Installation instructions | for authorised electricians

sonnenBatterie eco 8.2

EN

IMPORTANT

► **Read this documentation carefully before installation.**

► **Retain this document for reference purposes.**

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1 Information about this document

This document describes the installation of the sonnenBatterie eco 8.2.

Observe the following points:

► Read this document in its entirety before beginning the installation work.

► Keep this document in the vicinity of the sonnenBatterie.

1.1 Target group of this document

This document is intended for authorised electricians.

The actions described here must only be performed by authorised electricians.

1.2 Designations in this document

The following designations are used in this document:

Complete designation	Designation in this document
sonnenBatterie eco 8.2	storage system

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.
	Important information not associated with any risks to people or property.

Symbol	Meaning
►	Work step
1. 2. 3. ...	Work steps in a defined order
•	List

Table 1: Additional symbols

2 Safety

2.1 Intended Use

The sonnenBatterie eco 8.2 is a battery storage system which can be used to store electrical energy. Improper use of this system 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 therefore be observed in order to comply with the intended use of the product:

- The storage system must not be installed in any kind of combination.
- The storage system must be fully installed in accordance with the installation instructions.
- The storage system must be installed by an authorised electrician.
- The storage system must only be used at a suitable installation location.
- The transport and storage conditions must be observed.

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

2.2 Requirements for the electrician

The storage system must only be installed and commissioned by authorised electricians. Authorised electricians must meet the following criteria:

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

2.3 General safety information

► Only use the storage system in its original state – without any unauthorised modifications – and when it is in proper working order.

► An appropriate and readily accessible disconnect device shall be incorporated in the fixed wiring.

► Ensure that all protective devices are working properly.

2.3.1 Danger due to incorrect operation

Incorrect operation puts you and others at risk and could cause material damage.

► Read through these instructions and all further applicable documents carefully, paying special attention to the chapters on safety and warnings.

The device must not be opened during operation.

Manipulating the cabling inside can lead to short circuits/arcs during operation, thus posing a risk of burns and electrocution.

2.3.2 Danger to life due to explosive and flammable materials

► Do not use the storage system in potentially explosive environments.

2.3.3 About repairs on the storage system

All repairs on the storage system and the replacement of battery modules must be performed by authorised service technicians only. When replacing batteries, replace with the same type and number of batteries or battery modules.

2.3.4 Danger to life due to product modifications or changes to the product environment

► Never block or bypass the protective devices.
► Never modify the protective devices.
► Do not make changes to the storage system.
► Do not make changes to the electrical and data supply lines.

2.3.5 Conduct in case of a fire / Important information for fire services

Fire may occur with electrical equipment despite its careful design. Likewise, a fire in the vicinity of the equipment can cause the storage system to catch fire, releasing the contents of the battery modules.

► Observe the warnings about the risk of injury/burns due to the escape of electrolyte (see section 2.5 – pg. 9).

In the event of a fire in the vicinity of the product or in the storage system itself, proceed as follows:

► Only firefighters with appropriate protective equipment (safety gloves, safety clothing, face guard, breathing protection) are permitted to enter the room where the burning storage system is located.

There is a danger of electrocution when extinguishing fire while the storage system is switched on. Therefore, before starting to extinguish the fire:

► Switch off the storage system.
► Switch off the mains fuses in the building.

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

► Observe the minimum distances specified in DIN VDE 0132 for the extinguishing agent used.

The storage system works with an output voltage of 230 V (AC) and is therefore considered a low-voltage system.

► 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:

- The battery modules have a nominal voltage of 51.2 V (DC) and therefore fall into the range of protected extra-low voltage (under 60 V DC).
- The battery modules do not contain metallic lithium.

Further information can be found in the following document: *Merkblatt für Einsatzkräfte – Einsatz an stationären Lithium Solarstromspeichern* (Information sheet for electricians – Use on stationary lithium solar energy storage systems, published by the German Solar Association, or BSW – Bundesverband der Solarwirtschaft e.V.)

2.4 Regulations (directives, laws, standards)

► Observe all relevant, currently applicable national regulations, especially the regulations of the local power supply companies. The authorised electrician is responsible for knowing and observing all of the regulations relevant to their work.

2.5 Warnings

This section contains specific warnings that must always be observed when working with the product.

DANGER

Danger to life due to electrocution!

Touching components inside the storage system poses a danger to life due to electrocution.

► Do not touch any components.
► Do not remove any plastic covers.
► Never reach below covers.

DANGER

Danger to life due to electrocution!

When carrying our electrical work on the storage system, the following must be observed:

► Switch off the storage system.
► Disconnect the relevant electrical circuits.
► Secure against anyone switching on the device again.
► Check that the device is disconnected from the power supply.
► Only authorised electricians are permitted to carry out electrical work.

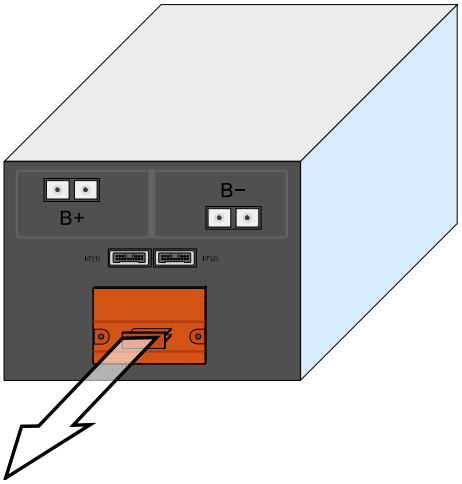
WARNING

Risk of burns!

Very high short-circuit currents are possible.

The following must be observed when working with the battery modules:

The battery module is activated when the fuse connector is plugged in. The voltage runs between the plus and minus contacts of the battery module (nominal voltage of battery modules: 51.2 V DC). The battery module is deactivated when the fuse connector is unplugged. No voltage runs between the plus and minus contacts of the battery module. If all interconnected battery modules are deactivated, it is safe to work on a battery module.



When working on the DC circuit:

- ► Set aside metal jewellery.
- ► Switch off the storage system.
- ► Switch off the series fuse.
- ► Remove the orange fuse connectors on all battery modules.

WARNING

Risk of injury and burns due to the escape of electrolyte

The battery modules installed in the storage system are protected by multiple protective devices and can be operated safely.

Despite their careful design, the battery cells inside the battery modules may corrode or experience thermal runaway in the event of mechanical damage, heat or a fault.

This can have the following effects:

- High heat generation on the surface of the battery cells.
- Electrolyte may escape.
- The escaping electrolyte may ignite and cause an explosive flame.
- The smoke from burning battery modules can irritate the skin, eyes and throat.

Therefore, proceed as follows:

- ► Do not open the battery modules.
- ► Do not mechanically damage the battery modules (pierce, deform, strip down, etc.)
- ► Do not modify the battery modules.
- ► Do not allow the battery modules to come into contact with water (except when extinguishing a fire in the storage system).
- ► Do not heat the battery modules. Operate them only within the permissible

temperature range.

► Do not short-circuit the battery modules. Do not allow them to come into contact with metal.

► Do not continue to use the battery modules after a short circuit.

► Do not deep-discharge the battery modules.

In the event that module contents are released:

► Do not enter the room under any circumstance.

► Avoid contact with the escaping electrolyte.

► Contact the fire services.

Notice

Deep-discharge of the battery modules

Destruction of the battery modules!

► Do not disconnect the storage system from the public grid for long periods of time.

► Never continue to operate battery modules which have been deep-discharged.

3 Product description

3.1 Technical data

sonnenBatterie	eco 8.2/2	eco 8.2/4	eco 8.2/6	eco 8.2/8	eco 8.2/10	eco 8.2/12	eco 8.2/14	eco 8.2/16
System data (AC)								
Nominal voltage	230 V							
Nominal frequency	50 Hz							
Nominal power	1,500 W	2,000 W	2,500 W	2,500 W	2,500 W	2,500 W	2,500 W	2,500 W
Nominal current	6.5 A	8.7 A	10.9 A	10.9 A	10.9 A	10.9 A	10.9 A	10.9 A
Mains connection	single-phase, L / N / PE							
Mains topology	TN / TT							
Mains connection fuse	miniature circuit breaker | type B | 16 A							
Battery data (DC)								
Cell technology	lithium iron phosphate ($LiFePO_4$)							
Usable capacity	2.0 kWh	4.0 kWh	6.0 kWh	8.0 kWh	10.0 kWh	12.0 kWh	14.0 kWh	16.0 kWh
Nominal voltage	51.2 V							
Dimensions / Weight with small extension cabinet (from 2 kWh up to 10 kWh)								
Dimensions (H/W/D) in cm	70/64/22	137/64 /22	137/64 /22	137/64 /22	137/64 /22	–	–	–
Weight in kg	71	112	137	162	187	–	–	–
Dimensions / Weight with big extension cabinet (from 2 kWh up to 16 kWh)								
Dimensions (H/W/D) in cm	70/64/22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22	184/64 /22
Weight in kg	71	123	148	173	198	223	248	273
Power meter								
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							
Safety								
Protection class	I (PE conductor)							
Degree of protection	IP21							
Rated short-time withstand current (Icw)	3,000 A							
Ambient conditions								
Ambient temperature range	5°C ... 30°C							
Storage temperature range	0°C ... 40°C							
Transport temperature range	-15 °C ... 40°C							
Max. rel. humidity	90%, non-condensing							
Permissible installation altitude	2,000 m above sea level							
Additional ambient conditions	• Even floor, suitable for heavy loads. • Free from corrosive and explosive gases (ammonia content max. 20 ppm). • Free from dust (especially flour dust or sawdust). • Free from vibrations. • Free access to the installation location. • Installation room can be ventilated. • No direct sunlight.				• Observe fire control standards. • Smoke detectors must be installed both at the installation location and in bedrooms. • The currently applicable building codes must be observed. • The installation location must not be at risk of flooding.			

Table 2: Technical data

3.2 System components

Figure 1: System components

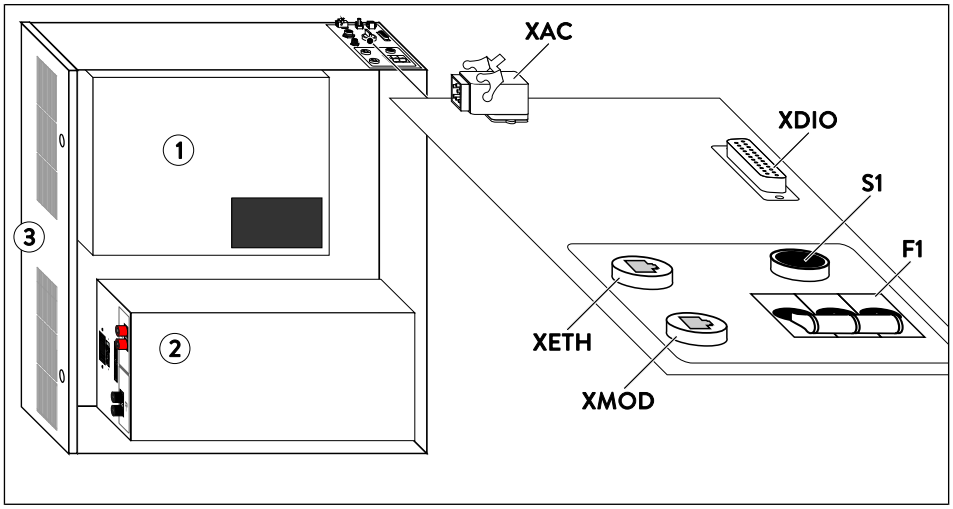


Table 3: System components

No.	Designation	Function
1	Battery inverter	Conversion of batteries' direct current into alternating current
2	Battery module	Storage of electrical power
3	Filter plate	Holder for filter pad
F1	fuse switch	On/off switch for storage system
XAC	Mains connection socket	Sending and receipt of digital signals
XDIO (optional)	Digital inputs and outputs	Interface to emit and receive digital signals
XETH	Ethernet port	Data connection to router for home network
XMOD	Modbus port	Data connection to power meter
S1	switch	Pressed during the switch-on procedure (see section 7.2 – pg. 52).

3.3 Type plate

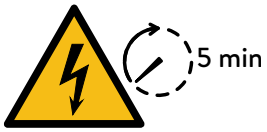
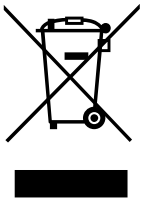
The type plate for the storage system is located on the outer surface of the system. The type plate can be used to uniquely identify the storage system. The information on the type plate is required for the safe use of the system and for service matters.

The following information is specified on the type plate:

- Item designation
- Item number
- Version (hardware version)
- Technical data of the storage system

The nominal power and battery capacity of the storage system differ depending on the number of battery modules installed. For this reason the nominal power and battery capacity must be entered on the type plate by the electrician installing the system.

3.4 Symbols on the outside of the storage system

Symbol	Meaning
	Warning: flammable materials
	Warning: hazards due to batteries
	Warning: electrical voltage
	Warning: electrical voltage Wait five minutes after switching off (capacitor de-energising time)
	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.

4 Transport and storage

4.1 Storage

Storage describes the condition when the storage system is not connected to the public electrical mains and the battery modules cannot be automatically charged.

4.1.1 Ambient conditions during storage

The ambient conditions specified in Tabular 2 (pg. 12) must be observed during storage.

4.1.2 Storing the battery modules

Notice

Damage/destruction of battery modules due to deep-discharge!

During storage the battery modules automatically discharge at a minimal level. Deep-discharge could damage or destroy the battery modules. For this reason, the battery modules can only be stored for a limited amount of time.

Observe the following points:

- The battery modules must be charged to 85% (charging status upon delivery) when stored.
- Store the battery modules for no longer than 6 months.
- Install the battery modules in the storage system after 6 months at the most and commission the storage system.
- During storage the orange fuse plug must not be plugged into any battery module.

4.2 Transport

4.2.1 Ambient conditions during transport

The ambient conditions specified in Tabular 2 (pg. 12) must be observed during transport.

