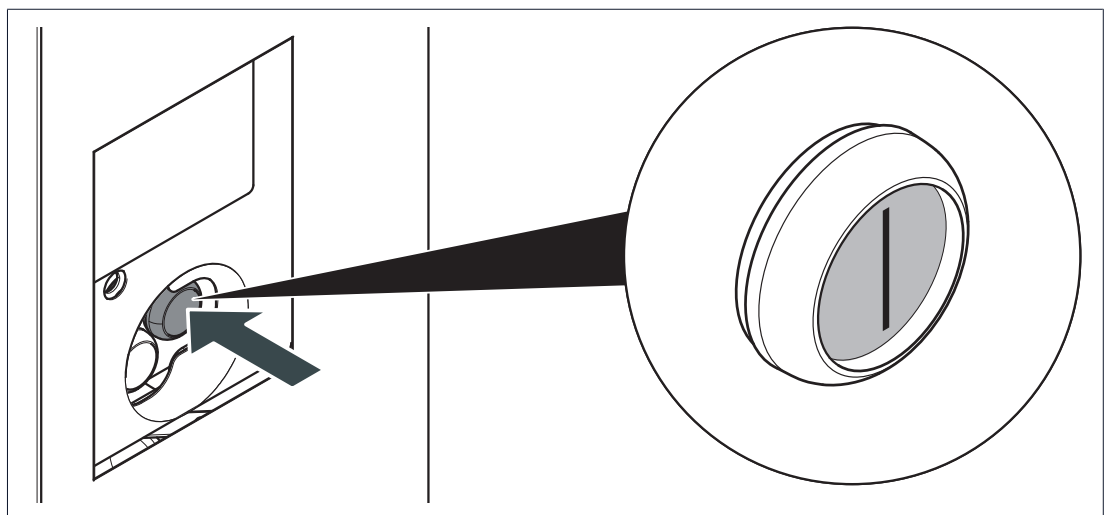
The specified degree of protection for the storage system and therefore touch protection and protection against the ingress of water and foreign bodies is only achieved when the switch cover of the storage system is mounted.

4.1 Switching the storage system on



The storage system can only be switched on if the public network voltage has been switched on first.

1. Switch on the grid voltage using the miniature circuit breaker for the mains line.
2. Remove the switch cover on the inspection window of the switch panel.



3. Press the ON/OFF switch so it clicks into the **ON (I)** position.
4. Reattach the switch cover to the inspection window.

The storage system then starts and runs a self-test. Once the self-test is successful, the storage system is ready to operate.

When the storage system is in normal operation, the sonnen Eclipse pulses white (see Function of the sonnen Eclipse [P. 13]).

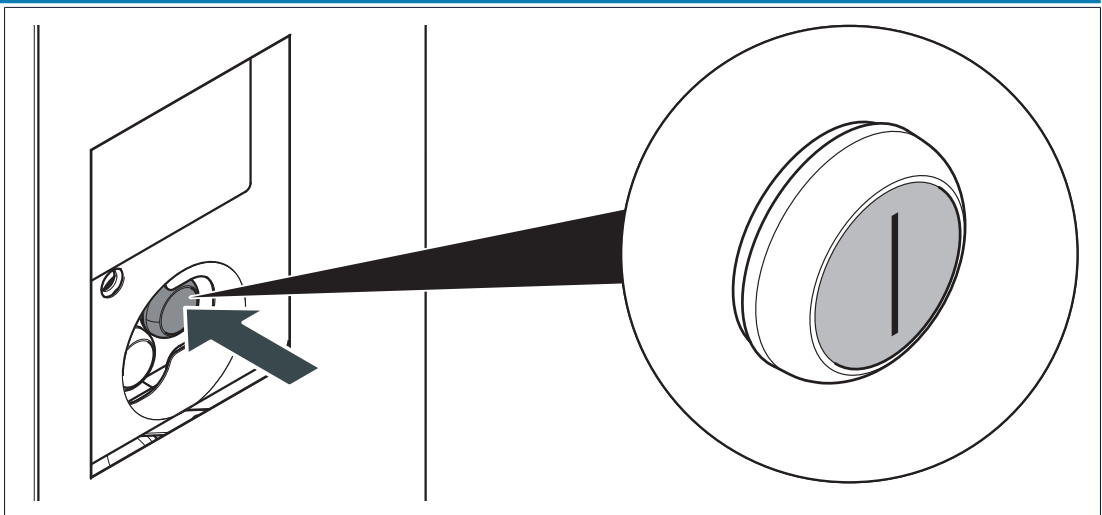
4.2 Switching the storage system off

NOTICE

Deep-discharge of the battery modules

Destruction of the battery modules!

- ▶ Do not disconnect the storage system from the public electricity grid for long periods of time.
- ▶ Never continue to operate battery modules which have been deep-discharged.



1. Remove the switch cover on the inspection window of the switch panel.
2. Press the ON/OFF switch. The sonnen Eclipse switches off.
3. Switch off the grid voltage using the miniature circuit breaker for the mains line.
4. Reattach the switch cover to the inspection window.

The storage system is decommissioned when it is switched off. **DANGER! There is still live voltage inside the storage system. Before authorised electricians can work safely on the storage system, the storage system must be completely switched off to be electrically isolated.**

5 Function

5.1 Basic principle

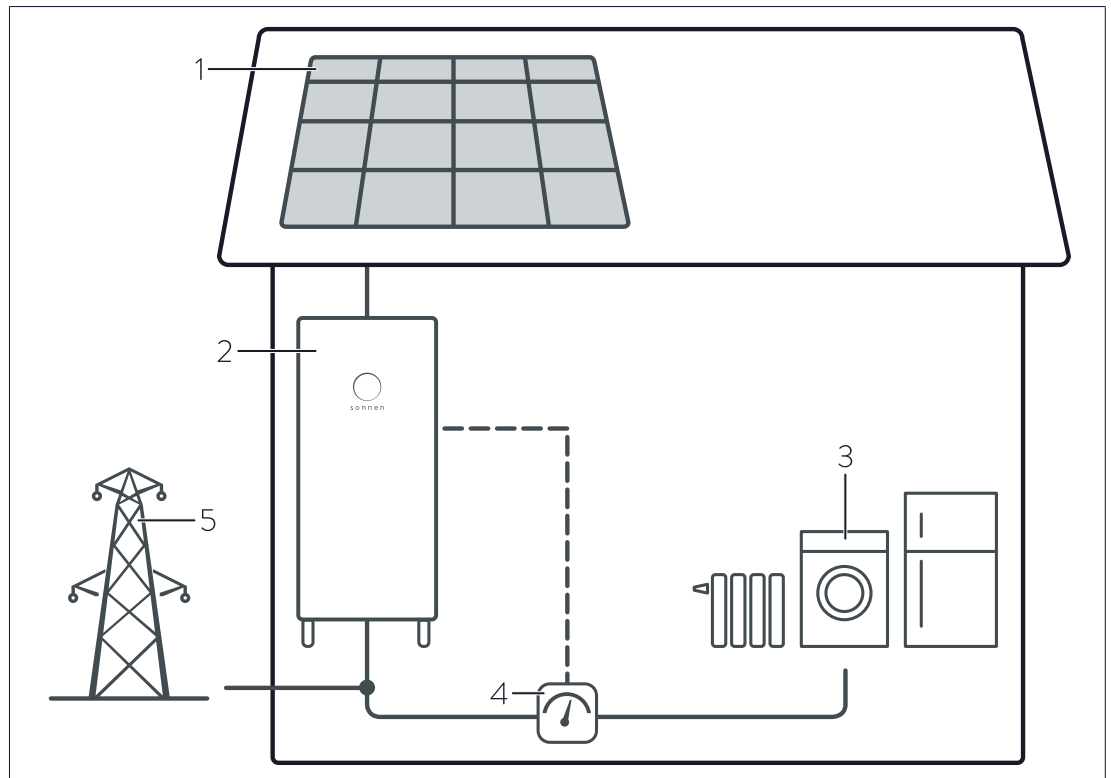


Illustration 1: sonnenBatterie function

- | | | | |
|---|---|---|----------------------------|
| 1 | PV system | 4 | Measurement of consumption |
| 2 | Storage system | 5 | Public electricity grid |
| 3 | Consumers in building (e. g. washing machine, hob, lamps, refrigerator, etc.) | | |

The storage system (2) is connected to the PV system (1) and the public electricity grid (5). Furthermore the current consumption of the consumers in the building (3) is constantly measured (4).

