

## **Installation instructions**



**Hager energy storage system**  
XEM800

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**Hager battery module**  
XEM100

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## Introduction

### Energy storage system, part of the building's energy management system *flow*

The energy storage system is part of the building's energy management system *flow* and can only be operated and configured in connection with the energy management controller.

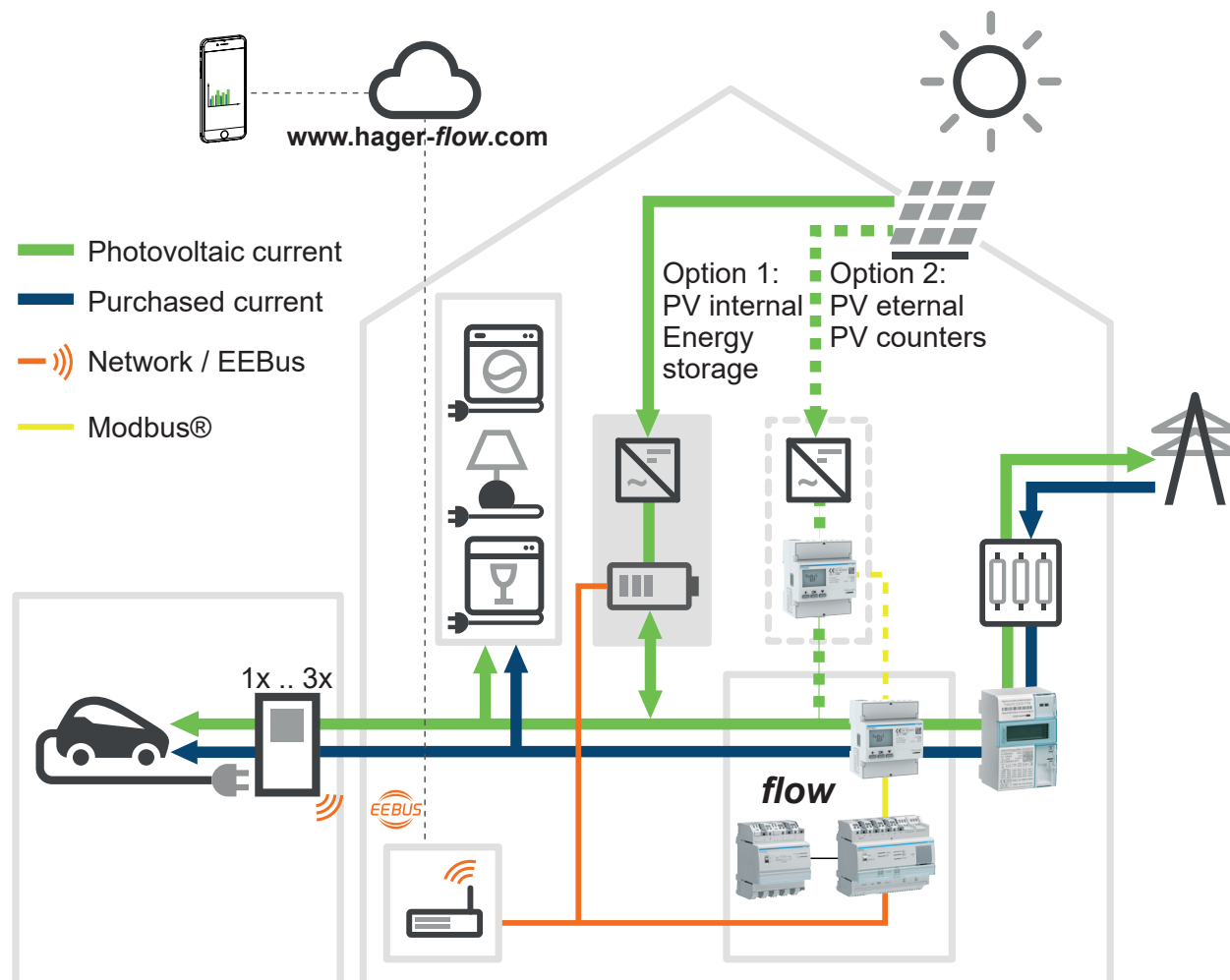


Figure 1: Energy management with *flow*



## Target group and subject matter of the document

This documentation is for qualified electricians only. It describes the installation of the Hager energy storage system. The configuration and commissioning of the Hager *flow* System are described in the instructions for the energy management controller XEM461. The qualified electrician must be comprehensively trained for the installation of the Hager *flow* system, certified by Hager, and have basic knowledge of network technology.

## Safety instructions

**Electrical equipment may only be installed and assembled by a qualified electrician in accordance with the relevant installation standards, regulations, directives and safety and accident prevention directives of the country.**

**The device must be opened by a qualified electrician only!**

**Do not stay within a distance of less than 30 cm from the inverter for long periods due to potential health risks caused by radiation.**

**Failure to comply with these installation instructions may result in damage to the device, fire or other hazards.**

**Do not wear metal body jewellery during the installation.**

**Do not technically modify the energy storage system and follow the installation sequence at all times.**

**When using the energy storage system in a manner not specified by Hager, the protection provided by the system may be reduced.**

**Only Hager may carry out work to the battery controller, battery module or inverter!**

**The whole energy storage system has been designed for access by trained and qualified staff only, not for end users.**

**If the device is used to establish a connection to the Internet then corresponding safety measures must be implemented to protect the network against unauthorised access.**

**These instructions are an integral component of the product and must be retained by the end user.**

## Storage, transport and scope of delivery

### Transport



#### **CAUTION!**

To protect the battery modules and their components against damage, they must be handled with care during transport and the legal requirements for battery transports complied with at all times!

Please also refer to the document "Safe handling of lithium ion batteries in accordance with ADR 2017 for fitters and dispatchers". The load must be properly secured. Download on the [hager.de/flow](https://www.hager.de/flow) website

Keep the original battery module boxes for secure transport in accordance with UN38.3 Hazardous Goods Class 9 in case you need to replace them and for future disposal.

An inspected ABC fire extinguisher with a 2 kg minimum volume must be carried during transport.

The energy storage system must not be transported with a previously installed battery module.

It is recommended to transport the energy storage system as supplied on the pallet. Should it be necessary to repackage the system, care must be taken not to damage and of its mechanical parts and that the original boxes containing the battery modules and inverter are transported in the correct position (writing on the box is facing the right way up, not upside down or sideways).

### Storage

If the energy storage system is stored in an electrician's workshop and is not connected to the mains during storage, it must be ensured that the installation of deep discharge battery cells does not cause any danger. This is ensured through the inspection by the fitter described in this installation instruction as well as the internal safety measures of the energy storage system.

Should the battery system detect deep discharge in battery modules during installation, contact Hager so that they can be replaced with properly functioning battery modules.

The energy storage system must be stored dry and at a temperature between 5 °C and 35 °C.

### Scope of delivery

Please inspect the supplied goods thoroughly. Should you find damage to the packaging that indicate damage to the device, or should you find apparent damage to the device, you must not accept it and report the damage to Hager within 24 hours.

Compensation for the damage will be claimed from the respective transport company.

Energy storage system components in flow sets		XEM1000	XEM2000	XEMV1000	XEMV2000
XEM800	Energy storage system including electronics	1	1	1	1
XEM100	Battery module 5.8 kWh	1	2	1	2
XEM002	Inverter	1	1	1	1
-	Supporting rail for energy storage system wall mounting	1	1	1	1
-	Mounting tabs with fixing screws	4	4	4	4
-	Spacer for base assembly	2	2	2	2
-	Battery module connection cable set	1	2	1	2
XEM200	Optional accessory Base for upright assembly				
XEM250	Optional accessory SG Ready interface for heat pump connection				

Table 1: Scope of delivery

## Tool list

- Insulating pliers
- Suitable voltage meter
- Rotating field indicator
- Slot screwdriver 0.4 x 2.5 mm (data plug assembly, terminal block connection)
- Slot screwdriver 0.8 x 4 mm (for connecting the battery cable terminal)
- Philips screwdriver (for connecting the energy storage system with the base)
- Knife (removing the sheathing from the leads)
- Hammer drill with fitting drill bit (for wall mounting the energy storage system)
- Size 13 spanner (fixing the energy storage system hangers)
- Torx screwdriver T25 (attaching the inverter)
- Torx screwdriver T 20 (battery clamps in the battery modules)
- Spirit level, side cutter, combination pliers

## Additional installation material (not included in scope of delivery)

Additional construction materials and tools must be provided in addition to the materials included in the scope of delivery. The following materials are required for the assembly of the energy storage system described below:

- Minimum 4 attachments (e.g. screw-anchor combinations) for hanging up the energy storage system
- Recommended cable NYM-J 5x6 or 10 mm<sup>2</sup> for connecting the energy storage system
- PE cable 6 mm<sup>2</sup> for connecting the overvoltage protection in the energy storage system
- Residual current circuit-breaker type B 300 mA CFB640E as preliminary fuse in the cable cut
- Circuit breaker 32 A B Characteristic MBN332 as preliminary fuse in the cable cut
- Cat. 6 network cable with RJ45 plugs for network connection
- Maximum 2 photovoltaic strings with 4 MC4 plugs

## Design and layout of the device

The energy storage system consists of 4 main components: the housing, inverter, battery controller and battery modules. The three last components are or will be installed in the housing. The following images show the basic structure (Figure 2) and (Figure 3).

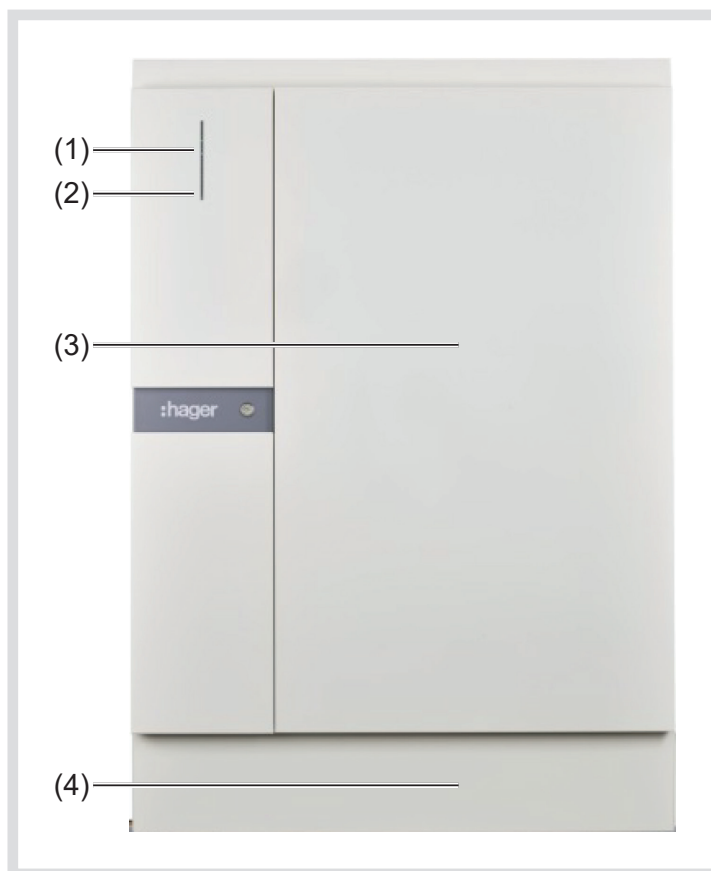


Figure 2: Energy storage system, external

- (1) LED status display
- (2) Operation button
- (3) Housing
- (4) Base XEM200 for upright assembly, optional

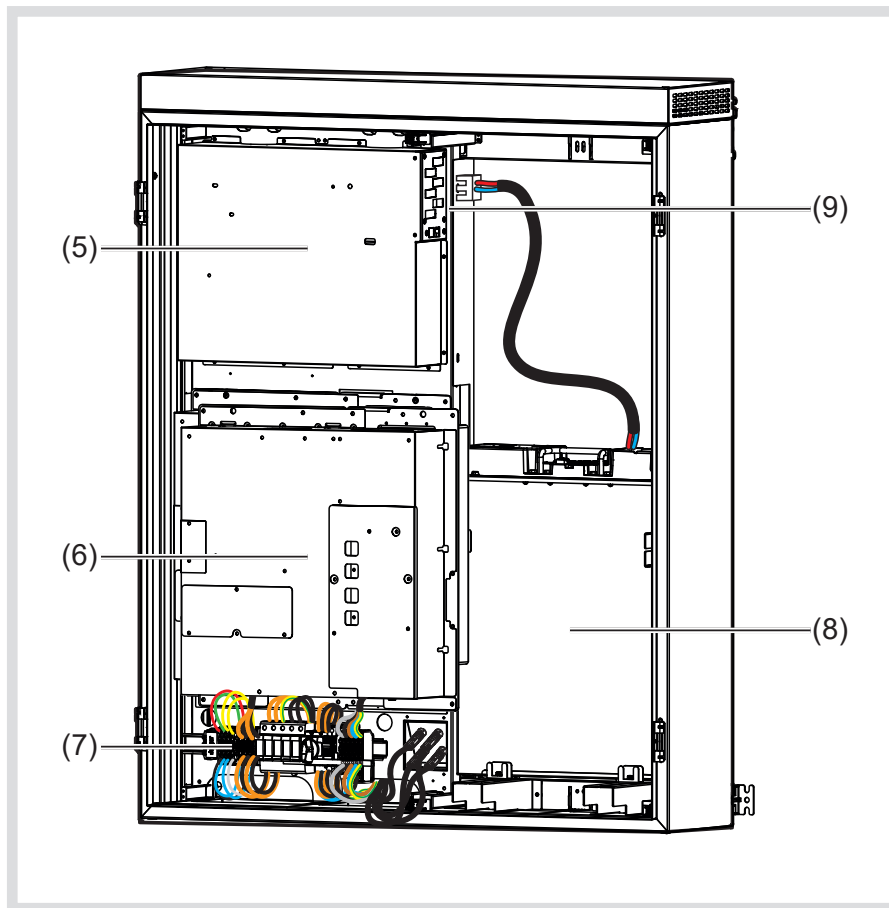


Figure 3: Energy storage system, internal

- (5) Battery controller
- (6) Inverter
- (7) Main connection area with:
  - RJ45 patch module
  - DEHNGuard DC overvoltage protection
  - Photovoltaic rotary switch
  - Circuit breaker 16 A for the integrated mains supply
  - Modular plug-in terminal for connecting to the power supply
  - 4 MC4 jacks for connecting the photovoltaic modules
- (8) Battery module
- (9) Battery connection panel

### Type label

The type label is located on the outside to the right of the energy storage system. It serves to clearly identify the energy storage system and is required when contacting the service team (Figure 4).