4.2.2 Transporting battery modules

CAUTION

Improper transport of battery modules

Fire outbreak at battery modules or emission of toxic substances!

► Transport the battery modules in their original packaging only. If you no longer have the original packaging, new packaging can be requested from sonnen GmbH.

► Never transport damaged battery modules.

Lithium-ion batteries are hazardous goods. Therefore the following points must be observed when transporting the battery modules:

► Observe the general transport regulations based on the mode of transport as well as all legal regulations.

► Consult an external hazardous goods expert.

The battery module data relevant for transport is provided in the following:

- Hazardous goods class: 9
- UN number: UN3480 'lithium-ion batteries'
- Battery module mass (including packaging): 29 kg

4.2.3 Inspecting for transport damage

⚠ CAUTION

Use of damaged battery modules

Fire outbreak at battery modules or emission of toxic substances!

► Unpack the battery modules immediately after transport and inspect them for transport damage.

If damage (deformation, damage to the housing, emission of substances and the like) is discovered:

► Do not use the battery modules under any circumstance.

► Inform the service team.

⚠ CAUTION

Insulation fault when storage system is damaged

Danger of electric shock when touching damaged insulation elements!

► Unpack the storage system immediately after transport and inspect it for transport damage.

► Do not use a damaged storage system under any circumstance.

Paragraph 425 of the German Commercial Code (*Handelsgesetzbuch*) forms the legal basis for processing transport damage.
The shipping company can only be held liable for transport damage if it can be proven that the damage occurred during the course of transport. For this reason it is important to follow the instructions given here as closely as possible.

Transport damage is divided into open and hidden damage. Open damage is externally visible damage to the transported goods or their packaging. Hidden damage occurs when the packaging is not damaged but the transported goods inside are.

Open transport damage must be reported to the shipping company immediately.

The following timeframes apply in the case of hidden transport damage:

- Deutsche Post / DHL / parcel services: report damage within 24 hours
- Shipping company: report damage within 7 days

Proceed as follows:

1 Check the shipping documents

► Check the recipient address and number of shipped goods in the presence of the

shipper.

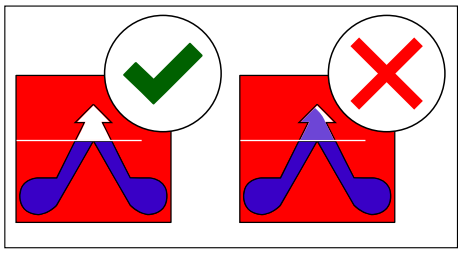
2 Inspect the goods for open damage

► Inspect the packaging and transport goods for external damage in the presence of the shipper.

If damage is discovered:

► Inspect the goods for hidden damage in the presence of the shipper.

Figure 2: Transport indicator affixed to the packaging



► Check the transport indicator affixed to the packaging of the main cabinet in the presence of the shipper.

The storage system has not been transported properly if blue powder has been transferred into the arrow of the transport indicator.

► Refuse to accept the goods if blue powder has been transferred into the arrow of the transport indicator.

3 Inspect the goods for hidden damage

This inspection should also take place in the presence of the shipper if possible.

► Unpack the goods.

► Inspect the goods for hidden (not immediately visible) transport damage.

If transport damage is discovered:

► Stop unpacking the product.

► Collect photographic evidence of the damage.

► Refuse to accept the goods if the discovered defects are serious.

4 Document the defects

► Document the defects identified on the consignment note.

The documentation should include the following:

- Notation ‘Conditional acceptance’
- Registration number of the delivery vehicle
- Signature of the shipper

5 Report the damage

► Report the damage to the responsible transport company and the manufacturer immediately.

► Send the consignment note/delivery note with the shipper's confirmation of the damage and photographic evidence to the manufacturer by email.

Damage claims cannot be settled if the above mentioned documentation is not submitted within the stated reporting time frames.

4.2.4 Temperature adjustment after transport

Notice

Damage to the storage system due to condensation

If the temperature of the storage system is lower than the ambient temperature of the room when it is delivered, condensation may form inside the storage system. This may damage the storage system.

- ► Check the inside of the storage system for condensation before installation.
- ► Only install the storage system if there is no condensation on the surfaces.

If the storage system has been transported in sub-zero temperatures, proceed as follows:

1. Set up the storage system in a suitable location.
2. Open all control cabinet doors.
3. Leave the storage system to stand for at least 24 hours with open control cabinet doors.
4. Only then can you commission the storage system.

5 Installation

5.1 Scope of delivery

► Check the following scope of delivery to ensure it is complete.

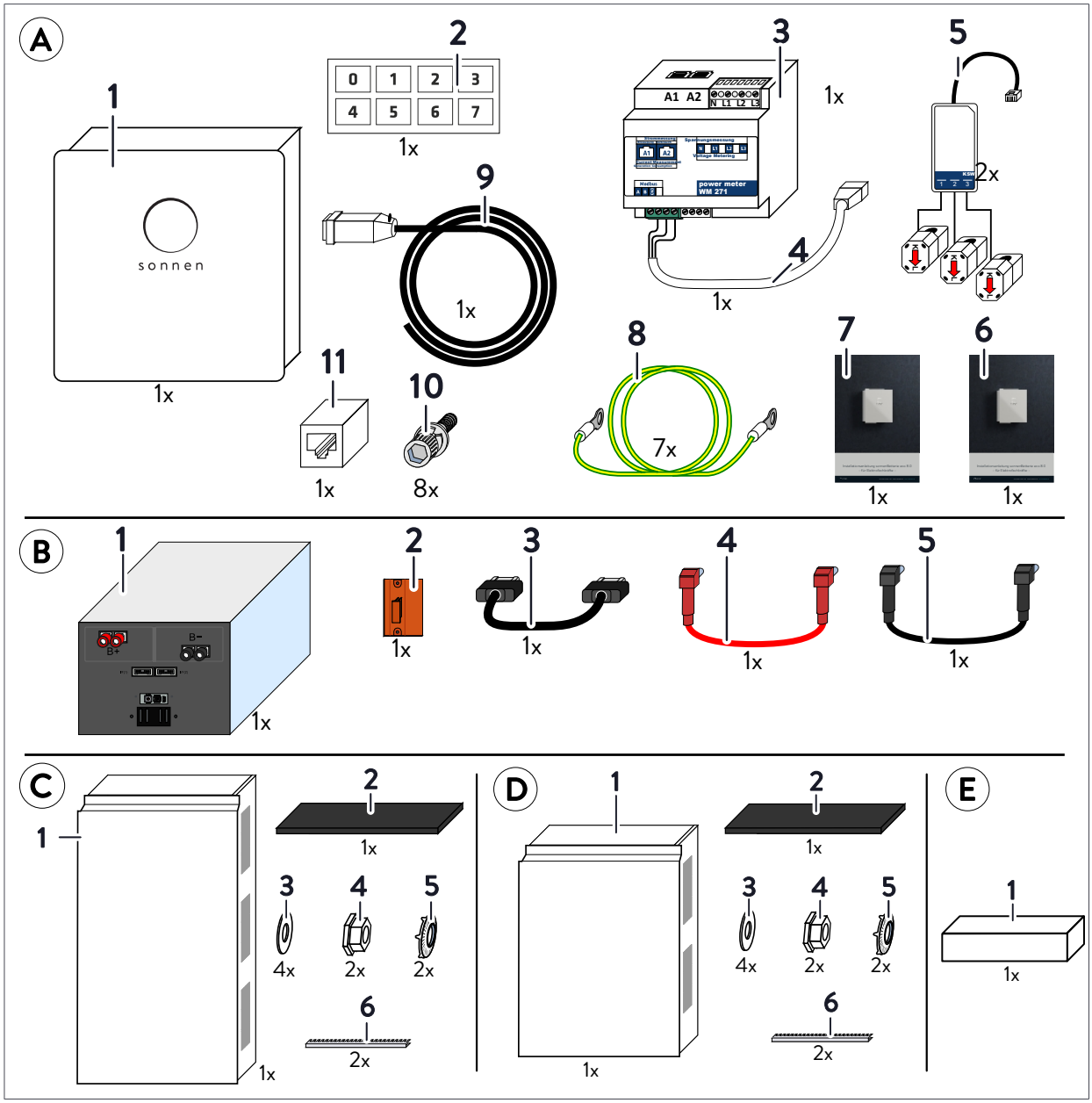


Figure 3: Scope of delivery

A	Scope of delivery for main cabinet
1	Main cabinet
2	Numbering for battery modules
3	Power meter
4	Modbus line
5	KSW60-3 current transformer
6	Operating instructions
7	Installation instructions

B	Scope of delivery for battery module
1	Battery module
2	Fuse plug
3	BMS communication line
4	DC line red
5	DC line black

C	Scope of delivery for big extension cabinet (optional)
1	Big extension cabinet
2	Levelling mat
3	Washer
4	Locking nut
5	Contact disc
6	Edge protection

8 Earth conductor
9 AC cable
10 Combination screw
11 RJ45 coupling

Additional in scope of delivery for AU:

Miniature Circuit Breaker B16

D Scope of delivery for small extension cabinet (optional)

1 Small extension cabinet
2 Levelling mat
3 Washer
4 Locking nut
5 Contact disc
6 Edge protection

E Scope of delivery for pedestal (optional)

1 Pedestal

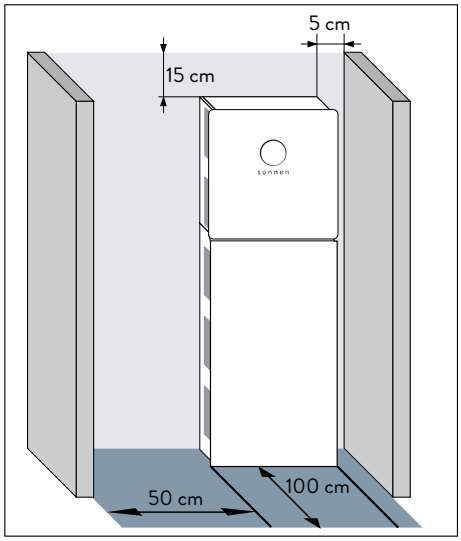
5.2 Selecting the installation location

5.2.1 Requirements for the installation location

► Observe the required ambient conditions (see Table 2: Technical data – pg. 12).

5.2.2 Observing minimum distances

Figure 4: Minimum distances



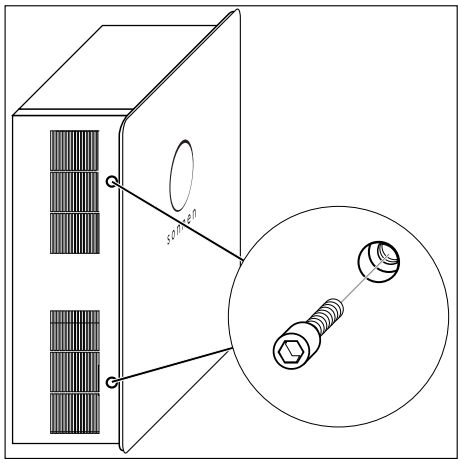
► Observe the specified minimum distances to neighbouring objects.

The minimum distances ensure that:

- there is sufficient heat dissipation,
- the storage system door can be opened easily and
- there is sufficient space for maintenance work.

5.3 Opening the doors of the main cabinet

Figure 5: Opening the doors of the main cabinet



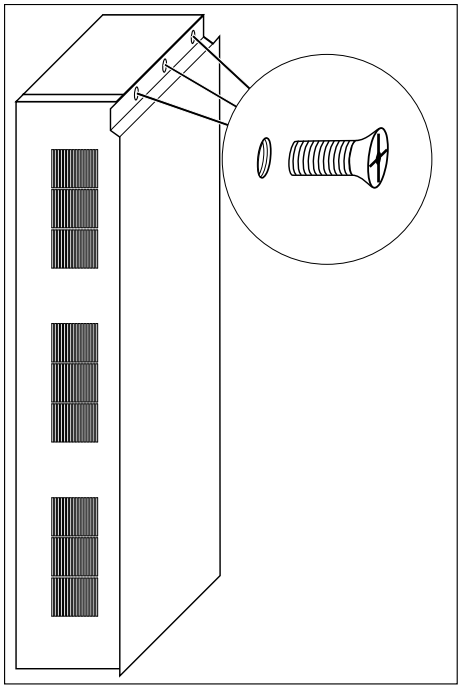
► Remove the two Allen screws on the left side of the main cabinet.

The doors can then be opened.

5.4 Removing the cover of the extension cabinet

Figure 6:

Removing the cover of the optional extension cabinet



To remove the cover of the optional extension cabinet:

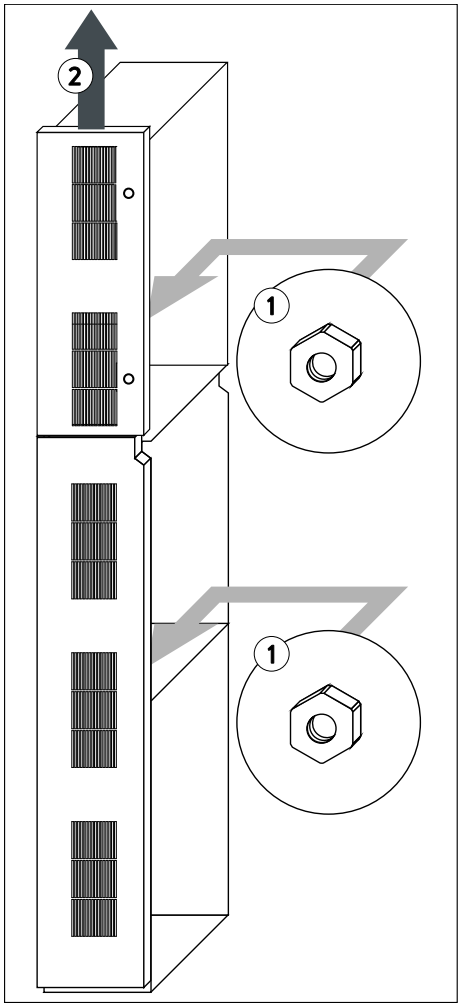
► Remove the three screws.