Generation > Consumption

If the generation of power is greater than the consumption, there is a surplus of electrical energy. In this case as much as possible of this surplus is used to charge the battery of the storage system.

If the entire portion of the surplus can not be charged into the battery, the remaining surplus is fed into the public electricity grid.

Consumption > Generation

If the consumption is greater than the generation of power, there is a deficit of electrical energy. In this case the battery is discharged to even out as much of the deficit as possible.

If the entire deficit can not be compensated by discharging the battery, the remaining deficit is covered by the public electricity grid.

5.2 Feed-in limit

PV systems are subject to a feed-in limit in some circumstances. The feed-in limit restricts the PV system's feed-in power at the mains connection point.

Example

- Nominal power of PV system: 10 kWp
- Power limit: 50%
- Maximum feed-in power: 5 kW

In this example, the feed-in power of 5 kW must not be exceeded. The following figure shows an example of the PV system's production over the course of a day.

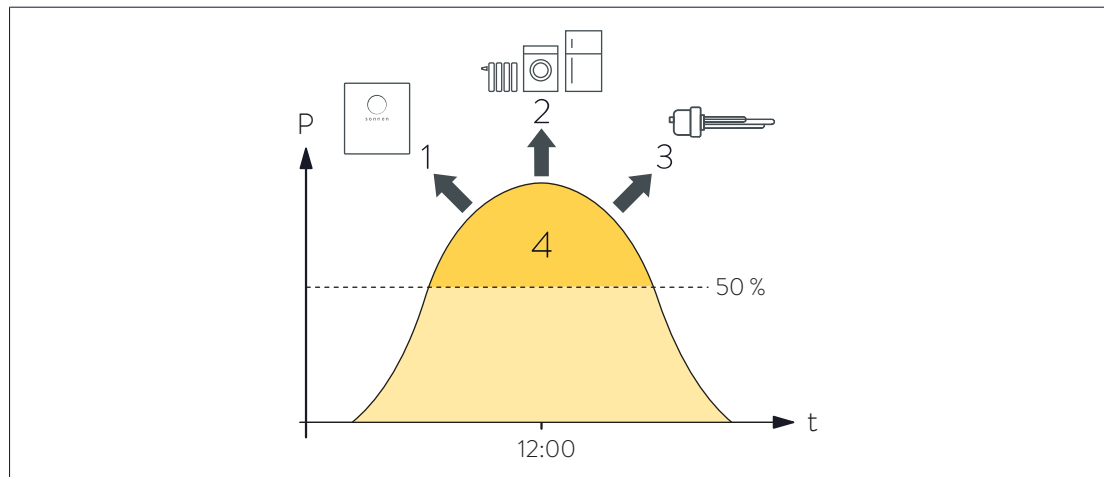


Illustration 2: Example: feed-in limit at 50% of nominal power

- 1 Charging of storage system
- 2 Switch-on of consumers via self-consumption switch
- 3 Switch-on of consumers (e. g. sonnenHeater)
- 4 Midday peak, which must not be fed into the electricity grid

To prevent production reduction – and therefore energy loss – the excess energy is first stored in the storage system (1) and consumption is increased by switching on consumers (2, 3). Production is only reduced if these measures do not lead to the desired limit. Measures for limiting feed-in are explained in detail in the following. The individual measures are carried out one after the other. Only when one measure does not achieve the desired reduction is the next measure introduced.

1. Charging of battery

Excess energy is directed to the storage system battery. In order for this to occur, there must be sufficient storage capacity available in the battery. For this reason, on sunny days it is often a good idea to reduce the charging power in the morning hours in order to reserve sufficient remaining capacity of the battery for midday. The charging behaviour is intelligently controlled for this purpose (see Intelligent charging management [P. 19]).

2. Switch-on of consumers

The consumers are activated as soon as the feed-in limit is exceeded.

Consumers connected to the self-consumption switched are switched on first. A heating element can be activated, for example, using this permanently connected switch output. The energy surplus is then used to activate other consumers (e.g. sonnenHeater).

3. Reduction of PV power

Production is reduced via an integrated switch contact on the PV inverter. This limits the inverter of the PV system to a defined power output. In order for this to occur, the PV inverter must support power reduction using a switch contact or an external solution (e.g. a solar datalogger). Your installer will connect and configure the PV reduction.

5.3 Intelligent charging management

The charging behaviour of the storage system is controlled via intelligent charging management. The aims of this intelligent control are as follows:

- Storage of the midday peak in the storage system (sufficient storage capacity must still be available for this)
- Full charging of the storage system until evening (so there is sufficient energy for night-time)

Intelligent charging management only affects the function of the storage system if the storage system is operated by a PV system with a feed-in limit.

Functional principle of intelligent charging management

The storage system is connected to a server via the internet. This server creates a consumption and production forecast for the individual hours of the day in question. The production forecast is based on

- the weather forecast,
- the nominal power of PV system and
- the orientation of the PV system.

The consumption forecast is calculated based on actual consumption from the previous week.

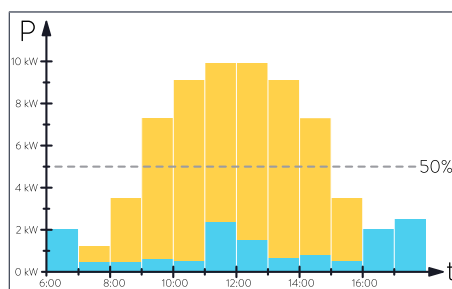


Illustration 3: Production forecast (yellow) and consumption forecast (blue)

The figure on the left shows an example of a production and consumption forecast. In this example, an average consumption of 0.5 kW and a production of approx. 9 kW are calculated for the time between 10 and 11 a.m.

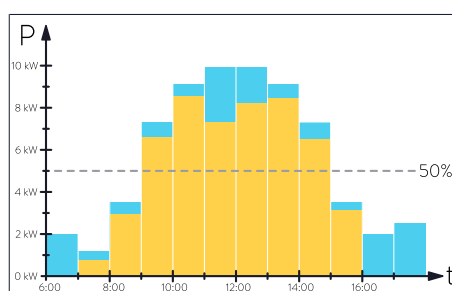


Illustration 4: Forecast surplus

Subtracting the consumption (blue) from the production (yellow) gives you the forecast surplus (8.5 kW in this example). The consumption bars have been placed on top of the production bars in the diagram.

In this example, feeding in the entire surplus at midday would lead to the feed-in limit (of 5 kW) being exceeded. For this reason it is ideal if as much of the energy surplus as possible exceeding the feed-in limit is used to charge the battery.

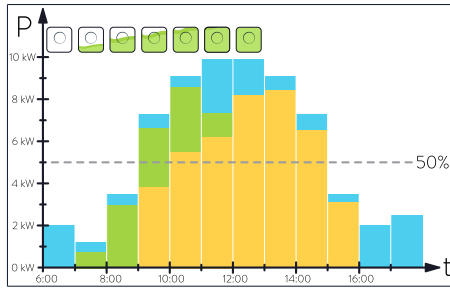


Illustration 5: Charging behaviour without intelligent charging management

yellow forecast production
 blue forecast consumption
 green charging of storage system

Without intelligent charging management, the storage system would immediately use the surplus to charge the battery (until the maximum charging power is reached). In this example, this behaviour would result in the storage system being fully charged before midday, meaning that the surplus exceeding the feed-in limit after this point would no longer be able to be stored in the battery.