If the type label is covered during installation, the data must be written down and kept safe.










<h1>:hager</h1> <p>E3DC GmbH Karlstraße 5 D-49074 Osnabrück phone +49 6842 945 9800 www.hager.de beratung.hems@hager.de</p>	Type	XEM800
	Serial no.	XEM-311819000050
	AC inverter type	E12
	Max. DC power	13000W
	Max. DC input voltage	1000V
	Min. MPP voltage	250V
	Max. MPP voltage	850V
	Max. input current	2x 20A
	Nominal power (230V, 50Hz)	10000W
	Nominal frequency	50Hz
	Nominal voltage	230V
	Max. output current	20A
	Feedin phases	3
	Phases	3 (400V / 63A)
	Ambient temperature	+5°C ... +35°C
<p>Use only batteries approved by E3/DC!</p> <p>Made in Germany</p>	Enclosure	IP 30
	Safety class	1
      		
 <p>Three sources of voltage present</p> <ul style="list-style-type: none"> <li>- PV-Generator</li> <li>- AC-Grid</li> <li>- Battery</li> </ul>  <p>Isolate all sources before maintenance!</p>		

Figure 4: Type label





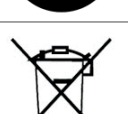
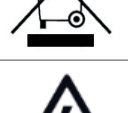



Symbol	Severity	Explanation
	CE symbol	The device meets the requirements of the applicable EU regulations and standards.
	Warning, hot surfaces	-
	Warning, safety hazard	-
	Read the documentation	-
	Waste Electrical and Electronic Equipment (WEEE)	Solar inverters must not be disposed of as household waste but returned to a specialist retailer for recycling.
 	Warning, always take note of the discharge time.	<p><b>Risk to life from high electric voltages in the inverter!</b></p> <p>Even once the device has been disconnected from the mains, it may continue to carry voltage.</p> <p><b>Please always wait 30 minutes until the capacitors have discharged!</b></p>
 <p>Three sources of voltage present</p> <ul style="list-style-type: none"> <li>- PV-Generator</li> <li>- AC-Grid</li> <li>- Battery</li> </ul>	<p><b>Caution!</b></p> <p>The device has three main supplies:</p> <ul style="list-style-type: none"> <li>- Photovoltaic generator</li> <li>- AC network</li> <li>- Battery:</li> </ul>	Switching off just one of the main supplies may not be enough to complete stop the voltage in the entire system.
	Isolate all sources before maintenance!	- -

Table 2: Type label symbols

## Function

The energy storage system increases the use of home-generated electricity. Whereas the standard energy output of photovoltaic systems is usually only around 20%, this value can be increased to over 70%. The annual electricity bill can therefore be reduced as long as the electricity consumption does not increase. These values strongly depend on the design of the photovoltaic system, energy storage system and consumer behaviour and may vary significantly in individual cases.

If a feed-in tariff is paid, for example in accordance with the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz - EEG), the annual payback decreases due to the reduced amount of electricity fed into the grid.

### Correct use

- The energy storage system is exclusively designed for operation with the Hager energy management controller *flow*. Home-generated electricity produced by photovoltaic systems is consumed, stored or fed into the grid.
- Communication with the energy management controller XEM461 in the local network.
- The energy storage system is connected to the home network in the cut.
- The energy storage system is suitable for indoor use only.
- The instructions that come with the device are part of the product and must be kept safe for use at any time.

## Operation

### Switch-on



#### CAUTION!

**This step must be performed by certified electrical companies only!**

- Switch on the circuit breaker and Residual current circuit-breaker of the energy storage system mains supply leads in the master cabinet (Figure 26).
- Switch on the circuit breaker for the battery controller in the energy storage system.
- Switch on the photovoltaic system on the photovoltaic rotary switch in the energy storage system
- i** The configuration and commissioning in connection with the Hager *flow* system is described in the instructions of the energy management controller XEM461.

### Switch off



#### CAUTION!

**The battery module may be damaged due to deep discharge!**

**The energy storage system may only be switched off temporarily for maintenance purposes.**

- Switch off circuit breaker in the meter cabinet.
- Switch off the photovoltaic system with the photovoltaic rotary switch.
- Switch off the circuit breaker for the battery controller in the energy storage system.
- Switch off the battery module at the on/off switch  
The LED display on the battery module turns off.
- Now wait at least 5 minutes before opening the energy storage system.
- Before working on electrical components of the energy storage system, wait 30 minutes until the capacitors have discharged.

**LED status display**

The LED status display (1) is switched off during normal operations. Press the operation button (2) at the bottom of the LED status display to turn it on and display the current status of the energy storage system for approximately 1 minute (Table 3).

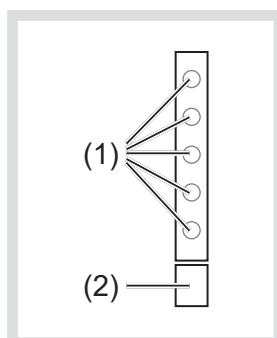


Figure 5: LED status display and operation button

(1) LED status display

(2) Operation button

If the LED status display moves up, the energy storage system is charging. The top LED of the LED status display indicates the charging level (20%, 40%, 60%, 80% or 100%). If the LED status display moves down, the energy storage system is discharging. The top LED of the LED status display indicates the current charge (20%, 40%, 60%, 80% or 100%).

► For detail see **Energy storage system operating instructions**

LED status display	Charging / discharging status	
	Green light increasing to 60%	System charges to 60%
	Green light decreasing from 100%	System discharges from 100%
	Green light constant display (e.g. 40%)	No activity, charge approx. 40%



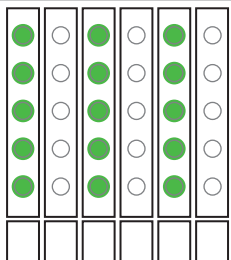
	Short, repeated flashing of all LEDs when pressing the operation button (2), then no display	System is discharged
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Table 3: LED status display operating status

## LED error messages

If the centre LED of the LED status display lights up or flashes red or yellow, an error has occurred. The error codes with the corresponding recommendations are listed in the following document (Table 4).

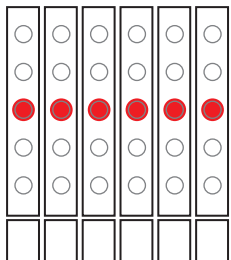
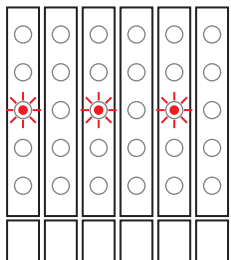
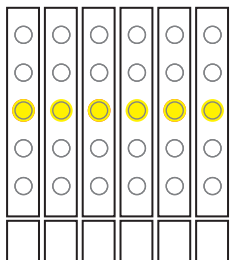
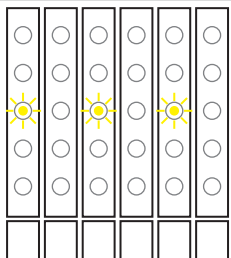
Error code		Error type	Recommendations
	Red light permanently on	Slight system error	Restart the system
	Red light flashes permanently	Severe system error	Contact certified electrical company
	Yellow light permanently on	Communication error	Check internet connection and restart the system
	Yellow light flashes permanently	Communication error and system error	Contact certified electrical company

Table 4: LED status display error messages

## Energy storage system assembly

### Selecting a suitable assembly location with permissible environmental conditions



**CAUTION!**

**The energy storage system must be permanently wired into the existing building installation and meet the applicable national installation regulations and legal provisions.**

**The manufacturer does not assume any liability in the event of non-compliance with the assembly location requirements and permissible environmental conditions.**

To optimally and safely operate the energy storage system, the following assembly location requirements must be complied with:

- No direct sunlight
  - Room temperature between 5 °C and 35 °C
  - No area subject to explosion hazards
  - No room subject to flooding
  - Dry room
  - No corrosive gases
  - No environment containing ammonia
  - No saline humidity
  - No heaters in the immediate vicinity of the assembly location
  - It is recommended to choose a well-ventilated assembly location to prevent heat accumulation
  - Minimum room volume (generally designed for non-climatised interior room)
    - With active room ventilation: 10 m<sup>3</sup>
    - Without active room ventilation: 50 m<sup>3</sup>
  - Minimum space below, above and in front of the energy storage system in accordance with specifications:
    - below the energy storage system: min. 20 cm or base assembly
    - above the energy storage system: min. 20 cm
    - in front of the energy storage system: min. 80 cm
  - The maximum assembly height is 2,000 m above sea level.  
Installations at greater altitudes must be requested from Hager and are possible if taking into account derating factors.
  - If assembling the system in the living space, please note that the device may emit noise during operation (fan noises, etc.) that may become a nuisance.
  - During installation, ensure that the energy storage system will not be mechanically impaired during installation or daily operation (e.g. by doors that hit against the energy storage system when opening). Further measures for the mechanical protection of the energy storage system may have to be implemented.
  - Emergency exits must be kept clear at all times
  - Applicable fire protection regulations must be complied with
  - An ABC fire extinguisher or carbondioxyde extinguisher should be available.
- i** It is recommended to design the operating room in accordance with F30 (fire-retardant). and flammable materials should not be stored in this room as this would increase the potential risk.
- i** The device must be installed so that it can be safely accessed for servicing. Do not place items in the free space in front, behind and to the sides of the device.

## Assembly on the wall



### CAUTION!

**2 fitters are required for assembling the energy storage system on the wall due to its great weight.**

The system must be assembled on a smooth, solid and non-flammable wall. The load-bearing capacity of the wall must be designed to hold the weight of the energy storage system (Table 5).

Energy storage system	XEM1000 / XEMV1000 / XEM2000 / XEMV2000
Weight	approx. 240 kg

Table 5: Weight of energy storage system

The weight can be used to determine a suitable fixing system by fixing system manufacturers. The manufacturers provide helpful tools, such as an anchor finder (Table 6), for selecting the correct anchors.

A minimum of 4 or more fixings (e.g. screw-anchor combinations or anchors) with a maximum diameter of 8 mm (max. drillhole diameter 10 mm) must be used.

For example, an installation with four UX 10 x 60 anchors in a concrete wall with a minimum thickness of 25 cm would result in a load-bearing capacity of 400 kg, which would be sufficient to hold the system.

When assembling the energy storage system on a wooden wall, it must be mounted on non-flammable material! Construction panels made from calcium silicate are suitable for this purpose, for instance.

Aerated concrete walls are generally unsuitable for attaching the energy storage system, for example. In this case, the energy storage system must be installed on a base, as described in the section about base assembly on page 18.

## Lasten und Technische Daten

Empfohlene Lasten / Dübel in N (kg), bei Verwendung von Holzschrauben mit dem größten Schraubendurchmesser.  
Diese Angaben beinhalten die erforderlichen Sicherheitsfaktoren und gelten für zentrischen Zug/Überkraft und Schrägzug.

Dübel	Empfohlene Lasten						Technische Daten						
	Beton ≥ B 25	Ziegelvollstein ≥ M12 Kalksandvollstein ≥ KS12	Hochlochziegel ≥ H12, Rohdicke ≥ 140 mm Kalksandlochstein ≥ KS16	Hohlblock / Vollsteine aus Leichtbeton ≥ H12, V2	Porenbeton (Gasbeton) ≥ PB 2, PP 2 (G2)	Gipskarton, Gipsfaser- platten ≥ 12,5 mm	Bohr- durchmesser (mm)	min. Bohr- lochtiefe (mm)	min. Bohrlochtiefe bei Durchsteckmontage (mm)	min. Verankerungstiefe (mm)	Dübel- länge (mm)	empf./beigef. Schrauben vor/bis (mm)	max. Nutzlänge (mm)
UX													
UX 5 x 30	200 (20)	200 (20)	200 (20)	100 (10)	35 (3,5)	100 (10)	5	40		30	30	3 - 4	Δ
UX 6 x 35	400 (40)	200 (20)	200 (20)	150 (15)	35 (3,5)	100 (10)	6	45		35	35	4 - 5	Δ
UX 6 x 50	600 (60)	300 (30)	200 (20)	150 (15)	60 (6)	100 (10)	6	60		50	50	4 - 5	Δ
UX 8 x 50	800 (80)	300 (30)	200 (20)	150 (15)	80 (8)	100 (10)	8	80		50	60	4,5 - 6	Δ
UX 10 x 60	1000 (100)	500 (50)	200 (20)	250 (25)	150 (15)	100 (10)	10	75		60	60	6 - 8	Δ
UX 12 x 70	1500 (150)	700 (70)	300 (30)	250 (25)	200 (20)	100 (10)	12	85		70	70	8 - 10	Δ
UX 14 x 75	1800 (180)	800 (80)	400 (40)	300 (30)	200 (20)	100 (10)	14	95		75	75	10 - 12	Δ

Table 6: Anchor selection (extract from the Fischer "Anchor finder")

- Place the supporting rail horizontally against the wall and mark the fixing holes so that the minimum distance of 20 cm between the energy storage system and the ceiling and floor is maintained (Figure 6).