► Slide the cover up.

5.5 Removing the filter plates

Figure 7:

Removing the filter plates



The filter plates of the main and optional extension cabinet can be removed. Removing them makes it easier to install the battery modules later.

► Remove the nuts (1) inside the main and extension cabinet.

► Slide the covers up (2) and take off the cover and place it to the side.

5.6 Installing the storage system

This chapter describes how to install the storage system.

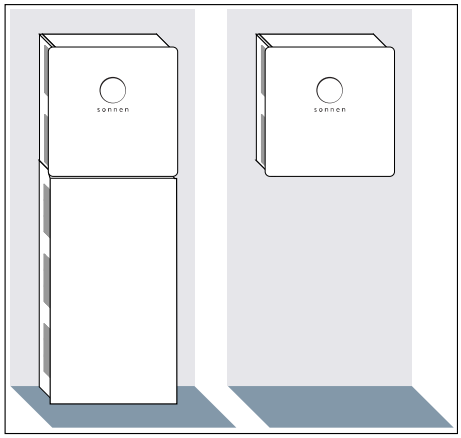


Figure 8:

Left: storage system with optional extension cabinet (floor-mounted)

Right: storage system without optional extension cabinet (wall-mounted)

A storage system with the optional extension cabinet must be floor-mounted.

A storage system without the optional extension cabinet must be mounted to the wall with screws.

⚠ WARNING

Inadequate protection against contact if installed without base cabinet

Risk of injury from contact with the battery modules through the openings in the floor of the main cabinet!

► Ensure that both openings in the floor of the main cabinet are sealed with permissible blanking plugs on the inside and matching nuts on the outside of the storage system.

Permissible blanking plugs[1] must meet the following requirements:

- Material: metal or plastic with a flammability class of V-1 in accordance with UL94
- Fine thread: M32x1.5
- External diameter: 35 mm
- Temperature range: -60 °C to +200°C

5.6.1 Using the correct mounting materials

► Use only screws with the following properties:

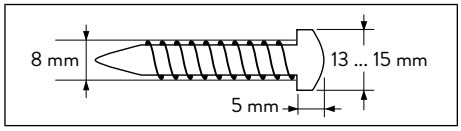


Figure 9: Parameters of the screws used

- The diameter of the screw head must be between 13 mm and 15 mm.
- The screw diameter must be 8 mm.
- The screw head must not exeed 5 mm.

5.6.2 Placing the levelling mat or the pedestal

The levelling mat (1) is part of the scope of delivery for the extension cabinet. It is used to compensate uneven floors.
Alternatively the extension cabinet can be placed on an optional pedestal (3)

1 Blanking plugs and nuts can be purchased from sonnen.

instead of the levelling mat. This is helpful if the extension cabinet doesn´t meet flush with the wall (e.g. because a skirting board is mounted).

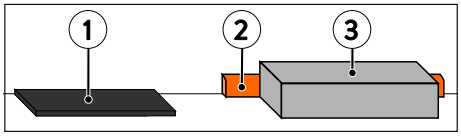


Figure 10: The levelling mat (1) compensates uneven floors. The optional pedestal (3) can e.g. can be used in combination with a skirting board (2)

► Place the levelling mat or the pedestal at the preferred installation location.

5.6.3 Drilling the holes

Holes must be drilled into the wall to mount the storage system. The arrangement of the holes depends on whether the big or the small extension cabinet is used.

With small extension cabinet (up to 10 kWh)

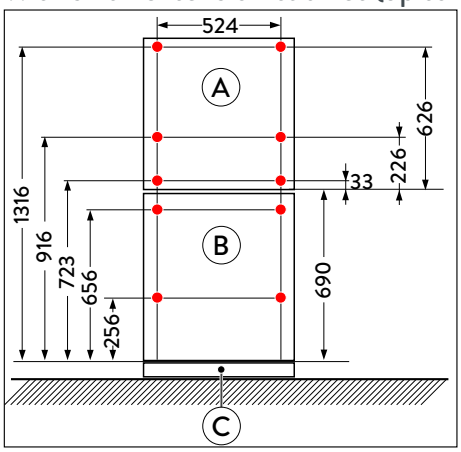


Figure 11: Drill template for storage systems with small extension cabinet (figure is not to scale – all specifications are in millimetres)

A	Main cabinet
B	Small extension cabinet
C	Levelling mat (height: 10 mm) or pedestal (optional – height: 80 mm)

For storage systems consisting of main and small extension cabinet:

► Drill the holes shown in red in figure on the left.

► Note that the storage system must be placed on the levelling mat or the pedestal (C).

With big extension cabinet (up to 16 kWh)

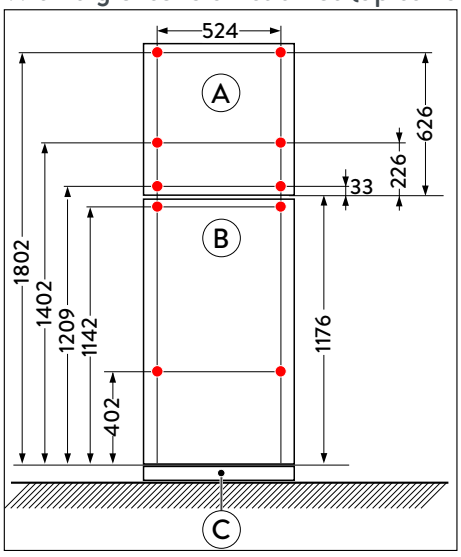


Figure 12: Drill template for storage systems with big extension cabinet (figure is not to scale – all specifications are in millimetres)

A	Main cabinet
B	Big extension cabinet
C	Levelling mat (height: 10 mm) or pedestal (optional – height: 80 mm)

For storage systems consisting of main and big extension cabinet:

► Drill the holes shown in red in figure on the left.

► Note that the storage system must be placed on the levelling mat or the pedestal (C).

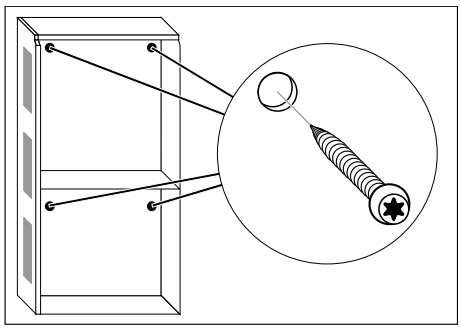
Without extension cabinet

If the storage system is used without extension cabinet it is a good idea to observe the dimensions provided in one of the two figures above. That way no new holes need to be drilled if the storage system is extended at a later time.

5.6.4 Mounting the storage system

1 Mount the extension cabinet

Figure 13: Screwing on the extension cabinet

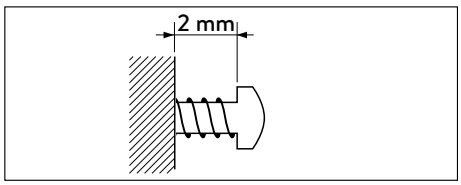


► Mount the extension cabinet (optional) on the wall using suitable screws and dowels (see 5.6.1 – pg. 24).

2 Apply the screws

There are keyhole attachments on the rear of the main cabinet. The main cabinet is mounted using these attachments.

Figure 14: Distance between screw head and wall

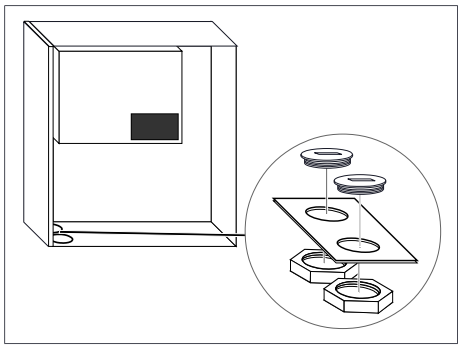


► Apply suitable screws and anchors (see 5.6.1 – pg. 24) to the previously drilled holes.

The screw should not be completely screwed in. The screw head should protrude from the wall by approx. 2 mm (see above figure).

3 Remove the blind caps (if existing)

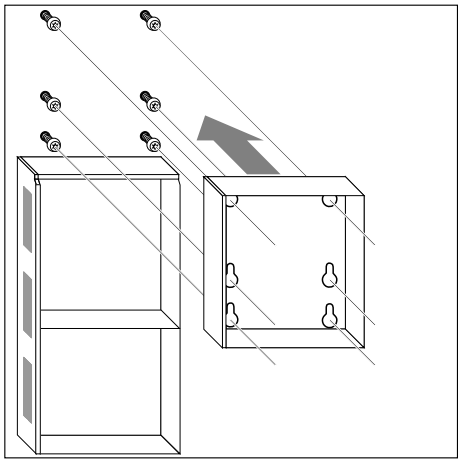
Figure 15: Remove the blind caps



► Remove the blind caps if existing. The blind caps are located at the bottom of the main cabinet.

4 Mount the main cabinet

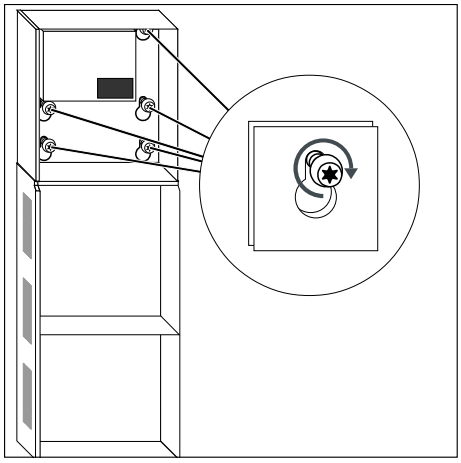
Figure 16: Mounting the main cabinet



► Hang the main cabinet on the previously mounted screws.

5 Tighten the screws

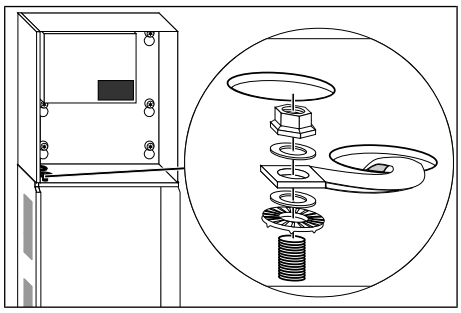
Figure 17: Tightening the screws on the main cabinet



► Tighten the five screws.

6 Connect the housing

Figure 18: Connecting the housing



An earth conductor is already connected in the extension cabinet.

► Connect the other end of the earth conductor to the earth bolt in the main cabinet.

► Tighten the self-locking nut with a torque of 5 Nm.

6 Electrical connection

DANGER

Danger to life due to electrocution!

The following points must be observed when carrying out electrical work on the storage system or on the electrical distributor:

- ▶ Switch off the storage system.
- ▶ Disconnect the relevant electrical circuits.
- ▶ Secure against anyone switching on the device again.
- ▶ Check that the device is disconnected from the power supply.
- ▶ Only authorised electricians are permitted to carry out electrical work.

DANGER

Touch voltage in the event of a fault

Danger to life due to electrocution!

- ▶ Install residual current device (RCD) upstream of the storage system (RCD – Type B – 30 mA).

Notice

Observe the maximum line lengths.

None of the lines connected to the storage system (electrical power, Ethernet line, Modbus line, other data lines, etc.) are allowed to exceed a maximum length of 30 m.

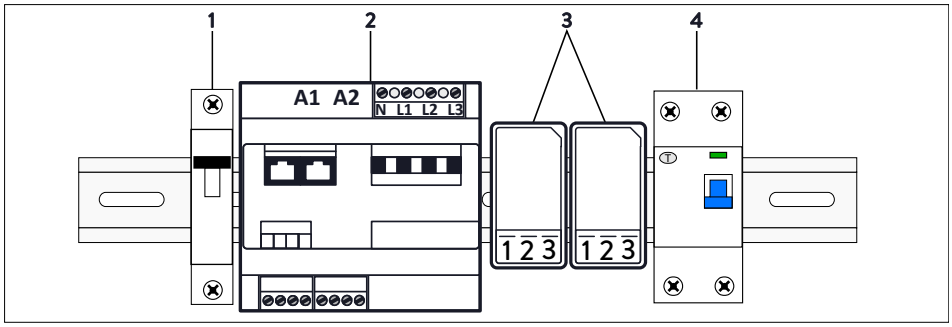
6.1 Working on the electrical distributor

6.1.1 Placing components in the distributor

Several components must be placed in the electrical distributor for the electrical connection of the storage system. Approx. 25 cm of free space on a mounting rail is required for placing the components.

► Place the following components in the electrical distributor:

Figure 19: Components to be placed in the distributor



1	Miniature circuit breaker B16 (not included in scope of delivery)
2	WM 271 power meter
3	Transformer interfaces
4	Residual current device (RCD) – Type B – 30 mA (not included in scope of delivery)

Explanations for the components:

- The miniature circuit breaker (1) protects the connection line to the storage system.
- The power meter (2) and the transformer interfaces (3) are used to measure the consumption and generation of power in the building.
- The RCD (4) protects against high touch voltage in the event of a fault.

6.1.2 Wiring components in the electrical distributor

► Wire the components previously placed in the electrical distributor like it is shown on the following pages.

