Operating instructions for Operators

sonnenBatterie 10 performance+

Document no. 857 • Part no. 1003515 • Version 02 • **sonnengroup.com**

EN

IMPORTANT

→ This entire document must be read carefully.

→ This document must be kept for reference purposes.

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Document

Document number / Version 857 / 02

Part number / Revision 1003515 / 02

Valid for DE, AT, CH

Publication date 17/07/2025

Latest version can be accessed at **https://documents.sonnen.de/s/user-manual-sB10p-plus-en**

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1 Information about this document

→ Make sure you read this entire document carefully.

→ Keep this document for reference purposes.

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 performance+	Storage system
sonnenModule 4	Battery module
Authorised electrician	Electrician performing the installation/ Installer
Person who purchased the storage system and on whose premises the system is installed	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.**
ⓘ INFO	**Important information not associated with any risks to people or property.**

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

1.4 Change history

Version / Date	Changes compared to the previous version
02 / 16-07-2025	Use exclusively in the local customer network defined (see Operating the storage system [P. 15]).

Version / Date	Changes compared to the previous version
	Information on the digital welcome page [P. 24] added.
	Request for installation location added (see technical data).
01 / 05-12-2024	House connection size for use of emergency power function [P. 26] increased.
	Information on switching off the storage system [P. 16] with emergency power function added.
	Values added to the Technical data [P. 37] section.
00 / 14-10-2024	Initial creation.

1.5 Further information

ⓘ INFO	Information on the EU battery regulation: https://sonnengroup.com/eu-battery-regulation/

2 Safety

2.1 Proper use

The sonnenBatterie 10 performance+ is a battery storage system which can be used to store electrical energy and, when using the integrated emergency power function, can maintain the power supply in the event of a power failure.

Incorrect or improper use can result in danger to life and limb of the user or third parties or damage to the product and other property.

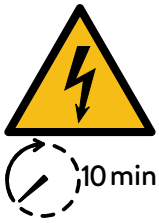
The following points must be observed at all times in order to ensure **proper use**:

- 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 authorized 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.
- The storage system must not be used long-term without connection to the public electricity grid.
- Generators (e. g. a PV system) must never be connected to the output of the emergency power function.
- 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 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.
- 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.

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

2.2 Qualified electricians

The storage system must be installed and commissioned 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 has successfully completed the sonnen certification training.

2.3 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 or burns to skin, eyes, respiratory tract and mucous membranes due to steam or smoke from burning battery modules.
- Irritation of skin, eyes, respiratory tract and mucous membranes due to leaking electrolyte.

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.

2.4 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, seek medical attention.
3. Contact the sonnen service team (+49 8304 92933 444).

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 (+49 8304 92933 444).

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 400 V (AC) and 204.8 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 operating voltage of 204.8 V (DC).
- The battery modules do not contain metallic lithium.

ⓘ INFO	Further information can be found in the 'Information sheet for emergency services – Use on stationary lithium solar energy storage systems'('Merkblatt für Einsatzkräfte – Einsatz an stationären Lithium-Solarstromspeichern', published by the German Solar Association).

2.5 Symbols on the product

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

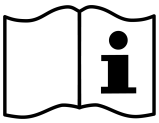
Warning: flammable materials.

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.

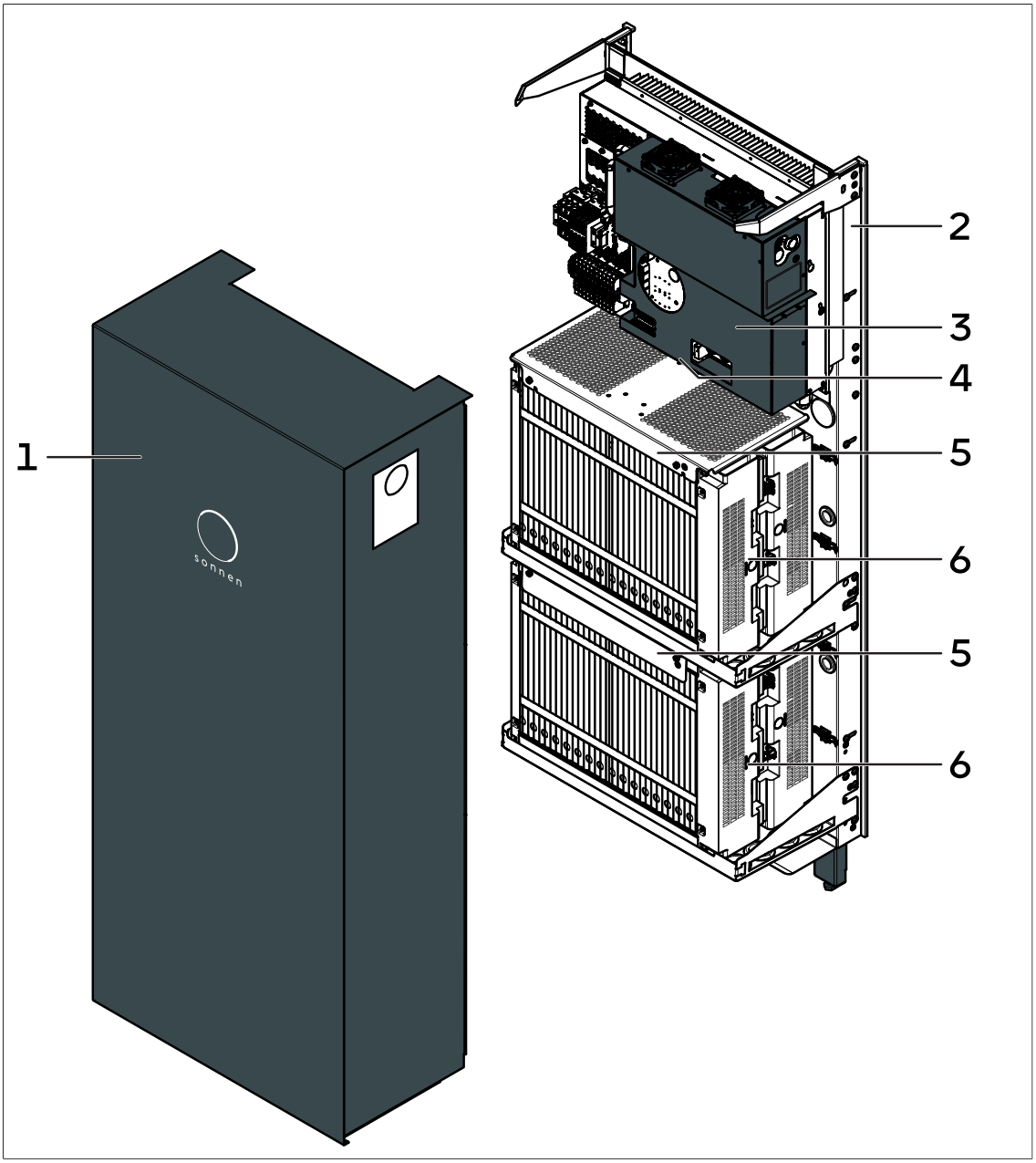
Protective earthing. Labelling of earthing points.