To stay within the Feed-in limit [P. 17], the power of the PV system would need to be reduced. This would lead to an energy loss and therefore also a financial loss. Intelligent charging management attempts to avoid fully charging the battery too early. To this end, the storage system receives a charging plan for the day early in the morning from the server.

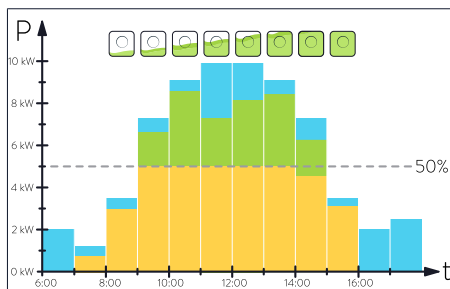


Illustration 6: Charging behaviour with intelligent charging management

yellow forecast production
 blue forecast consumption
 green charging of storage system

In this example, charging of the storage system is avoided in the morning hours. At midday the storage system is charged only enough so that the feed-in limit can be observed.

Intelligent charging management adaptation

After commissioning the intelligent charging management system has to adapt to conditions on site. The production forecast, for example, depends on the weather forecast and the orientation, roof angle, shading, etc. of the PV system. The consumption forecast depends on individual consumption and the electrical consumers in use.

Statistical consumption and production data is required in order for intelligent charging management to take these complex factors into account. Since none of this necessary information exists immediately after the storage system is installed, this data must first be collected. For this reason, intelligent charging management requires approx. seven days for calibration. During this time the charging behaviour may not be ideal. After these seven days have passed, intelligent charging management will have adapted to match your individual consumption and production profile.

Intelligent charging management limits

The effectiveness of intelligent charging management depends on how accurate the production and consumption forecasts are.

- An incorrect weather forecast results in an incorrect production forecast.

- The consumption forecast depends on consumption from the previous week. Drastically fluctuating consumption therefore negatively impacts the quality of the consumption forecast. The more consistent the consumption, the more accurate the consumption forecast.

6 Digital sonnen world

By purchasing the storage system you receive access to sonnen digital products. To monitor the storage system and other sonnen products in real time and configure settings, you have several options:

my.sonnen.de

You can access the **online portal** at any time. In addition to an overview of your products and contracts, you will also find interesting information on the sonnenCommunity and sonnen's energy services.

Find out more here: Using the online portal [P. 23].

find-my.sonnen-batterie.com

You can access the **web interface of the storage system** via a network connection. The web interface allows you to access specific information on your storage system and adjust settings for special functions.

The commissioning assistant, which is used by your installer to configure and commission the storage system, can also be accessed here (installer's login required).

Find out more here: Using the web interface [P. 24].

6.1 Using the online portal

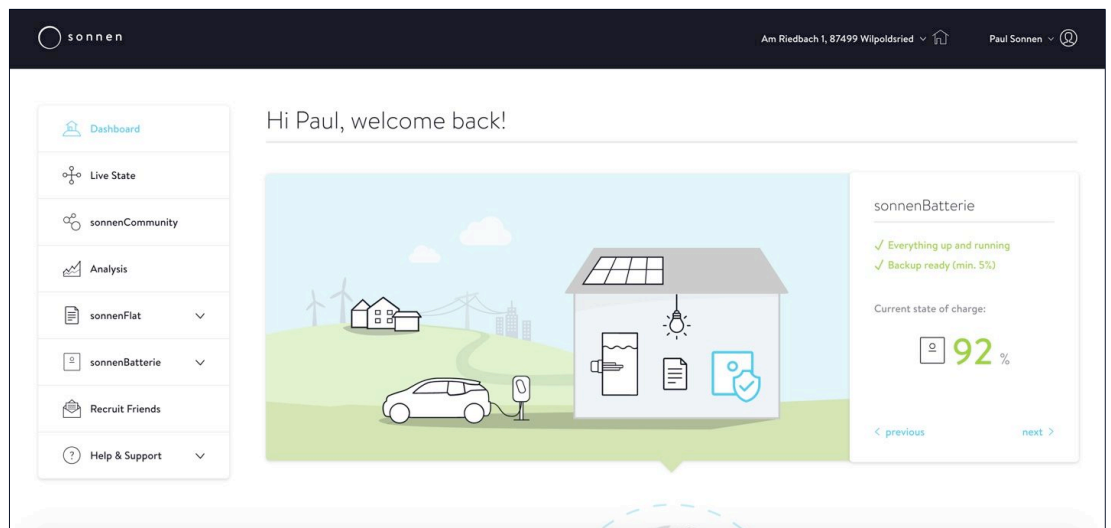


Illustration 7: Online portal start page

6.1.1 Logging into the online portal

To use the online portal, you need a sonnen account. If you already have a sonnen account, you can log into the online portal directly. If not, you can create a personal sonnen account as follows:

- ▶ Enter the following address into an internet browser: **my.sonnen.de**



Alternatively, you can use the code here on your smartphone to access the online portal.

- ▶ Scan the code with a QR reader. You can download a QR reader from the app store for your particular device.

The login window opens.

- ▶ Click on the corresponding button to register and create a sonnen account.

After creating the sonnen account you can use this in future to log in and access all sonnen digital products.

6.1.2 Visualising measurement data

A fundamental part of the online portal is the graphic display of the data from your storage system and of processes within your building.



Illustration 8: Viewing current energy flows

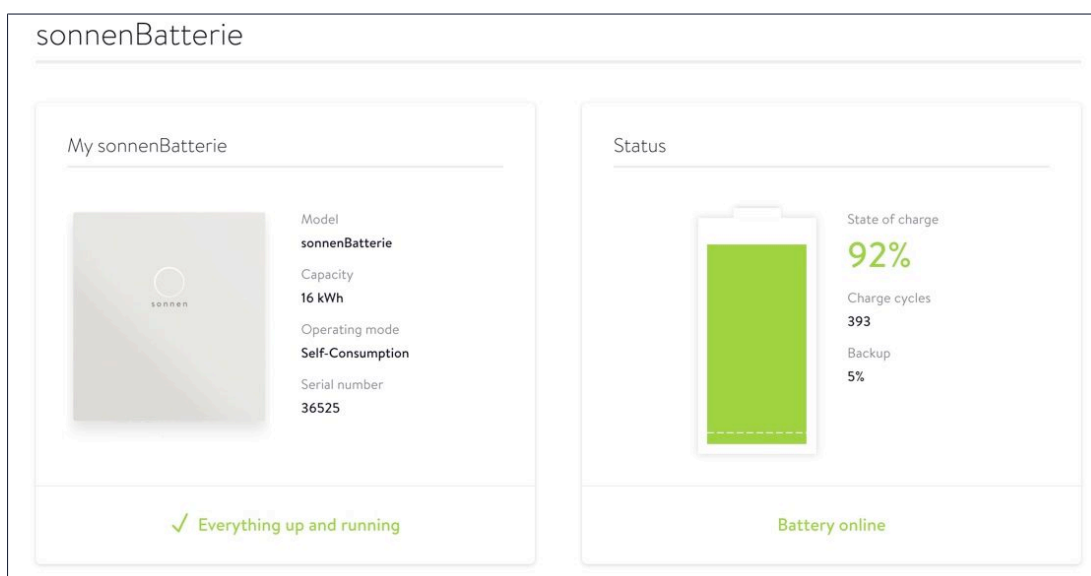
The energy flow offers a quick overview of the current distribution of electricity within your household. The different displays are always up-to-date and continuously supplied with live data.

You can use the analysis to see more details. Here you can easily track the activities of your household throughout the day. You can also create an overview of all recorded data on production and consumption over longer periods of time.



6.1.3 Overview of your sonnen products

The pages for the sonnenBatterie provide an overview of the current status of your storage system and information on your existing sonnen accessories. You can also see technical details and installation data here.