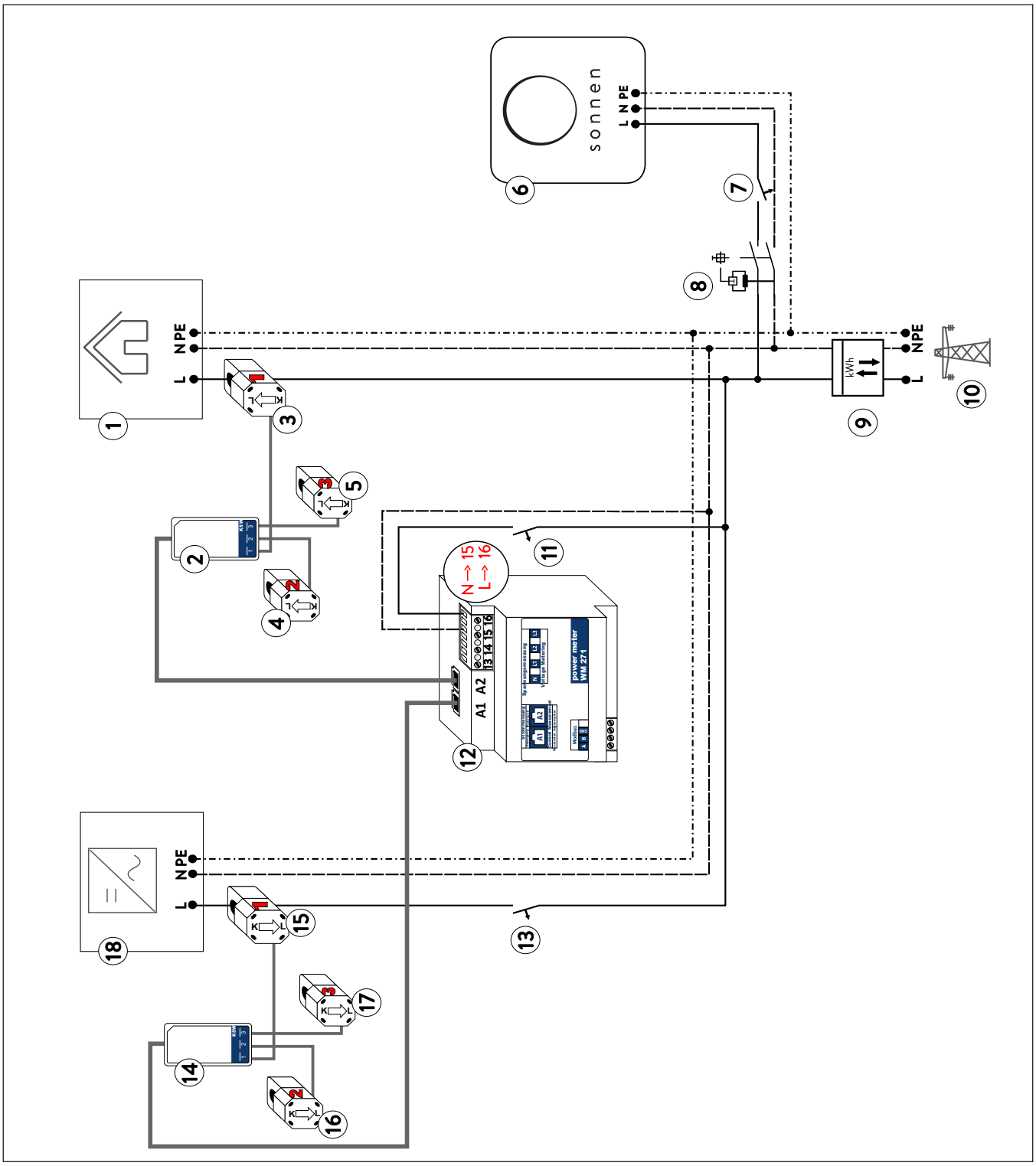


Figure 20: Circuit diagram overview – electrical connection at single-phase mains

1 Consumers in building	7 B16 miniature circuit breaker	13 PV inverter miniature circuit breaker
2 Transformer interface for consumption (A2)	8 RCD – Type B – 30 mA	14 Transformer interface for production (A1)
3 Current transformer for consumption – L1	9 Bidirectional counter	15 Current transformer for production – L1
4 Current transformer for consumption – L2	10 Public electrical mains	16 Current transformer for production – L2
5 Current transformer for consumption – L3	11 Miniature circuit breaker[2]	17 Current transformer for production – L3
6 Storage system	12 WM 271 power meter	18 PV inverter

2 Protection of the line must be ensured.

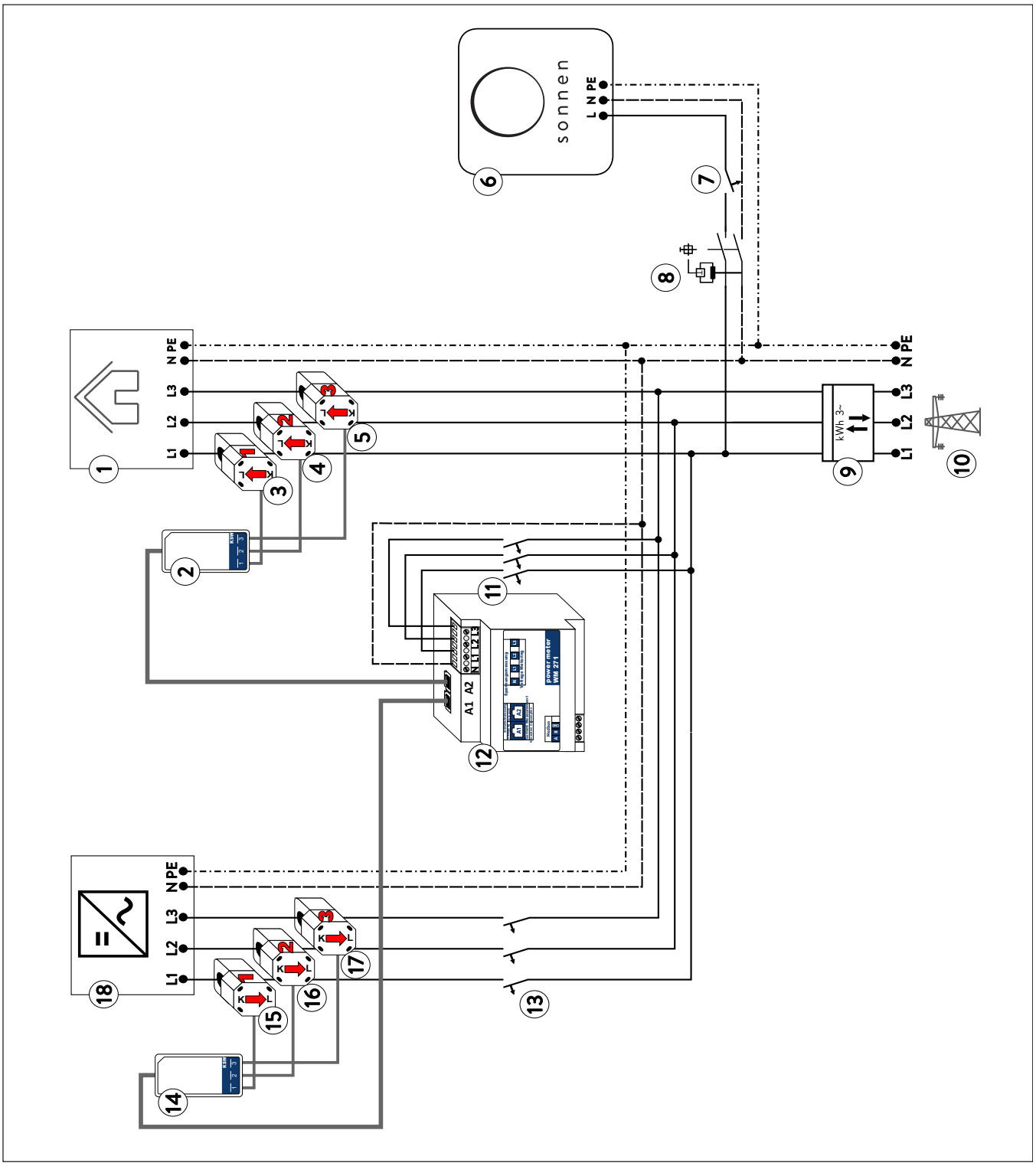


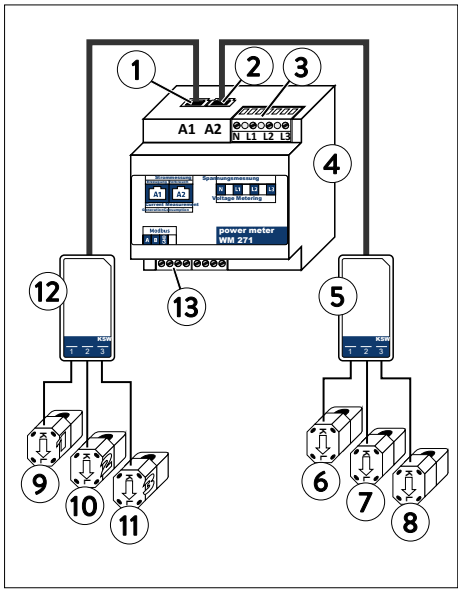
Figure 21: Circuit diagram overview – electrical connection at three-phase mains

1	Consumers in building	7	B16 miniature circuit breaker	13	PV inverter miniature circuit breaker
2	Transformer interface for consumption (A2)	8	RCD – Type B – 30 mA	14	Transformer interface for production (A1)
3	Current transformer for consumption – L1	9	Bidirectional counter	15	Current transformer for production – L1
4	Current transformer for consumption – L2	10	Public electrical mains	16	Current transformer for production – L2
5	Current transformer for consumption – L3	11	Miniature circuit breaker[3]	17	Current transformer for production – L3
6	Storage system	12	WM 271 power meter	18	PV inverter

3 Protection of the lines must be ensured.

The following points must be observed when connecting the power meters:

Figure 22: Power meter components

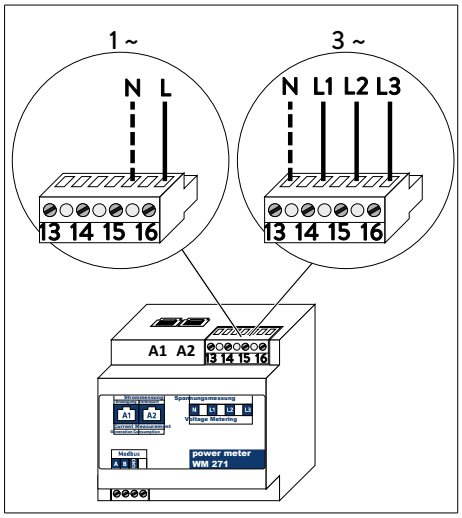


1	A1 – input for generation
2	A2 – input for consumption
3	Voltage measurement terminal strip
4	Power meter
5	Transformer interface for consumption
6	Clamp-on current transformer for consumption – L1
7	Clamp-on current transformer for consumption – L2
8	Clamp-on current transformer for consumption – L3
9	Clamp-on current transformer for production – L1
10	Clamp-on current transformer for production – L2
11	Clamp-on current transformer for production – L3
12	Transformer interface for production
13	Modbus terminal strip

- Never confuse inputs A1 and A2.
- The lines connected to the voltage measurement terminal strip (3) must be protected by suitable miniature circuit breakers.

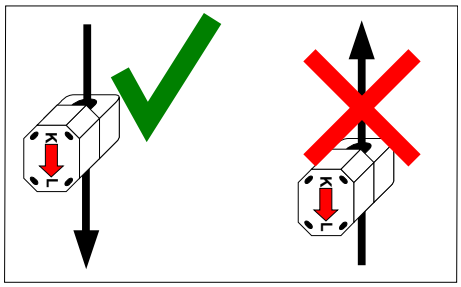
  Additional miniature circuit breakers do not have to be installed if the lines are already protected in accordance to the relevant, currently applicable regulations and standards.

Figure 23: Connection to the voltage terminal strip at single-phase (1~) and three-phase (3~) mains



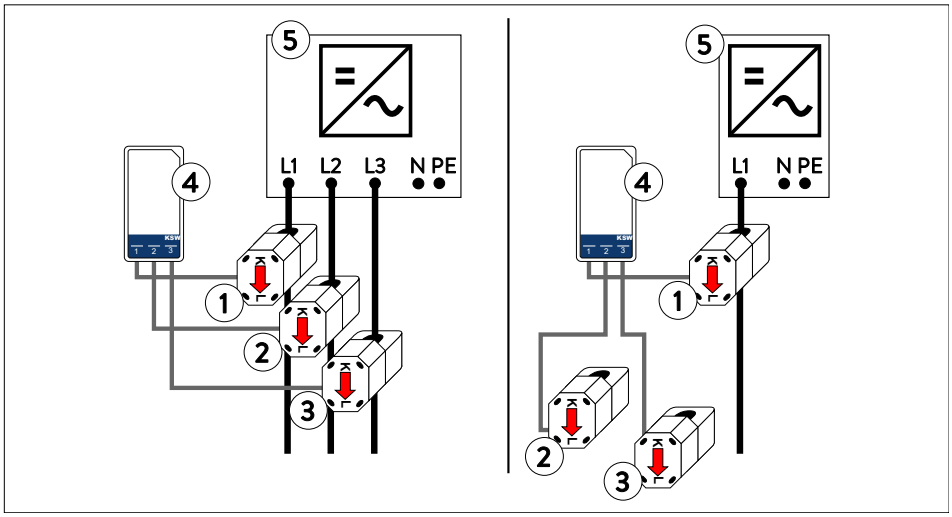
- The connection to the voltage terminal strip depends on the number of phases.
  In the case of a single-phase (1~) mains, the voltage terminal strip must be wired like it is shown on the left part of the figure. In case of a three-phase (3~) mains wire as shown on the right part of the figure .

Figure 24: Correct (left) and incorrect (right) energy flow direction



- The clamp-on current transformers are clamped across the affected lines.
  The energy flow direction of the clamp-on current transformer must be observed.
  The energy flow in the line must run from K to L.

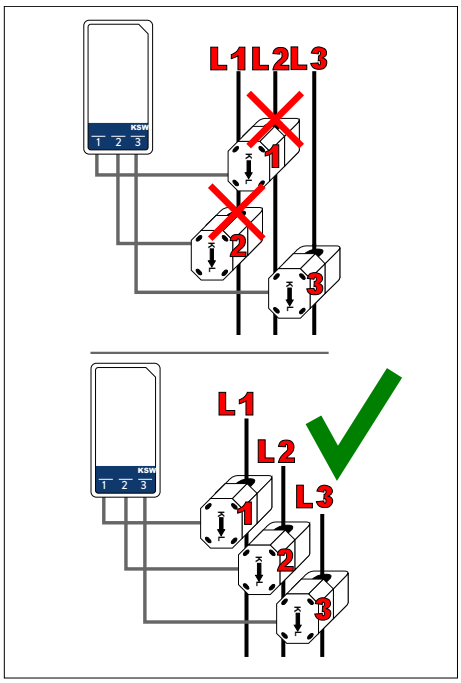
Figure 25: Connecting the clamp-on current transformers for three-phase (left) and one-phase generators (right)



1	Clamp-on current transformer for generation L1
2	Clamp-on current transformer for generation L2
3	Clamp-on current transformer for generation L3
4	Transformer interface for generation
5	PV inverter or generator

- In the case of a one-phase PV inverter or a single-phase mains, only the clamp-on current transformer for the phase in question is connected. The other two clamp-on current transformers must not be connected.