3 Product description

3.1 System components

The storage system comprises multiple components, which are assembled at the installation location for the storage system and installed there. The components of the storage system are described in the following.

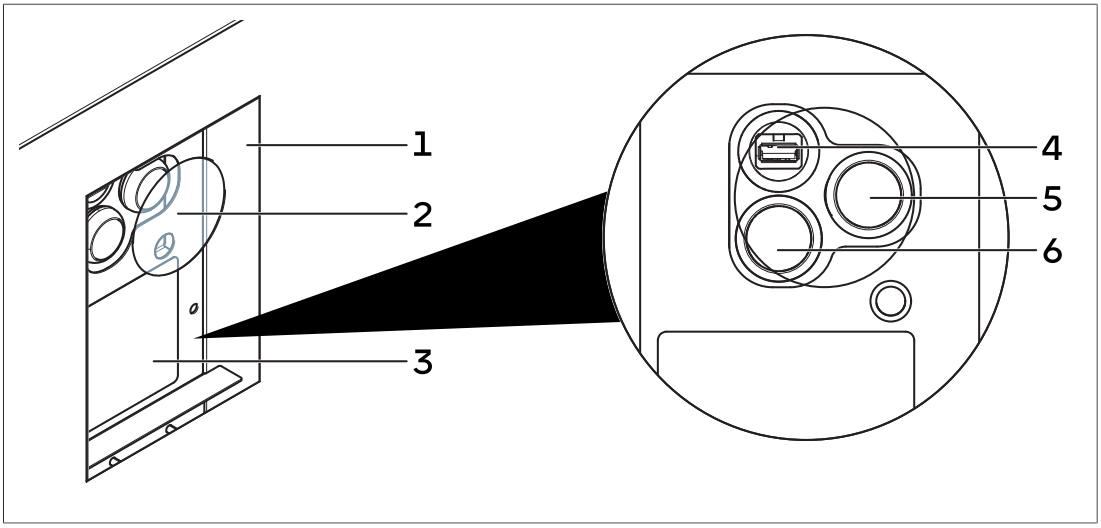
Overview of storage system



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 emergency power function and switch panel.

No.	Designation	Function
4	Cable entry	Sealed entry point for lines to be routed into the storage system from the back.
5	Battery holder	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	Switch cover	Silicone cap that can be removed for operating the storage system.
3	Type plate	Technical data and other information for identifying 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.
6	Illuminated switch	Button for restarting emergency power operation after an overload (if emergency power function is installed).

INFO 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. You need the information on the type plate for safe use and to obtain assistance from sonnen service if you have any questions. 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 and number
- Serial 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 performance+		
Extension set	Second mounting frame with cover. For installing up to six additional battery modules.	4000110 + 3000159
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
Clamp-on current transformer up to 400 A	For measuring and recording amperages higher than 60 A. Available for maximum amperages up to 100 A, 200 A or 400 A.	11215, 11216, 11659
Power meter EM357-EE	For integration of further measurement points in the power measurement.	1002221
Additional sonnen products for extending storage system functionality		
sonnenCharger	Charging station for electric vehicles for intelligent control by the storage system.	Different versions available
sonnenKNX modules	Mounting rail modules for integration of the storage system in a KNX infrastructure.	4000050

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/blue	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 emergency power function: storage system is in backup operation.
orange	pulsing	No internet connection. For storage systems with emergency power function: an overload has been detected in backup operation.
red	constant	Problem detected. → Contact the electrician who installed the storage system or the sonnen service team!

3.5 Activating the warranty

During first-time commissioning, the electrician performing the installation runs the commissioning wizard in order to configure all of the important settings for the storage system. Certain personal information is also supplied, so that the storage system can be assigned to the customer and the installation is documented. The successful completion of the commissioning wizard 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.

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, 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.

ⓘ INFO

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

ⓘ INFO

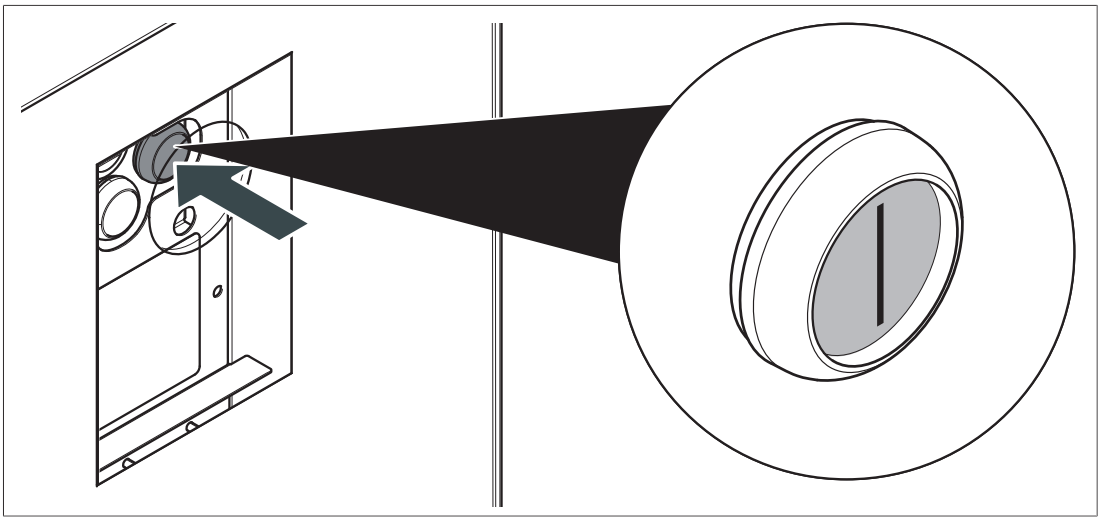
The storage system is intended exclusively for use within the local customer network. It must not be made accessible from the public Internet under any circumstances. Improper configuration or exposure to the internet may result in significant security risks, including unauthorized access, data loss, or system compromise.

