Operating manual



# SMA Storage M

**SMA Storage M 12.3 / SMA Storage M 16.4 / SMA Storage M 20.5 / SMA Storage M 24.6 / SMA Storage M 28.7 / SMA Storage M 32.8 / SMA Storage M 36.9 / SMA Storage M 40.9 / SMA Storage M 45.0 / SMA Storage M 49.1**

**ENGLISH**

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# 1 Information on this Document

## 1.1 Validity

This document is valid for:

- SMA Storage M 12.3 (3x STM-BM-4.09-10)
- SMA Storage M 16.4 (4x STM-BM-4.09-10)
- SMA Storage M 20.5 (5x STM-BM-4.09-10)
- SMA Storage M 24.6 (6x STM-BM-4.09-10)
- SMA Storage M 28.7 (7x STM-BM-4.09-10)
- SMA Storage M 32.8 (8x STM-BM-4.09-10)
- SMA Storage M 36.9 (9x STM-BM-4.09-10)
- SMA Storage M 40.9 (10x STM-BM-4.09-10)
- SMA Storage M 45.0 (11x STM-BM-4.09-10)
- SMA Storage M 49.1 (12x STM-BM-4.09-10)

## 1.2 Target Group

The tasks described in this document must only be performed by qualified persons. Qualified persons must have the following skills:

- Knowledge of how an inverter works and is operated
- Knowledge of how batteries work and are operated
- Training to deal with risks associated with installing, repairing, and using electrical devices, inverters, and batteries
- Training in the installation and commissioning of electrical devices and installations
- Knowledge of all applicable laws, regulations, standards, and directives
- Knowledge of and compliance with this document and all safety information

## 1.3 Content and Structure of this Document

This document describes the mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning of the product.

The latest version of this document as well as additional information about the product can be found at www.SMA-Solar.com.

Illustrations in this document are reduced to the essential information and may deviate from the real product.

## 1.4 Levels of Warning Messages

The following levels of warning messages may occur when handling the product.

| ⚠ DANGER |
| --- |
| Indicates a hazardous situation which, if not avoided, will result in death or serious injury. |

| ⚠ WARNING |
| --- |
| Indicates a hazardous situation which, if not avoided, could result in death or serious injury. |

| ⚠ CAUTION |
| --- |
| Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. |

| NOTICE |
| --- |
| Indicates a situation which, if not avoided, can result in property damage. |

## 1.5 Symbols in the Document

| Symbol | Explanation |
| --- | --- |
|  | Information that is important for a specific topic or goal, but is not safety-relevant |
| ☐ | Indicates a requirement for meeting a specific goal |
| ☑ | Required result |
|  | Example |
| ⚠ QUALIFIED PERSON | Sections describing activities to be performed by qualified persons only |

## 1.6 Typographies in the document

| Typography | Use | Example |
| --- | --- | --- |
| **bold** | • Messages<br>• Terminals<br>• Elements on a user interface<br>• Elements to be selected<br>• Elements to be entered | • Connect the insulated conductors to the terminals **X703:1** to **X703:6**.<br>• Enter **10** in the field **Minutes**. |
| **>** | • Connects several elements to be selected | • Go to Settings > Date. |
| [**Button**]<br>[**Key**] | • Button or key to be selected or pressed | • Select [**Enter**]. |
| # | • Placeholder for variable components (e.g., parameter names) | • Parameter **WCtlHz.Hz#** |

## 1.7 Designations in the Document

| Complete designation | Designation in this document |
| --- | --- |
| SMA Storage M | Battery, battery system, product |
| STM-BMS-10 | BMS unit (Battery Management System) |
| STM-BM-4.09-10 | Battery module, module |
| Sunny Boy Smart Energy<br>Sunny Tripower Hybrid X | Hybrid inverter, inverter |

## 1.8 Additional Information

Additional information is available at www.SMA-Solar.com.

| Title and information content | Type of information |
|---|---|
| SUNNY BOY SMART ENERGY 3.6 / 4.0 / 5.0 / 6.0 / 8.0 / 9.9 Mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning | Operating manual |
| SUNNY BOY SMART ENERGY "Approved Batteries and Information on Battery Communication Connection" | Technical Information |
| SUNNY TRIPOWER HYBRID X 5 / 6 / 8 / 10 / 12 / 15<br>Mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning | Operating manual |
| SUNNY TRIPOWER HYBRID X 20 / 25 / 30<br>Mounting, installation, commissioning, configuration, operation, troubleshooting and decommissioning | Operating manual |
| "SUNNY TRIPOWER HYBRID X "Approved Batteries and Information on Battery Communication Connection" | Technical Information |

# 2 Safety

## 2.1 Intended Use

The SMA Storage M battery system is a modular standalone storage. It consists of a central battery management unit (BMS, type STM-BMS-10) and battery modules of type STM-BM-4.09.-10.

For the intended operation of the system, exactly one BMS unit in conjunction with a minimum of three and a maximum of twelve battery modules must be installed and operated. The minimum configuration of the system must consist of one BMS unit and three battery modules.

The system may only be expanded by adding battery modules of type STM-BM-4.09-10. Do not exceed the total number of twelve battery modules. Operation with fewer than three or more than twelve battery modules is not approved and therefore not permitted.

The maximum number of battery modules also depends on the specific inverter being used. The thresholds and connection conditions specified in the related technical documentation of the inverter must be observed.

Operating the battery system outside of these specifications, in particular by exceeding the permitted number of modules or using unapproved components, constitutes improper use and is prohibited.

For the operation of the SMA Storage M battery system only the inverter types listed below are approved. The maximum number of battery modules each permitted must be observed:

Sunny Boy Smart Energy 3.6 / 4.0 / 5.0 / 6.0 / 8.0 / 9.9 (SBSExx-50)

- Supports a maximum of 7 battery modules
- Corresponds to: SMA Storage M 28.7

Sunny Tripower Hybrid X 5 / 6 / 8 / 10 / 12 / 15 (STPHxx-60)

- Supports a maximum of 9 battery modules
- Corresponds to: SMA Storage M 36.9

Sunny Tripower Hybrid X 20 / 25 / 30 (STPHxx-70)

- Supports a maximum of 12 battery modules
- Corresponds to: SMA Storage M 49.1

The SMA Storage M can be used for home applications such as increased self-consumption and peak load shaving.

The communication interface of the inverter used must be compatible with the product. The entire voltage range must be completely within the permissible input voltage range of the inverter. The maximum permissible DC input voltage of the product must not be exceeded.

No additional loads or components in the DC connection may be connected between the battery and inverter.

The product is suitable for indoor and outdoor use.

The product must only be used as stationary equipment.

All components must remain within their permitted operating ranges and their installation requirements at all times.

The product is not suitable for supplying life-sustaining medical devices. A power outage must not lead to personal injury.

The product must only be used in countries for which it is approved or released by SMA Solar Technology AG and the grid operator.

The products by SMA Solar Technology AG are not suitable for use in

- Medical devices, in particular products for supplying life-support systems and machines,
- Aircraft, the operation of aircraft, the supply of critical airport infrastructure and airport systems,
- Rail vehicles, the operation and supply of rail vehicles and their critical infrastructure.

The above list is not exhaustive. Contact us if you are unsure whether products by SMA Solar Technology AG are suitable for your application.

Use SMA products only in accordance with the information provided in the enclosed documentation and with the locally applicable laws, regulations, standards and directives. Any other application may cause personal injury or property damage.

The documentation must be strictly followed. Deviations from the described actions and the use of materials, tools, and aids other than those specified by SMA Solar Technology AG are expressly forbidden.

Alterations to the SMA products, e.g., changes or modifications, are only permitted with the express written permission of SMA Solar Technology AG. Unauthorized alterations as well as failure to observe the documentation will void guarantee and warranty claims and in most cases terminate the operating license. SMA Solar Technology AG shall not be held liable for any damage caused by such changes.

Any use of the product other than that described in the Intended Use section does not qualify as appropriate.

The documentation supplied is an integral part of SMA products. Keep the documentation in a convenient, dry place for future reference and observe all instructions contained therein.

This document does not replace any regional, state, provincial, federal or national laws, regulations or standards that apply to the installation, electrical safety and use of the product. SMA Solar Technology AG assumes no responsibility for the compliance or non-compliance with such laws or codes in connection with the installation of the product.

The type label must remain permanently attached to the product.

## 2.2 Important Safety Information

Keep the manual for future reference.

This section contains safety information that must be observed at all times when working.

The product has been designed and tested in accordance with international safety requirements. As with all electrical or electronical devices, some residual risks remain despite careful construction. To prevent personal injury and property damage and to ensure long-term operation of the product, read this section carefully and observe all safety information at all times.

**⚠ DANGER**

**Danger to life due to electric shock when live components or DC cables are touched**

The DC lines may be energized. Touching live DC cables results in death or serious injury due to electric shock.

- Prior to performing any work, switch off the product, disconnect the inverter from voltage sources and make sure it cannot be reconnected.
- Do not touch non-insulated parts or cables.
- Do not disconnect the DC connectors under load.
- Wear suitable personal protective equipment for all work on the product.

**⚠ DANGER**

**Danger to life due to electric shock when touching live enclosure parts with damaged grounding conductor**

High voltages may be applied to the enclosure of the product if the grounding conductor of the DC connection is damaged or has not been connected correctly. Touching live enclosure parts results in death or lethal injuries due to electric shock.

- Connect the grounding conductor for the battery system as described in this document.

**⚠ DANGER**

**Danger to life due to fire or explosion due to improper handling of the battery modules**

Improper handling can cause the lithium inside the battery to ignite. This can cause a fire or explosion. Death or lethal injuries due to hot or flying debris can result.

- Never use defective or damaged battery modules.
- Do not open, pierce, or drop battery modules.
- Do not install or operate the battery modules in potentially explosive atmospheres or areas of high humidity.
- Do not expose the battery modules to high temperatures.
- Never throw the battery modules into a fire.
- Store the battery modules dry and within the specified temperature range.
- If a fire starts from the battery, contact the fire department. Extinguishing is a high risk due to toxic gases, risk of explosion and rapid spread.

**⚠ DANGER**

**Danger to life due to electric shock when touching live system components in case of a ground fault**

If a ground fault occurs, parts of the system may still be live. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Prior to performing any work, switch off the product, disconnect the inverter from voltage sources and make sure it cannot be reconnected.

**⚠ DANGER**

**Danger to life due to electric shock when live components are touched on opening the product**

High voltages are present in the live parts and cables inside the product during operation. Touching live parts and cables results in death or lethal injuries due to electric shock.

- Do not open the product.

**⚠ WARNING**

**Danger to life due to electric shock from destruction of the measuring device due to overvoltage**

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

- Only use measuring devices with measurement ranges designed for the maximum DC voltage of the battery.

**⚠ WARNING**

**Danger to life due to burns caused by electric arcs through short-circuit currents**

Short-circuit currents in the battery can cause heat build-up and electric arcs. Heat build-up and electric arcs may result in lethal injuries due to burns.

- Disconnect the battery from all voltages sources prior to performing any work on the battery.
- Remove watches, rings and other metal objects prior to carrying out any work on the battery.
- Use insulated tools and wear insulated gloves for all work on the battery.
- Do not place tools or metal parts on the battery.

**⚠ WARNING**

### Danger to life due to fire or explosion when batteries are fully discharged

A fire may occur due to incorrect charging of fully discharged batteries. This can result in death or serious injury.

- Put the battery into operation no longer than twelve months after production or six month after conditioning.
- If the battery cannot be put into operation within twelve months after production or six months after conditioning, request reconditioning of the battery.
- Before commissioning the system, verify that the battery is not fully discharged.
- Do not commission the system if the battery is fully discharged.
- If the battery is fully discharged, contact Service.

**⚠ WARNING**

### Risk of injury due to toxic substances, gases and dusts

In rare cases, damages to electronic components can result in the formation of toxic substances, gases or dusts inside the product. Touching toxic substances and inhaling toxic gases and dusts can cause skin irritation, burns or poisoning, trouble breathing and nausea.

- Protect the battery enclosure against destruction.
- Do not open or deform the battery.
- Do not throw batteries into fire. Batteries may explode in fire.
- Only perform work on the battery (e.g., troubleshooting, repair work) when wearing personal protective equipment for handling of hazardous substances (e.g., safety gloves, eye and face protection, respiratory protection).
- If toxic substances have been inhaled, consult a doctor immediately.
- Ensure that unauthorized persons have no access to the product.
- Install, operate, maintain and dispose of the battery according to the manufacturer's specifications.

**⚠ WARNING**

### Risk of injury due to weight of product

Injuries may result if the battery modules are lifted incorrectly or dropped while being transported or mounted.

- Transport and lift the product carefully. Take the weight of the product into account.
- Transport the product individually only.
- Always have several persons transport and mount the product. The number of persons depends on the locally applicable standards and directives.
- Use suitable means of transport, e.g. a dolly. Do not damage the enclosure of the battery components.
- Wear suitable personal protective equipment, at a minimum safety footwear with a non-slip sole and steel cap, for all work on the product.

**⚠ CAUTION**

### Risk of burns due to hot battery modules

The battery module can get hot during operation. Touching hot battery modules can cause burns.