**i** The drillholes must have a minimum distance of 136 cm to the floor and 36 cm to the ceiling.

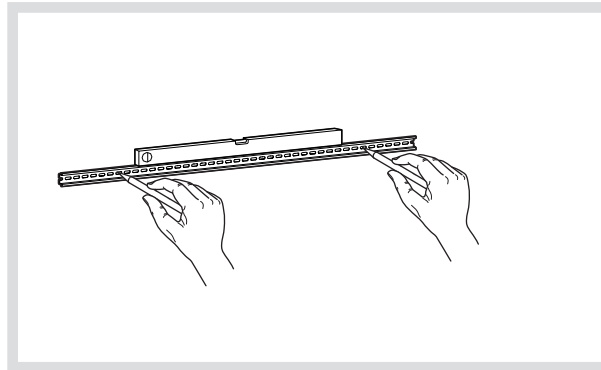


Figure 6: Mark the drillholes

- Drill at the drawn-on markings and push anchors into the drillholes. (Figure 7).



**CAUTION!**

**When drilling, ensure that no dust enters the energy storage system. Dirt and dust in the cooling element of the inverter can impair the cooling function and result in the destruction of the inverter!**

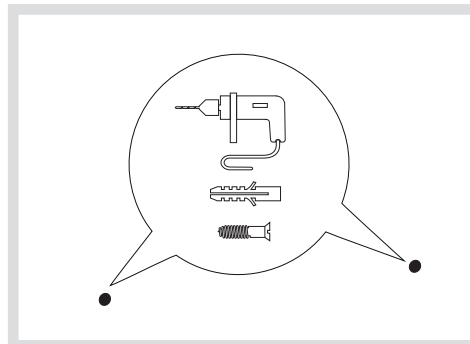


Figure 7: Drill the fixing holes

- Align and fix the supporting rail on the wall with screws (Figure 8).

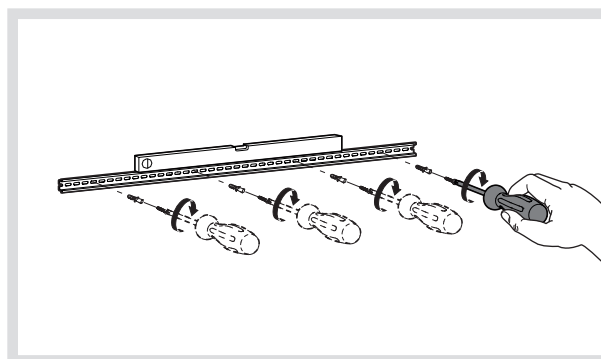


Figure 8: Assemble the supporting rail

**i** The doors of the energy storage system can be removed prior to attaching it to the wall to reduce the weight.

- Pull off the plug on the LED status display before removing the left door (Figure 9).

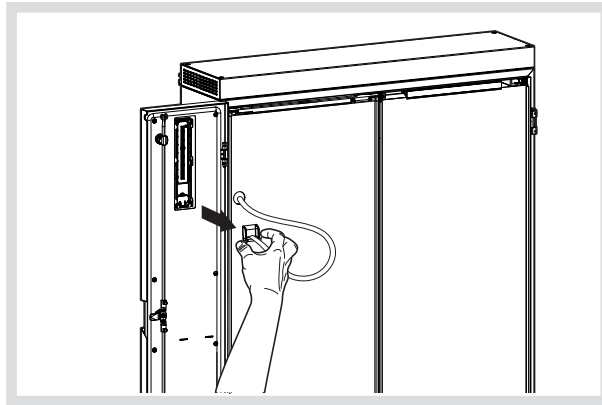


Figure 9: Pull off the plug from the LED status display

- Push up the door split pins to remove the door. Once the energy storage system has been installed, replace the doors and fix them by pushing down the door split pins (Figure 10).

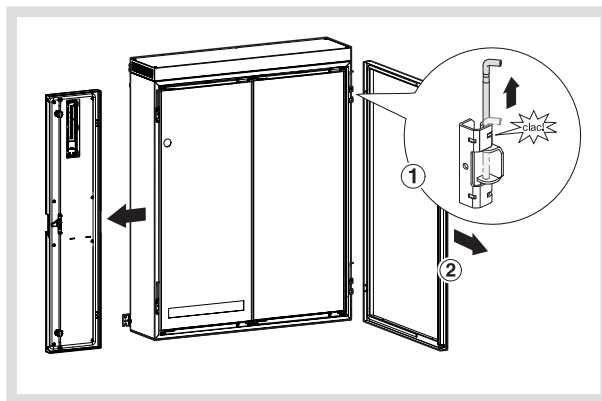


Figure 10: Door removal

- Screw 2 mounting tabs to the top of the back of the energy storage system to fix it into the supporting rail (Figure 11).

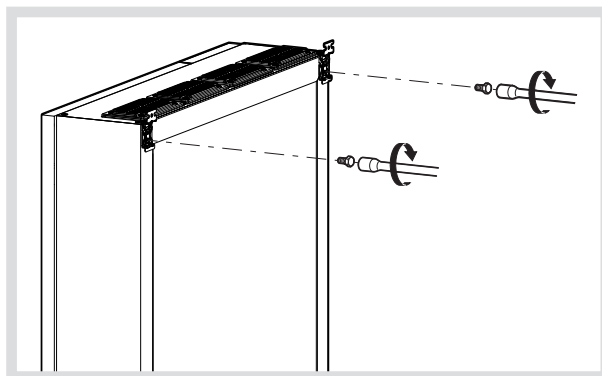


Figure 11: Assembly mounting tabs for wall mounting

- Screw 2 mounting tabs to the bottom of the rear of the energy storage system to fix it on its side to the supporting rail (Figure 12).

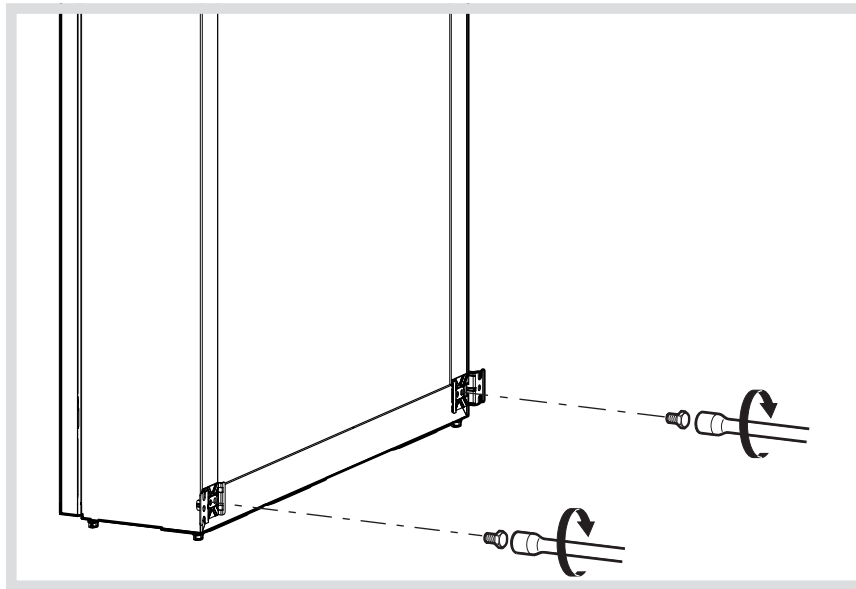


Figure 12: Assembly of mounting tabs for fixing in a sideways position

- Fix the energy storage system to the supporting rail (Figure 13).

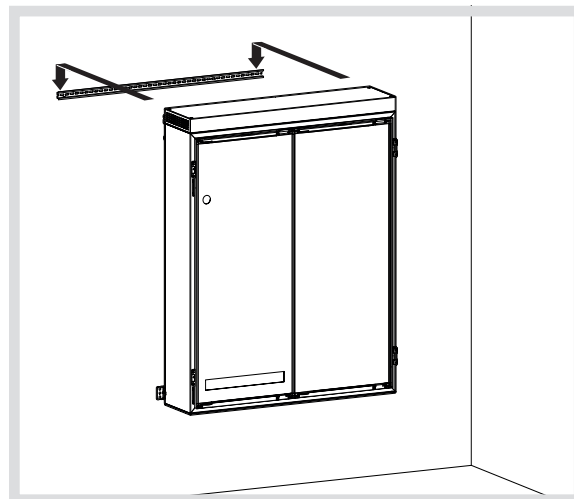


Figure 13: Mount the energy storage system

- Drill through the bottom mounting tabs and fix the energy storage system to the wall with anchors and screws.
- Securely fix the sheathed mains cable, network cable and photovoltaic string cable below the energy storage system and feed them into the energy storage system through the cable entry.

**i** Power cables and data connections must be separated.

#### Base assembly



#### CAUTION!

**2 fitters are required for assembling the energy storage system on the base due to its great weight.**

- i** Before lifting the energy storage system, the doors can be removed to reduce the weight.
- Pull off the plug on the LED status display before removing the left door (Figure 14).

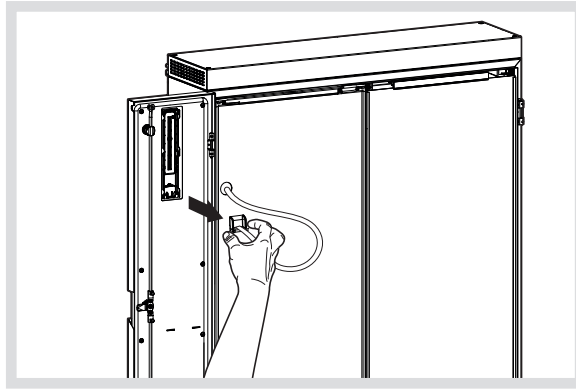


Figure 14: Pull off the plug from the LED status display

- Push up the door split pin to remove the door. Once the energy storage system has been installed, replace the doors and fix them by pushing down the door split pins (Figure 15).

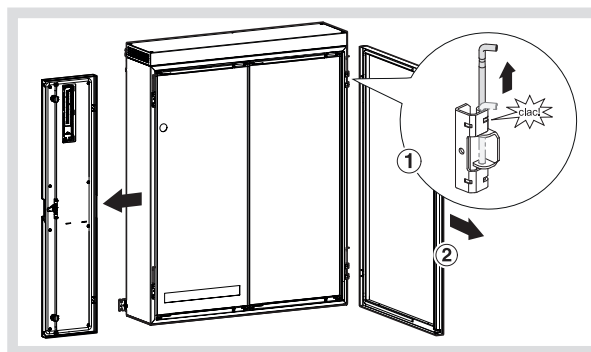


Figure 15: Door removal

- i** For a base assembly, the optional XEM200 base and a solid floor are required.
- Fix the closed base front plate, both base sides and perforated base rear plate to the base with the screws provided (Figure 16).
- Assemble the energy storage system on the base (Figure 16).

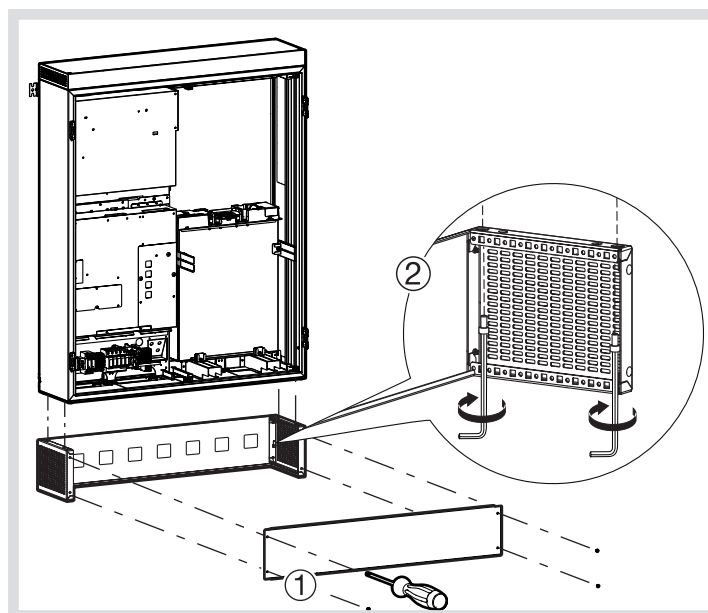


Figure 16: Base assembly

- Screw the spacers to the back of the energy storage system for fixing the system on the side and improve ventilation. (Figure 17).