4.1 Switching the storage system on

ⓘ INFO

The storage system can only be switched on if the public grid 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

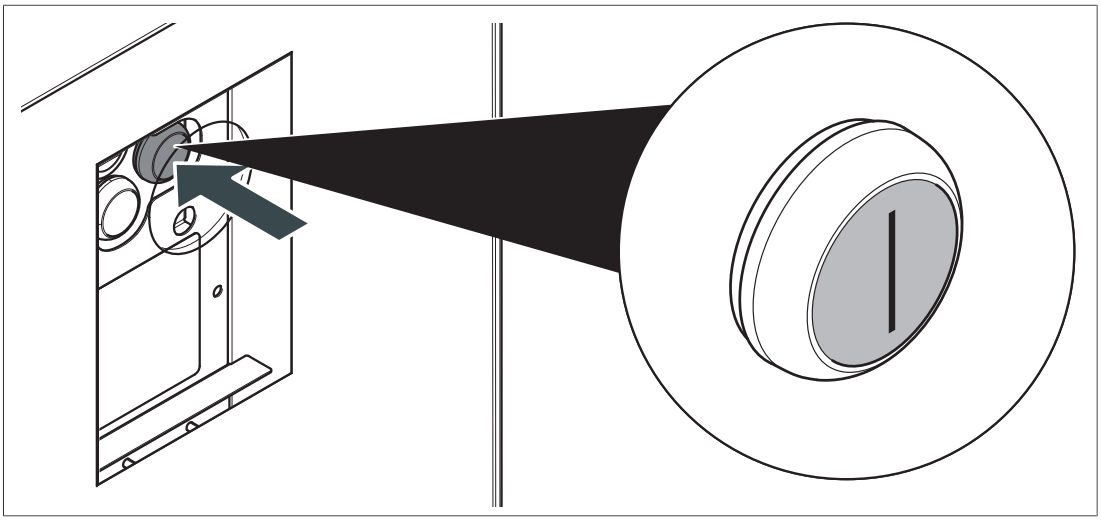
Destruction of the battery modules!

→ 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.

INFO

If the **storage system** is installed **with emergency power function**, switching off the miniature circuit breaker de-energizes the entire house or all connected backup power circuits.



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

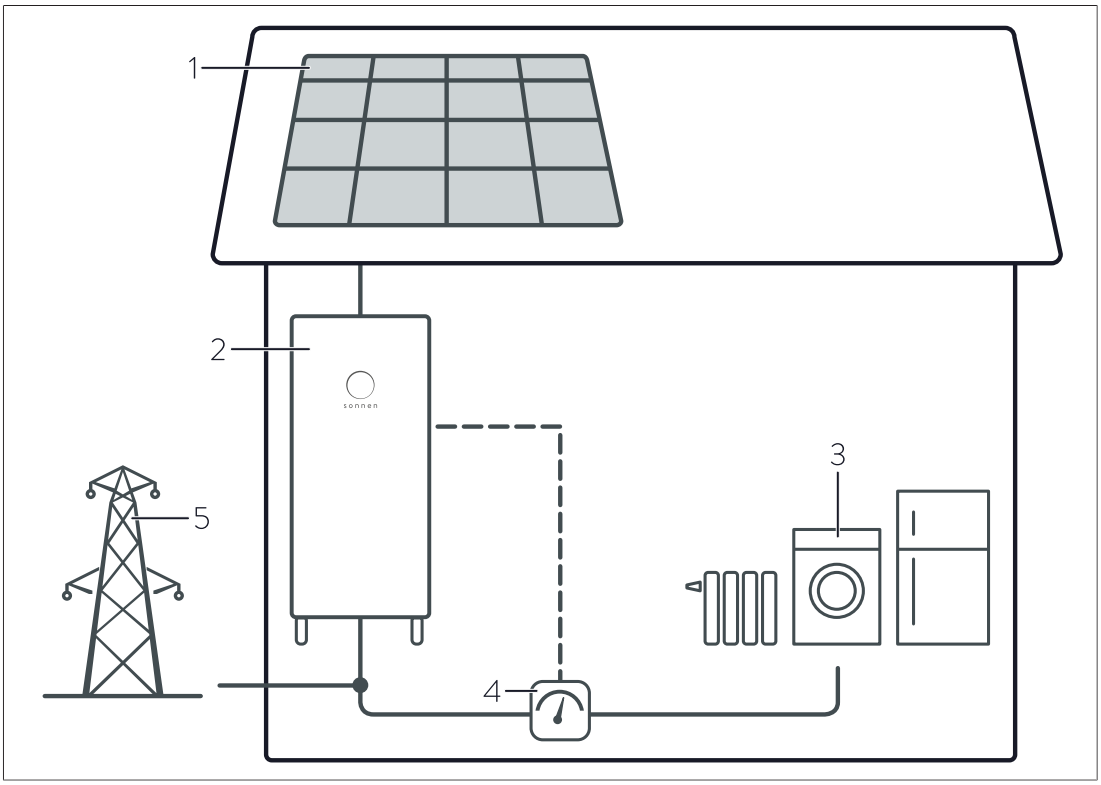


Illustration 1: sonnenBatterie function

1	PV system (optional: with external inverter)	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: 60 %
- Maximum feed-in power: 6 kW

In this example, the feed-in power of 6 kW must not be exceeded. The following figure shows an example of the PV system's production over the course of a day.

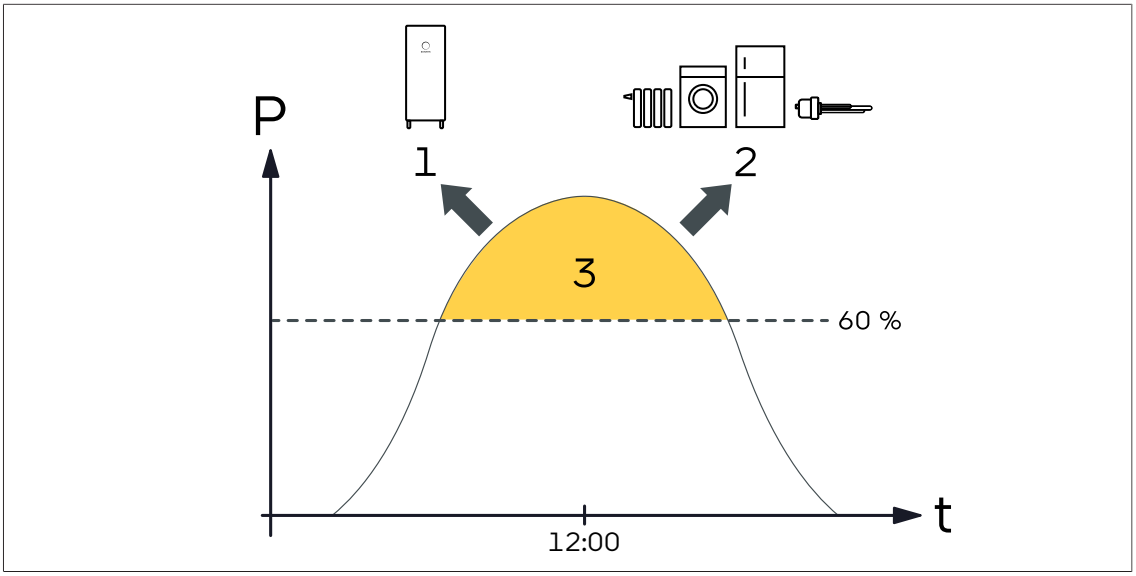


Illustration 2: Example: feed-in limit at 60 % of nominal power

1 Charging of storage system
2 Switch-on of consumers via self-consumption switch
3 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). 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. 20]).