- Before touching the battery modules, wait until the battery modules have cooled down.

**⚠ CAUTION**

**Risk of injury due to sharp edges**

The battery components contain sheet metal parts with sharp edges. Touching the sharp-edged sheet metal parts may result in injuries.

- Wear safety gloves for mounting and disassembling the battery.

**NOTICE**

**Damage to the battery modules due to moisture or corrosive substances**

Moisture or corrosive substance penetration can damage the product and impair its functionality.

- Do not immerse battery modules in liquid.
- Do not expose battery cells to corrosive substances (e.g., ammonia, salt).

**NOTICE**

**Damage to the product due to cleaning agents**

The use of cleaning agents may cause damage to the product and its components.

- Clean all battery components with a dry cloth only.

# 3 Scope of Delivery

## 3.1 Scope of Delivery of Battery Management System

Check the scope of delivery for any externally visible damage. If visible damages are detected, document the damaged areas and immediately inform SMA Solar Technology AG. Never commission the battery if components are damaged.

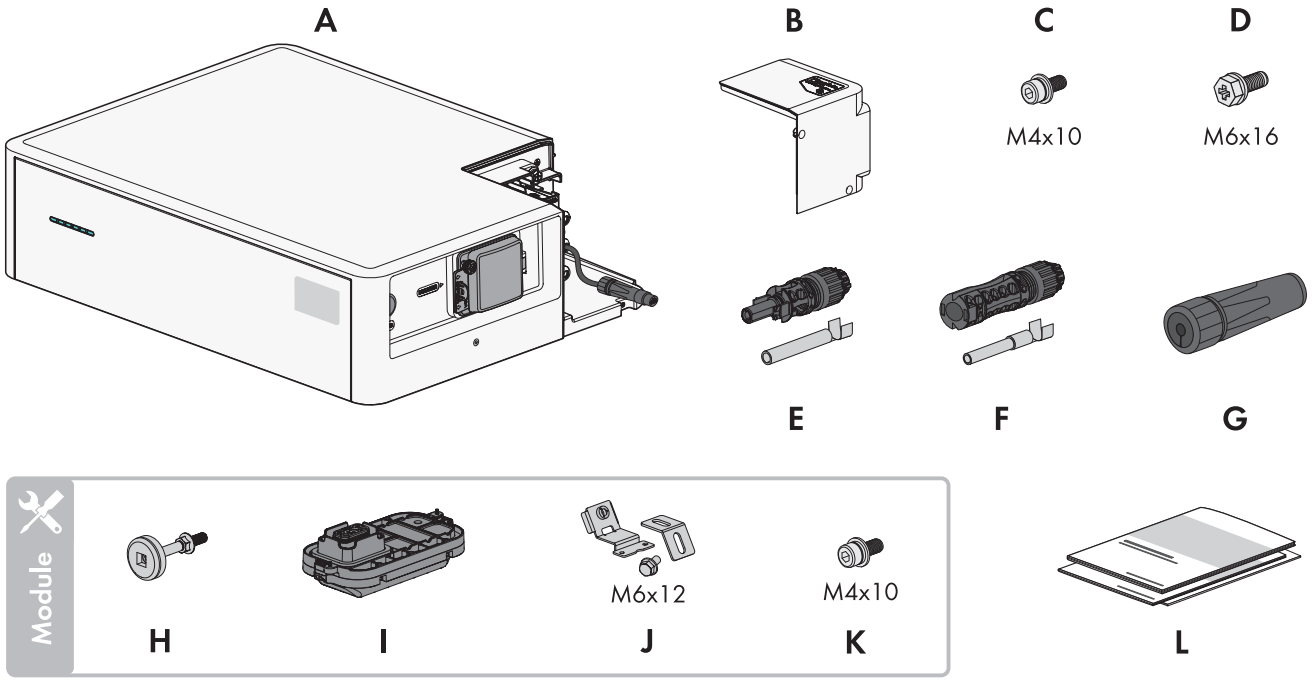



Figure 1: Components Included in Scope of Delivery of Battery Management System

| Position | Quantity | Designation |
|---|---|---|
| A | 1 | Battery management system (BMS) |
| B | 1 | Connection area cover |
| C | 2 | Screw and washer assembly M4x10 |
| D | 3 | Screw and washer assembly M6x16 |
| E | 1 | Positive MC4 connector by Stäubli |
| F | 1 | Negative MC4 connector by Stäubli |
| G | 1 | Adapter for connecting the network cable (suitable for inside and outside areas) |
| H | 4 | Adjustable feet |
| I | 1 | U-turn unit |
| J | 4 | Wall mounting bracket with M6x12 screw and washer assembly |

| Position | Quantity | Designation |
|---|---|---|
| K | 10 | Screw and washer assembly M4x10 |
| L | 1 | Documentation package consists of:<br>• Safety information booklet<br>• Quick reference guide poster with illustrated instructions for initial installation and commissioning<br>• Supplementary Sheet of the EU Battery Regulation |

## 3.2 Scope of delivery of battery modules

Check the scope of delivery for any externally visible damage. If visible damages are detected, document the damaged areas and immediately inform SMA Solar Technology AG. Never commission the battery if components are damaged.

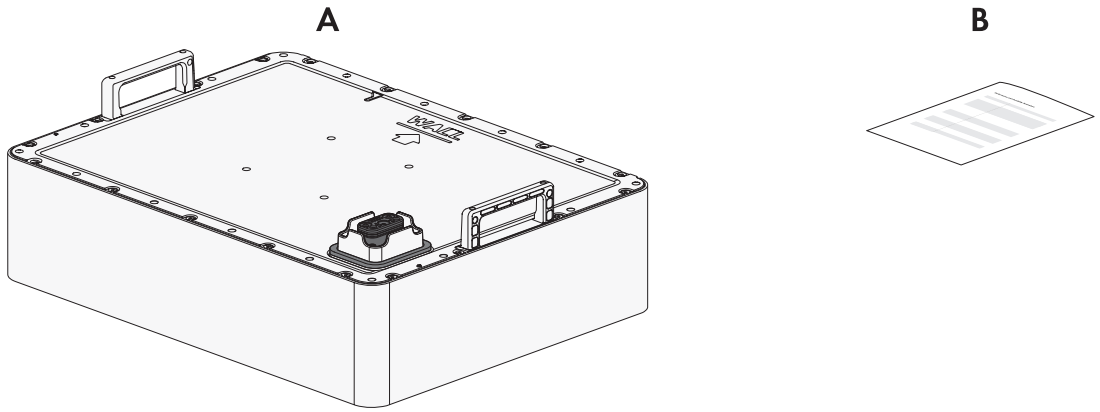



Figure 2: Components Included in Scope of Delivery of Battery Module

| Position | Quantity | Designation |
|---|---|---|
| A | 1 | Battery module |
| B | 1 | Supplementary sheet Battery Regulation |

# 4 Additionally Required Materials and Equipment

| Material | Explanation |
|---|---|
| Tape measure | For measuring the distances between bore holes for mounting |
| Marker pen | For marking the bore holes for mounting |
| Hammer drill with drill bit | For drilling the bore holes for mounting |
| Spirit level | For aligning the mounting bracket |
| Ring terminal lugs (M6x12) | For attaching to the grounding cables |
| Insulation stripping tool | For stripping the insulation off from the grounding cables |
| Crimping tool | For crimping the ring terminal lug on the grounding cable (10 $mm^2$) and for assembling the DC cables. |
| Voltmeter/ multimeter | For verifying that no voltage is present |
| Torque screwdriver | For tightening bolted connections with the specified tightening torque. |
| Grounding cable | Necessary for the connection of the protective grounding (grounding conductor – PE). |
| Data cables | Necessary for data communication between the components. |
| DC cable | Necessary for the connection of the DC lines between the components. |

# 5 Product overview

## 5.1 System Overview

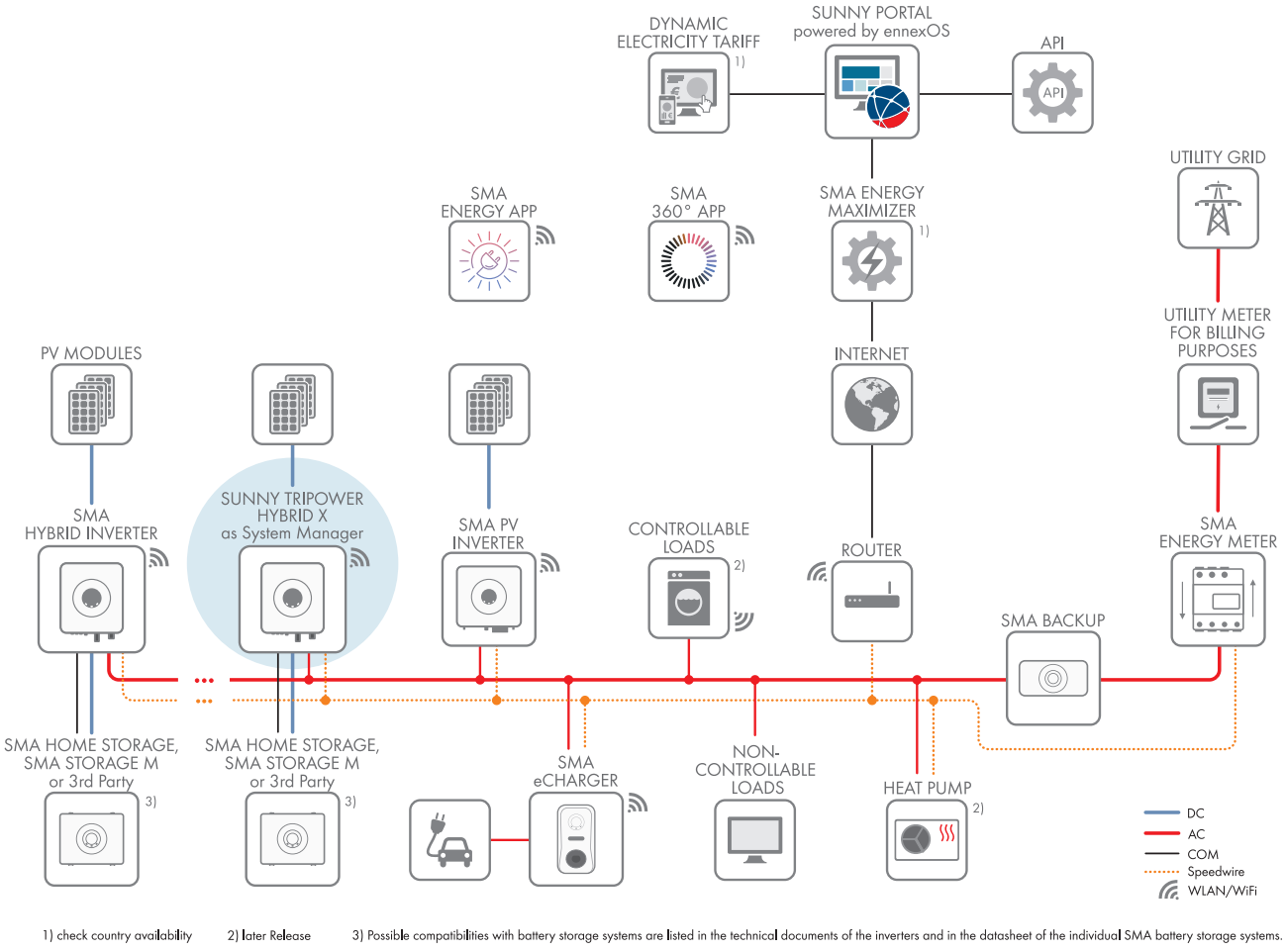



Figure 3: Design of the system (example)

## 5.2 Product Description

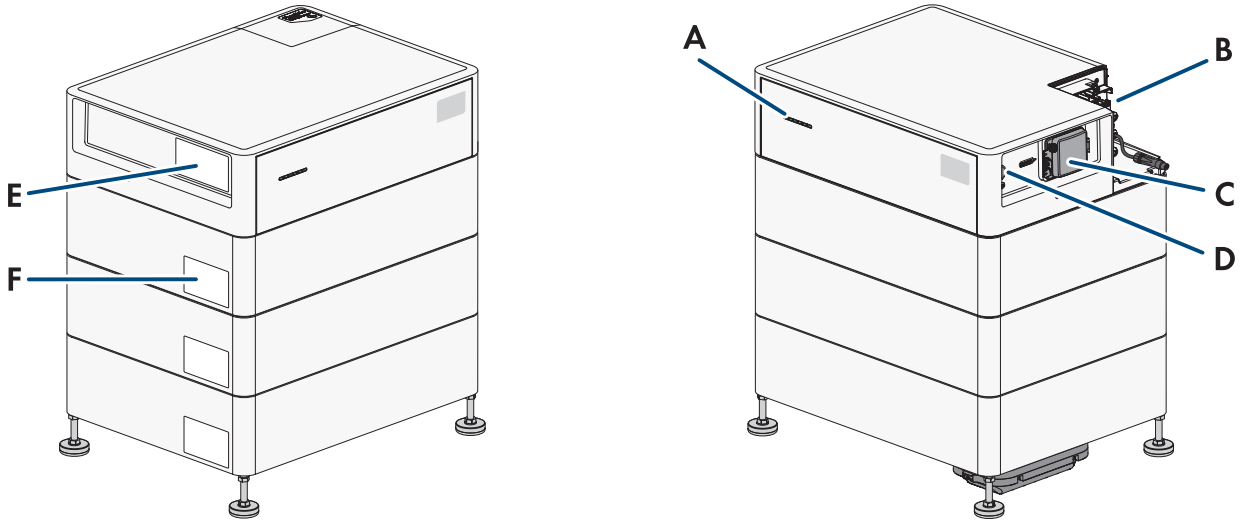



Figure 4: Design of the product

| Position | Designation |
|---|---|
| A | LED bar (display of state of charge and operating state) |
| B | Connection Area |
| C | DC circuit breaker (fuse) |
| D | Power button (black start) – button for manually performing a battery black start |
| E | BMS unit type label<br>The type label clearly identifies the product. The type label must remain permanently attached to the product. You will find the following information on the type label:<br>• Device type (Model)<br>• Serial number (Serial No. or S/N)<br>• Date of manufacture<br>• Device specific characteristics<br>• QR code for battery passport |
| F | Battery module type label |