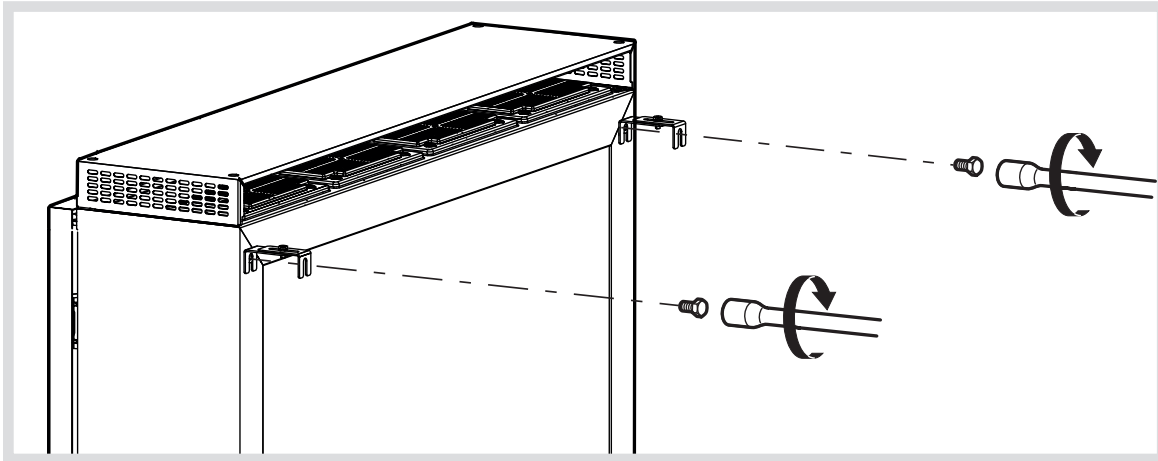


Figure 17: Rear assembly of the tabs on the side

- Measure the distance of the fixing holes and distance to the floor, mark on the wall and drill.
- Remove the bottom part from the spacer and fix to the wall with screws.
- When setting up the energy storage system, connect the bottom part of the spacer for the wall with the top part of the spacer for the cabinet using the bolt and nut.

#### ATTENTION!

**When drilling, ensure that no dust enters the energy storage system. Dirt and dust in the cooling element of the inverter can impair the cooling function and result in the destruction of the inverter!**

- Insert the unsheathed mains cable, network cable and photovoltaic string cable into the energy storage system through the cable entry.
- i** Power cables and data connections must be separated.

#### Inverter assembly

- Insert the bottom of the inverter into the mounting device above the main connection area (Figure 18).

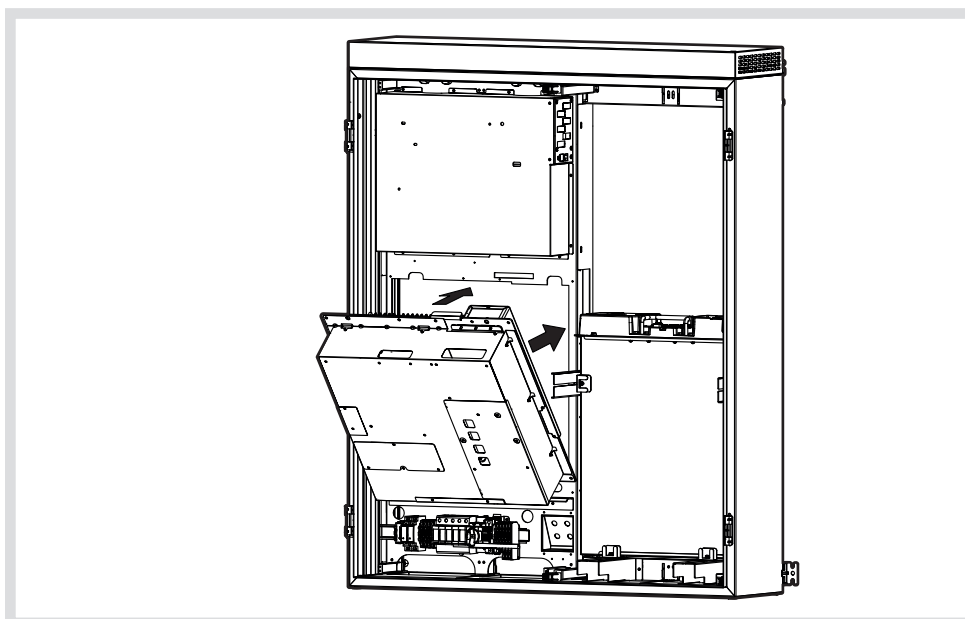


Figure 18: Insert the inverter



- Lift the inverter up, adjust it to the side and fix it with the 8 Torx 25 fastening screws provided (Figure 19).

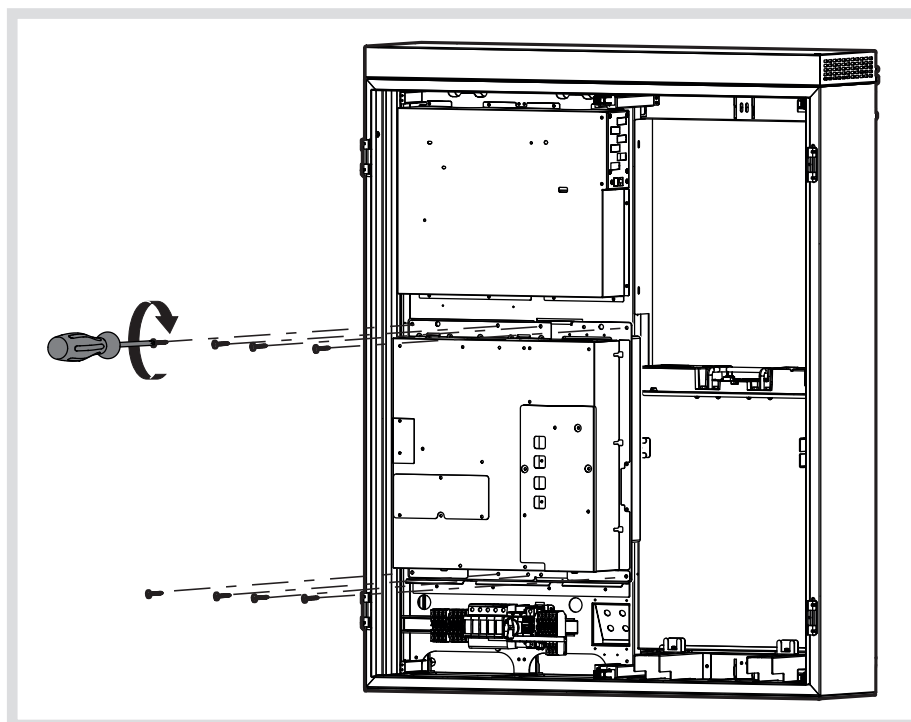


Figure 19: Fix the inverter with screws

- Insert battery controller plugs that are protected against polarity reversal in the inverter (Figure 20).

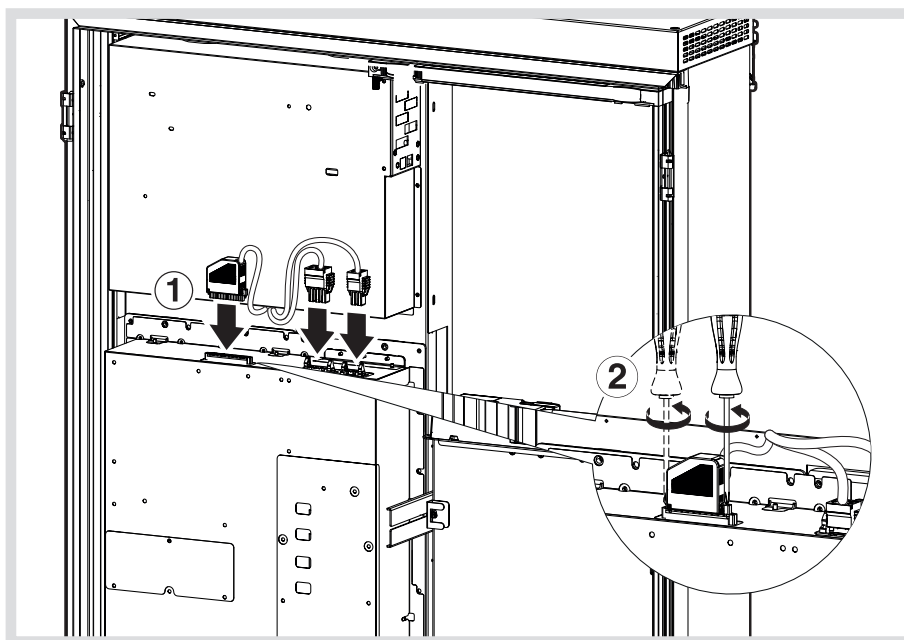


Figure 20: Connect the inverter with the battery controller

- Unscrew the cable cover on the inverter and feed out the photovoltaic connection cable on the left and the network connecting cable on the right, then re-attach the cable cover so that the cables are all in the cable duct opening (Figure 21).

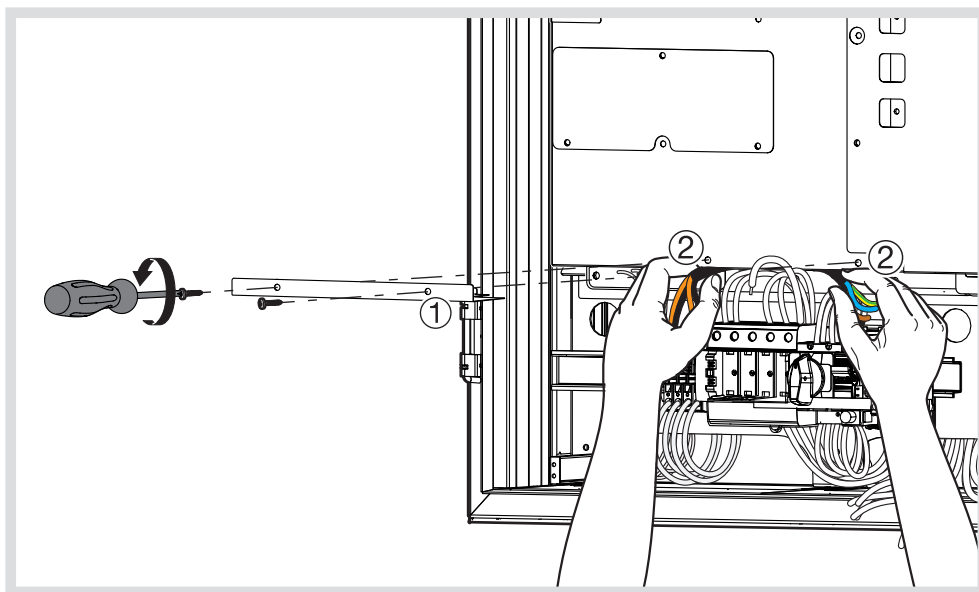


Figure 21: Feed out the connection cables from the inverter

- Connect the pre-assembled mains cable of the inverter to the modular plug-in terminals of the network supply cable in the main connection area with a slot screwdriver (Figure 22).

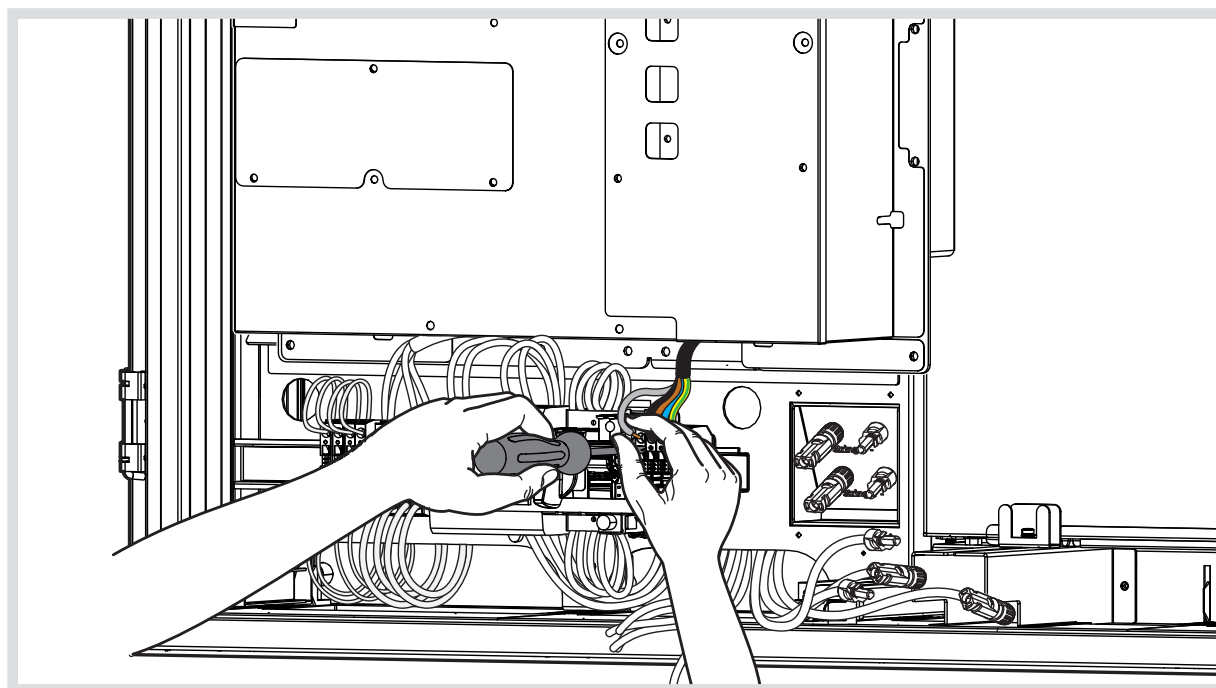


Figure 22: Inverter mains connection

- Connect the photovoltaic connection cable of the to the photovoltaic modular plug-in terminals with a slot screwdriver (Figure 23).