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. A heating element can be activated, for example, using this permanently connected switch output.

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. This is also known as forecast-based charging. 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.

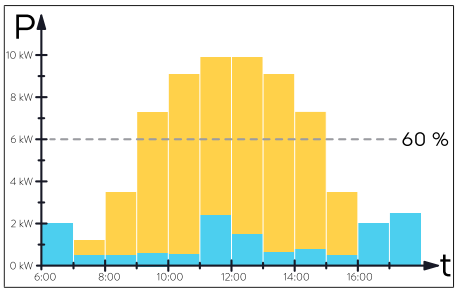


Illustration 3: Production forecast (yellow) and consumption forecast (blue)

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.

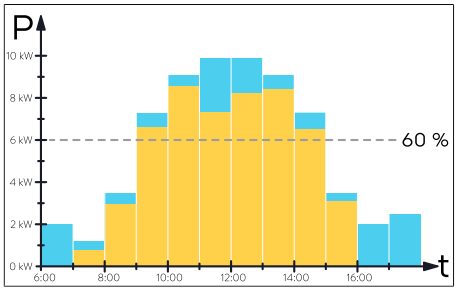


Illustration 4: Forecast surplus

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.

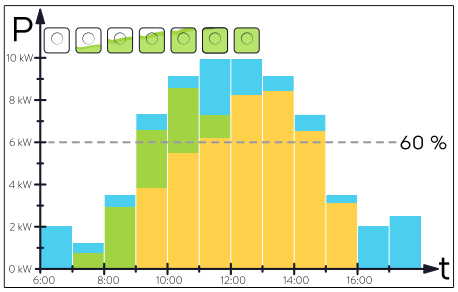


Illustration 5: Charging behaviour without intelligent charging management

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.

yellow	forecast production
blue	forecast consumption
green	charging of storage system

To stay within the Feed-in limit [P. 19], 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.

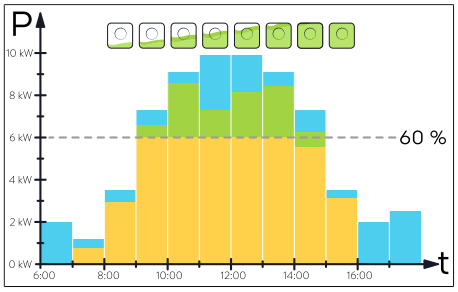


Illustration 6: Charging behaviour with intelligent charging management

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.

yellow	forecast production
blue	forecast consumption
green	charging of storage system

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.

5.4 Battery maintenance

To maintain the battery modules and therefore preserve their longevity, the storage system is regularly charged to 100 %.

Battery maintenance process and background

Depending on the system, deviations in the voltage and charge occur within the battery modules over time. Fully discharging and then charging the battery modules can counteract this effect, and this process is necessary to ensure the longevity of the storage system battery.

In summer months, the PV system production ensures that the battery modules are regularly fully charged. In winter months, PV system production is often not sufficient to fully charge the storage system, which is why battery maintenance is performed. Battery maintenance is performed by the storage system as often as necessary, especially during times when there is heavy snow and/or very short periods of sunlight.

Duration of battery maintenance

Battery maintenance usually takes around 24 hours, but it may take several days in individual cases.

Visualisation of battery maintenance

If battery maintenance is carried out, it is possible that the charge status line in the diagram of the storage system does not change for an extended period of time and then increases sharply.

More information

A detailed description of battery maintenance can be found at sonnen.de/batteriepflege-sonnenbatterie.

5.5 Regular software updates

Regular software updates are performed to keep the storage system up to date and minimise potential malfunctions.

Software update procedure and background

Software updates are sent to the storage system via the internet once per quarter and then automatically installed.

The software updates are gradually distributed to all storage systems over a period of several days or weeks; there is no set day and/or time for the updates.

Software update duration

A software update generally takes 10 minutes or less to install. It may take longer if the internet connection is poor.

Software update visual indicators

When a software update is being installed on the storage system, the sonnen Eclipse goes out for the duration of the update. The storage system then goes back to the status it had before the software update and the sonnen Eclipse responds accordingly.

The flow chart (on the internet portal) indicates a software update by a small gap in the drawings.

More information

Information on which software version is currently installed on your storage system can be found on the sonnen app or the internet portal (go to sonnenBatterie > Details). You will also find a link to the version notes there, which describe the changes implemented in the respective software version.

6 Digital sonnen world

Purchasing the storage system gives you access to digital products from sonnen. You have the following options to monitor the storage system and other sonnen products live and to make adjustments to the settings:

sonnen app

You can access the sonnen app at any time from home or on the go. It provides a detailed yet clear overview of products and contracts, data on electricity consumption and generation, energy services and your involvement in the sonnenCommunity.

Find out more here: Use the sonnen app [P. 24]

Digital welcome page

Here you will find information on the first steps after installing your sonnenBatterie, information on sonnen's extensive product range and helpful links: http://sonnen-group.com/welcome

Internet portal

You will still be able to access the internet portal online. In addition to an overview of your products and contracts, it also provides information on the sonnenCommunity and the energy services of sonnen.

Use the following link to access the internet portal: my.sonnen.de

6.1 Logging into the sonnen app

In order to use the sonnen app, you need a sonnen user account. To log in or register, first download the app to your mobile device:

→ Use the code on the right to access the sonnen app download page in the App Store.

→ Install and open the sonnen app.

→ Click on the corresponding button to log in with your existing user account or to register again. The user account is the same as the one used when using the internet portal.

6.2 Use the sonnen app

Homescreen

The Homescreen is the main access point to the sonnen app.

Here you can get an overview of the energy status in your home, manage all your sonnen products, see the successes and discover other useful functions.

→ Tap the battery symbol to view all information about the status and current charge of your storage system.

→ Tap on the horizontal lines to view the detailed data view and an evaluation of the last few hours.

→ Select emergency buffer (if available) to determine the minimum energy reserve of your storage system and adapt it to your personal needs.

Real-time View

For a detailed overview of the energy generated and consumed at the current time, tap the Live Flow of Energy area. Here you get a real-time overview of where electricity is generated and where the energy flows.

Historical Data

A precise analysis of the energy generated and consumed can be found in the Historical Data section. Here you can find an overview of energy consumption, degree of self-sufficiency and contribution to the sonnenCommunity for selected dates or periods. The battery diagram shows you when the storage system was charged or discharged and when it was in battery maintenance mode. During battery maintenance, it is possible that the charge status line (green) does not change for an extended period of time and then increases sharply.

Energy tariff

The sonnen App gives you access to flexible booking of our electricity tariffs and energy solutions - sustainable, cost-efficient and tailored to your individual needs. Of course, you also have access to your contract management, contract details and invoices at any time via the app.