6.2 Using the web interface

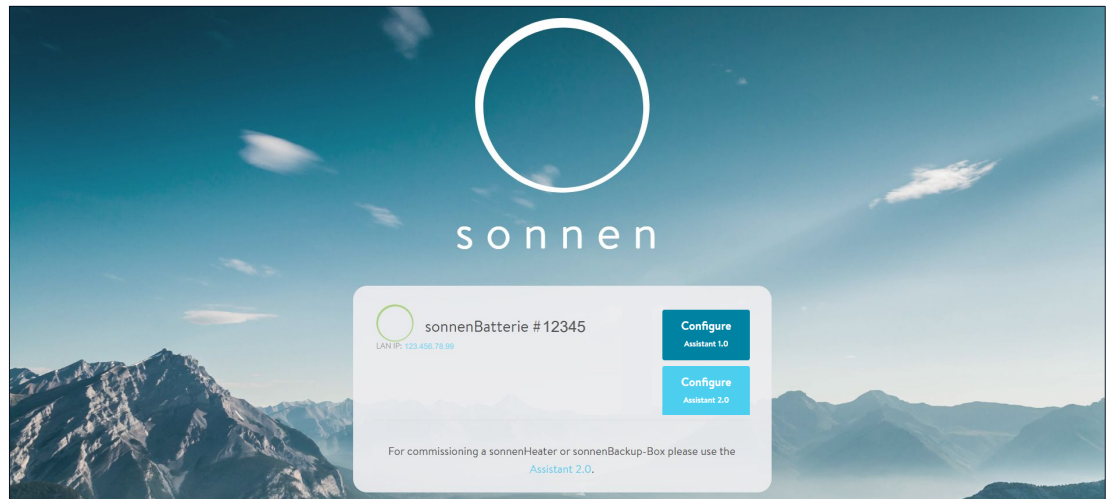
6.2.1 Logging into the web interface

Conditions:

- ✓ The storage system is connected to the router of the home network.
- ✓ Your laptop or PC also accesses the home network.
- ✓ The storage system has been set up by the installer using the commissioning assistant 2.
 - ▶ Enter the following address into an internet browser:

<https://find-my.sonnen-batterie.com>

The following window appears:



- ▶ Click on the **Configure Assistant 2.0** button or on the blue LAN IP number.

The login page appears.

- ▶ Log in as the **User**.

Use the initial password the first time you log in. This password can be found on the type plate of the storage system.

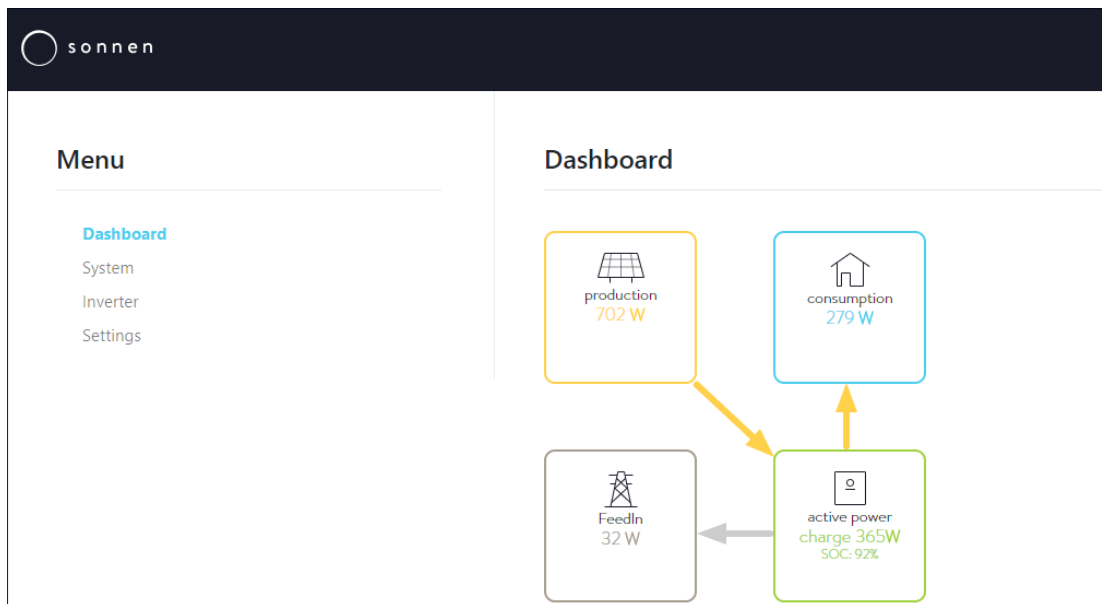
- ▶ Assign an individual password for the storage system after you have logged in successfully using the initial password.



Contact the sonnen service team if you have forgotten the individually assigned password or need to reset the password for another reason.

6.2.2 Dashboard page

The start page of the web interface (Dashboard) provides an initial overview of the current status of your storage system. All of the energy flows are specified there in watts and clarified with arrow indicators.



The current production of the PV system and the consumption of the electrical consumers in the building are displayed in contrast with the storage system and the public electricity grid. Usage from the public electricity grid is displayed when production and the electricity available from the storage system are not sufficient to meet the energy needs of the building. Feed-in is displayed when there is sufficient electricity available to feed some into the public grid within any existing feed-in limit.

The state of charge (SOC) of the battery modules is specified in relation to the storage system and information as to whether the storage system is storing electricity (charging) or providing electricity (discharging) is displayed.

6.2.3 System page

The System page provides technical background information on your storage system.

For example, you can see how many battery modules are installed (General Information > Capacity) and what the maximum power provided by the inverters is (General Information > Inverter Max. Power).

The other information, such as the serial number and model designation of your storage system (each under General Information), is mainly useful in the event of a fault, especially if you contact your installer or the sonnen service team.

6.2.4 Inverter page

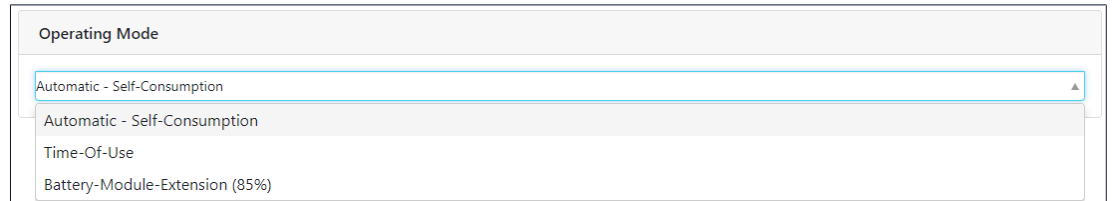
The Inverter page is where a self-test can be performed. This is necessary for inverters commissioned in certain countries (including Italy). Italian standard CEI 0-21, for example, requires a self-test function for all inverters feeding into the public grid, where the self-test checks the inverters one after the other to determine their response times for over-voltage, undervoltage, maximum frequency and minimum frequency.

Since this function is only required in certain regions, the test is only displayed if your installer has selected a corresponding country code during commissioning.

6.2.5 Settings page

Depending on the configuration of your storage system, the following areas are displayed on the Settings page:

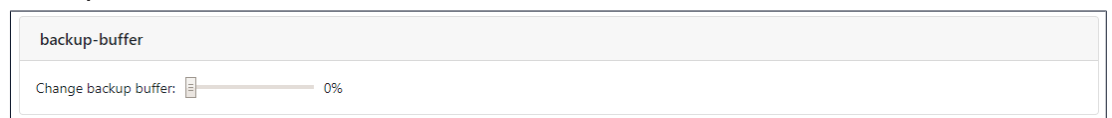
Operating Mode



The Self-Consumption Operating Mode is normally used.

The other two operating modes (Time of Use (time linking) and Battery-Module-Extension) are only required in certain cases and should only be set by the installer.

backup-buffer



If a sonnenProtect is connected to the storage system, the backup-buffer field is displayed. You can select the backup buffer as a percentage here. This portion of the storage capacity is then reserved for the backup supply, i.e. this portion of the capacity is not available to the storage system in normal operation.