Figure 26: Connecting the clamp-on current transformers – incorrect (top) and correct (bottom)



- **Do not confuse the phases.**
  Power measurement only works if the current and voltage of the same phase are measured.
  Example: clamp-on current transformer L1 (marked with number 1) must be connected to phase L1. This phase L1 must also be connected to terminal L1 of the voltage measurement terminal strip. Only then can the correct power for phase L1 be determined.

6.2 Configuring the power meter

The power meter only provides correct measured values when the right measurement mode is activated on the device. The single-phase measurement mode is the default setting. With a three-phase grid, then, the measurement mode must be switched to three-phase measurement.

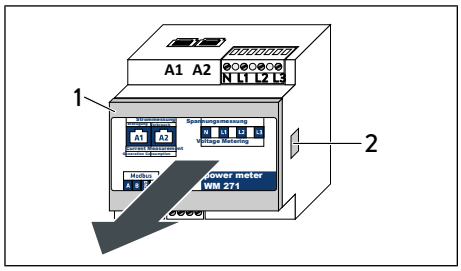


Figure 27: Remove the front cover of the power meter

1	Front cover of the power meter
2	Clip to remove the front cover

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

▶ Remove the front cover (1).

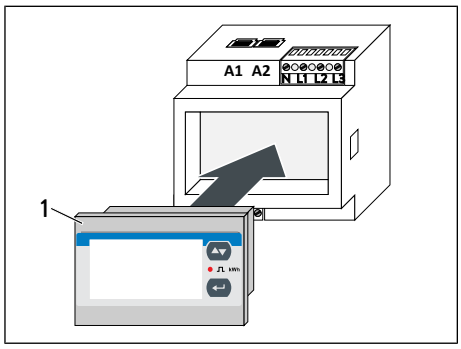


Figure 28: Inserting the touch display

1	Touch display

▶ Insert the touch display into the power meter.

▶ Supply the power meter with energy.

Figure 29: Touch display

▶ Press ↵ for a longer period of time until the *password entry screen* appears.

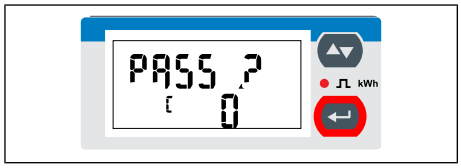


Figure 30: password entry screen

▶ Press ↵ for a longer period of time until the *CnGPASS screen* appears.

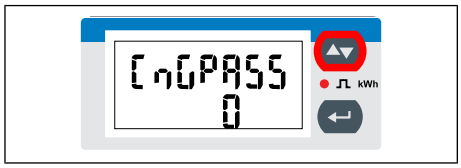


Figure 31: CnGPASS screen

▶ Press ▲▼ once.

The *SYS screen* appears.

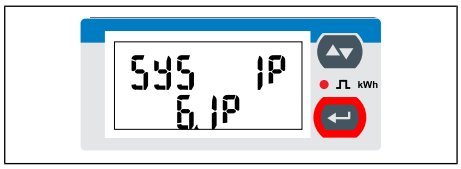


Figure 32: SYS screen

► Press ↵ once.

Now it is possible to change the measuring mode.

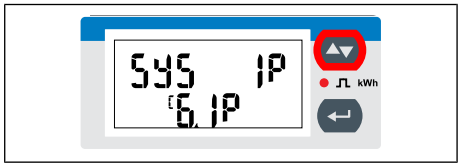


Figure 33: SYS screen – change of measuring mode

► Press ▲▼ twice until the setting 3P | 2.3P appears.

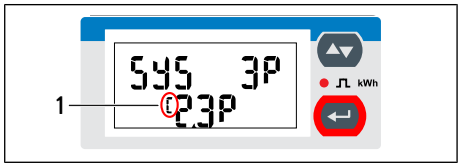


Figure 34: SYS screen – setting 3P | 2.3P

1 Sign that shows that changes are possible

► Press ↵ for a longer period of time until the sign (1) disappears.

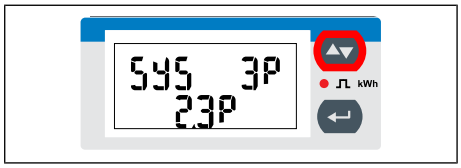


Figure 35: SYS screen after changing the measuring mode

► Press ▲▼ ten times.

The *end screen* appears.

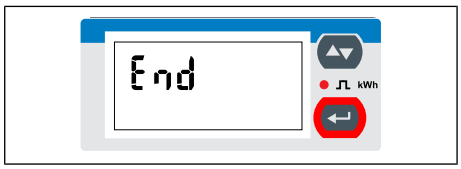


Figure 36: End screen

► Press ↵ once.

The three-phase measuring mode is now activated.

► Remove the touch display

► Insert the front cover into the power meter.

6.3 Connecting the Ethernet cable

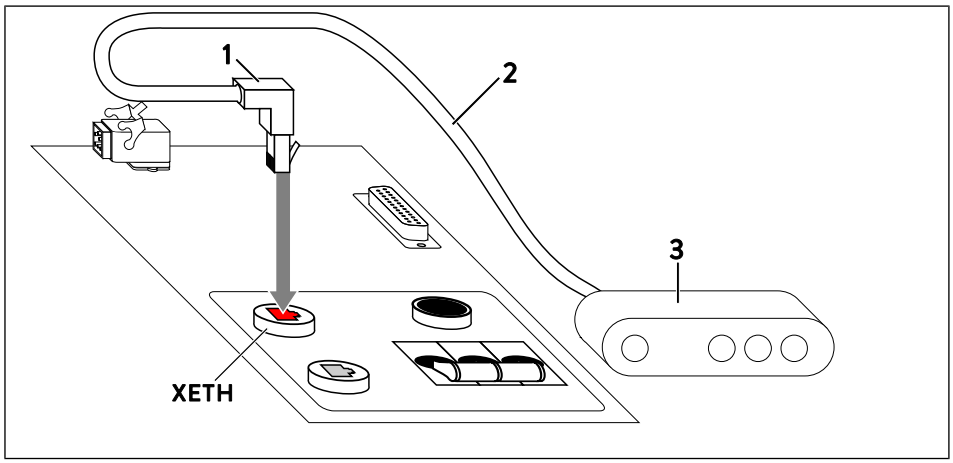
► Use a patch cable with the following properties as the Ethernet cable:

- Patch cable is Cat 5 e
- Patch cable is shielded
- One end of the patch cable has an angled male connector (1) so that the cover can be completely closed.

► Connect the patch cable (2) to the Ethernet port (XETH) of the main cabinet.

► Connect the other end of the Ethernet cable to the router of the home network (3).

Figure 37: Connecting the Ethernet line to the top of the main cabinet



1	Angled connector
2	Patch cable (not included in scope of delivery)
3	Home network router
XETH	Ethernet port

Upon commissioning, the storage system automatically establishes the connection to the internet once the patch cable has been correctly connected.

If the connection to the internet is not automatically established after commissioning:

► Follow the instruction in section 8 (S. 55).

6.4 Connecting the Modbus cable

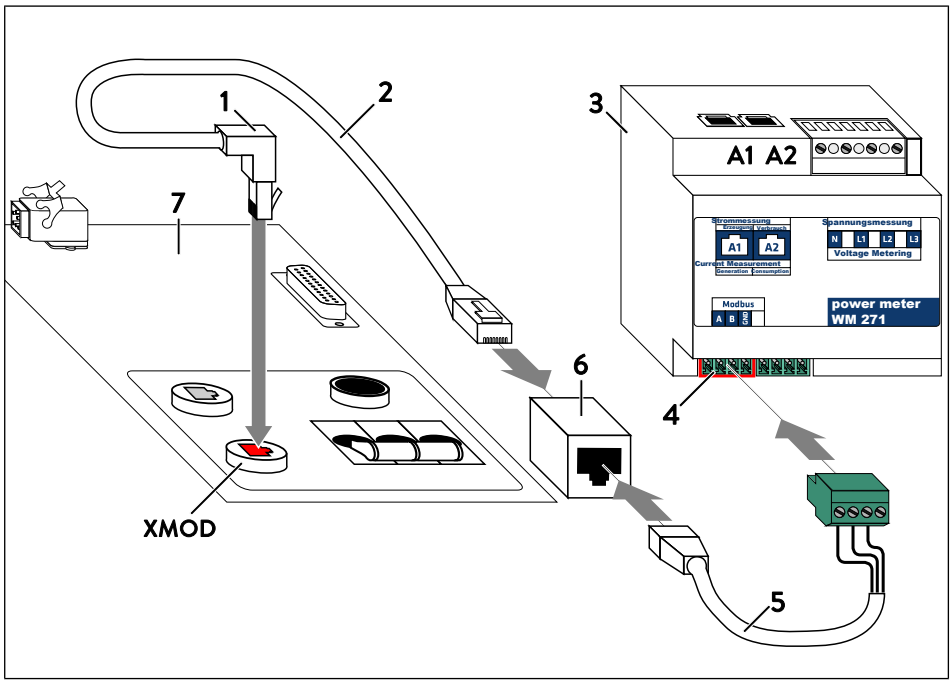
Measurement data is transmitted from the power meter to the storage system using the Modbus line.

► Use a patch cable with the following properties as the Modbus cable:

- Patch cable is Cat 5 e
- Patch cable is shielded
- One end of the patch cable has an angled male connector (1) so that the cover can be completely closed.

► Connect the patch cable (1) as shown in the following figure.

Figure 38: Connecting the Modbus line



1	Angled male connector
2	Patch cable (not included in scope of delivery)
3	Power meter
4	Modbus terminal strip
5	Modbus line A- = white/blue B+ = blue GND = brown
6	RJ45 coupling
7	Ports on top of the main cabinet
XMOD	Modbus port

6.5 Connecting the mains line

DANGER

Danger to life due to electrocution!

The following points must be observed when carrying out electrical work on the storage system or on the electrical distributor:

- ▶ Switch off the storage system.
- ▶ Disconnect the relevant electrical circuits.
- ▶ Secure against anyone switching on the device again.
- ▶ Check that the device is disconnected from the power supply.
- ▶ Only authorised electricians are permitted to carry out electrical work.

▶ Connect the AC line as shown in the figure below.
Ensure that the stickers (2 and 3) face upwards.

▶ Close the lock (4).

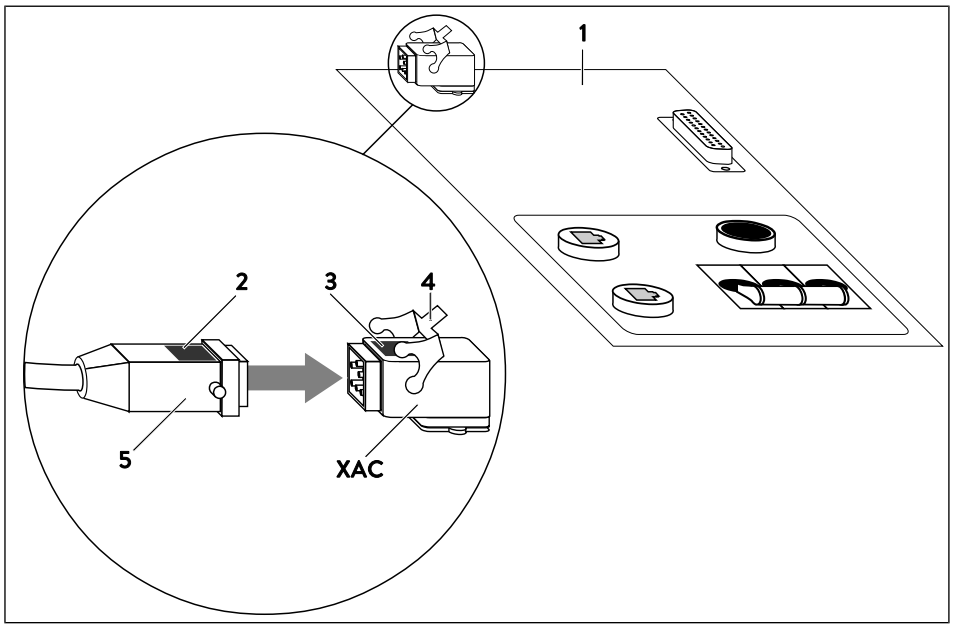


Figure 39: Connecting the mains line

1	Ports on top of the main cabinet
2	Sticker
3	Sticker
4	Lock
5	Mains line plug
XAC	Mains connection socket

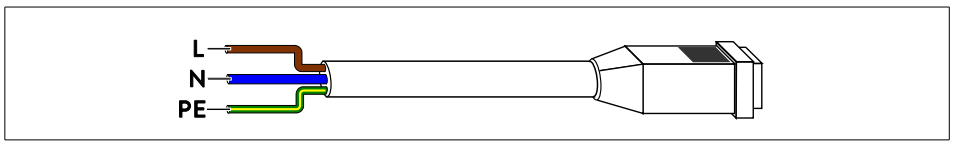


Figure 40: Color coding of the wires

6.6 Installing the battery modules

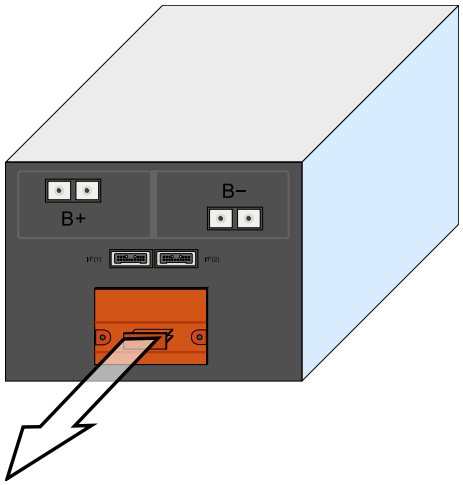
WARNING

Risk of burns!