Help & Support

For help with the sonnen app and sonnen products, please go to Help & Support. Here you will find answers to frequently asked questions or you can send a support request directly to sonnen and also check the status of the requests.

7 Emergency power function (optional)

- Both when the sonnenBatterie 10 performance+ is first being installed and after the fact, the emergency power function can be added to the system.

→ Observe the Safety [P. 7] information for the storage system at all times!

Connection options for the storage system with emergency power function

The emergency power function of the storage system is designed as standard to provide backup power for all three phases of an entire household in the event of a grid outage (**connection option 1**). This is possible for house connections with a **maximum fuse rating of 63 A** per phase. However, the thermal throughput must not exceed 30 kW.

If the building has a larger connection, three-phase **backup circuits** must be installed **separately** (**connection option 2**). In this case, when there is a grid outage only the electrical consumers connected to the backup circuits are supplied with electricity from the storage system.

Both connection options can be implemented as a standalone power system (also known as an AC microgrid) using an electrical generator (e.g. PV system) (see Standalone operation – grid outage (with AC microgrid)).

→ The installing electrician decides together with the operator which connection option is to be used based on the on-site conditions and installs the storage system with emergency function accordingly.

7.1 Switching the emergeny power function on/off

Switching on the emergency power function

The emergency power function becomes active as soon as the storage system is properly commissioned and switched on (see Switching the storage system on [P. 15]).

→ Ensure that the circuit breaker in the supply line of the storage system is switched on

Switching off the emergency power function

To switch off the emergency power function, the storage system must be switched off.

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

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

7.2 Function

A storage system with emergency power function automatically switches from grid to backup operation or stand-alone operation (with AC island) and vice versa. The various operating states are described below.

7.2.1 Grid operation - no grid outage

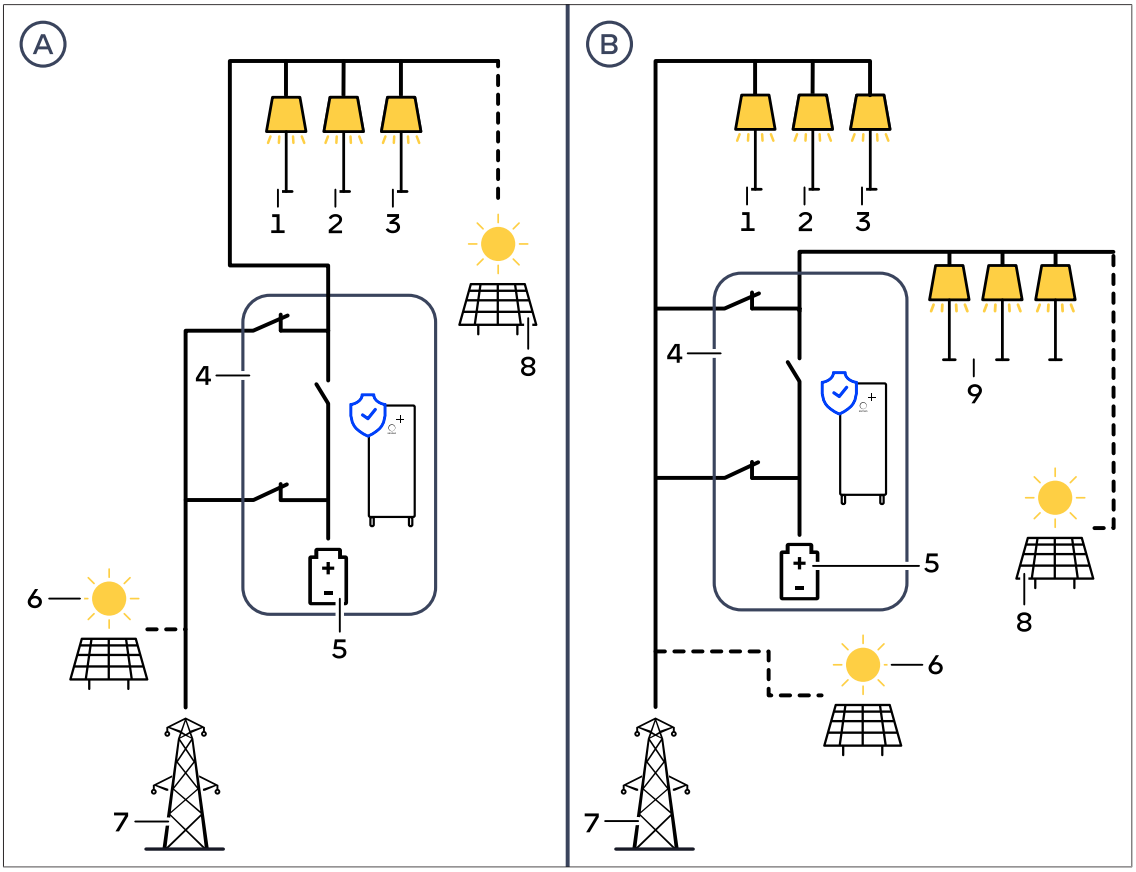


Illustration 7: Normal operation - no grid outage (A: connection option 1; B: connection option 2)

1	Consumers connected to phase L1	6	PV system
2	Consumers connected to phase L2	7	Public electricity grid
3	Consumers connected to phase L3	8	PV system (for AC Microgrid)
4	Storage system with emergency power function	9	Consumers connected to backup circuit(s) (phase 1-3)
5	Storage system battery		

The electrical consumers are connected to the public electricity grid at phase 1 to phase 3 in grid operation. With connection option 2, electrical consumers are also connected to the three phases of the backup circuit(s) and then to the public electricity grid.

An electrical generator such as a PV system (9) must be positioned behind the storage system with emergency power function in the building mains for AC microgrid function. This electrical generator can be the only generator in the building mains, but two (or more) PV systems (7, 9) can also be used for power production.

All consumers in the building are supplied with electrical power. The storage system controls the flow of energy in the building, as described in the storage system product documentation.