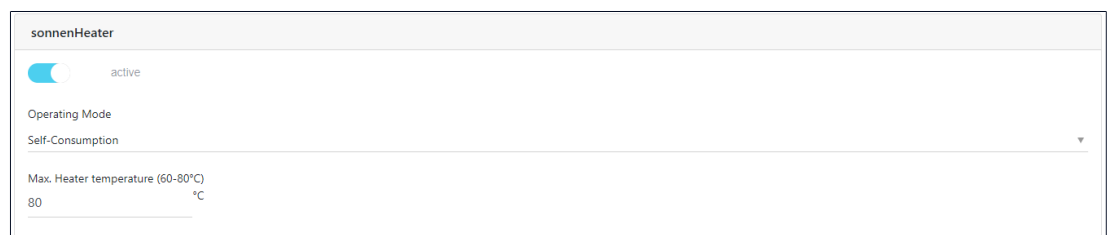
Combined heat and power unit (CHP)

If a CHP with constant power output is connected to the storage system and has been set up appropriately by the installer, the Combined Heat and Power (CHP) field is displayed.

The Power specifies the constant power of the CHP and should not be changed after initial configuration by the installer. The lower limit of the charging state at which the CHP is activated (Charge state to start CHP) and the upper limit at which the CHP is stopped (Charge state to stop CHP) are specified as percentages.

- ▶ Contact your installer before changes are made to the settings.

sonnenHeater



If a sonnenHeater (heating element) is connected to the storage system, the sonnenHeater field is displayed. The initial settings were configured by your installer when the sonnenHeater was commissioned. You have the option as the operator to change the settings. You can activate or deactivate the sonnenHeater, select the operating mode and define the maximum temperature.

Operating Mode Self-Consumption

In this mode the surplus of the PV system (= PV production - consumption) is used first to charge the battery and then to supply connected consumers.

The storage system detects the sonnenHeater as an additional consumer and distributes any PV surpluses in the following order:

1. Charging of storage system.
2. Switch-on of consumers via self-consumption switch.
3. Switch-on of sonnenHeater.

Operating Mode Feed-in optimization

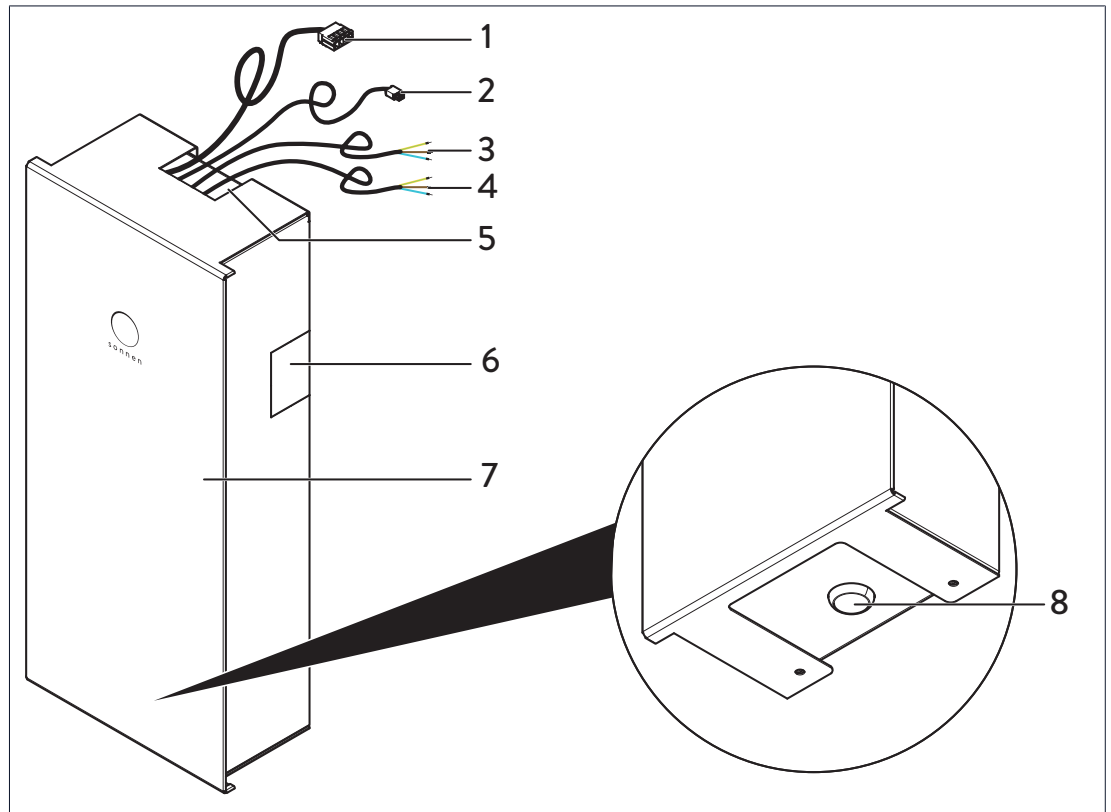
In this mode the aim is to achieve the maximum permissible feed-in of PV production into the public electricity grid and avoid PV reduction as follows. The maximum feed-in power depends on whether there is a feed-in limit. The Feed-in optimization operating mode should be set for all storage systems which have a corresponding feed-in limit (e.g. KfW subsidy).

The sonnen smart home components are supplied with electricity in order to prevent PV system production from being reduced. The individual consumers are also supplied with electricity according to the aforementioned order of priorities.

7 sonnenProtect 4000 (optional)

- Both when the sonnenBatterie 10 is first being installed and after the fact, a sonnenProtect 4000 can be added to the system.
- ▶ Observe the Safety [P. 6] information for the storage system and sonnenProtect at all times!

7.1 System components of the sonnenProtect



- | | | | |
|---|-----------------------------------|---|----------------------------------|
| 1 | IN line from storage system | 5 | Cutout for cable duct |
| 2 | Signal line to storage system | 6 | Cutout for additional cable duct |
| 3 | OUT line to backup circuit | 7 | sonnenProtect |
| 4 | IN line from building distributor | 8 | Illuminated switch |

7.2 Type plate

The type plate is located on the outer surface of the sonnenProtect. The type plate can be used to uniquely identify the sonnenProtect. The information on the type plate is required for the safe use of the system and for service matters.

The following information is specified on the type plate:

- Item designation
- Item number
- Technical data

A duplicate of the type plate for the sonnenProtect 4000 is affixed by the installer to the storage system.

7.3 Operating the sonnenProtect

Switching on the sonnenProtect

- ▶ Ensure that the miniature circuit breaker in the supply line to the sonnenProtect is switched on.
- The sonnenProtect becomes active as soon as the storage system is properly commissioned and switched on (see Switching the storage system on [P. 15]).

Switching off the sonnenProtect

To switch off the sonnenProtect manually, proceed as follows:

- ▶ Switch the storage system off (see Switching the storage system off [P. 16]).

DANGER! Before authorised electricians can work safely on the sonnenProtect, the storage system and sonnenProtect must be completely switched off to be electrically isolated.

7.4 Function

A storage system with sonnenProtect automatically switches from grid to backup operation (and vice versa). The two operating modes are described in the following.