Very high short-circuit currents are possible.

The following must be observed when working with the battery modules:

The battery module is activated when the fuse connector is plugged in. The voltage runs between the plus and minus contacts of the battery module (nominal voltage of battery modules: 51.2 V DC). The battery module is deactivated when the fuse connector is unplugged. No voltage runs between the plus and minus contacts of the battery module. If all interconnected battery modules are deactivated, it is safe to work on a battery module.



When working on the DC circuit:

- ▶ Set aside metal jewellery.
- ▶ Switch off the storage system.
- ▶ Switch off the series fuse.
- ▶ Remove the orange fuse connectors on all battery modules.

Notice

Damage to battery modules due to short circuit!

If a short circuit occurs when installing the battery modules despite great care to avoid this, proceed as follows:

- ▶ Do not install the affected battery modules under any circumstance.
- ▶ Notify the service team.

6.6.1 Measuring the battery module voltages

Notice

Damage to battery modules due to high compensating currents!

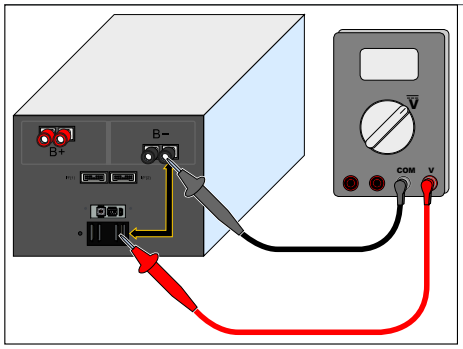
Differing battery module voltages lead to high compensating currents when the storage system is switched on.

► Measure the voltages between the internal plus and minus poles of all battery modules (see figure below) and note these down.

The battery modules are only allowed to be installed if the maximum deviation between the measured voltages is less than 1 V. If the deviation is greater than 1 V:

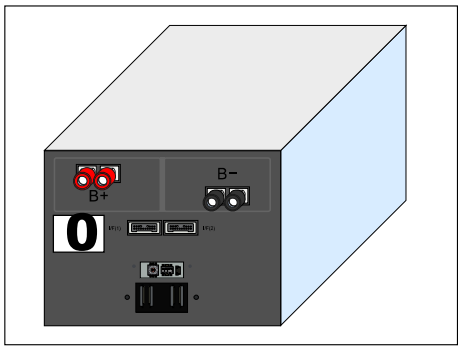
► Notify the service team.

Figure 41: Measuring the battery module voltages



6.6.2 Numbering the battery modules

Figure 42: Numbering the battery module

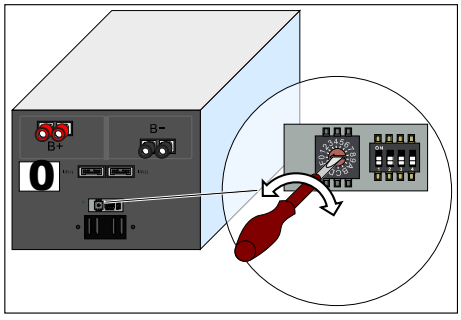


► Apply the supplied stickers to the modules.

The numbering begins with zero and continues in ascending order.

6.6.3 Defining the communication addresses

Figure 43: Setting the communication addresses using the rotary switch



► Set the communication addresses for the battery modules using the rotary switch.

The communication address matches the number of the battery module.

6.6.4 Setting the termination switches

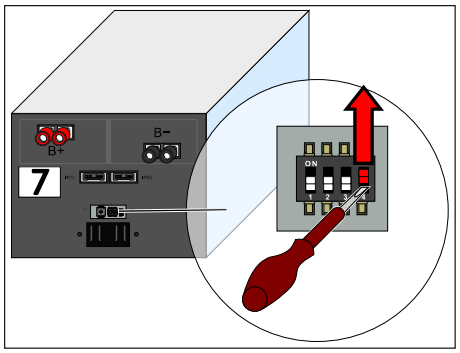


Figure 44: Setting the termination switch on the battery module with the highest number

► Slide the termination switch (switch 4) of the battery module with the highest number[4] up (switch position *ON*).

► Ensure that the termination switches of all other battery modules are in switch position *OFF*.

6.6.5 Positioning the battery modules

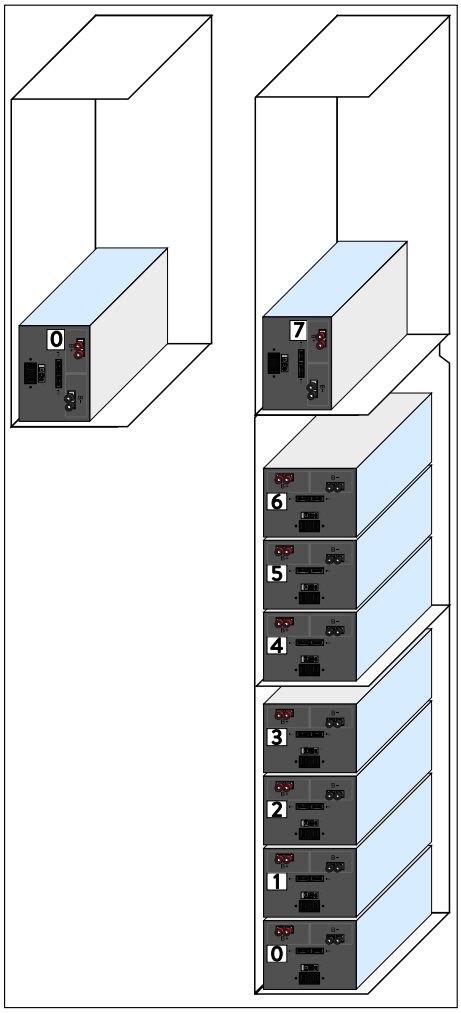


Figure 45: Positioning the battery modules – without extension cabinet (left) and with extension cabinet (right)

If **no** extension cabinet is used:

► Position the battery module as shown in the left part of the image.

If an extension cabinet is used:

► Position the battery modules as shown in the right part of the image.

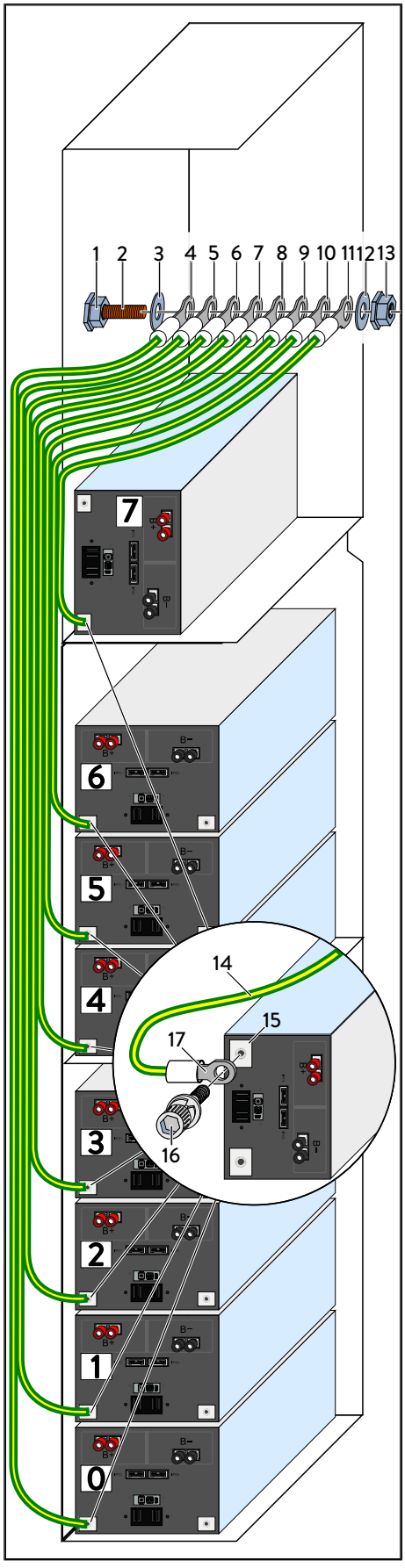
4 With a sonnenBatterie eco 8/2 this is battery module 0, with a sonnenBatterie eco 8/4 this is battery module 1, and so on... With a sonnenBatterie eco 8/16 this is battery module 7.

6.6.6 Earthing the battery modules

Figure 46:

Earthing the battery modules

1, 13	Self-locking nut
2	Earth bolt
3, 12	Washer
4 – 11, 17	Cable lug
14	Earth line
15	Earth connection on battery module
16	Allen screw



Lines are already connected to the earth bolt (2). These lines are secured with the self-locking nut (1). The earth lines of the battery modules are also connected to the earth bolt (2).

► Connect all earth lines to the earth bolt (2).

Ensure that components (2) to (12) are arranged correctly. The cable lugs must lie flat on top of each other.

► Tighten the self-locking nut (13) with a torque of 5 Nm.

► Connect the other ends of the earth lines to the earth connections of the battery modules (15).

► Tighten the Allen screws (16) with a torque of 4 Nm.

6.6.7 Connecting the DC lines

WARNING

Risk of fire due to high contact resistances and short circuit!

Incorrectly connected DC lines can cause a short circuit and thus high heat generation. Improperly connected DC lines can also create high resistance at the point of contact. As very high currents flow through the DC circuit, this high contact resistance can lead to great loss of energy (electrical energy is converted into heat). This can have the following effects:

- Cable fire:

The area around the affected point of contact is heated above permissible temperatures. A fire breaks out and hazardous substances are released.

- Damage to the battery modules:

The high contact resistance generates various high battery module loads. Battery modules may be damaged or destroyed by this. Therefore, proceed as follows:

► Check all plug connections. Only red lines are allowed to be plugged into red sockets. Only black lines are allowed to be plugged into black sockets.

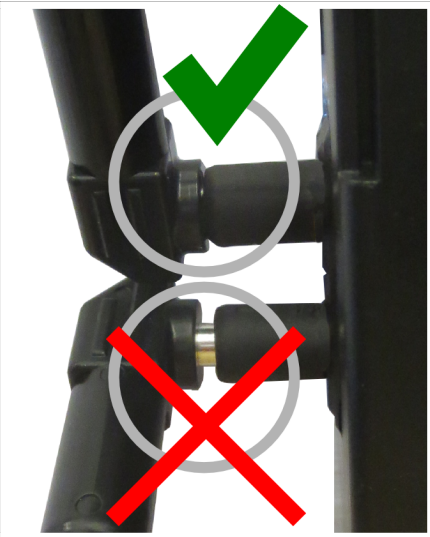


Figure 47: Correctly connected (top) and incorrectly connected (bottom) DC line

► Ensure that all DC lines are plugged into the sockets all the way.

DANGER

Danger to life due to electrocution if DC lines are incorrectly connected!

Each battery module has a nominal voltage of 51.2 volts. The battery modules are connected in parallel using the supplied DC lines. The battery modules must never be connected in series, as this could result in life-threatening high voltages from the series connection. The high voltage can also lead to damage/destruction of components.

► Ensure that all battery modules are connected in parallel, i.e. all plus poles of the battery modules are connected together (red to red). Likewise, ensure that all minus poles of the battery modules are connected together (black to black).

If **no** extension cabinet is used:

► Connect the DC lines as shown in the figure on the right.

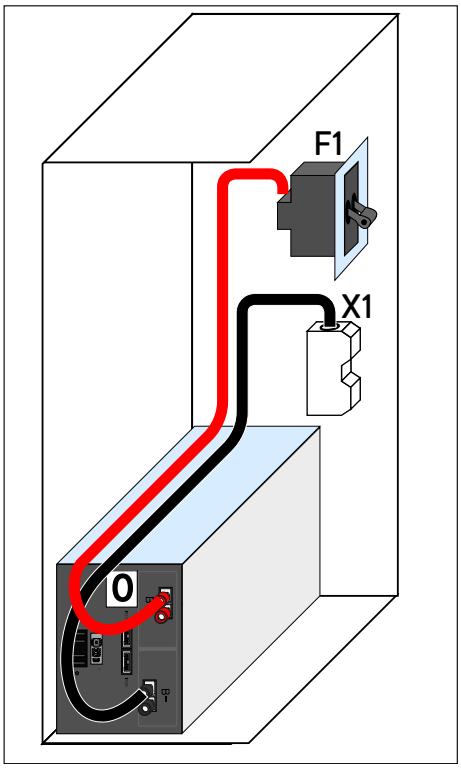


Figure 48: Connecting the DC lines on the sonnenBatterie eco 8/2 without extension cabinet

If an extension cabinet is used:

► Connect the DC lines as shown in the figure on the right.

Observe the following points:

- The plus line is connected from F1 to the plus pole of battery module 0.
- The minus line is connected from terminal X3 to the minus pole of the last battery module (with the highest number).

  With a sonnenBatterie eco 8/2 this is battery module 0,

  with a sonnenBatterie eco 8/4 this is battery module 1,

  with a sonnenBatterie eco 8/6 this is battery module 2, and so on...

  with a sonnenBatterie eco 8/16 this is battery module 7.