7.2.2 Backup operation - grid outage (without AC microgrid)

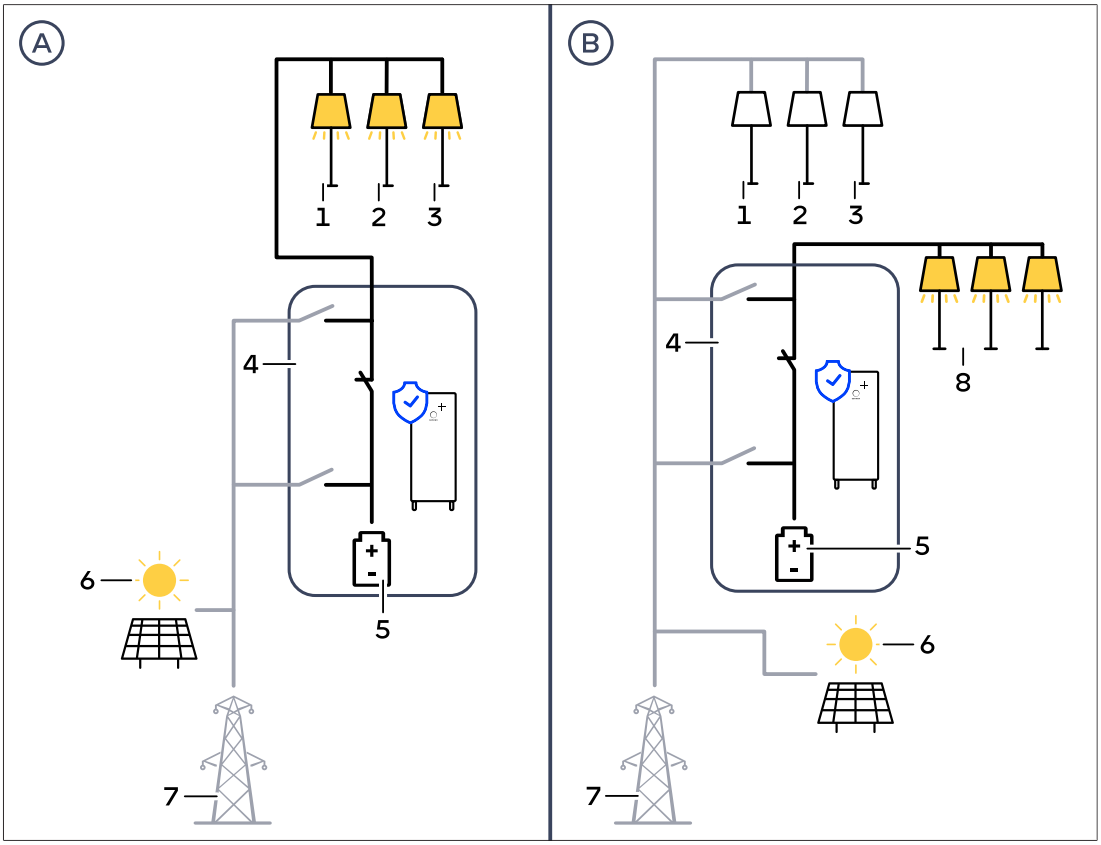


Illustration 8: Backup operation - grid outage (A: connection option 1; B: connection option 2)

1 Consumers connected to phase L1
2 Consumers connected to phase L2
3 Consumers connected to phase L3
4 Storage system with emergency power function
5 Storage system battery
6 PV system
7 Public electricity grid
8 Consumers connected to backup circuit(s) (phase 1-3)

The storage system with emergency power function automatically detects a grid outage. As soon as the mains voltage drops to approx. 180 V, the connection to the public electricity grid is disconnected.

Backup power is generated by the storage system after approx. 10 s. With connection option 1 (A), the consumers connected to phases 1-3 in the building are supplied with electrical power this way.

With connection option 2 (B), the electrical consumers connected to the backup circuit(s) are supplied with backup power. Consumers connected to phases L2, L2 or L3 are not supplied with electrical power.

The switch from grid to backup operation or standalone operation is indicated on the storage system by the sonnen Eclipse (light ring). The colour of the sonnen Eclipse changes from **white** (normal operation) to **green** (backup/standalone operation)

As soon as the public electricity grid is back up and running, the storage system switches back to grid operation.

Automatic stop of backup operation

The storage system continues to provide electrical power until a minimum battery charging status is reached. From this point on, no further discharge is allowed, and the backup operation stops completely.

7.2.3 Standalone operation - grid outage (with AC microgrid)

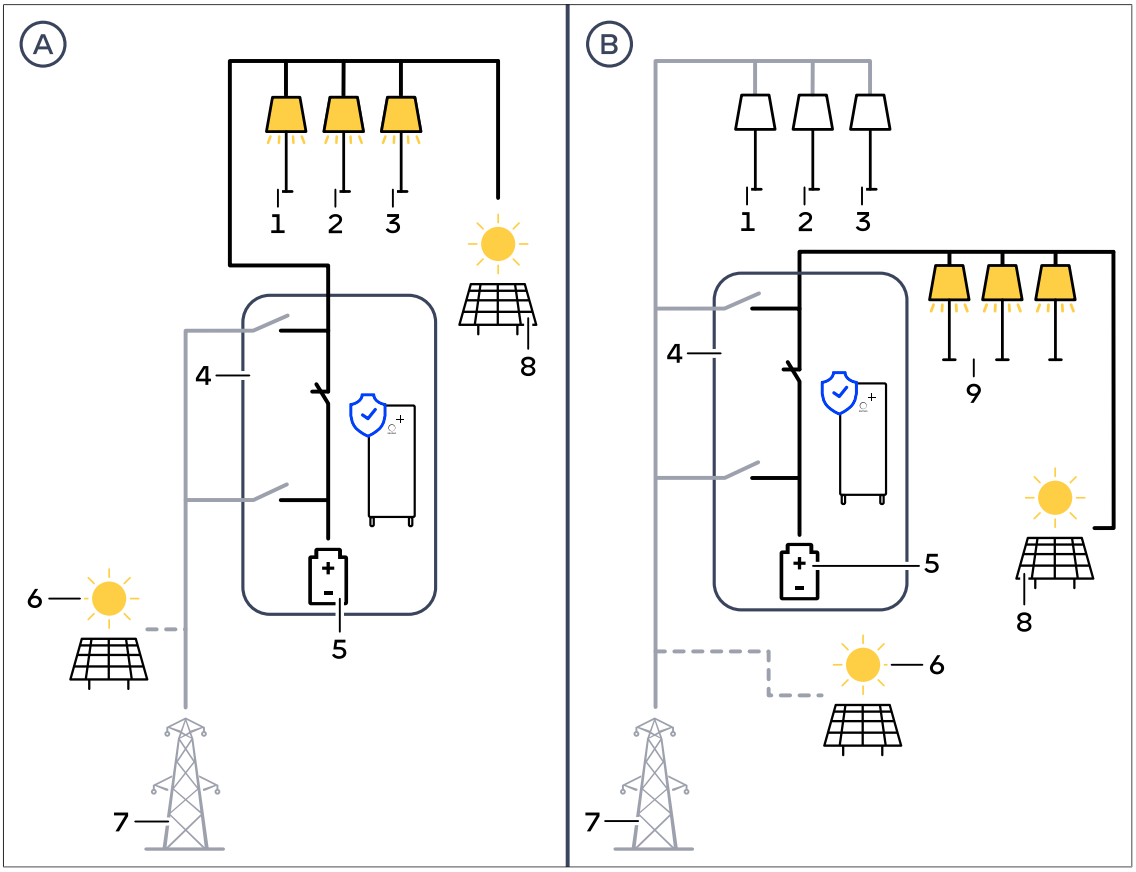


Illustration 9: Standalone operation - grid outage with AC Microgrid (A: connection option 1; B: connection option 2)

1	Consumers connected to phase L1	6	PV system
2	Consumers connected to phase L2	7	Public electricity grid
3	Consumers connected to phase L3	8	PV system (for AC Microgrid)
4	Storage system with emergency power function	9	Consumers connected to backup circuit(s) (phase 1-3)
5	Storage system battery		

The storage system with emergency power function automatically detects a grid outage. As soon as the mains voltage drops to approx. 180 V, the connection to the public electricity grid is disconnected.