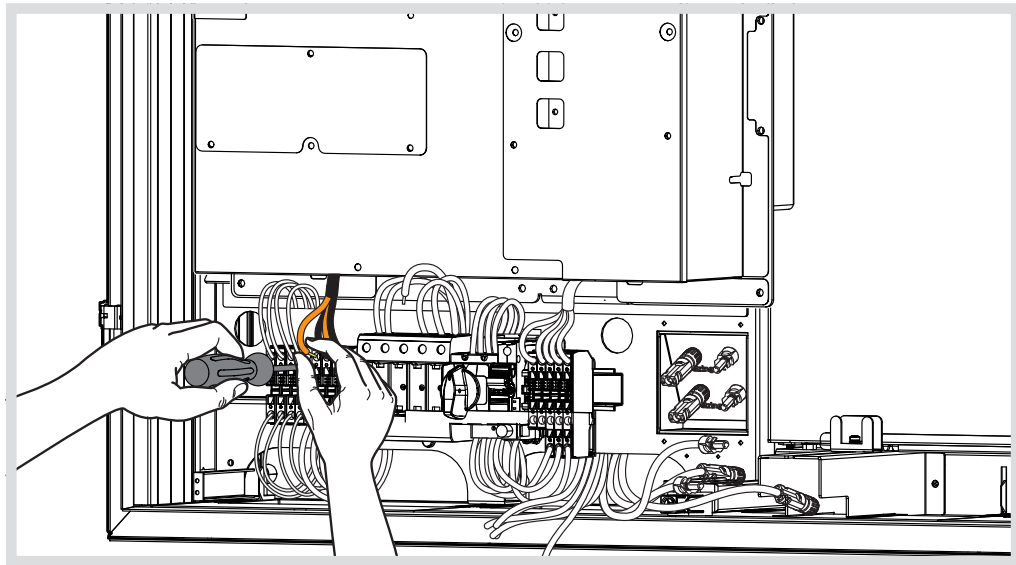


Figure 23: Inverter photovoltaic connection

## Electrical connection



### CAUTION!

Electrical equipment may only be installed and assembled by a qualified electrician in accordance with the relevant installation standards, regulations, directives and safety and accident prevention directives of the country.



### DANGER!

Touching live parts can result in an electric shock.

An electric shock can be lethal.

Before working on the device, disconnect all associated circuit breakers, photovoltaic rotary switches and battery module switches.

Cover all live parts in the area!

Do not disconnect the DC voltage by disconnecting the DC-connectors (MC-4 plugs) only (risk of arcing)!



### WARNING!

Risk to life from high voltages in the inverter!

The device may still contain voltage even once it has been disconnected from external voltages.

Please always wait at least 30 minutes for the capacitors to discharge and ensure that the switch for the battery modules is switched off.



### DANGER!

Fire risk due to system overload.

An unsuitable mains cable carries a fire risk due to system overload  
Design the mains cable in accordance with the technical device data!

**ATTENTION!**

The device carries DC voltage and is designed for operation with photovoltaic modules only!

Operation with other DC sources could destroy the device and is therefore prohibited.

The inverter must be connected to the mains and the AC and DC voltages switched on in the sequence stated in this instruction.

**Use overvoltage protection modules**

The overvoltage protection is provided by the DEHNGuard overvoltage modules.

- Push the DEHNGuard PV500 supplied into the central overvoltage module mounting device until it clicks into place (Figure 24).

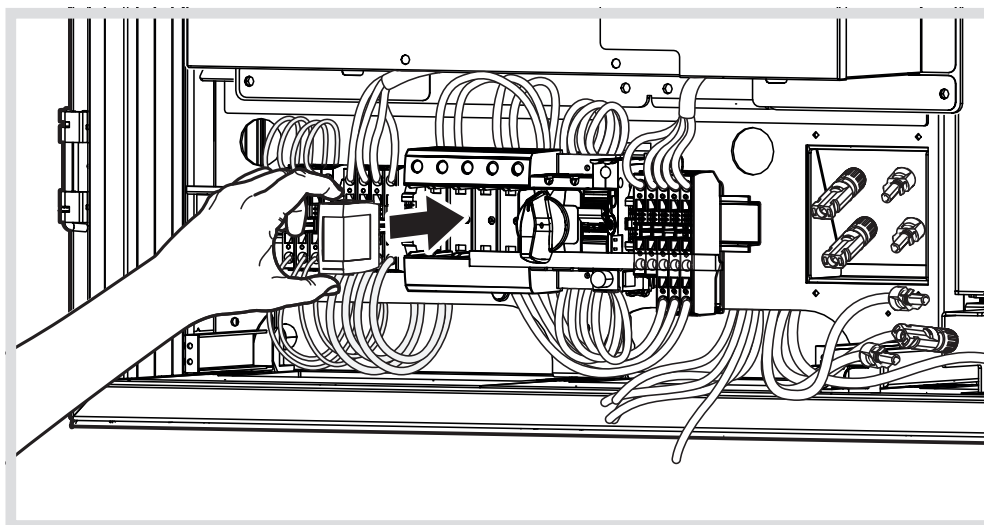


Figure 24: DEHNGuard PV500 installation

- Push the four DEHNGuard PV SCI 500 into the four overvoltage protection modules mounting devices on the left and right until they click into place (Figure 25).

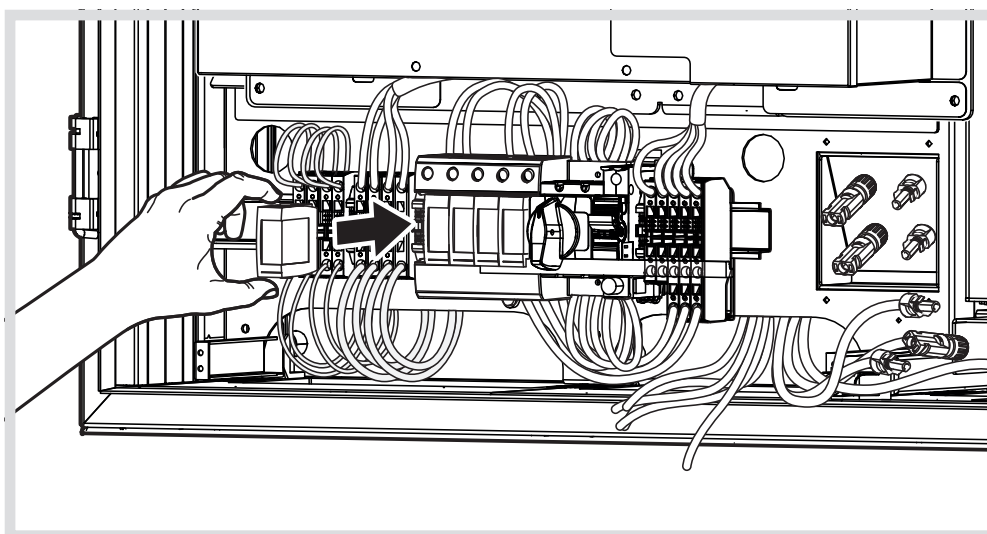
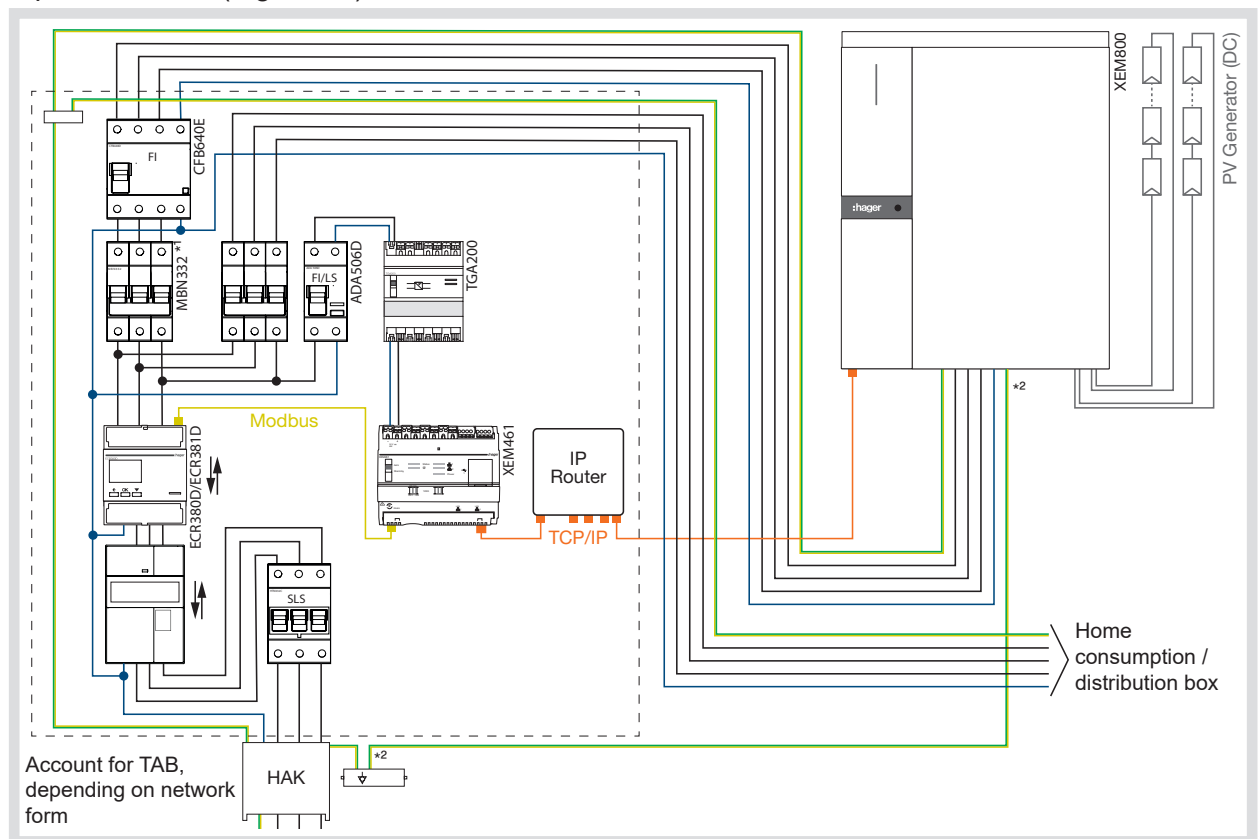


Figure 25: DEHNGuard PV SCI 500 installation

## Connecting the energy storage system to the house network (AC connection)

The energy storage system must be operated on three phases in TN and TT networks only. It is installed in the cut to the house network and requires an additional connection to the potential equalisation rail (Figure 26).



1\* Depending on cable length and conductor cross-section

2\* Continuous earth conductor  $\geq 6 \text{ mm}^2$

Figure 26: Installation in the house network

The network connection cables (recommended NYM-J 5x6 or 10 mm<sup>2</sup>), from the meter cabinet to the energy storage system must be installed in the building in accordance with the applicable installation regulations. In addition, a direct earth conductor  $\geq 6 \text{ mm}^2$  must be installed to the potential equalisation rail as overvoltage protection (specifications of DIN VDE 0100-534 for the connection of overvoltage protection units must be taken into consideration). The mains cable must be fused with a 30 mA type B Residual current circuit-breaker in the meter cabinet (recommendation in the Hager catalogue: CFB640E) and a 32 A circuit breaker type B (recommendation in the Hager catalogue: MBN332).

- i** The 300 mA Residual current circuit-breaker and 32 A circuit breaker, which act as preliminary fuses in the meter cabinet, are not part of the product and not included in the scope of delivery.
- Cut conductors L1, L2, L3, N and (leave PE 8 mm longer) to length and strip 10 mm (Figure 27).

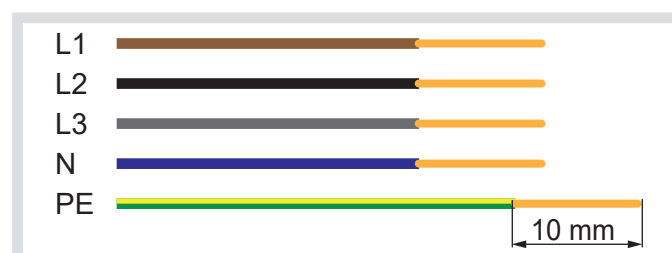


Figure 27: Stripping length

- Connect the conductors to the modular plug-in terminals in the energy storage system using a slot screwdriver (Figure 28).