## 5.3 Symbols on the Product

| Symbol | Explanation |
|---|---|
|  | Beware of a danger zone<br>This symbol indicates that the product must be additionally grounded if additional grounding or equipotential bonding is required at the installation site. |
|  | Beware of electrical voltage<br>The product operates at high voltages. |

| Symbol | Explanation |
|---|---|
|  | Warning of hazards from batteries<br>This symbol indicates the danger of handling batteries. |
|  | Potentially explosive substances warning<br>Improper handling or fire can cause the product to ignite or explode. |
|  | The heavy weight of the product can cause serious injuries. |
|  | Corrosive substances warning<br>The product contains corrosive substances that can cause severe injury if they come into direct contact with the skin. |
|  | Electric arc hazards<br>The product has large electrical potential differences between its conductors. Arc flashes can occur through air when high-voltage current flows. |
|  | Beware of hot surface<br>The product can get hot during operation. |
|   | Danger to life due to high voltages in the inverter; observe a waiting time of 5 minutes.<br>High voltages that can cause lethal electric shocks are present in the live components of the inverter.<br>Disconnect the inverter from voltage sources and make sure it cannot be reconnected before working on the product. |
|  | Observe the documentations<br>Observe all documentations supplied with the product. |
|  | Use eye protection<br>Wear eye protection for all work on the device. |
|  | No open flame<br>Handling an open flame and sources of ignition is forbidden in the immediate vicinity of the product. |
|  | Access is prohibited for all children<br>Children must be kept at a safe distance from the product. |
|  | Recycle the entire battery system including all components. |
|  | WEEE designation<br>Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site. |

| Symbol | Explanation |
|---|---|
|  | WEEE designation<br>Do not dispose of the product together with the household waste but in accordance with the disposal regulations for electronic waste applicable at the installation site. |
| CE | CE marking<br>The product complies with the requirements of the applicable EU directives. |
|  | RoHS labeling<br>The product complies with the requirements of the applicable EU directives. |

## 5.4 Interfaces and Functions

### 5.4.1 RJ45 connection

The battery is equipped with an RJ45 terminal as standard. The battery can communicate via cables with SMA inverters via this RJ45 terminal (information on supported SMA products at www.SMA-Solar.com).

### 5.4.2 User Interface

The product is controlled by an inverter and is integrated into the user interface of the inverter.

### 5.4.3 Increased self-consumption

With increased self-consumption, the highest possible proportion of the power of a generator (e.g., a PV system) is stored and consumed at the place where it is generated. With increased self-consumption, power output and power consumption at the point of interconnection are reduced.

The SMA Home Storage Solution supports the increased self-consumption through intermediate storage of energy from generators.

### 5.4.4 Function and Operation of the Power Button (Black Start)

The power button on the battery storage system is only for manually performing a battery black start. Upon actuating the power button, the battery supplies voltage on the DC side. The effect of the power button depends on the installed system configuration and the current operating state.

#### Parallel grid operation

The power button has no function in normal parallel grid operation.

- The battery system is controlled automatically via the inverter.
- The battery is ready for operation when the DC fuse is switched on.

#### Power outage without SMA automatic transfer switching device

If an SMA automatic transfer switching device for backup power supply is not installed, the emergency power supply (Secure Power Supply, SPS) on the inverter can be activated manually. If there is no PV power available during the power outage, the battery can be used as the energy source.

1. After a power outage without PV generation, the battery switches itself off after approximately 30 minutes of inactivity to save energy.
2. Press the power button to reactivate the battery. The battery then supplies the DC voltage necessary for starting the inverter.
3. The SPS function on the inverter can then be activated. The inverter restarts powered by the battery and supplies the SPS output with energy.

### Power outage with SMA automatic transfer switching device

The power button is not needed in systems with an SMA automatic transfer switching device (SMA Backup 1P or SMA Backup 3P / 4P).

In the event of a power outage, the automatic transfer switching device automatically disconnects the system from the utility grid and switches over to backup power supply automatically. The available energy remaining in the battery storage system will be used automatically. A manual intervention via the power button is not necessary.

## 5.5 LED Signals

The LED bar comprises six fields.

Fields 1 to 4 display the current state of charge (SOC) of the battery. The number of LEDs lit indicates the available state of charge.

Field 5 acts as a visual separator between the state of charge display and the status display and has no other function.

Field 6 is a two-color LED. This LED displays the current operating state of the battery through various colors and light patterns.

| Field | |
|---|---|
| 1 to 4 | State of charge (SOC) display |
| 5 | Separator without display function |
| 6 | Two-color status LED for displaying the operating state |

| Explanation | Status | LED 1 (Blue) | LED 2 (Blue) | LED 3 (Blue) | LED 4 (Blue) | LED 6, two-color (Blue/red) |
|---|---|---|---|---|---|---|
| Update | - | ■ | ■ | ■ | ■ | ■ (Blue) |
| Start program (bootloader) | | ★ | ★ | ★ | ★ | ★ |
| Waiting for operating conditions | SOC 0% – 0.9% | | | | | ■ (Blue) |
| | SOC 1% – 25% | ● | | | | ■ (Blue) |
| | SOC 25.1% – 50% | ● | ● | | | ■ (Blue) |
| | SOC 50.1% – 75% | ● | ● | ● | | ■ (Blue) |
| | SOC 75.1% – 100% | ● | ● | ● | ● | ■ (Blue) |
| Charging | SOC 0% – 25% | ■ | | | | ● (Blue) |
| | SOC 25.1% – 50% | ● | ■ | | | ● (Blue) |
| | SOC 50.1% – 75% | ● | ● | ■ | | ● (Blue) |
| | SOC 75.1% – 99.9% | ● | ● | ● | ■ | ● (Blue) |
| | SOC 100% | ● | ● | ● | ● | ● (Blue) |

| Explanation | Status | LED 1 (Blue) | LED 2 (Blue) | LED 3 (Blue) | LED 4 (Blue) | LED 6, two-color (Blue/red) |
|---|---|---|---|---|---|---|
| Discharging | 100% – 75.1% | ● | ● | ● | ★ | ● (Blue) |
| | 75% – 50.1% | ● | ● | ★ | | ● (Blue) |
| | 50% – 25.1% | ● | ★ | | | ● (Blue) |
| | 25% – 0.1% | ★ | | | | ● (Blue) |
| | 0% | | | | | ● (Blue) |
| Warning – operation continues | The SOC LEDs display the state of charge / discharge. | | | | | ■■ (Blue / red in alternation) |
| Battery error (no operation), communication to the inverter available | | - | - | - | ● (Blue) | ● (Red) |
| Battery error (no operation), no communication to the inverter | | - | - | - | - | ● (Red) |

★ Flashes at 2 Hz (2x per second)
■ ★ Flashes at 1 Hz (1x per second)
● On

## 5.6 Battery Use by the Inverter

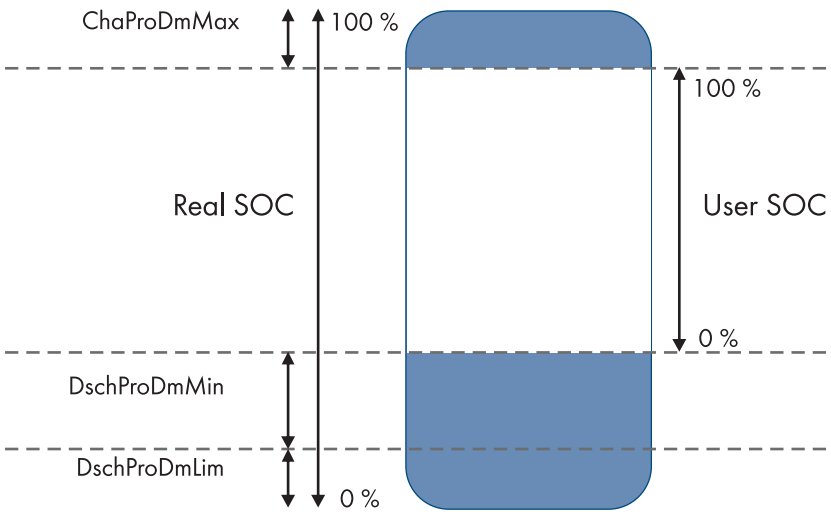



Figure 5: State of charge ranges of the battery

| Range | Parameter | Inverter behavior |
|---|---|---|
| ChaProDMMax | **End-of-charge range** | In this range, the inverter operates in protected mode to protect the battery from overcharging (charge stop mode). |
| DschProDMMin | **End-of-discharge range** | In this range, the inverter operates in protected mode to protect the battery from deep discharge (discharge stop mode). |

| Range | Parameter | Inverter behavior |
|---|---|---|
| DschProDmLim | **Deep discharge protection range** | To protect the battery from deep discharge, the inverter switches off (deep discharge protection). |
| User SOC | - | User SOC is the range in the battery state of charge that is displayed via the user interface of the inverter.<br>The inverter uses the battery within this range for increased self-consumption and for the functions that can be configured in the energy management profile (self-consumption range). |
| Real SOC | - | Real SOC is the maximum available range of the battery state of charge. |

## 5.7 Modular extension of the battery modules

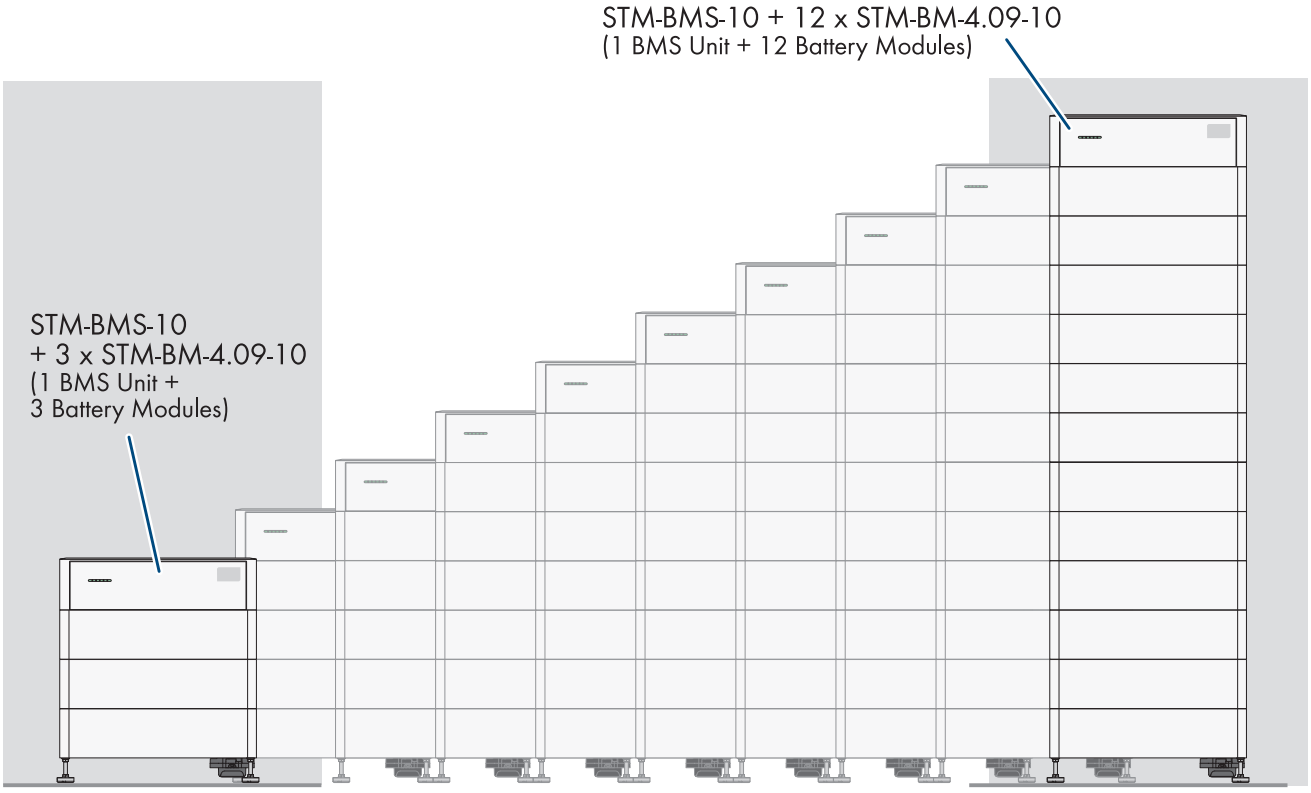



Figure 6: Modular design of the battery modules

The maximum supported number of battery modules per battery tower depends on the inverter used. You will find information on this in the inverter technical data.