Backup power is generated by the storage system after approx. 10 s. With connection option 1 (A), the consumers connected to phases 1-3 in the building are supplied with electrical power this way.

With connection option 2 (B), the electrical consumers connected to the backup circuit(s) are supplied with backup power. Consumers connected to phases L2, L2 or L3 are not supplied with electrical power.

The electrical generator (e.g. PV system) also produces electrical power after a manufacturer-specific switch-on time if there is PV production. This power is used to supply the electrical consumers or charge the battery modules of the storage system, depending on what the building needs are.

The switch from grid to backup operation or standalone operation is indicated on the storage system by the sonnen Eclipse (light ring). The colour of the sonnen Eclipse changes from **white** (normal operation) to **green** (backup/standalone operation)

As soon as the public electricity grid is back up and running, the storage system switches back to grid operation.

Automatic stop and start of standalone operation

The storage system continues to provide electrical power to the consumers until a minimum battery charging status is reached and there is no (or no sufficient) PV generation. From this point on, no further discharge is allowed, and the backup operation stops completely.

The storage system tries to restore standalone operation at predefined restart times by checking whether there is sufficient PV production to supply the active electrical consumers with power.

To increase the possibility of standalone operation restarting, there should be as few electrical consumers in the building at the restart time(s) as possible. Therefore:

→ Switch off electrical consumers with high power consumption (e.g. heating, lighting, pumps, compressors).

Overload protection through frequency shift

To ensure that the standalone operation is not switched off as battery modules are getting full and cannot take the pv surplus energy anymore, the storage system inverter increases the frequency from 50 Hz to 52.2 Hz when the state of charge (SOC) reaches a level greater than or equal to 91 %.

The PV inverter detects this frequency increase and stops production and therefore charging of the storage system battery modules. The electrical consumers in the building are supplied with power from the storage system battery modules from this point in time.

The frequency is reset to 50 Hz and production starts up again when the state of charge of the battery modules drops below 85 % and standalone operation is active again.

7.2.4 Backup operation – overload detection

- The illumination of the illuminated switch indicates that the electrical consumers connected to the emergency power function 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 or do not connect any electrical consumers if their power consumption exceeds the nominal power or (when switching on) the maximum power of the backup operation.

→ Press the illuminated switch for approx. 2 seconds.

⇨ Backup operation has started successfully when the illuminated switch no longer lights up.

ⓘ INFO	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. 34].

7.2.5 Backup buffer

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

- The emergency buffer is initially set by the electrician performing the installation when the storage system is commissioned with the emergency power function.

7.2.6 AC microgrid reenabling time

The reenabling times define the three times at which the storage system tries to restore standalone operation by checking whether the PV system is producing enough electricity to start the storage system and supply the active electrical consumers with power. The times are selected based on the on-site circumstances (PV system power, PV system orientation).

- The reenabling time is initially set by the electrician performing the installation when the storage system is commissioned with the emergency power function.

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 1: 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.

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.

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.

→ Only transport damaged battery modules in accordance with the applicable regulations.

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

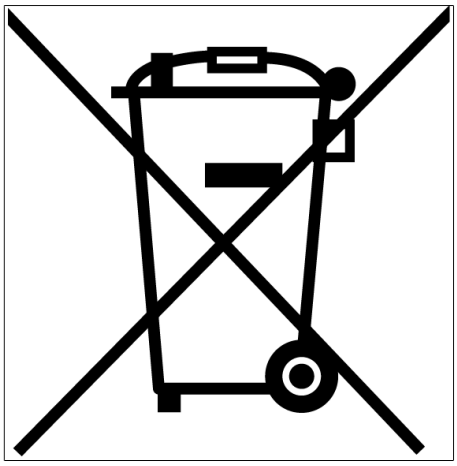


Illustration 10: WEEE symbol

→ Dispose of the storage system and the batteries it contains 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 performance+

Fault	Possible cause(s)	Solution
The sonnen Eclipse of the storage system pulses white.	The storage system is in normal operation.	No troubleshooting 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.	→ Check that the circuit breaker in the supply line of the storage system is switched on. If so: The public electricity grid does not provide any electrical energy (grid outage). → It can only be waited until the public electricity grid supplies energy again. Thereafter, the storage systems resumes normal operation.
The sonnen Eclipse of the storage system pulses orange.	The internet connection to the storage system has been interrupted.	→ Check whether the home network router is able to establish an internet connection. If so: → Ensure that the network line 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.	→ Contact your installer or the sonnen service team to get help resolving the problem.
No online connection to the storage system.	No connection between the storage system and the server.	→ Make sure that the ethernet line between the storage system and the router of the home network is correctly connected. → Make sure that the TCP or UDP ports of the following services are enabled for outgoing connections in the router: **TCP ports:** 443 (https) **UDP ports:** 123 (NTP); 1194, 1196 (VPN); 5353 (zeroconf)

10.2 sonnenBatterie 10 performance+ with emergency power function

Fault	Possible cause(s)	Solution
Grid operation (no grid outage)		
The electrical consumers are not supplied with energy in grid operation.	The lines have not been correctly connected.	→ Contact your installer and have the electrical wiring checked.
	The MCB in the supply line to the storage system is switched off.	→ Switch on the MCB.
	The RCD or another circuit breaker is switched off.	→ Switch on all circuit breakers.
	The RCD or another circuit breaker 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.
	Problem in the power module of the storage system.	→ Contact your installer to get help resolving the problem. To ensure the power supply to the house during this time: ***With change over switch:*** → Set the change over switch to grid operation. ***Without change over switch:*** → Contact your installer so that they can carry out the manual bypass in the storage system.
Backup operation (grid outage) – backup operation does not start		
Backup operation does not start. The sonnen Eclipse pulses **green** and switches **off** after several minutes. The illuminated switch **does not light up**.	No backup buffer is 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.	When the grid outage is over and the public electricity grid once again begins supplying electrical energy, the storage system automatically switches to grid operation.
	With AC Microgrid: The PV system produces no or insufficient electrical energy to start the backup operation.	***With AC Microgrid:*** If the PV system produces sufficient electrical energy at one of the defined reenabling times and the grid outage continues, the backup operation starts again.
	The storage system is switched off.	→ Switch on the storage system.
Backup operation does not start. The sonnen Eclipse pulses **green**. The illuminated switch **does not light up**.	The residual current device (RCD) or another circuit breaker is switched off.	→ Switch on all circuit breakers.
	The residual current device (RCD) or another circuit breaker 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 sonnen Eclipse pulses **orange**. The illuminated switch **lights up**.	Electrical consumers with too high of a power consumption are connected to the circuit.	→ Switch off electrical consumers or reduce their power consumption.