7.4.1 Grid operation - no grid outage

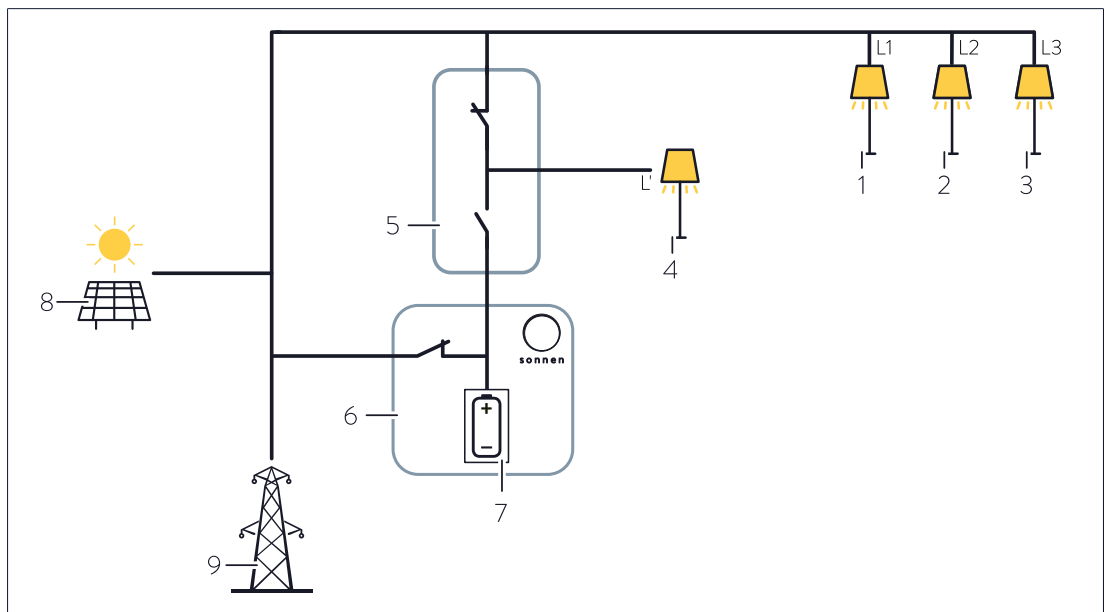


Illustration 9: Grid operation - no grid outage

- | | | | |
|---|--------------------------------------|---|-------------------------------|
| 1 | Consumer connected to phase L1 | 6 | Storage system |
| 2 | Consumer connected to phase L2 | 7 | Battery of the storage system |
| 3 | Consumer connected to phase L3 | 8 | PV system |
| 4 | Consumer connected to backup circuit | 9 | Public electricity grid |
| 5 | sonnenProtect | | |

In grid operation the consumers connected to phase L1 to L3 and the consumers connected to the backup circuit (1 - 4) are connected to the public electricity grid (9). All consumers in the house are supplied with electrical power. The storage system controls - as described in the product documentation of the storage system - the energy flows in the building.

7.4.2 Backup operation - grid outage

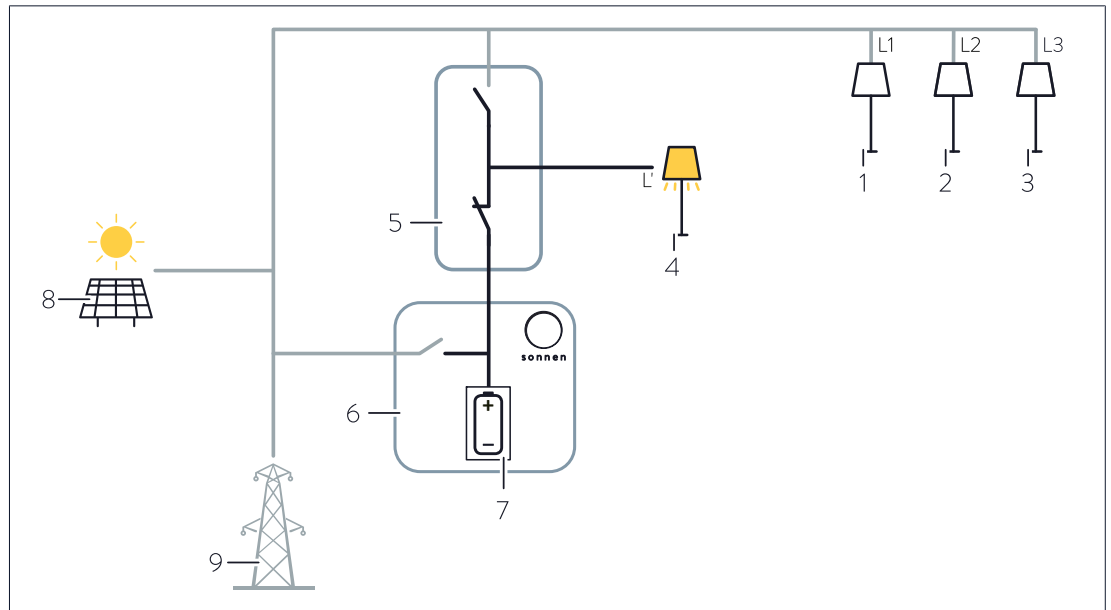


Illustration 10: Backup operation - grid outage

- | | | | |
|---|--------------------------------------|---|-------------------------------|
| 1 | Consumer connected to phase L1 | 6 | Storage system |
| 2 | Consumer connected to phase L2 | 7 | Battery of the storage system |
| 3 | Consumer connected to phase L3 | 8 | PV system |
| 4 | Consumer connected to backup circuit | 9 | Public electricity grid |
| 5 | sonnenProtect | | |

The sonnenProtect (5) automatically detects a grid outage. As soon as the voltage of the electricity grid drops to approx. 180 V, the connection to the public electricity grid (9) is disconnected.

Backup power is generated after approx. 5 seconds. The consumers connected to backup circuit in the house (4) are thereby supplied with electrical power. Consumers connected to the phase L1, L2 or or L3 (1 - 3) will **not** be supplied with electrical power.

The switchover from grid to backup operation is signaled by the sonnen Eclipse (light ring) on the storage system. The color of the sonnen Eclipse changes from **white** (normal operation) to **green** (backup operation).

The storage system with sonnenProtect switches from backup to grid operation as soon as the public electricity grid (9) starts to deliver electrical power again.

Automatic stop and resumption of the backup operation

The storage system with sonnenProtect generates electrical power until a minimum state of charge of the battery is reached. Thereafter, no further discharge is allowed.

7.4.3 Backup operation – overload detection

- The illumination of the illuminated switch indicates that the electrical consumers connected to the sonnenProtect are causing excessive power consumption.
- Backup operation is stopped when an overload is detected until there is no more overload and the illuminated switch has been pressed for approx. 2 seconds.

When the illuminated switch lights up:

- ▶ Switch off electrical consumers in the backup circuit or do not connect any electrical consumers to the backup circuit if their power consumption exceeds the nominal power or (when switching on) the maximum power of the sonnenProtect.
 - ▶ Press the illuminated switch for approx. 2 seconds.
- ⇒ Backup operation has started successfully when the illuminated switch no longer lights up.



In certain situations it may take up to three minutes for backup operation to start after the illuminated switch is pressed.

- ▶ Further information for specific situations can be found in section Troubleshooting [P. 36].

7.4.4 Backup buffer

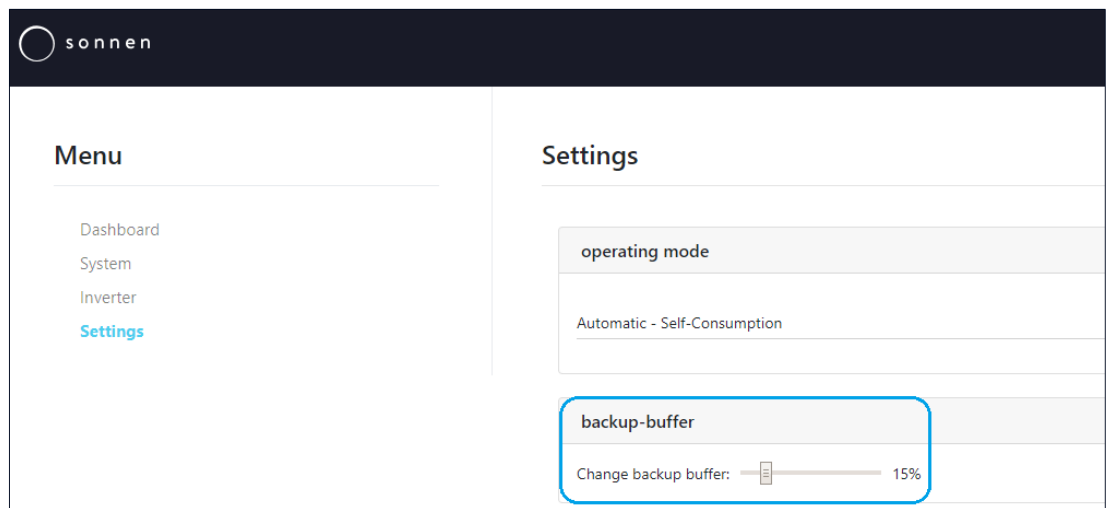
The part of the storage capacity reserved for supplying power to electrical consumers in backup operation is designated as a backup buffer. This buffer can be individually set and should be defined based on conditions on site (number of electrical consumers in the backup circuit and their power consumption). An backup buffer that is too high can mean that too little storage capacity is available in grid operation.