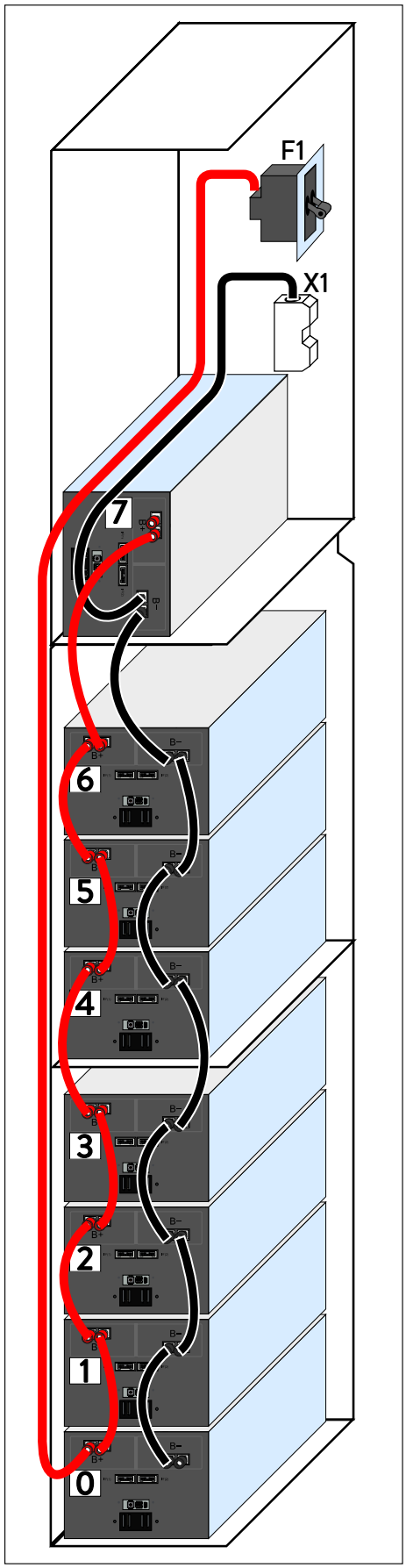


Figure 49: Connecting the DC lines on the sonnenBatterie eco 8/16

6.6.8 Connecting the BMS communication line

► Connect the BMS lines as shown in the following figures.
Use the supplied BMS communication lines.

Figure 50: Connecting the BMS communication line on the sonnenBatterie eco 8/2

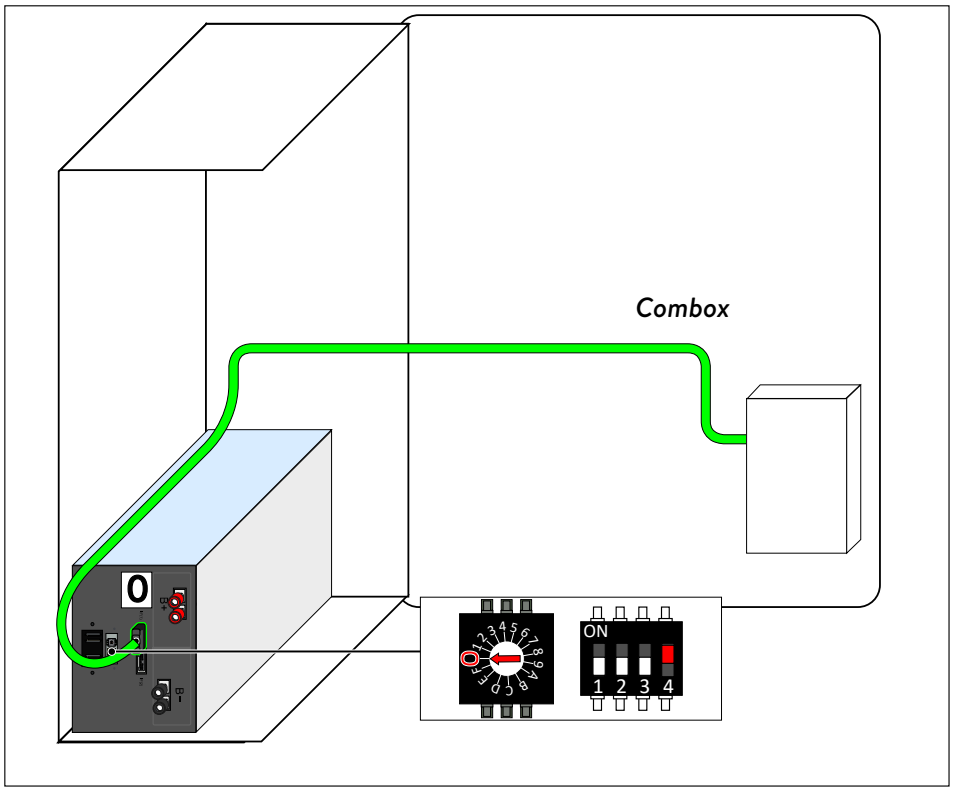
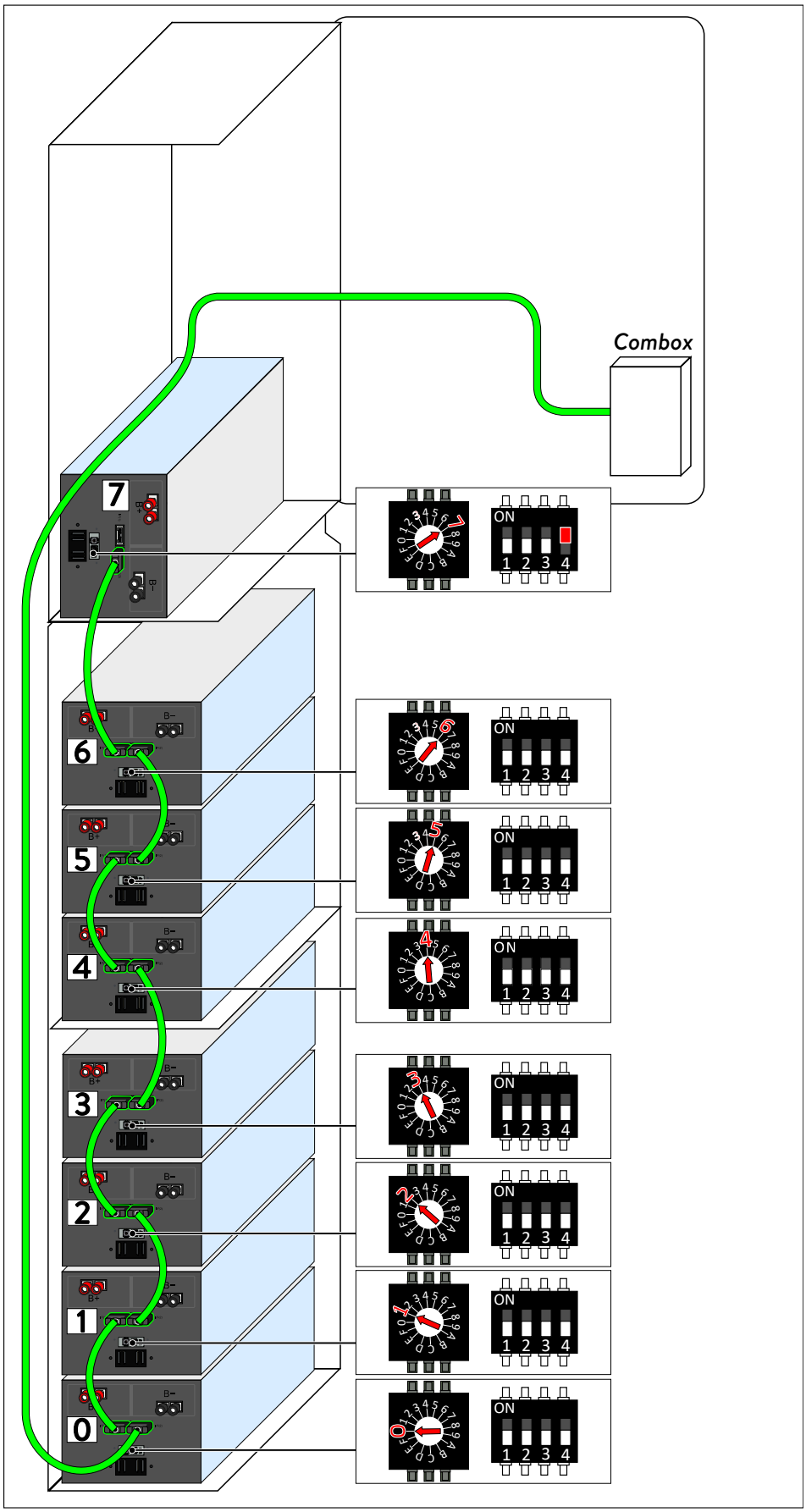


Figure 51:
Connecting the BMS communication lines to 8 battery modules



6.6.9 Attaching the fuse plugs

Prerequisite:

✔ All DC lines and BMS communication lines are correctly connected to the battery modules.

► Attach the fuse plugs on all battery modules.

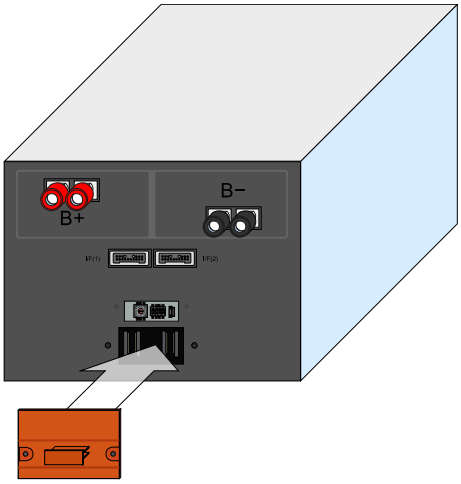


Figure 52: Attaching the fuse plugs

6.6.10 Entering the battery capacity/nominal power on the type plate

Tools:

- Permanent marker

► Mark off the correct battery capacity and nominal power on the type plate of the storage system.

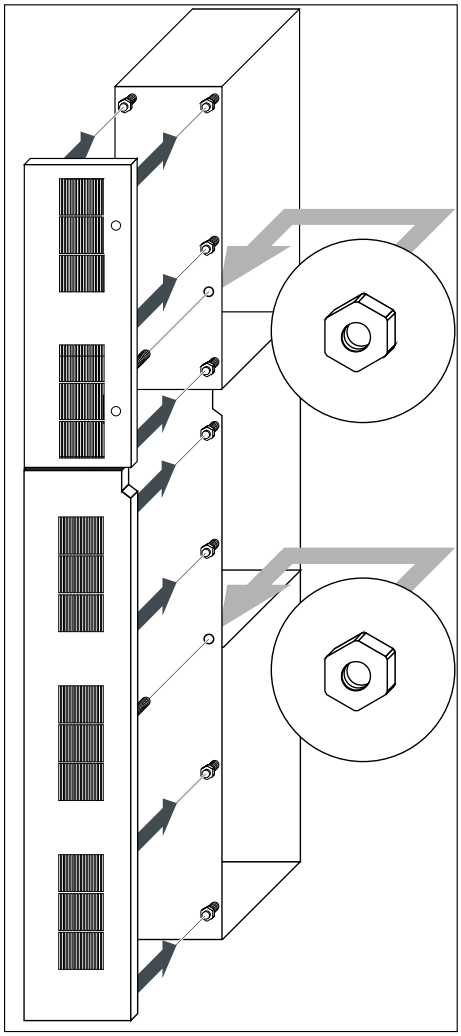
The type plate is located on the outside of the storage system. The battery capacity and nominal power can be determined from the technical data (see page 12).

6.7 Mounting filter plates and cover

6.7.1 Mounting filter plates

The previously removed filter plates must be reinstalled.

Figure 53:
Mounting the filter plates



1. Mount the filter plate at the extension cabinet.
2. Slide the filter plate down, till it is in its end position.
3. Mount the filter plate at the main cabinet.
4. Slide the filter plate down, till it is in its end position.
5. Mount the nuts on the inside of the cabinets.

6.7.2 Mounting cover

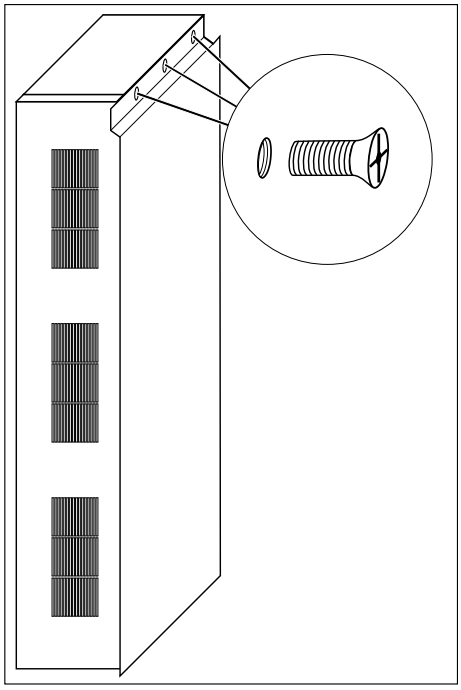


Figure 54: Mounting the cover of the extension cabinet

► Hook the cover into the front of the extension cabinet.

► Mount the cover with the three screws. Tighten the screws only slightly, making sure that the cover can still be moved.

► Close the door of the main cabinet and align the cover.

► Fully tighten the screws.

7 Commissioning

7.1 Initial commissioning

7.1.1 Commissioning checklist

► Check the following points during initial commissioning before switching on the system:

Table 4: Commissioning checklist

OK	Points to check
□	The installation location meets the requirements.
□	All DC lines are completely and correctly connected.
□	The Modbus line is correctly connected.
□	The Ethernet line is correctly connected.
□	The AC supply is correctly connected.
□	The AC line meets the requirements of all local and national guidelines for line dimensions.
□	The dimensions of the miniature circuit breaker installed in the AC line are correct.
□	A residual current device (RCD) has been correctly installed.

7.1.2 Commissioning report

► Complete the commissioning report in the appendix of this document in full.

► Make two copies of the commissioning report.

► Give the first copy to the operator.

► Send the second copy to sonnen GmbH within 5 working days.

7.2 Switching on the storage system

To switch on the storage system, the fuse switch F1 and switch S1 must be engaged in a specific order. F1 and S1 are located under the cover at the top side of the storage system.