It is only possible to add additional battery modules to the battery tower within the first 24 months after initial commissioning. When doing so, the maximum number of battery modules supported by the inverter may not be exceeded (see Section 13 "Installation of an additional battery module", page 55).

# 6 Transport

This section contains safety information that must be observed at all times when transporting the battery.

**⚠ CAUTION**

**Risk of injury due to inappropriate transport in a vehicle**

Inappropriate transport or insufficient use of transport in a vehicle securing devices can cause the battery to slip or tip over. The battery can cause injuries if it slips or tips over.

- Transport and lift the battery carefully. Take the weight of the battery into account.
- Position the battery in the vehicle in such a way as to prevent it from slipping.
- Secure the battery against slipping and tipping over with restraining straps, for example.
- Wear suitable personal protective equipment for all work on the battery.

The SMA Storage M battery module (STM-BM-4.09-10) is classified as dangerous goods: UN 3480 lithium-ion battery, class 9 (dangerous goods designation UN 3480, dangerous goods class 9). The safety information of the battery must be observed (see product page SMA Storage M).

All requirements of the Dangerous Goods Ordinance on Road, Rail, and Inland Navigation and the Convention on the International Carriage of Dangerous Goods by Road must always be complied with:

- ☐ Only trained and instructed personnel are allowed to transport the battery modules on public roads. The instructions must be documented and repeated.
- ☐ Smoking is not permitted in the vehicle during the journey.
- ☐ Smoking is not permitted in the vehicle or in the immediate vicinity during loading and unloading.
- ☐ Use a fire extinguisher if the battery system catches fire. An ABC dry powder extinguisher or a carbon dioxide ($CO_2$) extinguisher is recommended.
- ☐ The outer packaging of the battery must not be opened during transport.

# 7 Mounting

## 7.1 Requirements for Mounting

### 7.1.1 Requirements for the installation site of the battery modules

- The installation site must be suitable for the weight and dimensions of the product.
- The surface at the installation site must be dry, horizontal and flat.
- The installation site must not be exposed to direct solar irradiation. If the product is exposed to direct solar irradiation, the exterior plastic parts might age prematurely and overheating might occur. When becoming too hot, the product reduces its power output to avoid overheating.
- The installation site must be protected against rain and snow (e.g. through the use of a roof).
- There must be no heat sources in the immediate vicinity of the installation site.
- All ambient conditions must be met.
- The installation site must be less than 3000 m above mean sea level. If you would like to use the battery at altitudes above 3000 m, contact Service.
- On flood plains, the installation site must be elevated and always protected from contact with water.

### 7.1.2 Permitted and prohibited battery mounting positions

☐ The product may only be mounted in the permitted position as shown in the figure. This will ensure that no moisture can penetrate the product.

☐ The product should be mounted such that the LED signals and the type label can be read off without difficulty.

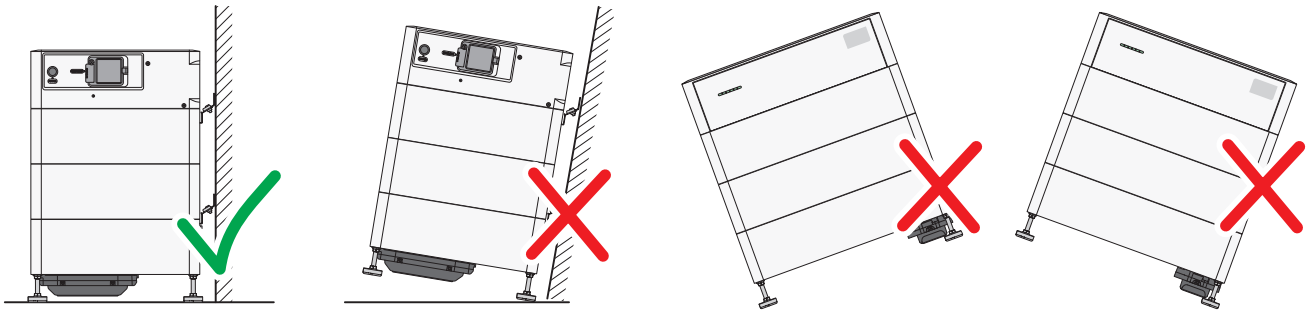


Figure 7: Permitted and prohibited mounting positions

### 7.1.3 Recommended clearances

If you maintain the recommended clearances, adequate heat dissipation will be ensured. Thus, you will prevent power reduction due to excessive temperature.

☐ Maintain the recommended clearances to walls as well as to other batteries, inverters or objects.

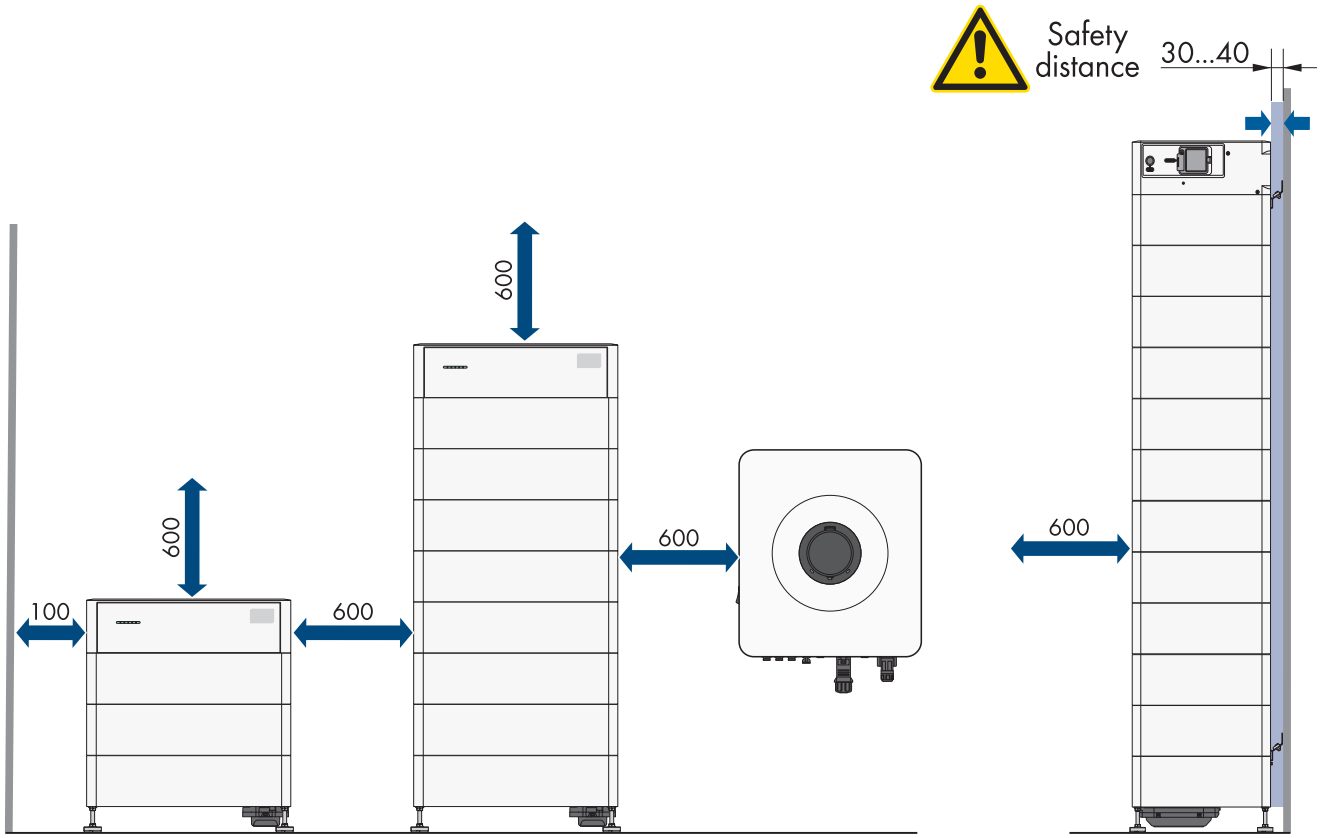



Figure 8: Recommended clearances (dimensions in mm)

## 7.2 Dimensions for mounting

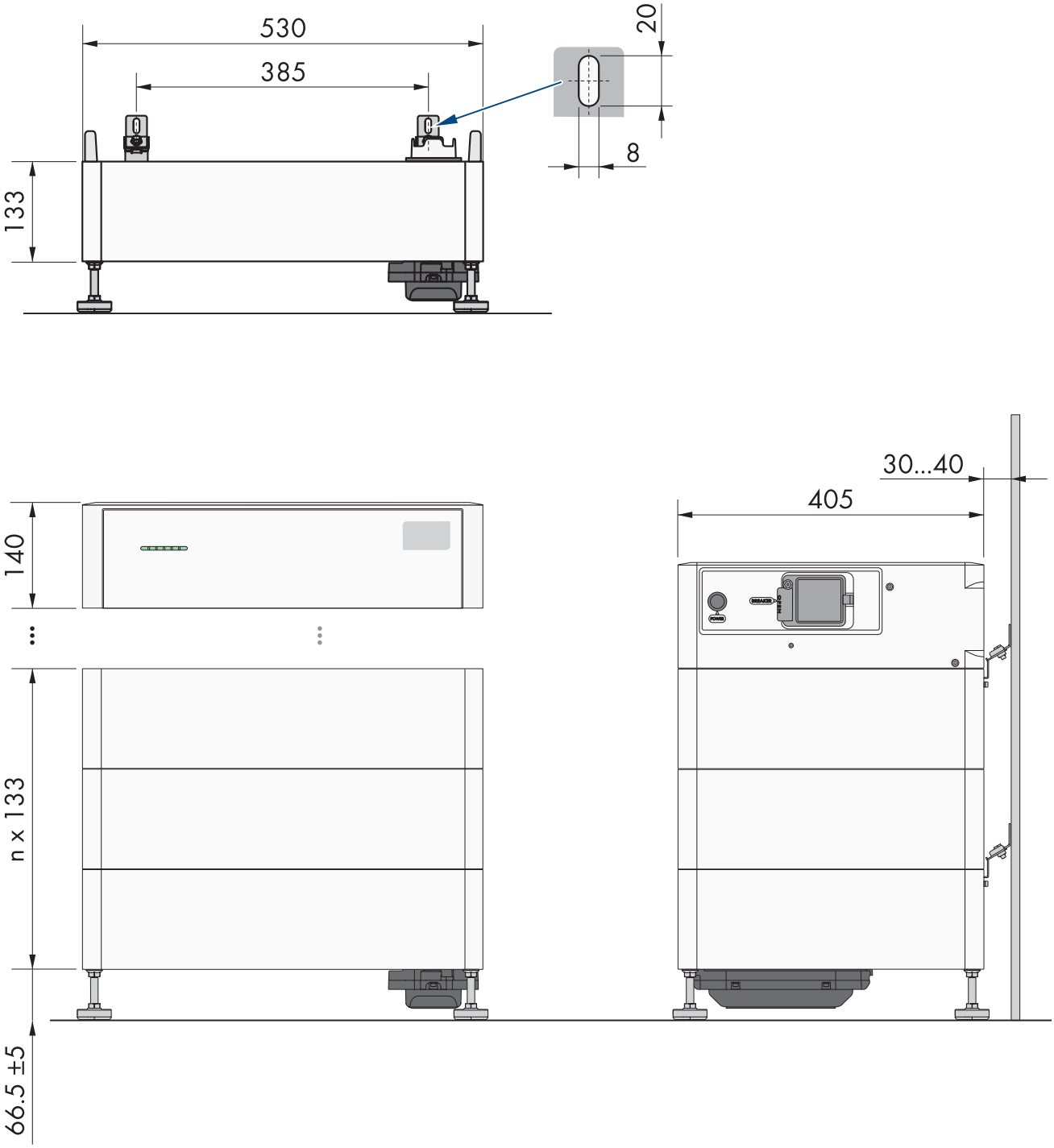
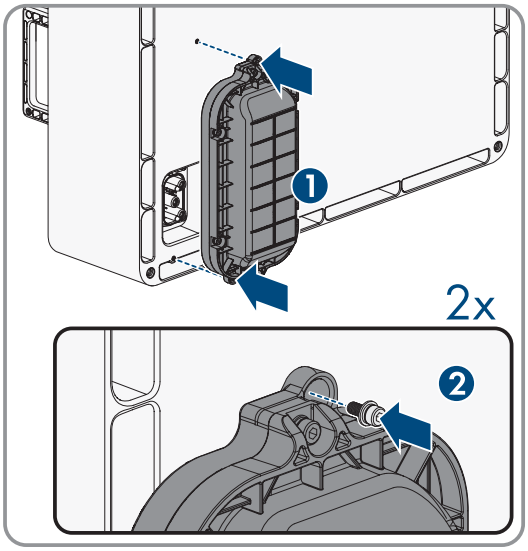