Setting the backup buffer

- The backup buffer is initially set by your installer when the storage system is commissioned with the sonnenProtect.

If you wish to change the backup buffer at a later time:

- ▶ Log onto the web interface of the storage system (see Logging into the web interface [P. 24]).
- ▶ Switch to the Settings page [P. 27].
- ▶ Change the percentage for backup-buffer to the desired value.



8 Maintenance

For fault-free, safe, reliable and long-lasting operation of the storage system, it is essential to carry out regular function checks and cleaning.

The battery modules installed in the storage system do not require maintenance.

8.1 Checking function

Maintenance interval	Action to be taken
Every 2 weeks	▶ Check whether there is a fault with the storage system.
Every 6 months	▶ Check for changes to the charging status. If functioning properly, the storage system should be charged to 100 % on a sunny day and the charging status should drop significantly overnight.

Table 2: Checking function

8.2 Cleaning

NOTICE

Use of unsuitable cleaning agent and/or excessive water

Material damage because of scratched surfaces and/or damage caused by penetration of water!

- ▶ Do not use scouring cloths, sponges or cleaning agent.
- ▶ Use only moist cloths, not wet cloths, to clean the system.
- ▶ Do not use water jets.

- ▶ Carefully clean the outside of the storage system with a clean, moist cloth. For tougher dirt, use a small amount of household dishwashing detergent on a moist cloth.
- ▶ Carefully clean the outside of the sonnenProtect with a clean, moist cloth. For tougher dirt, use a small amount of household dishwashing detergent on a moist cloth.

9 Uninstallation and disposal

9.1 Uninstallation

⚠ DANGER

Improper uninstallation of the storage system

Danger to life due to electrocution!

- ▶ The storage system must only be uninstalled by authorised electricians.

⚠ DANGER

Improper uninstallation of the sonnenProtect

Danger to life due to electrocution!

- ▶ The sonnenProtect must only be uninstalled by authorised electricians.

9.2 Disposal

⚠ CAUTION

Improper transport of battery modules

Fire outbreak at battery modules or emission of toxic substances!

- ▶ Only transport battery modules in packaging that meets applicable regulations.
- ▶ Never transport damaged battery modules.

The storage system, the batteries it contains and the sonnenProtect **must not** be disposed of as domestic waste!

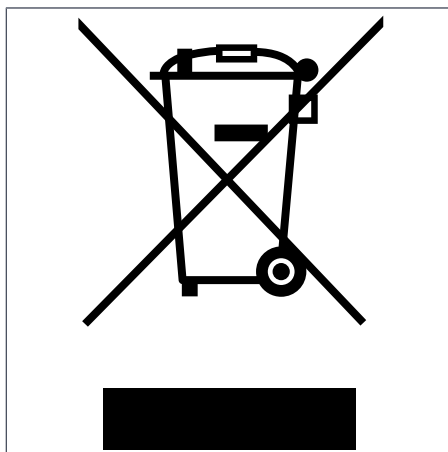


Illustration 11: WEEE symbol

- ▶ Dispose of the storage system, the batteries it contains and the sonnenProtect in an environmentally friendly way through suitable collection systems.
- ▶ Contact sonnen GmbH to dispose of old batteries.

In accordance with the German Battery Act (BattG 2009), sonnen GmbH will accept old batteries free of charge. Please note that the cost of transporting old batteries is not covered.

10 Troubleshooting

10.1 sonnenBatterie 10

Fault	Possible cause(s)	Solution
The sonnen Eclipse of the storage system pulses white.	The storage system is in normal operation.	No troubleshooting is necessary.
The sonnen Eclipse of the storage system pulses continuously green or pulses green and turns off after about 5 minutes.	The storage system is not connected to the public electricity grid.	<ul style="list-style-type: none"> ▶ Check that the circuit breaker in the supply line of the storage system is switched on. <p>If so:</p> <p>The public electricity grid does not provide any electrical energy (grid outage).</p> <ul style="list-style-type: none"> ▶ It can only be waited until the public electricity grid supplies energy again. Thereafter, the storage systems resumes normal operation.
	Storage system with backup power function only ¹ : The storage system is not connected to the public electricity grid and is in backup operation.	No troubleshooting necessary.
The sonnen Eclipse of the storage system pulses orange.	The internet connection to the storage system has been interrupted.	<ul style="list-style-type: none"> ▶ Check whether the home network router is able to establish an internet connection. <p>If so:</p> <ul style="list-style-type: none"> ▶ Ensure that the network cable for the storage system is connected to the home network router.
The sonnen Eclipse of the storage system illuminates red.	The storage system has detected a problem that is preventing normal operation or may cause damage to the storage system.	<ul style="list-style-type: none"> ▶ Please contact the sonnen service team to get help resolving the problem.
No connection to the web interface of the storage system (https://find-my.sonnen-batterie.com) or to the internet portal (my.sonnen.de).	No connection between the storage system and the server.	<ul style="list-style-type: none"> ▶ Make sure that the Ethernet line between the storage system and the Router of the home network is correctly connected. ▶ Make sure that the Router of the home network allows connections on the following ports: <p>TCP ports: 443 (https); 18883 (MQTT-TLS)</p> <p>UDP ports: 123 (NTP); 1196 (VPN)</p>

¹ Optional accessories sonnenProtect or sonnenBackup-Box.

10.2 sonnenProtect 4000 (optional)

Fault	Possible cause(s)	Solution
Grid operation (no grid outage)		
The electrical consumers in the backup circuit are not supplied with energy in grid operation.	The backup circuit lines have not been correctly connected.	Contact your installer and have the electrical wiring of the backup circuit checked.
	The miniature circuit breaker (MCB) in the supply line to the sonnenProtect is switched off.	Switch on the miniature circuit breaker (MCB).
	The residual current device (RCD) or another circuit breaker in the backup circuit is switched off.	Switch on all circuit breakers in the backup circuit.
	The residual current device (RCD) or another circuit breaker in the backup circuit has tripped.	Contact your installer and have the electrical wiring and the connected electrical consumers checked for faults. Switch on the affected circuit breaker once any faults are corrected.
Backup operation (grid outage) – backup operation does not start		
Backup operation does not start. The Eclipse on the storage system pulses green and goes off after several minutes. The illuminated switch on the sonnenProtect does not light up .	No backup buffer has been set. The batteries of the storage system have discharged so much that further discharging would lead to a deep discharge state and therefore damage the batteries.	There is nothing that can be done besides wait until the grid outage is done and the public electricity grid once again begins supplying electrical energy. The sonnenProtect will then automatically switch to grid operation.
	The storage system is switched off.	Switch on the storage system.
Backup operation does not start. The Eclipse on the storage system pulses green . The illuminated switch on the sonnenProtect does not light up .	The residual current device (RCD) or another circuit breaker in the backup circuit is switched off.	Switch on all circuit breakers in the backup circuit.
	The residual current device (RCD) or another circuit breaker in the backup circuit has tripped.	Contact your installer and have the electrical wiring and the connected electrical consumers checked for faults. Switch on the affected circuit breaker once any faults are corrected.
Backup operation does not start. The Eclipse on the storage system pulses orange . The illuminated switch on the sonnenProtect lights up .	Electrical consumers with too high of a power consumption are connected to the backup circuit.	Switch off electrical consumers in the backup circuit or reduce their power consumption. Press the illuminated switch on the sonnenProtect for approx. 2 seconds. Backup operation restarts. Only connect electrical consumers to the backup circuit when they have a power consumption that does not exceed the maximum power (see Technical data [P. 39]).