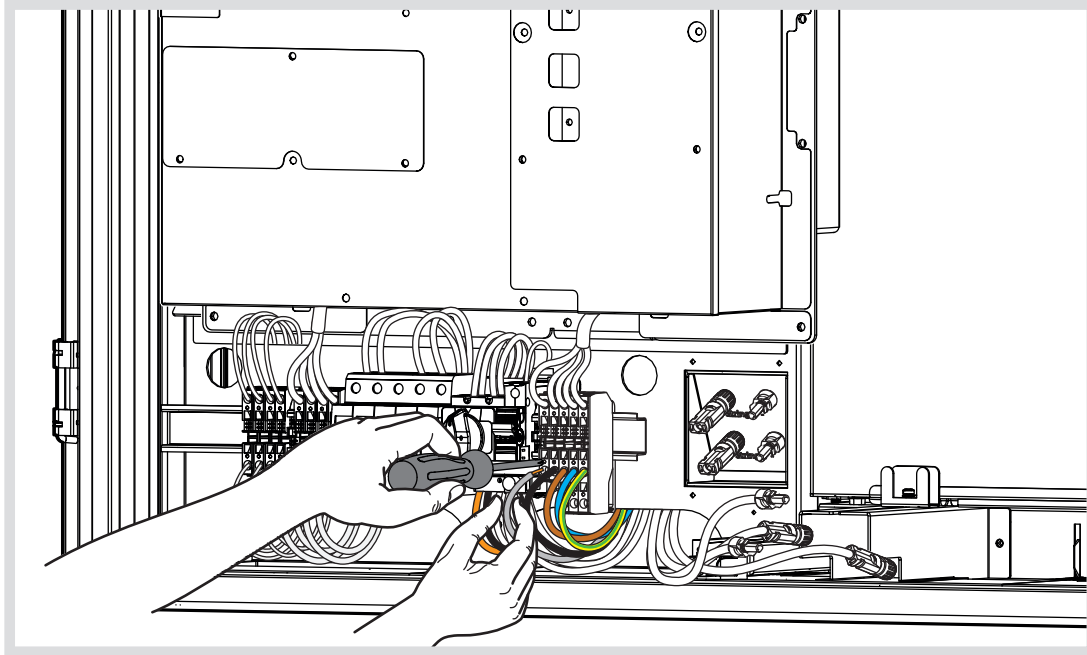


Figure 28: Mains cable connection

- i** A clockwise rotating field is required for the inverter to function properly.
- Connect the 6 mm<sup>2</sup> earth conductor from the potential equalisation to the overvoltage protector using Pozi-Drive screwdriver size 2 (Figure 29).

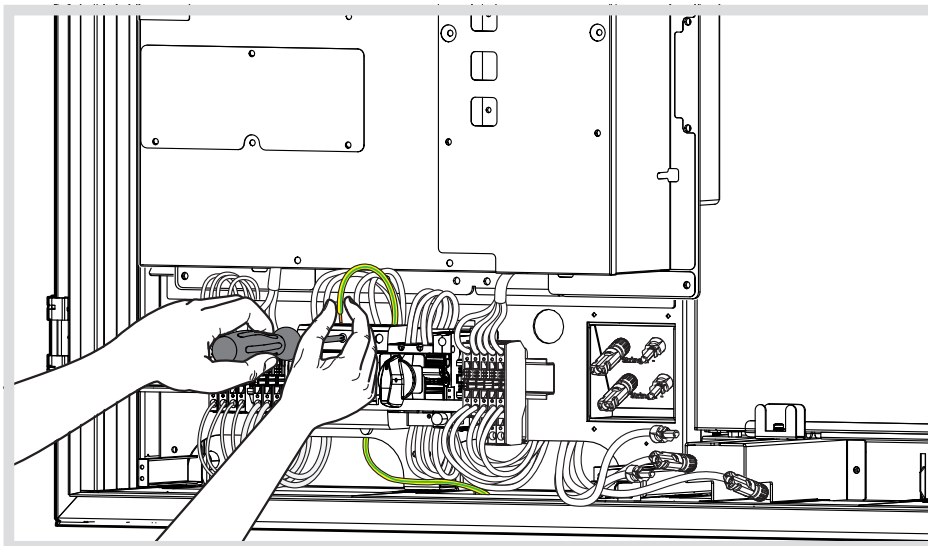


Figure 29: Connection of the earth conductor to the overvoltage protection

### Connecting photovoltaic modules to the energy storage system



#### **DANGER!**

**Risk to life from high voltages at the photovoltaic module cables!**

**DC voltage of up to 1,000 volts can exist between the photovoltaic positive and negative cables due to the design of the system. Photovoltaic modules create dangerous voltages even in low light!**

**Do not touch the two live cables!**



**DANGER!**

**Risk to life from electric shock!**

Due to technical conditions, the mains and photovoltaic sides are not electrically insulated.

Only use photovoltaic modules that meet IEC 61730 (application class A).

The photovoltaic module frames must be integrated in the potential equalisation.



**DANGER!**

**Risk of burns when working on the inverter!**

You can get burnt if the battery controller is disconnected from the inverter under load (by pulling on the connector).

The battery controller must never be disconnected from the inverter (pulling the connector) under load, i.e. never whilst voltage is fed into the inverter.

Always disconnect the mains supply before disconnecting the battery controller from the inverter.

Before working on the inverter or photovoltaic plug connections (MC-4 plug), turn the photovoltaic rotary switch to "0".



**WARNING!**

**Hazard due to electric shock!**

Dangerous touch voltages can occur when assembling photovoltaic systems.

Keep the positive and negative cables strictly separate from the potential earth (PE).



**WARNING!**

**Hazard due to electric shock!**

Dangerous touch voltages can occur when connecting the battery controller to the inverter.

The insulation before the battery controller must be tested.

**ATTENTION!**

The maximum DC input voltage of the energy storage system is 1,000 volt. If this voltage is exceeded, the inverter may be destroyed.

The temperature coefficients of the photovoltaic modules must be taken into consideration.

Ensure compliance with the voltage limits for ambient temperatures down to -20°C.

Only photovoltaic strings with the same number of cells and of the same type may be switched in series at each DC input (tracker).

Failure to do so could result in the modules being destroyed.

The open circuit voltage must not exceed 1,000 volt.



- i** Prior to connection it has to be checked that the photovoltaic system has the correct dimensions. The maximum open circuit voltage of a photovoltaic generator is achieved in full sunshine and minimal module temperature.

**ATTENTION!**

**Incorrect dimensions are a projecting error and can lead to the destruction of the energy storage!**

**Measure the insulation resistance between the protective earth (PE) and positive cable and/or the protective earth (PE) and negative cable of the photovoltaic generator. The measured insulation resistance must be within the limits specified in VDE 0126-23-1:2019-04.**

- Switch off the photovoltaic rotary switch ("0" position)
- Connect the connection cables of the photovoltaic modules that have been prepared with MC-4 connectors to the MC-4 jacks of the energy storage system.
- i** Ensure that the positive and negative cables are part of the same string.
- Plug the MC4 plugs into the jacks marked with + (Figure 30).
- Plug the MC-4 jack onto the MC-4 plug marked with – (Figure 30).
- i** When configuring the *flow* system through the energy management controller, state if one or two DC inputs (trackers) are being used.

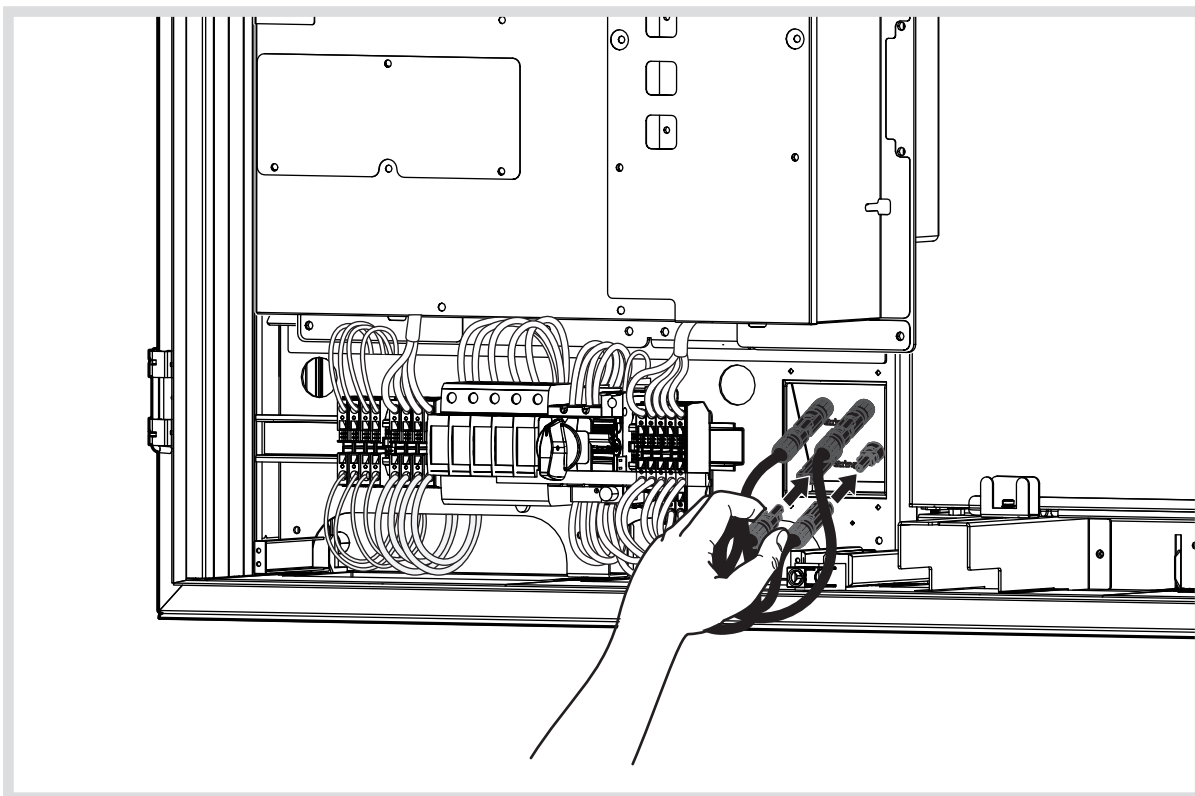


Figure 30: Connecting the photovoltaic modules

- i** Reversing the polarities is an installation error and could result in the destruction of the energy storage system!



## Network connection

A constant and stable Internet connection, preferably a DSL connection, is required for commissioning and operating the device. The device is connected to the customer's router / network through a network cable, which is to be installed in the building.

- i** The energy storage system and energy management controller of the *flow* system must be on the same network and subnet.
- Connect the RJ45 jack of the RJ45 patch module in the main connection area of the energy storage system with the customer's router / network through network cables, at least Cat. 6 (recommendation in the Hager catalogue: G8311) (Figure 31). DHCP must be activated on the router.

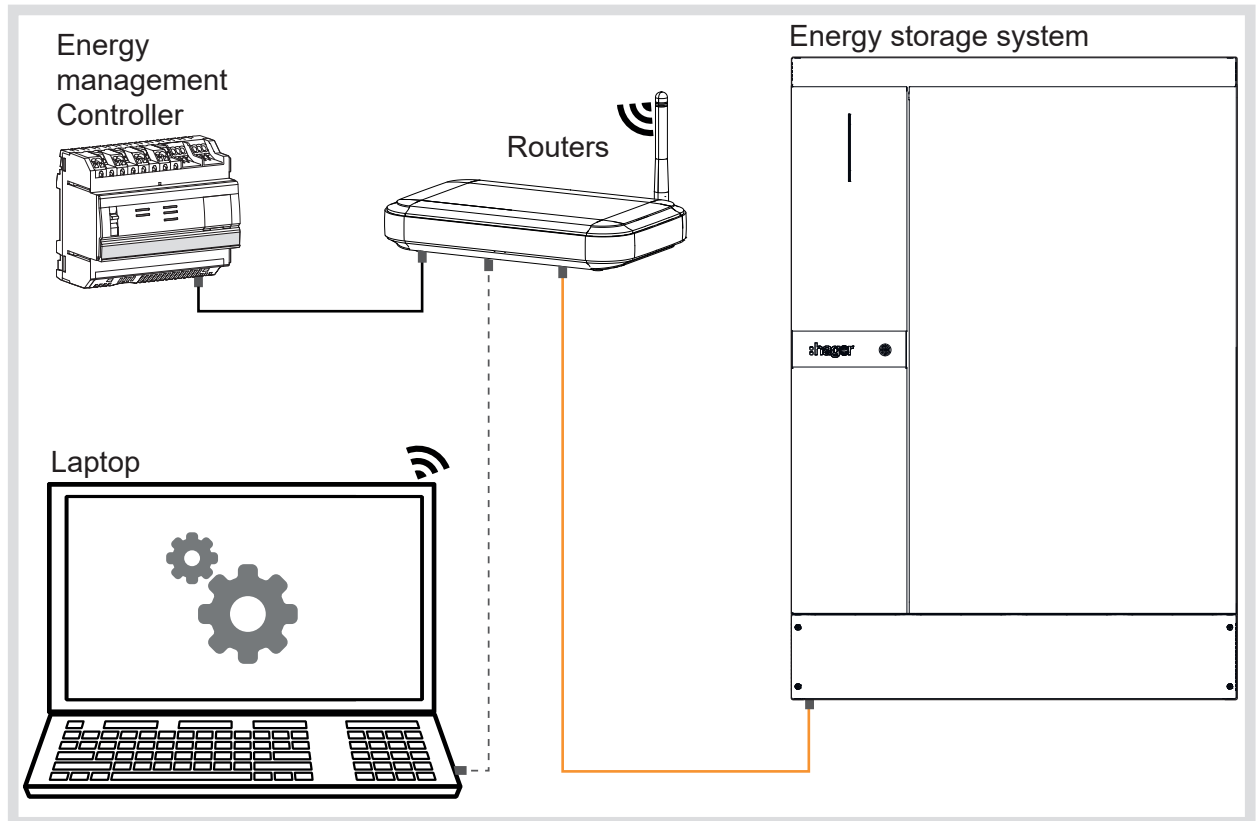


Figure 31: Energy storage system in the home network with Hager *flow*

- i** Optionally, a direct LAN connection can be created between the memory and a free LAN port of the energy management controller (LAN1 or LAN2). The energy management controller then works as an Ethernet switch.

### Connecting the SG Ready interface

Heat pumps and any other devices that are required can be integrated in intelligent electricity networks through the SG Ready interface. The heat pump and energy storage system communicate through 2 additional SG Ready relays in the main connection area. The energy management controller thus controls the heat pump with preset limits.