Figure 9: Position of the anchoring points (dimensions in mm)

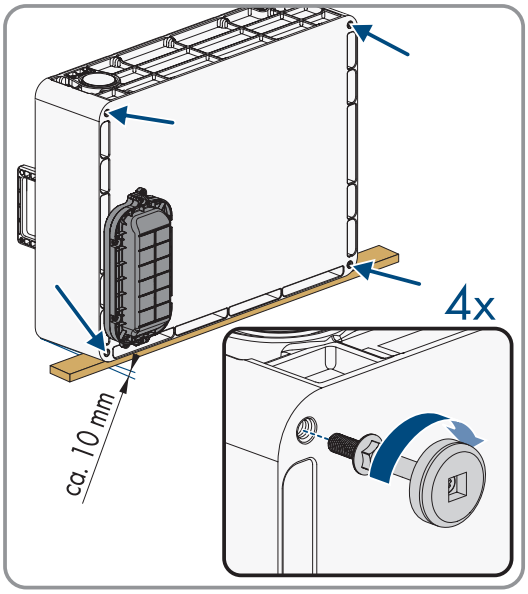
## 7.3 Mounting the Product

**Procedure:**

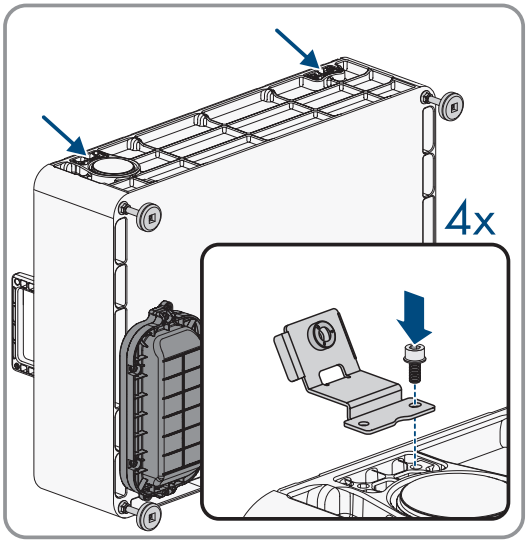
1. Mount the U-turn unit on the lowest battery module. To do so, lay the battery module on its side and attach the U-turn unit from below using the 2 screws (M4x10) AF3 (tightening torque 2 Nm).



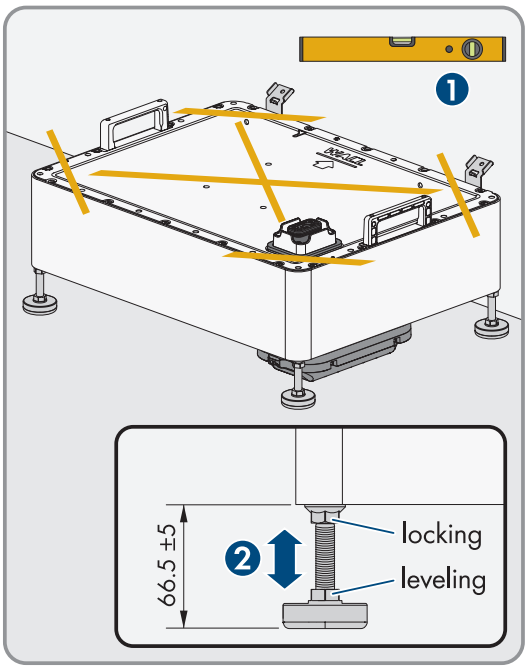

2. Place a 10 mm thick bar under the battery module and position it at a slight angle. Then mount the four adjustable feet on the lowest battery module.



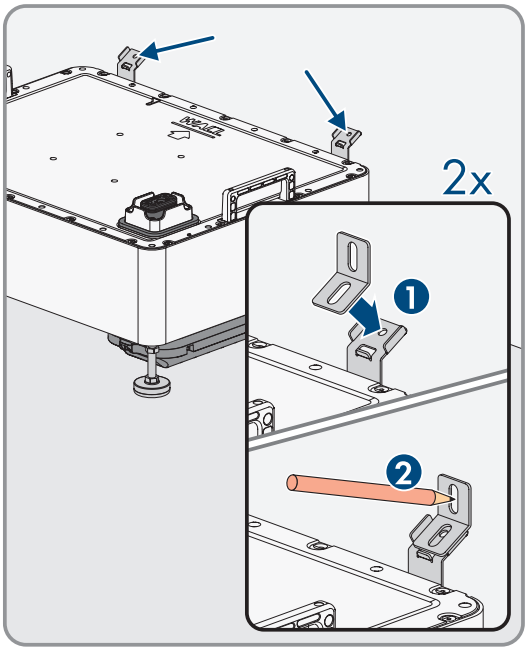

3. Attach the two fixing brackets to the lowest battery module using 2 supplied screw and washer assemblies (M4x10, AF3, tightening torque 2 Nm) per fixing bracket.



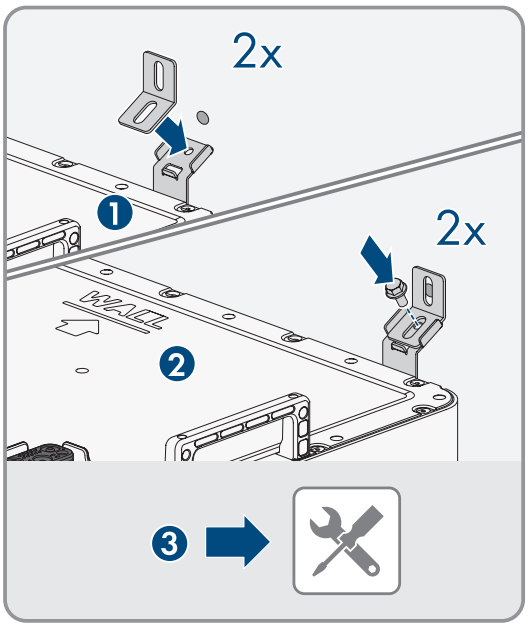
4. Push the battery module in front of the wall and level using the adjustable feet (AF15).



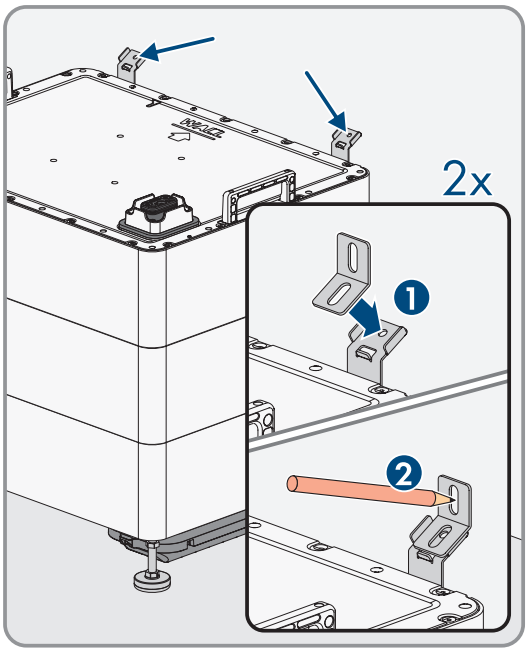

5. Hold the two wall mounting brackets to the fixing brackets and mark the positions of the two drill holes. Then move the battery module away from the wall and drill the drill holes.



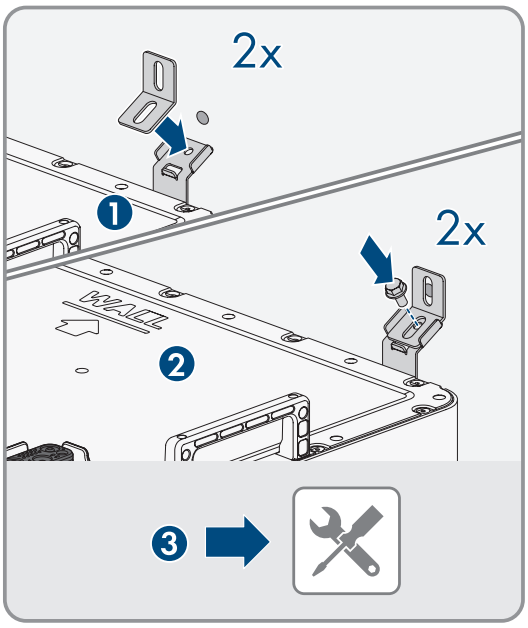
6. Position the battery module back up against the wall and secure it. Attach the two wall mounting brackets to the fixing brackets using the two screws (M6x12, AF10, tightening torque 5 Nm).



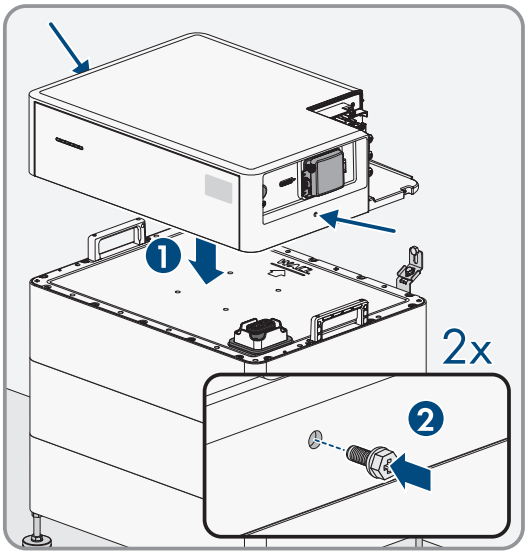

7. Align the required number of battery modules using the carrying handles and stack them one on top of the next. When doing so, ensure that the modules are aligned correctly.
8. The last battery module must be attached to the wall. To do so, attach the two fixing brackets to the uppermost battery module using 2 supplied screw and washer assemblies (M4x10, AF3, tightening torque 2 Nm).
9. Hold the two wall mounting brackets to the fixing brackets and mark the positions of the two drill holes. Then remove the uppermost battery module and drill the drill holes. During drilling, protect the remaining modules against dust and dirt.



10. Put the uppermost battery module back and attach it to the wall. Attach the two wall mounting brackets to the fixing brackets using the two screws (M6x12, AF10, tightening torque 5 Nm).

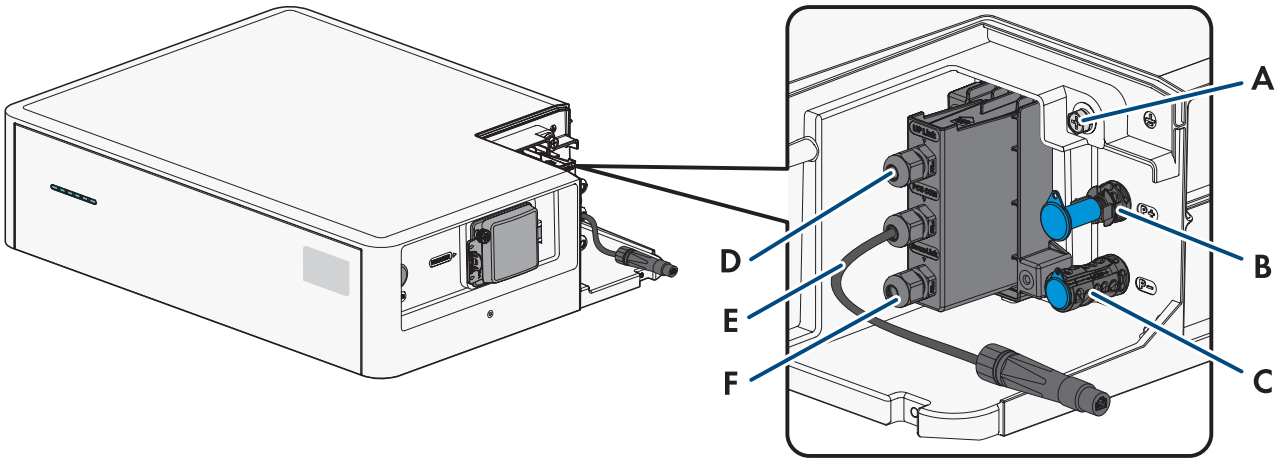



11. **NOTICE** Before putting the BMS unit into position, ensure that the DC circuit breaker is set to the OFF position.
12. Place the BMS unit onto the uppermost battery module and attach using the two screw and washer assemblies (M6x16) on the left and right (AF10, tightening torque 5 Nm).