Backup operation (grid outage) – backup operation stops

<p>Backup operation stops. The miniature circuit breaker (MCB) in the supply line to the sonnenProtect and the circuit breakers in the backup circuit have not tripped. The Eclipse on the storage system pulses green and goes off after several minutes. The illuminated switch on the sonnenProtect does not light up.</p>	<p>The backup buffer of the storage system batteries is depleted. The batteries have discharged so much that further discharging would lead to a deep discharge state and therefore damage the batteries.</p>	<p>There is nothing that can be done besides wait until the grid outage is done and the public electricity grid once again begins supplying electrical energy. The sonnenProtect will then automatically switch to grid operation.</p>
<p>Backup operation stops. The miniature circuit breaker (MCB) in the supply line to the sonnenProtect or a circuit breaker in the backup circuit has switched off. The Eclipse on the storage system pulses green. The illuminated switch on the sonnenProtect does not light up.</p>	<p>The residual current device (RCD) or another circuit breaker in the backup circuit has tripped.</p>	<p>Contact your installer and have the electrical wiring and the connected electrical consumers checked for faults. Switch on the affected circuit breaker once any faults are corrected.</p>
<p>Backup operation stops. The miniature circuit breaker (MCB) in the supply line to the sonnenProtect and the circuit breakers in the backup circuit have not tripped. The Eclipse on the storage system pulses orange. The illuminated switch on the sonnenProtect lights up.</p>	<p>Electrical consumers with too high of a power consumption are connected to the backup circuit.</p>	<p>Switch off electrical consumers in the backup circuit or reduce their power consumption. Press the illuminated switch on the sonnenProtect for approx. 2 seconds. Backup operation restarts. Only connect electrical consumers to the backup circuit when they have a power consumption that does not exceed the maximum power (see Technical data [P. 39]).</p>

11 Technical data

11.1 sonnenBatterie 10

System data (AC)		sonnenBatterie 10				
General	Nominal voltage	230 V				
	Nominal frequency	50 Hz				
	Nominal power ²	4,600 W				
	Nominal current	20 A				
	Power factor range	0.9 capacitive ... 0.9 inductive				
	Network Impedance (Z_{max})	R: 0.35 Ω; X: 0.22 Ω				
	Current (Max. continuous)	20 A				
	Max. output fault current	120 mA				
	Inrush current	0 A				
	Mains connection	single-phase, L / N / PE				
	Max. ext. overcurrent protection	25 A, 1ph				
	Mains topology	TN / TT				
	Mains connection fuse	Miniature circuit breaker Type B 20 - 25 A				
Depends on capacity ³ with sonnenModule 3	sonnenBatterie	10/5,5	10/11	10/16,5	10/22	10/27,5
	Nominal capacity	5.5 kWh	11 kWh	16.5 kWh	22 kWh	27.5 kWh
	Usable capacity	5 kWh	10 kWh	15 kWh	20 kWh	25 kWh
	Charging/discharging power ⁴	3,400 W	4,600 W	4,600 W	4,600 W	4,600 W
	Charging/discharging current	14.8 A	20 A	20 A	20 A	20 A
with sonnenModule 4	sonnenBatterie	10/5,5	10/11	10/16,5	10/22	10/27,5
	Nominal capacity	-	11 kWh	-	22 kWh	-
	Usable capacity	-	10 kWh	-	20 kWh	-
	Charging/discharging power ⁵	-	4,600 W	-	4,600 W	-
	Charging/discharging current	-	20 A	-	20 A	-
Battery data (DC)	Cell technology	lithium iron phosphate (LiFePO4)				
	Nominal voltage	102.4 V				
	Working voltage	204.8 V				
	Current (Max. continuous)	40 A				
	Short-circuit current	50 A				
	Min. number of battery modules	2				
	Max. number of battery modules	10				
Safety	Protection class	I / PE conductor				
	Required fault current monitoring	In TT networks: Residual current device (RCD) with a rated differential current of 300 mA; requirements on site must be observed.				

² at cos phi = 1

³ from 16.5 kWh: storage system with extension

⁴ at cos phi = 1

⁵ at cos phi = 1

Degree of Protection	IP30
Overvoltage category	2
Rated short-withstand current	10 kA
Separation principle	no galvanic isolation, transformer-less
Fulfilled standards and directives	AS/NZS 4777.2; CEI 0-21; EMC Directive 2014/30/EU; G98/99; IEC 61000-6-1; IEC 61000-6-3; IEC 62040-1; IEC 62109-1; IEC 62619; Low Voltage Directive 2014/35/EU; UN 38.3; VDE-AR-E 2510-2; VDE-AR-N 2510-50; VDE-AR-N 4105

Power measurement	Voltage measurement inputs	Nominal voltage (AC): 230 V (L-N), 400 V (L-L) max. connectible conductor cross-section: 1.5 mm ²
	Clamp-on current transformer	Max. measurable current: 60 A (standard), optional up to 400 A

Dimensions/weight⁶	sonnenBatterie	10/5,5	10/11	10/16,5	10/22	10/27,5	
	Dimensions (H/W/D) in cm	172-184/69/27					2 x 172-184/69/27
	Height without feet in cm						161
	Weight with sonnenModule 3 in kg	115	172	268	325	382	
	Weight with sonnenModule 4 in kg	-	138	-	257	-	

Ambient conditions	Environment	Indoor (conditional)
	Operating temperature range ⁷	-5 °C ... 45 °C
	Storage temperature range	0 °C ... 40 °C
	Transport temperature range	-15 °C ... 50 °C
	Max. rel. humidity	85%, non-condensing
	Permissible installation altitude	2,000 m above sea level
	Pollution degree	2

Requirements for the installation location

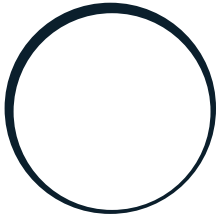
- No direct sunlight.
- No danger due to flooding.
- No corrosive and explosive gases. The maximum permissible ammonia content is 20 ppm.
- No dust, especially flour dust or sawdust.
- No vibrations.
- Ventilation possible.
- Free space available.
- Floor is suitable for heavy loads.
- Observe all fire control standards.
- Observe applicable local building codes.
- Smoke detectors must be installed both at the installation location and in bedrooms.

⁶ From 16.5 kWh: storage system with extension

⁷ Optimal: 5 °C ... 30 °C | Derating possible below 5 °C / above 30 °C.

11.2 sonnenProtect 4000 (optional)

System data (AC)	sonnenProtect 4000	
	with sonnenBatterie	10/5.5
Nominal power	3,000 W	4,000 W
Nominal frequency	50 Hz	
Output voltage	230 VAC +/- 10 %	
Overload (30 min.)	max. 3,400 W	max. 4,600 W
Power factor range	0 capacitive ... 0 inductive	
Max. output current (duration/100 ms)	20 A / 23 A	
Short-circuit current	40 A	
Network configuration in emergency operation	TN	
Mains connection	single-phase, L / N / PE	
Mains connection fuse	Miniature circuit breaker Type B 20 A	
Operating concept	Single-phase power supply via emergency circuit(s). The switch to emergency operation takes place automatically through the storage system.	
Switchover time	approx. 5 seconds	
Threshold power	none (starting from 0 W)	
Dimensions/weight	Dimension (H/W/D) in cm	52/23/12
	Weight in kg	approx. 10
Safety/protective devices	Protection class	II
	Degree of Protection	IP65
	Overvoltage category	2
	Required fault current monitoring	Residual current device (RCD) with a rated differential current of max. 300 mA; requirements on site must be observed.
Ambient conditions	Environment	Indoor/Outdoor
	Pollution degree	3
	Operating temperature range	-5 °C ... 50 °C
	Max. rel. humidity	100%, condensing
	Permissible installation altitude	2,000 m above sea level
	Additional ambient conditions	The ambient conditions prescribed for the storage system apply.



sonnen

energy is yours