#### ATTENTION!

**Before installing the SG Ready interface, ensure that the distribution network operator's specifications are being met (e.g. if the heat pump is registered as interruptible consumer unit with a reduced electricity tariff).**

The SG Ready label (Figure 32) is awarded [by the Bundesverband Wärmepumpe e. V., the federal heat pump association] to heat pumps with control technology that makes it possible to integrate into an intelligent electricity network.



Figure 32: SG Ready label

- i** Hot water heat pumps must have a controller that makes it possible to increase the hot water set temperature via automatic activation for the purpose of heat storage.
- i** Heating heat pumps with an SG Ready label must have a controller that covers 4 operating status.

SG Ready relay switching	Heating heat pumps operating status
Relay 1 = On Relay 2 = Off	<b>Operating status 1</b> (locked operation): This operating status is backward compatible with the EVU lock, which is often activated at set times, and comprises a maximum of 2 hours "hard" locking.
Relay 1 = Off Relay 2 = Off	<b>Operating status 2</b> (standard operation): In this switching mode, the heat pump runs in energy-efficient normal operation and fills some heat into the heat storage for the maximum 2-hour EVU lock.
Relay 1 = Off Relay 2 = On	<b>Operating status 3</b> (photovoltaic surplus operation): In this operating status, the heat pump runs higher within the controller for room heating and hot water preparation. It is not a definite start command, but a switch-on recommendation according to today's increase.
Relay 1 = On Relay 2 = On	<b>Operating status 4</b> (operation for curtailment): This is a definite start command if this is possible as part of the regular settings. For this operating status, it must be possible to set different control models on the controller for various tariff and use models: Variant 1: The heat pump (compressor) is actively switched on. Variant 2: The heat pump (compressor and additional electric heater) is actively switched on, optional: higher temperature in the heat storage
optional	Optionally, the room temperature can be used as a benchmark for controlling the system temperature (input or return temperature). Locking the heat pump with a room thermostat that depends on room temperature is insufficient.

Table 7: SG Ready relay operating status

- Disconnect the SG Ready control cable from the modular plug-in terminal block and remove the modular plug-in terminal block.
- Snap the two SG Ready relays EN145 of the SG Ready expansion set XEM250 (Figure 33) on to the DIN rail in the main connection area.

- Connect the blue strand from the grey cable of the battery controller to the A2 contacts of the two relays (Figure 33).

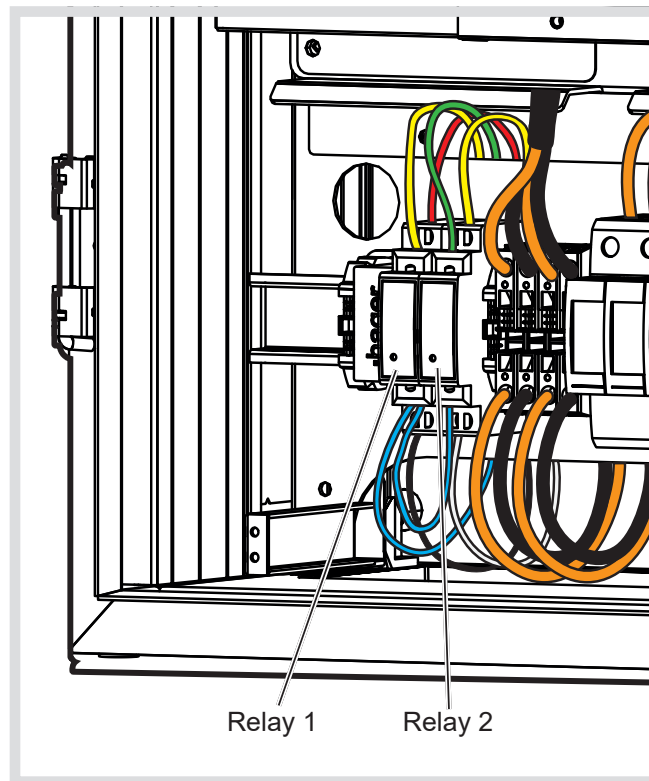


Figure 33: SG Ready relays in the main connection area

- Connect the yellow strand from the grey cable of the battery controller to the A1 contact relay.
- Connect the green strand in from grey cable of the battery controller to the A1 contact relay 2.
- i** Most heat pumps require one normally open contact. The normally open contact is therefore connected to terminals 1 and 2 of the two SG Ready relays.
- Connect the heat pump controller cable to the contacts of the SG Ready relays (see heat pump installation instruction).
- ✂** **Practical tip**  
Alternatively, one binary input of the Hager radio input, 2gang TRB302B, can be connected to each of the normally open contacts of the SG Ready relays to send the SG Ready signals to the heat pump. The heat pump can be fitted with 2 radio switch actuators with potential-free contact TRM694G whose contacts follow the SG Ready relays. The radio components should not be installed outside the metal cabinets in separate housings due to the radio signal transmission.

## Battery module assembly and connection

The battery modules are designed for assembly in the energy storage system.

Batteries can be a potential risk. Extremely high short circuit current can be created if handled incorrectly!

Please also note that batteries are never fully discharged, even in an obviously discharged state!

The batteries provided by Hager are exclusively designed for use in the Hager energy storage system. Hager does not assume any liability for damages and accidents caused by the batteries being used improperly or not as intended.



### First aid measures

#### Contact with leaking electrolyte:

- **Skin contact:**

**Do not touch leaking batteries without protection!**

**Rinse affected skin sections with water for at least 15 minutes.**

- **Eye contact:**

**Wear goggles if possible.**

**If leaking electrolyte gets into contact with the eyes, this can result in eye injuries.**

**Rinse eyes thoroughly with water and also contact a doctor.**

- **Swallowing:**

**If electrolyte has been swallowed:**

**Induce vomiting and also contact a doctor.**

- **Burns:**

**Accidental burns:**

**Apply first aid and also seek medical attention.**

- **Contamination of the airways:**

**Always leave the room if heavy smoke or gas develops.**

**If large amounts of smoke or gases have been breathed in, or if the airways have been noticeably irritated, seek medical attention.**

**Ensure that there is sufficient ventilation, if possible.**



### DANGER!

#### Risk to life from fire or explosion!

**Do not damage the battery module or expose it to strong impacts.**

**Do not use any damaged or defective battery modules.**

**Do not expose the battery modules to temperatures above 60 °C or fire**

**Do not place the battery near a heat source, such as a chimney.**

**Do not expose the battery modules to direct sunlight.**

**Avoid contacting the battery connections with electrically conducting items, such as wires or tools.**



## WARNING!

**Risk of electric shock!**

**Do not open , repair or modify the battery modules.**

**Do not touch the battery module with damp hands.**

**Do not expose the battery modules to damp or liquids.**

**Keep the battery modules away from children and animals.**

**Do not clean the battery modules with cleaning solution!**

**Do not insert foreign objects into the battery modules!**

**Avoid contact with fluids or vapours leaking from the battery module**



## CAUTION!

**Switch on the battery module with the on / off switch only for commissioning with the energy management controller XEM461 and after carefully checking the battery installation.**

**The batteries are partially charged in their default state. Particular care must therefore be taken when creating the electrical connection!**

### Battery module structure

**i** The battery modules are shown below as they are used in the energy storage system: The battery module consists of the following components (Figure 34).

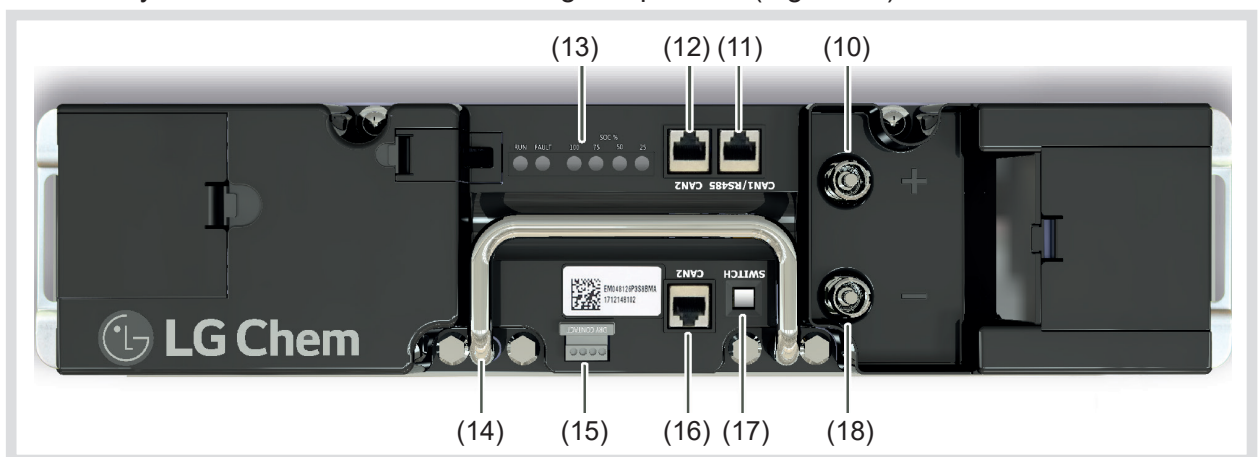


Figure 34: Battery module top view

- (10) + Jack for battery high-performance cable (orange plug)
- (11) **CAN1/RS485** RJ48 jack (battery module connection to the battery controller)
- (12) **CAN2** RJ48 jack (slave battery module connection to the master battery module (only connect for a slave battery module!))
- (13) LED status display battery module
- (14) Handle (attention: not suitable for carrying the battery)
- (15) Potential-free contact (is not used)
- (16) **CAN2** RJ48 jack (master battery module connection to the slave battery module)
- (17) **SWITCH** Battery module on / off switch
- (18) – Jack for battery power cable (black plug)

## Battery module assembly



### CAUTION!

Always transport the battery modules to the assembly location in their original packaging and unpack them there to protect them against damage!

The battery module should be inserted by two persons due to its great weight. Do not use the handle for carrying. It only serves to adjust the battery module once it has been inserted.

- Screw on the battery brackets (19) of the battery module mounting device at the bottom and on each side (Figure 35).
- Turn the battery module so that the connections for the battery power cables (10) and (18) are on the right.
- Place the battery module(s) in the battery module mounting device of the energy storage system and fix it by screwing on the battery bracket (19) .

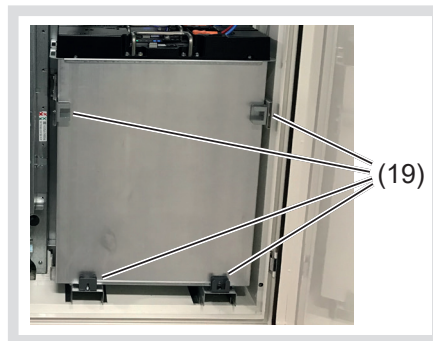


Figure 35: Battery bracket for battery module

(19) Battery bracket

## Battery module connection

One connection cable set each is provided for connecting the battery module (Figure 36).



### CAUTION!

Do not switch the polarity of the + and - plugs on the battery modules! Switching the polarity results in severe damage to the battery modules!

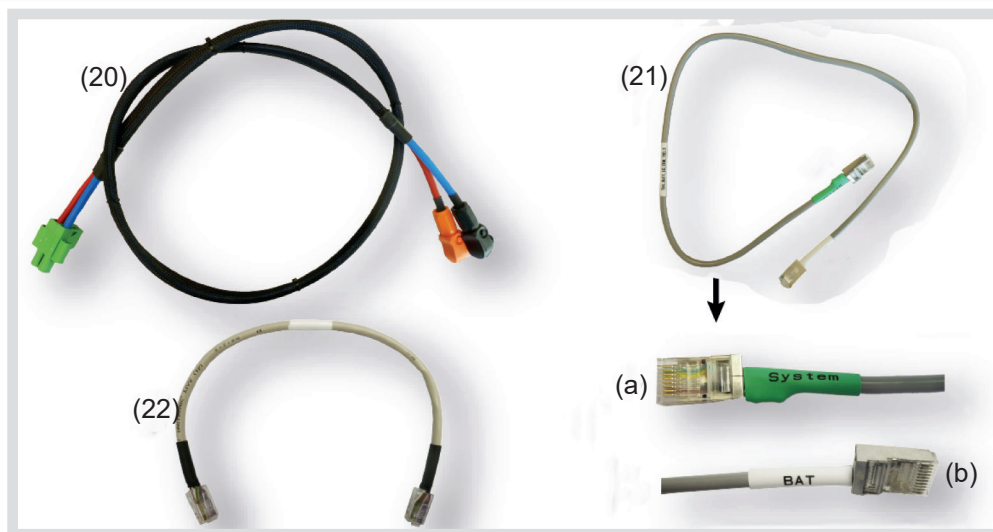


Figure 36: Connection cables provided with the battery module

(20) Battery power cable (mains cable)

(21) Communication cable (only one required per energy storage system)



(22) Slave communication cable (only required for 2 battery modules)

## Energy storage system battery module connection with one battery module

### Battery power cable connection

- From the battery power cable, (20) plug the orange battery plug into the + jack (10) and the black battery plug into the – jack (18) of the battery module (Figure 37).
- i** Do not jam the battery plugs when plugging them into the + and – jacks of the battery module, if possible. Turn the plugs slightly to the left and right until they audibly click into place.
- Plug the green plug of the battery power cable into a battery jack (24) of the battery connection field (Figure 37) and secure it by tightening the plug crews.