# 8 Electrical Connection

## 8.1 Overview of Battery Management System Connection Area




| Position | Designation |
|---|---|
| A | Protective grounding or equipotential bonding connection |
| B | Positive DC connector **P+** (type: Amphenol H4) for the connection to the inverter |
| C | Negative DC connector **P-** (type: Amphenol H4) for the connection to the inverter |
| D | Communication terminal **UP Link** (prepared for parallel connection) |
| E | Communication terminal **PCS COM** with RJ45 socket for connecting the battery communication system to the inverter |
| F | Communication terminal **Down Link** (prepared for parallel connection) |

## 8.2 Circuitry overview with Sunny Boy Smart Energy

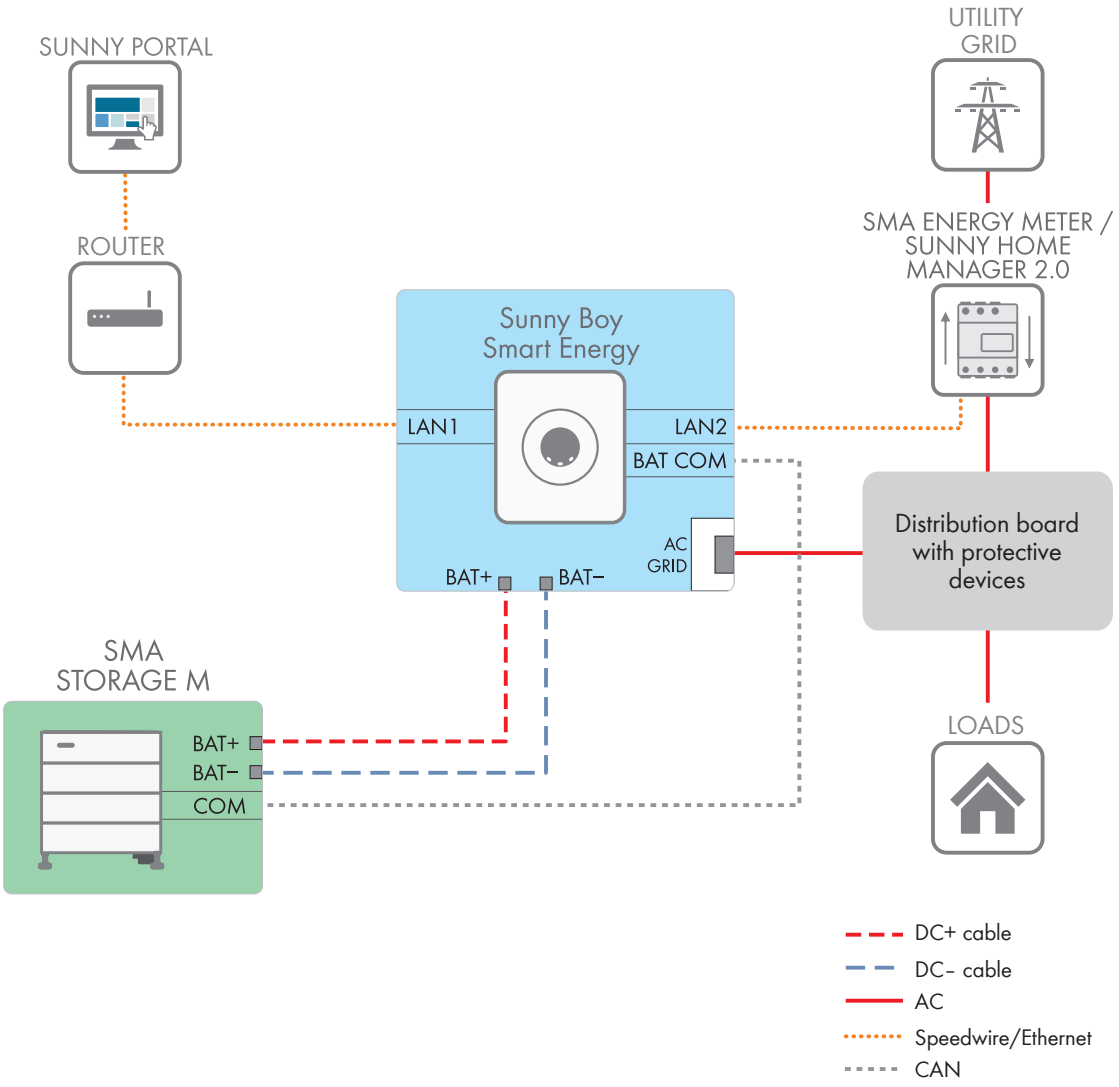



Figure 10: SMA Storage M with 1 Sunny Boy Smart Energy (example)

## 8.3 Circuitry overview with Sunny Tripower Hybrid X

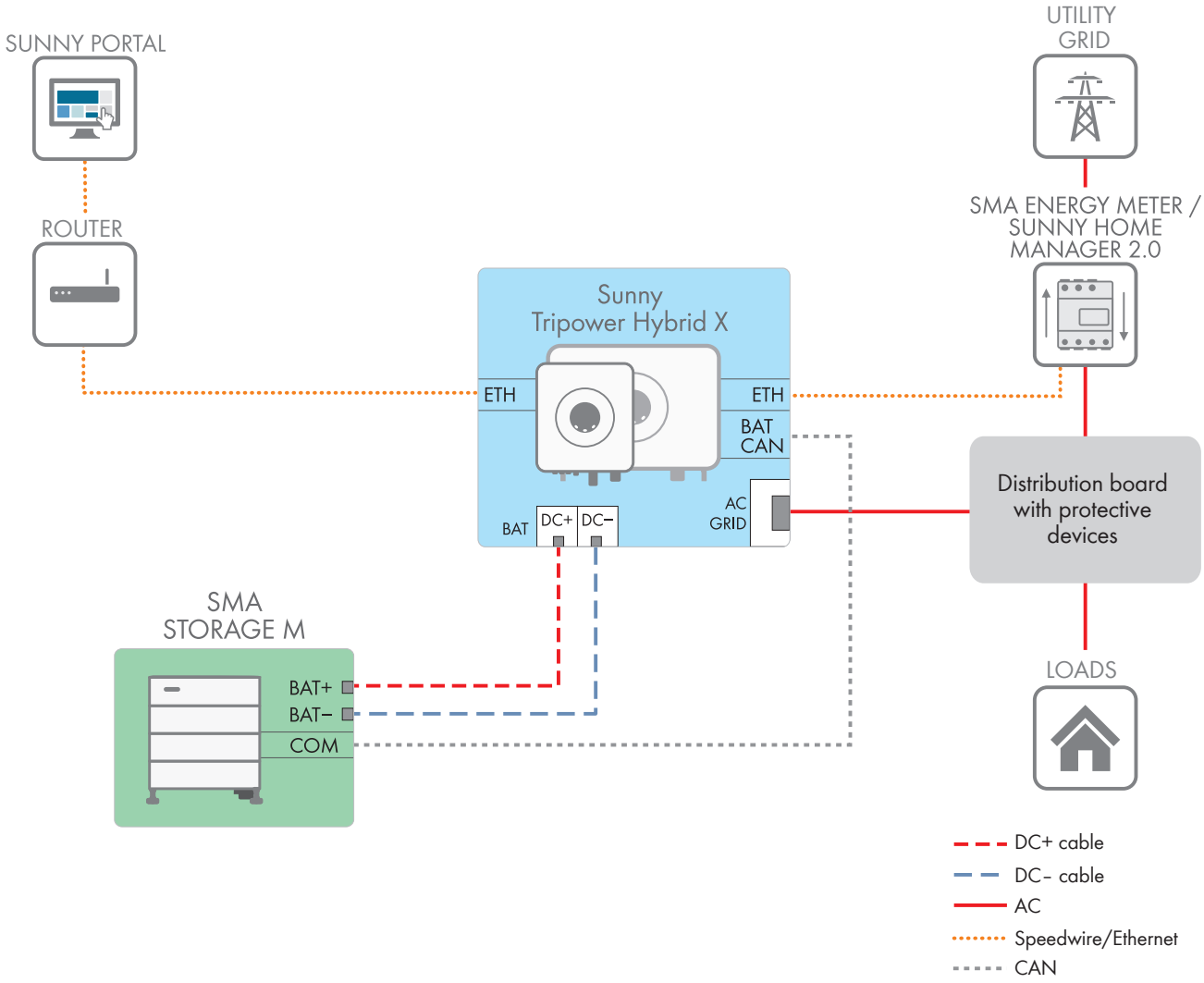



Figure 11: SMA Storage M with 1 Sunny Tripower Hybrid X (example)

## 8.4 Requirements for the electrical connection

### 8.4.1 Grounding cable requirements

An additional grounding on the Battery Management System is required to protect against touch current in case the grounding conductor fails at the terminal of the DC cable.

☐ A conductor cross-section of 10 mm² must be used

### 8.4.2 DC cable requirements

Observe the following cable requirements:

☐ Conductor type: copper wire

☐ Maximum cable length: 30 m

☐ The supplied MC4 Evo2 connector and a battery connection cable with a cross-section of 10 mm² must be used.

☐ Dielectric strength: At least 800 V

☐ The DC cables must be rated for the maximum battery voltage and the maximum battery current.

☐ When routing in outside areas, the UV resistance and reinforced insulation must also be ensured.

### 8.4.3 Battery Communication Cable Requirements

The cable length and quality affect the quality of the signal. Observe the following cable requirements:

- ☐ Cable type: 100BaseTx
- ☐ Cable category: minimum CAT5e
- ☐ Plug type: RJ45 of Cat5e or higher
- ☐ Shielding: SF/UTP, S/UTP, SF/FTP or S/FTP
- ☐ Number of insulated conductor pairs and insulated conductor cross-section: at least 2 x 2 x 0.34 mm²
- ☐ Maximum cable length between inverter and battery when using patch cables and installation cables: up to 30 m (taking cable requirements into consideration)
- ☐ UV-resistant for outdoor installation.

## 8.5 Electrical Connection Procedure

This section describes the procedure for the electrical connection of the product. It provides an overview of the steps, which must be performed in the prescribed sequence.

| Procedure | | See |
|---|---|---|
| 1. | Ensure that the requirements for the electrical connection are fulfilled. | Requirements for the electrical connection |
| 2. | Grounding the Battery | Section 8.6, page 35 |
| 3. | Connect the data cables of the battery. | Section 8.7, page 36 |
| 4. | Connecting the power cable of the battery | Section 8.8, page 37 |

## 8.6 Grounding the Battery

An additional grounding of the product is required to protect against touch current in case the grounding conductor fails at the terminal of the DC cable.

The product features a ground connection for this grounding.

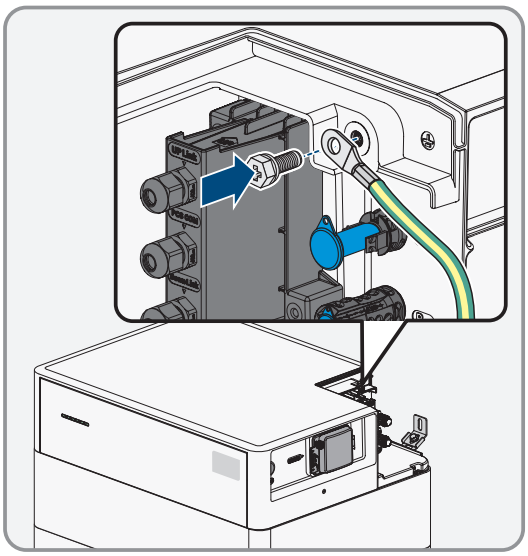
**Additionally required material (not included in the scope of delivery):**

- ☐ 1 heat-shrink tubing
- ☐ 1 ring terminal lug (M6)
- ☐ 1 grounding cable (10 mm²)

**Procedure:**

1. Strip off the insulation from the grounding cable and crimp the ring terminal lug (M6).
2. Pull the heat-shrink tubing over the grounding cable. The heat-shrink tubing must be below the stripped cable section.

3. Attach the grounding cable to the ground connection using the supplied screw and washer assembly (M6x16, tightening torque: 5 Nm).



## 8.7 Connecting the Data Cable of the Battery

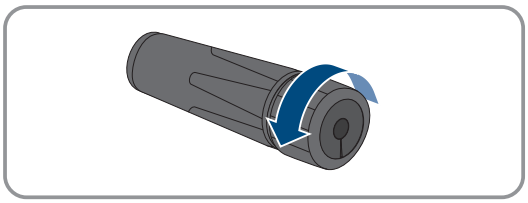
**Additionally required material (not included in the scope of delivery)**:

☐ Where required: Field-assembly RJ45 connector.

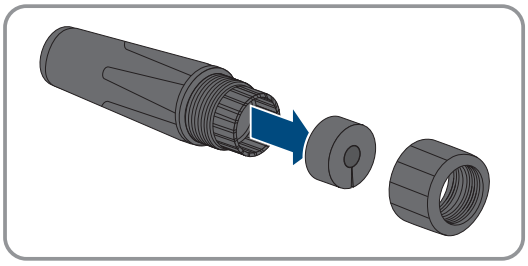
☐ Standard network cable

**Procedure:**

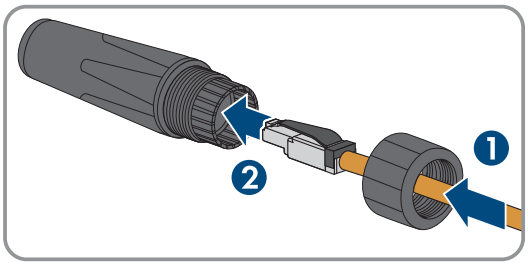
1. When using self-assembly network cables, assemble the RJ45 connectors and connect them to the network cable (see connector manual).
2. Remove the union nut from the adapter.