		→ Press the illuminated switch for approx. 2 seconds. Backup operation restarts. → Only connect electrical consumers when they have a power consumption that does not exceed the maximum power (see Technical data [P. 37]).
Backup operation does not start. The sonnen Eclipse and the illuminated switch **do not light up**.	Problem in the power module of the storage system.	→ Contact your installer to get help resolving the problem. To ensure the power supply to the house during this time: ***With change over switch:*** → Set the change over switch to grid operation. ***Without change over switch:*** → Contact your installer so that they can carry out the manual bypass in the storage system.
Backup operation (grid outage) – backup operation stops		
Backup operation stops. The miniature circuit breaker (MCB) in the supply line and the circuit breakers in the circuit have not tripped. The sonnen Eclipse pulses **green** and goes **off** after several minutes. The illuminated switch **does not light up**.	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 ***With AC Microgrid:*** The PV production of the PV system has stopped or has decreased to such an extent that there is not enough electrical energy available for backup operation.	When the grid outage is over and the public electricity grid once again begins supplying electrical energy, the storage system automatically switches to grid operation. → ***With AC Microgrid:*** If the PV system produces sufficient electrical energy at one of the defined reenabling times and the grid outage continues, the backup operation starts again.
Backup operation stops. The miniature circuit breaker (MCB) in the supply line or a circuit breaker in the circuit has switched off. The sonnen Eclipse on the storage system pulses **green**. The illuminated switch **does not light up**.	The residual current device (RCD) or another circuit breaker 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 stops. The miniature circuit breaker (MCB) in the supply line and the circuit breakers in the backup circuit have not tripped. The sonnen Eclipse pulses **orange**. The illuminated switch **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 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. 37]).

11 Technical data

11.1 sonnenBatterie 10 performance+

		sonnenBatterie 10 performance+
System data (AC)		
General	Nominal voltage	400 V
	Nominal frequency	50 Hz
	Nominal power*[1]	12,000 W
	Apparent power	12,000 VA
	Nominal current	17.4 A
	Max. inverter efficiency	97.2 %
	Power factor range	0.9 capacitive ... 0.9 inductive
	Max. THD	4 %
	Max. continous current	17.4 A
	Max. output fault current	120 mA
	Inrush current	3 A
	Mains connection	three-phase, L1 / L2 / L3 / N / PE
	Max. ext. overcurrent protection	20 A, 3ph
	Mains topology	TN / TT
	Mains connection fuse	Miniature circuit breaker | Type B | 20 A
	Self-consumption	37 W
	Noise emission	max. 34 dB(A)

Depends on capacity[2]	sonnenBatterie	10p+/11	10p+/22	10p+/33	10p+/44	10p+/55
	Number of battery modules	2	4	6	8	10
	Nominal capacity	11 kWh	22 kWh	33 kWh	44 kWh	55 kWh
	Usable capacity	10 kWh	20 kWh	30 kWh	40 kWh	50 kWh
	Charging/discharging power*	7,000 W	12,000 W	12,000 W	12,000 W	12,000 W
	Charging/discharging current	10.1 A	17.4 A	17.4 A	17.4 A	17.4 A

Battery data (DC)	Cell technology	lithium iron phosphate (LiFePO4)
	Nominal voltage	102.4 V
	Operating voltage	204.8 V
	Current (Max. continous)	40 A
	Short-circuit current (I_{SC})	80 A
	Max. battery efficiency	95.9 %
	Min. number of battery modules	2
	Max. number of battery modules	10

Emergency power function	sonnenBatterie	10p+/11	10p+/22	10p+/33	10p+/44	10p+/55
	Nominal power Discharging	5,000 W*	8,000 W*			
	Nominal power Charging	7,000 W*	8,000 W*			
	Overload (5 min)	5,500 VA	8,000 VA			
	Max. apparent power per phase	8,800 VA	9,600 VA			

[1] at power factor cos phi = 1

[2] from 33 kWh: storage system with extension

Safety	Mains connection fuse	Miniature circuit breaker 63 A max.[3]
	Switchover time	approx. 10 s
	Switchback time	approx. 3 s[4]
	Protection class	I / PE conductor
	Required fault current monitoring	In TT networks and for Easy Backup: In TT networks: Residual current device (RCD) with a rated differential current of max. 300 mA; requirements on site must be observed.
	Degree of Protection	IP30
	Overvoltage category	2
	Rated short-withstand current	10 kA
	Separation principle	no galvanic isolation, transformer-less
Regulatory requirements	Fulfilled standards and directives	IEC 60529; IEC 60730-1; IEC 61000-6-1; IEC 61000-6-3; IEC 62040-1; IEC 62109-1; IEC 62109-2; UN 38.8 / IEC 62281; IEC 62619; TOR Erzeuger; VDE-AR-E 2510-2; VDE-AR-N 2510-50; VDE-AR-N 4105
Power measurement with WM271	Voltage measurement inputs	Nominal voltage (AC): 230 V (L-N), 400 V (L-L) | max. connectible conductor cross-section: 1.5 mm²
	Clamp-on current transformer	Max. measurable current: 60 A (standard), optional up to 400 A
Power measurement with EM357	Voltage measurement inputs	Nominal voltage (AC): 230 V (L-N), 400 V (L-L) | connectible conductor cross-section: 1.5 mm²
	Measurable current	Max. 100 A

Dimensions/ weight[5]

sonnenBatterie	10p+/11	10p+/22	10p+/33	10p+/44	10p+/55
Dimensions (H/W/D)	172-184/69/36 cm		2 x 172-184/69/36 cm		
Height without feet	161 cm				
Total weight	166 kg	246 kg	376 kg	456 kg	536 kg

Ambient conditions	Environment	Indoor (conditional)
	Operating temperature range[6]	-5 °C ... 45 °C
	Storage temperature range	0 °C ... 40 °C
	Transport temperature range	-15 °C ... 50 °C
	Max. rel. humidity	90 %, 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.
- Easy access.
- Mounting surface (wall) is load-bearing, vertical, flat and made of non-combustible material.
- Floor is suitable for heavy loads.
- Observe all fire safety guidelines and regulations.
- Observe applicable local building codes.

[3] Max. thermal throughput: 30 kW

[4] After grid return the waiting time before switch back can be up to 5.5 minutes due to country-specific regulation.

[5] From 33 kWh: storage system with extension

[6] Optimal: 5 °C ... 30 °C | Derating possible below 5 °C / above 30 °C.

- Smoke detectors must be installed both at the installation location and in bedrooms. The smoke detectors must meet the requirements of the DIN EN 14604 standard.

https://documents.sonnen.de/s/user-manual-sB10p-plus-en

sonnen

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