### Connect the communication cables

- Plug the green marked RJ45 plug (a) of the communication cable (21) into the RJ45 jack (23) of the battery connection field (Figure 37).
- Plug the white marked RJ48 plug (b) of the communication cable (21) into the RJ48 jack **CAN1/RS485** (11) of the battery module (Figure 37).
- i** There can be a longer period between installing the battery module and the actual commissioning of the energy storage system. To prevent a deep discharge of the battery module, switch off the on / off switch on the battery module.

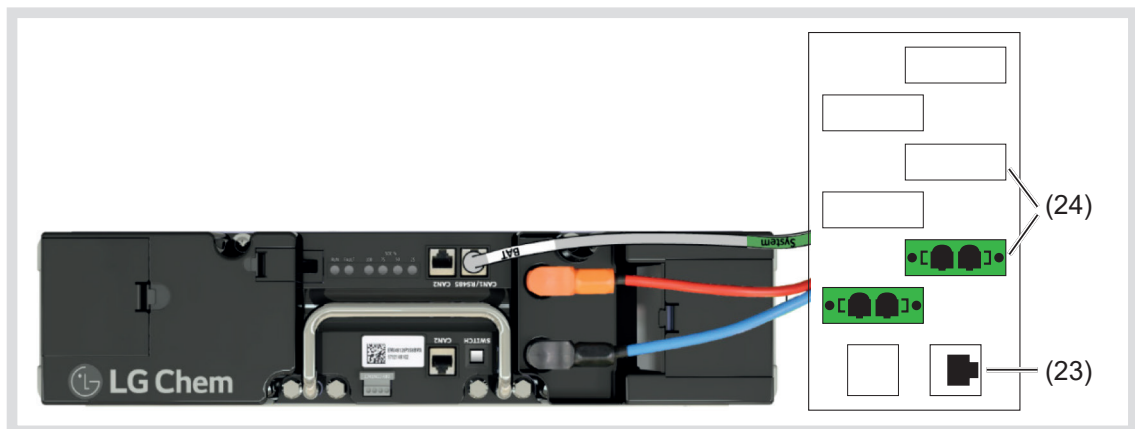


Figure 37: Battery module connection with one battery module

(23) RJ45 jack

(24) Master battery jack

## Energy storage system battery module connection with two battery modules

- i** The rear battery module should always be used as the master battery module.

### Battery power cable connection

- From the battery power cable, (20) plug the orange battery plug into the + jack (10) and the black battery plug into the – jack (18) of the respective battery module (Figure 37).
- i** Do not jam the battery plugs when plugging them into the + and – jacks of the battery module, if possible. Turn the plugs slightly to the left and right until they audibly click into place.
- Plug the green plugs of the battery power cable (20) of the master battery module and slave battery module into one battery jack each (24) of the battery connection field (Figure 38) and secure them by tightening the plug screws.
- Plug the green marked RJ45 plug (a) of the master communication cable (21) into the RJ45 jack (23) of the battery connection field.
- Plug the white marked RJ48 plug (b) of the master communication cable (21) into the RJ48 jack **CAN1/RS485** (11) of the master battery module.
- With the slave communication cable, (22) connect the top **CAN2** jack (16) of the master battery module with the bottom **CAN2** jack (12) of the slave battery module (Figure 38).



**CAUTION!**

**Never use the slave communication cable for connecting to the battery controller.**

**Switching the cable can lead to severe damage.**

- i** There can be a longer period between installing the battery modules and the actual commissioning of the energy storage system. To prevent a deep discharge of the battery modules, switch off the on / off switch (17) on the master battery module.

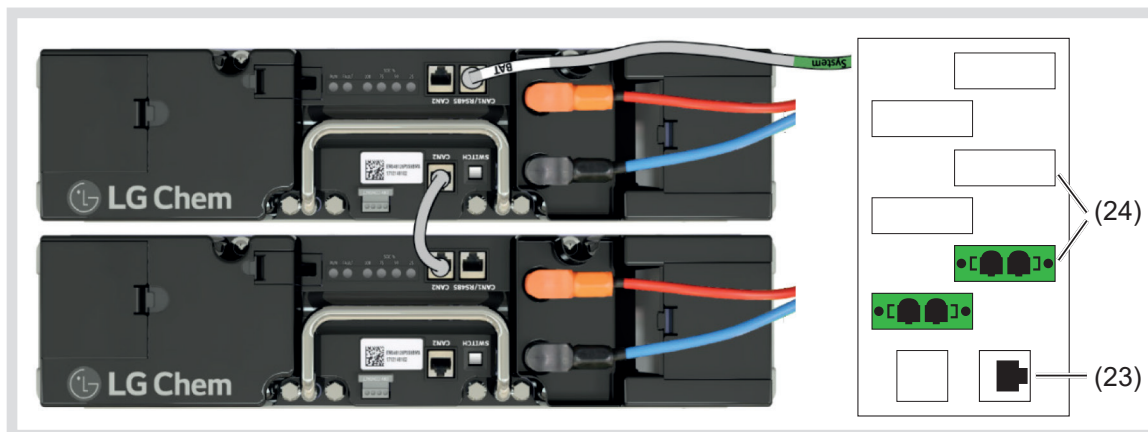


Figure 38: Battery module connection with 2 battery modules



## LED status display battery modules

The LED status display shows the status of the respective battery module after switching it on (Figure 39).

1	2	3	4	5	6	Severity
						Normal state (only this LED lights up during the initialisation phase)
						State of charge (SOC) $\leq 75\%$
						State of charge (SOC) $\leq 50\%$
						State of charge (SOC) $\leq 25\%$
						State of charge (SOC) $< 25\%$
						Voltage equality (only for 2 battery modules) Different voltages of the battery modules are automatically balanced out by the battery software. The red LED goes out when there is equal voltage.
						Warning If the battery module become unstable, it changes to warning mode and the right LED flashes green. The blue LEDs continue to show the battery charging status. In the example here this is 50% or more. The warning mode ends automatically once the battery module gets back to normal state. Contact the service team if the warning continues for longer periods.
						Error 1 (slight) The red LED flashes to indicate that a battery module is about to have a defect. Measures may be required. Contact the service team. The blue LEDs show the error number in binary form.
						Error 2 (severe) The battery module is operated outside the limits and a defect is imminent. Contact the service team. The blue LEDs show the error number in binary form.

LED off      LED flashes (green in this case)      LED flashes (red in this case)

1) The right blue LED for the charging status flashes in the master battery module.

Figure 39: LED status display battery modules

### Switching off the battery module

In the following cases operate the on / off switch (17) on the battery module so that the battery module LED status display is off.

- i** The energy storage system with 2 battery modules must be switched off with the on / off switch of the master battery module.
- Before installing the energy storage system
  - If the system is switched off for a longer period of time, e.g. prior to commissioning. This prevents a deep discharge of the battery modules.
  - When retrofitting previously installed systems
  - When replacing battery modules
  - After manually switching off the energy storage system through the menu of the energy management controller
  - After decommissioning the energy storage system
  - If the system is not in use for a longer period of time

## Commissioning

The energy storage system acts as an interim storage for photovoltaic energy created in the *flow* system. The energy storage system can feed any surplus energy into the electricity grid that is over a specified feed-in limit. The energy management controller must be used exclusively for configuring the system.

### Check connections and wiring

The following conditions have been met for commissioning the energy storage system:

- The energy storage system is connected and firmly wired to the house installation
- The installation and electric connection to the house installation as well as the clockwise rotating field have been checked.
- The installation and electric connection of the photovoltaic system to the energy storage system is firmly wired and has been checked. The insulation resistance of both photovoltaic conductors has been measured.
- The network cable between the energy storage system and router is connected and is in the same network and subnet as the energy management controller.

### Switching on the energy storage system



#### CAUTION!

**This step must always be performed by a certified electrical company!**

- Switch on the circuit breaker and Residual current circuit-breaker of the energy storage system mains cable.
  - Switch on the circuit breaker for the battery controller in the energy storage system.
  - Switch on the photovoltaic system on the photovoltaic rotary switch in the energy storage system  
The inverter then goes into operation if there is sufficient voltage in the photovoltaic modules.
  - Switch on the master battery module, which is connected with the battery connection field through the communication cable, only by briefly activating < 2 s the on / off **SWITCH** on the battery module.
- i** It is important to operate the on / off **SWITCH** of the master battery module only briefly. This is crucial for a correct initialisation process. Do not manually switch on any slave battery module! This happens automatically with the master.

- i** The configuration for commissioning in connection with the Hager *flow* system is described in the energy management controller instruction XEM461 under "Connecting the storage device with *flow*".

The LED lights up green on the battery modules.

The energy storage system starts to commission automatically with the battery training. The battery training serves to calibrate the calculation of the state of charge (SOC) of the battery. Meanwhile, the battery is charged up to 100% without accounting for the household consumption, then fully discharged without accounting for the photovoltaic energy generated. Once the battery training has been completed, the device automatically enters normal operation.

- i** If batteries are replaced at a later date or another battery is added to the system, the battery training also starts automatically with the re-commissioning process.

► **For details see the energy management controller installation and configuration instructions**

## Appendix

### Technical data

#### Input

Max. recommended DC power	13,000 W
Min. MMP voltage	250 V
Max. MMP voltage	850 V
Max. DC input voltage	1,000 V
Max. DC power per MPP tracker	20 A
Independent MPP trackers	2
Photovoltaic connection	2 x 2 MC4 connectors

#### Output

Nominal AC power (230 V, 50 Hz)	10,000 W (depending on photovoltaic size)
Max. apparent output power	13,800 VA
Nominal AC voltage L/N/PE 230 V	3 x 230 V
Rated AC frequency	50 Hz
Max. output current (per phase)	20 A
Feed-in phases / connection phases	3 / 3
Transformerless	technology
Cos $\varphi$ (Phi)	-0.9 ... +0.9

#### General data

Max. efficiency of the entire system	> 88 %
Effectiveness of the photovoltaic inverter EU	> 95 %
AC short circuit proof / earth fault monitoring	yes / yes
Operating temperature range	5 °C ... 35 °C
Storage / transport temperature	5 °C ... 35 °C
Relative humidity	85% (uncondensed)
Maximum operating height above sea level	2,000 m
Noise	< 35 dB
Protection class / cooling	IP20 / fan, depending on performance
Data interface	Ethernet / CAN
Dimensions (W x H x D)	1052 x 1350 x 296 mm
Height with optional base	1,550 mm
Total system weight excluding battery modules	152 kg
Weight of energy storage system with battery modules	196 kg with one module / 240 kg with two modules
LED	status display
Energy management	External through the energy management controller

## Battery system

	1 battery module	2 battery modules
	5.8 kWh	11.6 kWh
Battery inverter permanent output (kW)		3.0 kW
Battery technology	Lithium ion	
Weight per battery module	44 kg	
Weight of the battery modules	44 kg	88 kg
Effectiveness of batteries	> 95 %	
Temperature control	yes	
Useable battery capacity	5.8 kWh	11.6 kWh
Depth of discharge	100 %	100 %
Retrofitting to	11.6 kWh	(within the first year)

## System

External interfaces	, see energy management controller
SG Ready interface (heat pump connection)	, optional
Building automation	, see energy management controller

## Security:

Degree of protection	IP 30
Protection class	1
Degree of contamination	2
Recommended external protection and switch-off devices (not included in scope of delivery)	
Residual current circuit breaker (CFB640E)	4-pin, 10 kA, 40 A, 300 mA, type B
Circuit breaker (MBN332)	3-pin, 6 kA, 32 A, B characteristic

## Certificates and standards

### security

DIN 0126-1-1 and VDE-AR-N 4105  
 Directive 2014/35/EU Electrical equipment  
 Low voltage Directive 2014/30/EU Electromagnetic compatibility  
 Directive 2011/65/EG EU-RoHS  
 EN 61000-6-3:2011  
 EN 61000-6-2:2006  
 EN61000-3-2:2006 + A1:2009 + A2:2009  
 EN61000-3-3:2008  
 EN 62109-1:2010  
 EN 62109-2:2011  
 EN 50581:2012  
 Lithium ion batteries in accordance with UN 38.3 transport test (UN Manual of Tests and Criteria, Part III, subsection 38.3)

## Conformity

CE conformity

## Accessories

Battery module	XEM100
Base for upright assembly	XEM200
SG Ready interface (heat pump connection)	XEM250

## Maintenance and cleaning

The energy storage system is a maintenance-free product. No regular preventive maintenance is therefore required and none of the parts have to be replaced by the operator.

A qualified electrician certified for the Hager energy storage system can nevertheless check that the visible bolted joints are securely fixed (after removing the touch guard) during an e-check.

The outside of the energy storage system can be wiped with a dry or slightly damp cloth. It is not necessary to clean the inside. Check the electrical switching and safety equipment in the house distribution board for visual defects.

## Battery recycling

The battery modules are recycled by the system engineer and Hager. Please therefore contact the system engineer who will arrange for Hager to recycle the battery modules.

## Disposal



Disposal of electrical and electronic devices as well as batteries in the European Union.

The symbol of a crossed-out rubbish bin on the product and/or packaging indicates that the device must not be disposed off in the ordinary household rubbish. Your local municipality, waste disposal point or retailer where the device was purchased can give you information on recycling. By ensuring that the product is properly disposed of, you make an important contribution to the environmentally friendly disposal of the device and to preventing negative effects on the environment and health of other people.

## Warranty

We reserve the right to realise technical and formal changes to the product in the interest of technical progress.

Our products are under warranty within the scope of the statutory regulations.

If you have a warranty claim, please contact the point of sale.





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