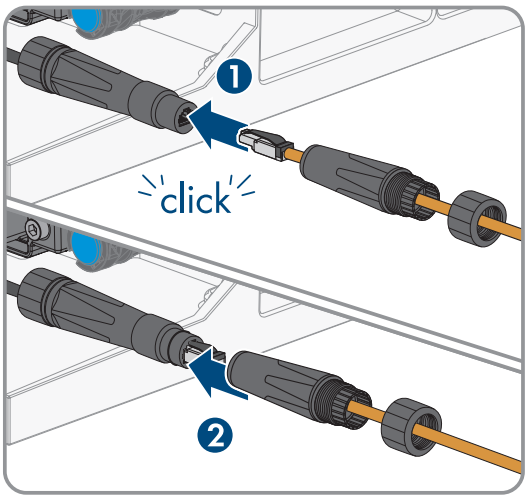
3. Detach the cable support sleeve. The cable support sleeve can be pressed out from the other side.



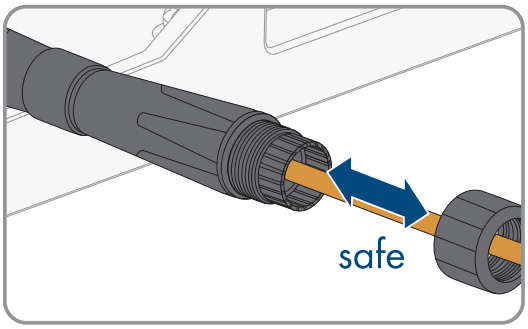
4. Thread the cable through the union nut and through the adapter.



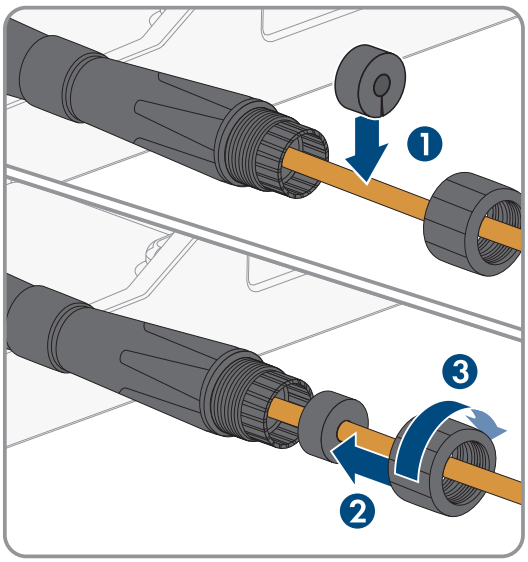
5. Plug the network cable into the RJ45 cable connector. When doing so, route the cable through the union nut and through the adapter.




6. Ensure that the network cable is securely in place.




7. Attach the cable support sleeve between the swivel nut and adapter and secure the cable. To do this, firmly tighten the adapter and the swivel nut.



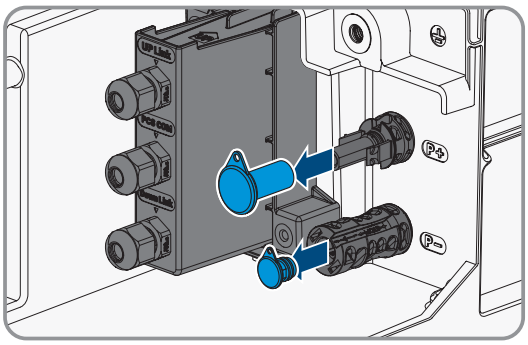

8. Connect the other end of the network cable to the inverter (see inverter manual).

## 8.8 Connecting the DC Cables

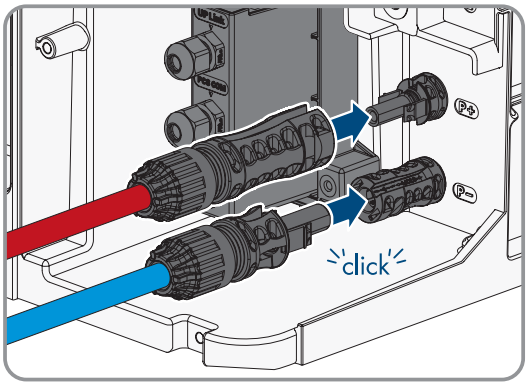
**Procedure:**

1. Disconnect the inverter from voltage sources (see inverter operating manual).
2. Disconnect the product from voltage sources (see Section 10 "Disconnecting the Product from Voltage Sources", page 42).

3. Remove the sealing plugs from sockets **P+** and **P-**.



4. Assemble the DC cables if necessary.
5. Attach the DC cables to the connectors **P+** and **P-** for the battery connection according to the labels.

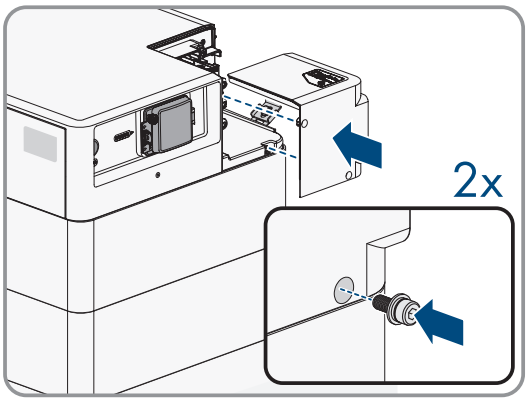



6. Connect the DC cables to the inverter (see inverter operating manual).

## 8.9 Attaching the Connection Area Cover

**Procedure:**

- Attach the connection area cover to the Battery Management System enclosure and fasten with the 2 screws (M4x10, tightening torque 2.0 Nm).



# 9 Commissioning

## 9.1 Commissioning Procedure

The entire system can be configured with the SMA 360° app following the connection of the individual components. SMA Solar Technology AG recommends using the SMA 360° App to configure the system.

| Procedure | | See |
|---|---|---|
| 1. | Check that all installed components have been correctly mounted and connected. | Checking the Mounting and Connection Work |
| 2. | Connect and switch on all devices in the system (e.g. inverter, energy meter, battery). | See operating manual for the products (see Section 9.3 "Switching on the Battery", page 39) |
| 3. | Configure the inverter that is to become the System Manager using the commissioning wizard of the SMA 360° app. | Section 9.4, page 40 |
| 4. | Checking the Battery Configuration via the Inverter User Interface | Section 9.5, page 41 |

## 9.2 Checking the Mounting and Connection Work

Before commissioning or during setup, perform a thorough check of all mounting and connection work.

**Requirement:**

☐ Ensure that the battery has been correctly mounted and connected.

**Procedure:**

1. Measure the ground resistance and continuity of the grounding conductor.
2. Measure the insulation resistance.
3. Check the polarity between the inverter and battery.

## 9.3 Switching on the Battery

**Requirements:**

☐ The battery modules must be correctly mounted.

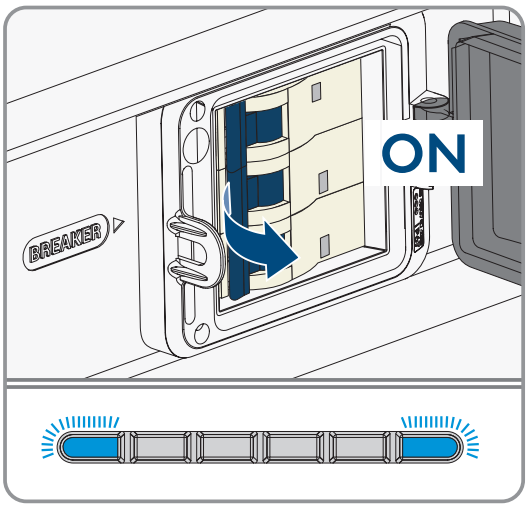
☐ All cables must be correctly connected.

☐ The inverter must be compatible with the battery and equipped with a firmware version that satisfies at least the minimum requirements (see inverter technical information "Approved Batteries and Information on Battery Communication Connection").

**Procedure:**

1. Open the cover of the DC circuit breaker on the Battery Management System.

2. Switch on the DC circuit breaker.




3. Close the cover of the DC circuit breaker on the Battery Management System.
4. Commission the inverter (see product manual).
5. The battery will be recognized automatically by the inverter. Check the configuration via the inverter user interface.

**Also see:**

- LED Signals ⇒ page 21

## 9.4 Configuring the System with the SMA 360° App

**Requirement:**

☐ All system components must be switched on (see manual of the products).

☐ The latest firmware must be installed on all system components.

☐ All system components must be located in the same network.

☐ An SMA ID must be available.

**Procedure:**

1. Download the SMA 360° App from the App Store or Play Store.
2. Open the SMA 360° App and log in with the SMA ID.
3. If a system consists of multiple products and Wi-Fi is to be used for configuration, the subordinate devices must each be connected to the network separately. In the SMA 360° app, go to **Setup** > **Network setup** to establish a Wi-Fi connection with the product. Follow the instructions. When requested by the app, scan the QR code of the product. It can be found on the type label of your product. Perform this process for each subordinate device within the system.
4. To start the commissioning wizard, go to **Setup** > **Commissioning**.
5. Follow the SMA 360° app instructions and scan the QR code on the product's cover when prompted by the app to configure it as the System Manager.
6. Select the **Inverter as System Manager** in the device settings, then continue with the app instructions.
   ☑ The Sunny Home Manager 2.0 or an SMA Energy Meter is detected during commissioning.
   ☑ The battery is detected during commissioning.
   ☑ The SMA backup solution is detected during commissioning.
   ☑ The SMA eCharger is detected during commissioning.

## 9.5 Checking the Battery Configuration via the Inverter User Interface

**Requirements:**

☐ The battery must be commissioned.

☐ The inverter must be commissioned.

☐ The user interface for the connected inverter must be open and you must be logged in as **Installer**.

**Procedure:**

1. Choose the system level in the focus navigation.
2. Select the menu **Configuration**.
3. Under [**Battery Configuration**], check the battery status.

# 10 Disconnecting the Product from Voltage Sources

**⚠ WARNING**

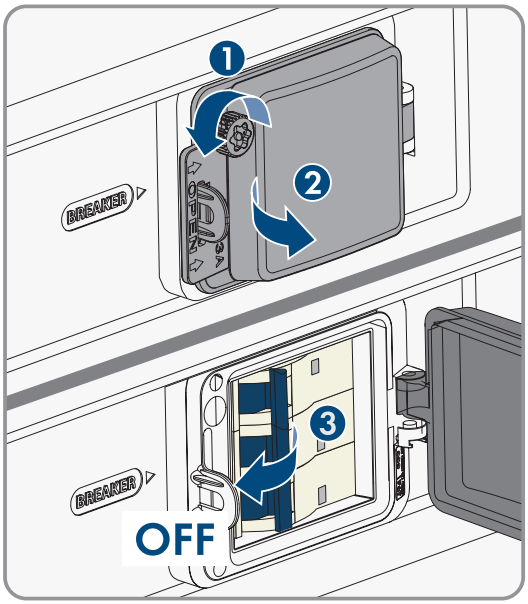
**Danger to life due to electric shock from destruction of the measuring device due to overvoltage**

Overvoltage can damage a measuring device and result in voltage being present in the enclosure of the measuring device. Touching the live enclosure of the measuring device results in death or lethal injuries due to electric shock.

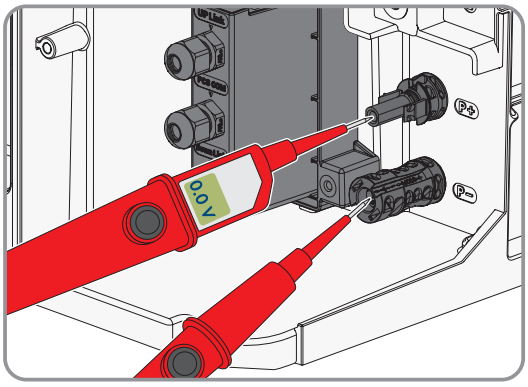
- Only use measuring devices with measurement ranges designed for the maximum DC voltage of the battery.

**Procedure:**

1. If a Backup Box or a Backup Kit (automatic transfer switching device) is present, ensure that this has been decommissioned in accordance with the respective manual before de-energizing the inverter. Otherwise, the backup function will be triggered and the system will remain live.
2. Disconnect the inverter from voltage sources (see inverter manual).
3. Open the cover of the DC circuit breaker on the Battery Management System and switch off the DC circuit breaker.




4. Remove the DC cables.
5. Verify the absence of voltage between the positive and negative poles on the BMS unit.




6. Close the cover of the DC circuit breaker.

# 11 Cleaning

System components exposed to soiling must be cleaned regularly to ensure that all products are free of dust, leaves, and other dirt.

**NOTICE**

**Damage to the product due to cleaning agents**

The use of cleaning agents may cause damage to the product and its components.

- Clean all battery components with a dry cloth only.

# 12 Troubleshooting

## 12.1 Event messages on the user interface of the inverter

### 12.1.1 Event 150

**Event message:**

- Battery imbalancing fault

**Explanation:**

Different measured values from the temperature sensors

**LED signal on battery module:**

Warning (the 6th LED is flashing blue and red in alternation)

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Wait until the operating temperature of the battery module is back within the specified range.
- If the error persists, contact Service.