7.2.1 Removing the cover

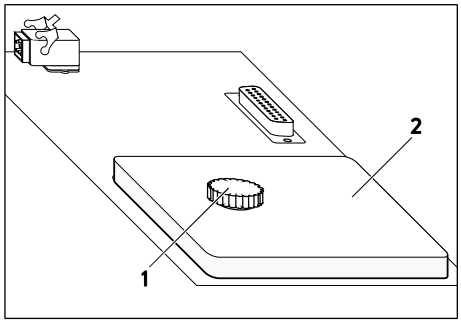


Figure 55: Removing the cover (2) at the top side of the storage system

► Remove the knurled nut (1).
To do this, rotate the knurled nut (1) counter clockwise.

► Remove the cover (2).

7.2.2 Switching on the storage system

Notice

If the storage system can't be switched on:

► Do not attempt switching on the storage system more then three times.

► Contact the service!

Further attempts can damage the battery modules.

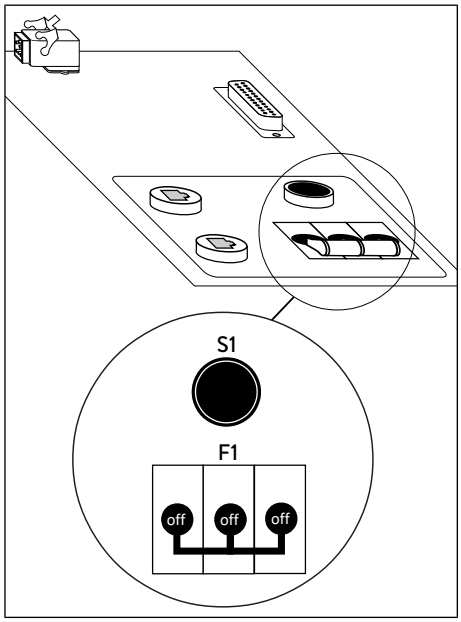


Figure 56: Fuse switch F1 and switch S1 at the top side of the storage system

1 Press switch S1 and hold it down while the following steps are carried out.
2 Switch on fuse switch F1.
3 Keep switch S1 held down for at least another 5 seconds.
4 Release switch S1.

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

► Mount the previously removed cover.

7.3 Running the commissioning wizard

With the help of the commissioning wizard the storage system can be configured. The operator as well as the authorised electrician have to enter some informations while the commissioning wizard is running.

The storage system is only ready for operation if the commissioning wizard is fully completed.

The commissioning wizard does not support changes of the power factor mode. Please contact the service, if this setting needs to be changed.

7.3.1 Establishing connection to storage system

► Connect the laptop (2) to the router of the home network.
The storage system must also be connected to the router of the home network.

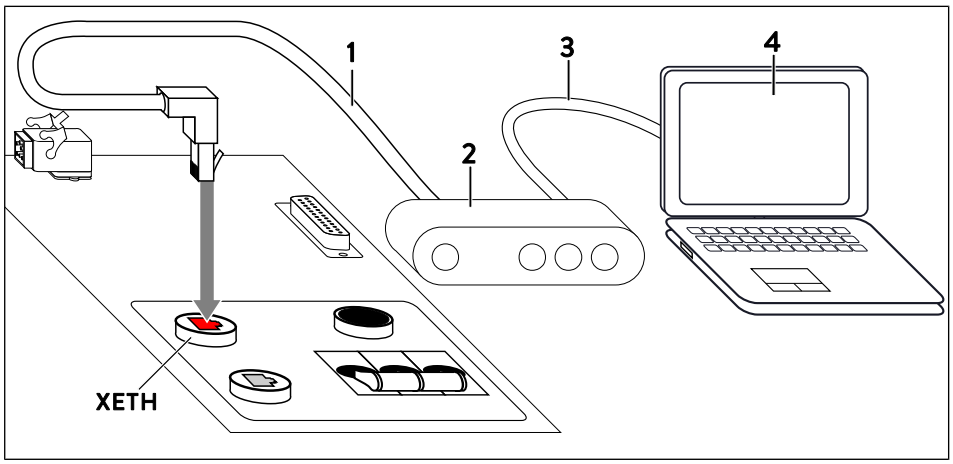
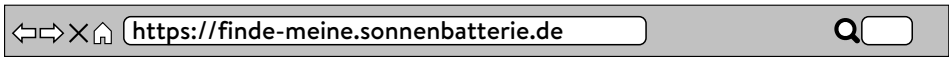


Figure 57: Ethernet wiring

1	Ethernet line
2	Router of the home network
3	Ethernet line
4	Laptop
XETH	Ethernet port at the top side of the storage system

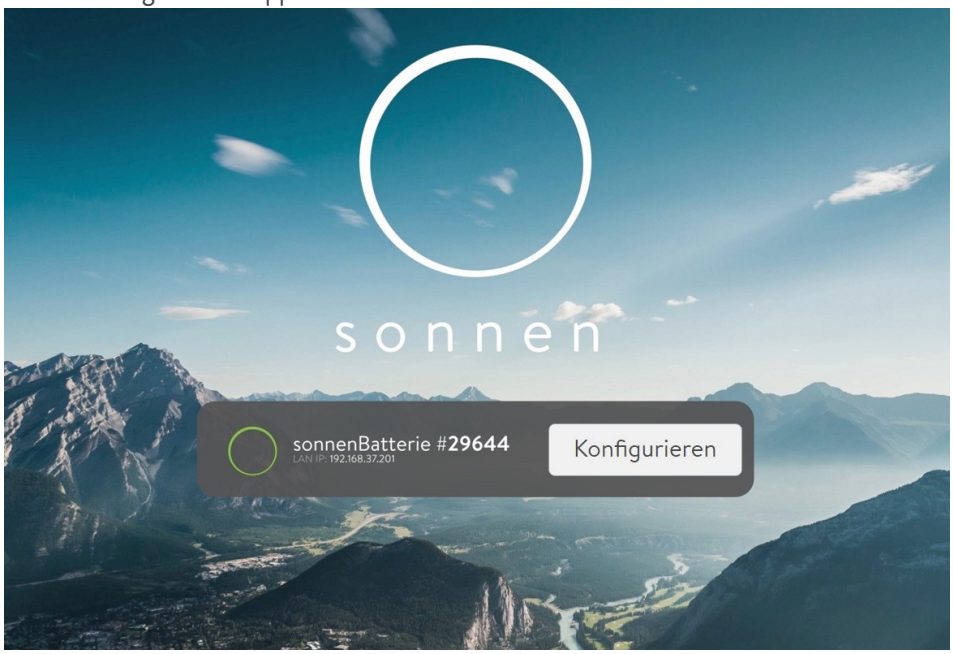
► Start a browser (e.g. Firefox, Chrome, Safari, ...) at your laptop.

► Enter the adress *finde-meine.sonnenbatterie.de* in the adress line of your browser.



The following window appears:

Figure 58: finde-meine.sonnenbatterie.de



► Click the button **Konfigurieren.**

The login page appears.

If the page *finde.meine.sonnenbatterie.de* does not appear or the storage system is not displayed:

► Follow the instructions in section 8 (S. 55).

7.3.2 Running the commissioning wizard

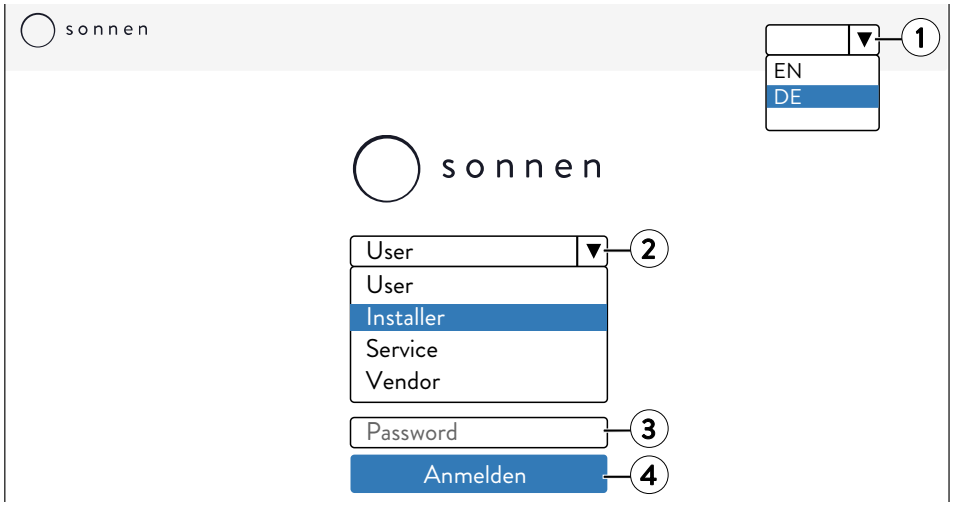
► Select your preferred language from the *language selection list* (1).

► Select the User *Installer* from the *user selection list* (2).

► Enter **Sonnen@Installer2016** in the password entry box (3).

► Click the button (4) to confirm your entries.

Figure 59: login page



1	Language selection list
2	User selection list
3	Password entry box
4	Confirm button

After that the commissioning wizard will start.

► Run the commissioning wizard until it is fully completed.

8 Troubleshooting

<table>
<tr><th>Disturbance</th><th>Reason</th><th>Correction</th></tr>
<tr><td>No internet connection (the storage system is not displayed at the Internet portal https://meine.sonnenbatterie.de)</td><td>No connection between the storage system and the server.</td><td>► 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:

<table>
<tr><th>TCP-Port</th><th>Service</th></tr>
<tr><td>22</td><td>SecureShell (ssh)</td></tr>
<tr><td>37</td><td>Time Server (ntp)</td></tr>
<tr><td>80</td><td>Online-Check (http)</td></tr>
<tr><td>222</td><td>VPN (server connection ssl)</td></tr>
<tr><td>232</td><td>VPN (backup)</td></tr>
<tr><td>443</td><td>App Control (https)</td></tr>
</table>
<table>
<tr><th>UDP-Port</th><th>Service</th></tr>
<tr><td>1194</td><td>(Server connection, ssl)</td></tr>
<tr><td>123</td><td>NTP</td></tr>
</table>
</td></tr>
</table>

9 Decommissioning

Notice

Deep-discharge of the battery modules

Destruction of the battery modules!

► Do not disconnect the storage system from the public grid for long periods of time.

► Never continue to operate battery modules which have been deep-discharged.

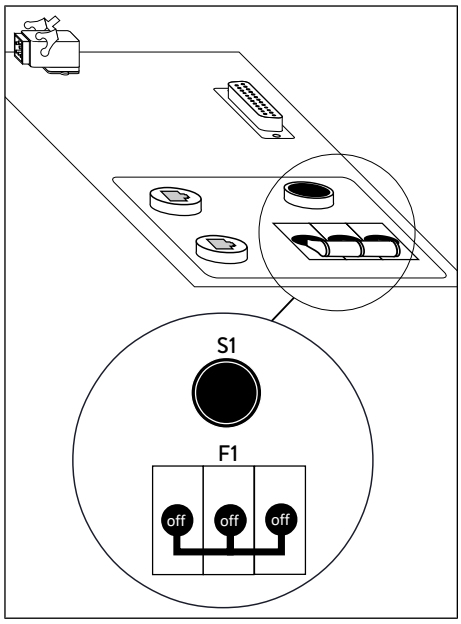


Figure 60: Fuse switch F1 and switch S1 on top of the storage system

► Remove the cover at the top side of the storage system (see chapter 7.2.1 – p. 52).

► Switch off F1.

10 Uninstallation and disposal

10.1 Uninstallation

DANGER

Improper uninstallation of the storage system

Danger to life due to electrocution!

► The storage system must only be uninstalled by authorised electricians.

10.2 Disposal

CAUTION

Improper transport and disposal of battery modules

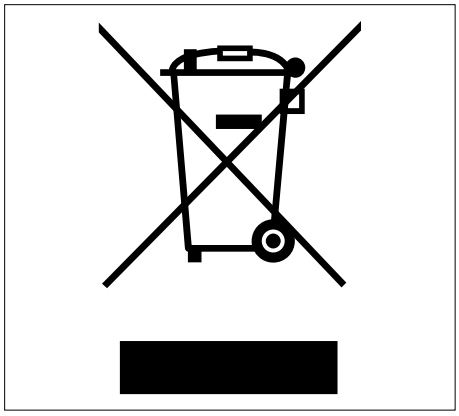
Fire outbreak at battery modules or emission of toxic substances!

► Transport the battery modules in their original packaging only. If you no longer have the original packaging, new packaging can be requested from sonnen GmbH.

► Never transport damaged battery modules.

► Do not dispose of batteries in a fire.

Figure 61: WEEE symbol



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

► 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.

11 Commissioning report

The completed commissioning report and the commissioning images (see next page) must be sent to the following email address within 5 working days of successful commissioning: service@sonnenbatterie.de		
Commissioning details		
Storage system serial number:	Date of commissioning:	
Operator details		
Surname, first name	Street	Post code, town
Telephone	Email address	
Storage system location (only required if location is different from the address above)		
Street	Post code, town	
Specialist company details		
Company	Street	Post code, town
Telephone	Email address	
Details on electrician carrying out the work		
Name	Company	Certification number
Details on network topology (mark off the applicable network)		
□ TT | □ TN-S | □ TN-C-S | □ TN-C | □ TN-C (classic earthing)		
Details on PV system		
Feed-in: □ one-phase | □ three-phase	Feed-in via phase: □ L1 | □ L2 | □ L3	
Nominal power of PV system		
Special notes/points to be addressed		
Electrician's declaration		
I confirm that my details are correct. The storage system was installed and commissioned by me in the proper manner. I followed the installation instructions in doing so.		
Place, date	Electrician's signature	

Operator's declaration		
I confirm that my details are correct. I received the warranty conditions.		
Place, date	Operator's signature	

Commissioning images			
Please provide the following images along with the commissioning report on completion of a sonnen system install.			
	Example:		*Example:*
✔ Complete storage system		✔ Battery Connection	
✔ Door Open		✔ Main Fuse Board	
✔ System Connections		✔ Power Meter Wiring	

sonnen

sonnen GmbH
Am Riedbach 1
D-87499 Wildpoldsried

Log into the internet portal (https://my.sonnen-batterie.com)
to find the latest documentation on the "Download" page.