### 12.1.2 Event 151

**Event message:**

- Battery overtemperature

**Explanation:**

Overtemperature on a battery module

**LED signal on battery module:**

Warning (the 6th LED is flashing blue and red in the first 10 minutes) or error (the 6th LED is flashing red after 10 minutes)

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Wait until the operating temperature of the battery module is back within the specified range.
- If the error persists, contact Service.

### 12.1.3 Event 152

**Event message:**

- Battery undertemperature

**Explanation:**

Undertemperature during discharge of a battery module.

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Wait until the operating temperature of the battery module is back within the specified range.
- If the error persists, contact Service.

### 12.1.4 Event 153

**Event message:**

- Overcurrent battery charging

**Explanation:**

Overcurrent battery charging

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Restart system.
- If the error persists, contact Service.

### 12.1.5 Event 154

**Event message:**

- Overcurrent battery discharging

**Explanation:**

Overcurrent during discharging

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Restart system.
- If the error persists, contact Service.

### 12.1.6 Event 155

**Event message:**

- Battery cell overvoltage fault

**Explanation:**

Overvoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Restart system.
- If the error persists, contact Service.

### 12.1.7 Event 156

**Event message:**

- Battery cell undervoltage fault

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Close the DC switch on the battery.
- Restart the system (battery and inverter).
- Check DC cable and connection.
- Charge battery.
- If the error persists, contact Service.

### 12.1.8 Event 157

**Event message:**

- Battery system undertemperature–charge

**Explanation:**

Charging at low temperature

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Wait until a permissible temperature of between -15°C and 50°C is reached.
- If the error persists at temperatures above -15°C, contact Service.

### 12.1.9 Event 158

**Event message:**

- Internal communication error

**Explanation:**

Communication fault between the battery modules.

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Check the communication cable connection between the battery modules.
- Restart system.
- If the error persists, contact Service.

### 12.1.10 Event 159

**Event message:**

- External communication disrupted

**Explanation:**

Communication between battery and inverter disrupted.

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Check the communication wiring between the battery and inverter.
- Ensure that the battery is correctly configured via the inverter user interface.
- If the error persists, contact Service.

## 12.1.11 Event 168

**Event message:**

- Battery issuing pre-charge error

**Explanation:**

The battery voltage is too low during the precharge phase.

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Switch off the DC circuit-breaker on the BMS unit.
- Stop and then restart the inverter.
- Wait a few seconds.
- Switch the DC circuit-breaker on the BMS unit back on.
- Check the DC cables and ensure that there is not a reverse polarity error
- If the error persists, contact Service.

## 12.1.12 Event 170

**Event message:**

- Battery event Short circuit

**Explanation:**

There is a short circuit

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Check DC cables.
- Contact Service.

## 12.1.13 Event 171

**Event message:**

- Battery event Battery cell overvoltage

**Explanation:**

Overvoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Contact Service.

## 12.1.14 Event 172

**Event message:**

- Battery event Battery cell undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Charge battery.
- Contact Service.

## 12.1.15 Event 173

**Event message:**

- Battery event Battery module overvoltage

**Explanation:**

Overvoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Contact Service.

## 12.1.16 Event 174

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Charge the battery.
- Check the DC and communication cables.
- If charging the battery is not possible, contact service.

## 12.1.17 Event 175

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Charge the battery.
- Check the DC and communication cables.
- If charging the battery is not possible, contact service.

## 12.1.18 Event 176

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is flashing blue and red (warning)

**Corrective measures:**

- Charge the battery.
- Check the DC and communication cables.
- If charging the battery is not possible, contact service.

## 12.1.19 Event 177

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Ensure that the battery is correctly configured via the inverter user interface.
- Charge the battery.
- Check the DC and communication cables.
- Contact Service.

## 12.1.20 Event 178

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Ensure that the battery is correctly configured via the inverter user interface.
- Charge the battery.
- Check the DC and communication cables.
- Contact Service.

## 12.1.21 Event 179

**Event message:**

- Battery event Battery module undervoltage

**Explanation:**

Undervoltage on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Ensure that the battery is correctly configured via the inverter user interface.
- Charge the battery.
- Check the DC and communication cables.
- Contact Service.

## 12.1.22 Event 180

**Event message:**

- Battery event Battery module overtemperature

**Explanation:**

Overtemperature on a battery module

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the system (battery and inverter) from voltage sources.
- Contact Service.

## 12.1.23 Event 181

**Event message:**

- Battery event Battery system power too high

**Explanation:**

Power too high during charging

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Switch off the battery.
- Contact Service.

## 12.1.24 Event 182

**Event message:**

- Battery event Battery system power too high

**Explanation:**

Power too high during discharging

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Contact Service.

## 12.1.25 Event 183

**Event message:**

- Battery event Battery system residual capacity too low

**Explanation:**

SOH ≤ 50%

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Contact Service.

## 12.1.26 Event 184

**Event message:**

- Battery event

**Explanation:**

Battery cell overvoltage deviation

**LED signal on battery module:**

The 6th LED is flashing blue and red (warning)

**Corrective measures:**

- Wait until the voltage is in the normal range.

## 12.1.27 Event 185

**Event message:**

- There is a short circuit

**Explanation:**

External short circuit between the battery and inverter

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Check DC cables
- Disconnect the system (battery and inverter) from voltage sources.
- Contact Service.

## 12.1.28 Event 186

**Event message:**

- Battery event Battery Management System relay error

**Explanation:**

Battery Management System relay error

**LED signal on battery module:**

NA: Main switch open

**Corrective measures:**

- Disconnecting the Battery from Voltage Sources
- Contact Service.

## 12.1.29 Event 187

**Event message:**

- Battery event Battery Management System defective fuse

**Explanation:**

Battery Management System defective fuse

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Disconnect the battery from voltage sources.
- Contact Service.

## 12.1.30 Event 188

**Event message:**

- Battery event Configuration of the parallel system faulty

**Explanation:**

The configuration of the parallel system is faulty.

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Check DC cables
- Check the communication cable, in particular the uplink and downlink.
- Ensure that the RJ45 bridges are plugged in correctly

## 12.1.31 Event 189

**Event message:**

- Battery event Configuration of the parallel system faulty

**Explanation:**

Configuration of the parallel system faulty

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Ensure that the RJ45 bridges are plugged in correctly.

## 12.1.32 Event 190

**Event message:**

- Battery event Module not recognized

**Explanation:**

BMS error

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Restart the battery.
- Contact Service.

## 12.1.33 Event 191

**Event message:**

- Battery event Battery Management System internal error

**Explanation:**

BMS error

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Contact Service.

### 12.1.34 Event 192

**Event message:**

- Battery event Number of connected modules outside of permissible range.

**Explanation:**

The number of connected modules is either too high or too low

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- See technical information "Approved Batteries and Information on Battery Communication Connection"

### 12.1.35 Event 193

**Event message:**

- Battery event Battery modules not compatible in part

**Explanation:**

Connected modules may not be from SMA

**LED signal on battery module:**

The 6th LED is glowing red

**Corrective measures:**

- Only use SMA-approved battery modules.

## 12.2 External appearance of the battery module

Changes to the external appearance of the battery modules can also indicate possible errors.

| Status change of the battery module | Corrective measures |
|---|---|
| Discolorations, scratches or signs of wear on the enclosure | • Contact Service, if required. |
| Deformation of the battery enclosure | • Disconnect the system (battery and inverter) from voltage sources.<br>• Contact Service. |

## 12.3 Automatic recharging when state of charge is low

If PV charging is not occurring and the state of charge (SOC) falls below a specified value, automatic recharging from the utility grid takes place.

# 13 Installation of an additional battery module

**Battery modules may only be added withing 24 months of initial commissioning. Additions after 24 months can lead to a reduction of the usable capacity of the new module to the level of the modules already installed.**

In order to install an additional battery module after initial commissioning of the battery system, always proceed as described in this section.

**Procedure:**

1. Check whether the inverter and the battery have the most current firmware version. The latest firmware version can be found on the respective product page at www.SMA-Solar.com.
2. If the inverter and the battery are not equipped with the latest firmware version, perform a firmware update of the inverter and of the battery (see manual of the inverter).
3. Log in to Sunny Portal powered by ennexOS filter for "Battery" in the menu **Monitoring > Event monitor**. Check the events to see whether the battery firmware update has been completed successfully.
4. Charge or discharge the battery to 30% SOC (see Section 14.3 "Bring the battery modules to a state of charge of 30%", page 56).
5. Disconnect the product from voltage sources (see Section 10 "Disconnecting the Product from Voltage Sources", page 42).
6. Undo the two screws (M6 / AF10) on the BMS unit and remove the BMS unit.
7. Mount the additional battery module and attach it to the wall (see Section 7.3 "Mounting the Product", page 28). To do so, remove the wall mounting bracket and fixing brackets on the uppermost module already installed and use them for the extension module.
8. Place the BMS unit onto the uppermost battery module and attach using the two screw and washer assemblies (M6x16, AF10, tightening torque 5 Nm).
9. Recommission the system with all battery modules.

# 14 Receipt of a Replacement Device

## 14.1 Procedure for Receiving a Replacement Device

This section describes the procedure for the electrical connection of the product. It provides an overview of the steps, which must be performed in the prescribed sequence.

| Procedure | | See |
|---|---|---|
| 1. | Removing an old or defective battery module | Section 14.2, page 56 |
| 2. | Installing a Battery Module | Section 14.4, page 57 |

## 14.2 Removing a Battery Module

**Procedure:**

1. Disconnect the product from voltage sources (see Section 10 "Disconnecting the Product from Voltage Sources", page 42).
2. Undo the two screws (M6 / AF10) on the BMS unit and remove the BMS unit.
3. Remove the wall mounting bracket on the uppermost module.
4. If necessary, remove further battery modules if the defective battery module is further down the tower.
5. Disassemble the defective battery module. If this is the lowest battery module, the adjustable feet and U-turn unit must be removed.
6. Store the defective battery module in a safe place (storage period: 30 calendar days). Observe the specifications for the storage of lithium-ion batteries.
7. If SMA Solar Technology AG requests the defective battery module for analysis, pack the defective battery module in the transport packaging of the replacement device and follow the specifications by SMA Solar Technology AG for returning the battery module.
8. If no request is made by SMA Solar Technology AG to return the defective battery module within the storage period, dispose of the defective battery module. Use the transport packaging of the replacement device.

## 14.3 Bring the battery modules to a state of charge of 30%

**Information: The 30% refers to the actual target state of charge. The SOC value displayed in Sunny Portal and in the Energy App / 360° App may differ due to the configured charge and discharge stop ranges.**

**Requirement:**

☐ You are logged into Sunny Portal powered by ennexOS.

**Procedure:**

1. In the focus navigation, select the inverter to which the battery is connected.
2. Select the menu **Configuration**.
3. Select the menu item **Parameters**.
4. Set the value of the parameter **Actual target-SOC (Parameter.Bat.TarSoc)** to 30%.
5. Select [**Maximum charge/discharge power for charge target**] for the parameter *Operation Mode Target-SOC (Parameter.Bat.TarSocMod)*
6. Click on [**Save**].
7. Once the target SOC has been reached, set the parameter **Operation Mode Target-SOC (Parameter.Bat.TarSocMod)** to [**Off**].
8. Click on [**Save**].

## 14.4 Installing a Battery Module

**⚠ CAUTION**

**Registration of the replacement device for the extended warranty required**

To be able to use an extended warranty of ten years, the replacement module must be registered via the SMA product registration homepage (www.sma-service.com) upon receipt of the device. The conditions of the SMA limited factory warranty apply.

For further information, please visit www.SMA-Solar.com.

**Requirements:**

☐ The defective battery module has been removed (see Section 14.2 "Removing a Battery Module", page 56).

☐ The remaining modules have been charged to 30% SOC (see Section 14.3 "Bring the battery modules to a state of charge of 30%", page 56).

**Procedure:**

1. Mount the new battery module.
   If the lowest battery module was replaced, mount the adjustable feet and U-turn unit. If the uppermost battery module was replaced, use the wall mounted bracket from the defective module and attach it to the wall.
2. Place the BMS unit onto the uppermost battery module and attach using the two screw and washer assemblies (M6x16, AF10, tightening torque 5 Nm).
3. Recommission the system with all battery modules.

# 15 Decommissioning the Product

To permanently decommission the product, perform the steps described in the following.

**Requirements:**

☐ Original packaging or packaging suitable for the weight and dimensions of the battery modules and the BMS unit is available.

☐ Mounting material for attaching the packaging on the Euro pallets is available (e.g., tie-down straps).

**Procedure:**

1. Disconnect the product from voltage sources (see Section 10 "Disconnecting the Product from Voltage Sources", page 42).
2. Disconnect all DC and grounding cables.
3. Disconnect all communication cables.
4. Undo the two screws (M6/AF10) on the BMS unit and remove the BMS unit.
5. Remove the wall mounting bracket from the uppermost module and remove the battery modules.
6. Remove the wall mounting bracket from the lowest module. Then unscrew the adjustable feet and remove the U-turn unit.
7. If the battery module or the BMS unit is to be stored or shipped: Package the battery module or the BMS unit. To do this, use the original packaging or packaging that is suitable for the weight and dimensions of the battery module or the BMS unit and that complies with the regulations for the transport of batteries.
8. Preparing battery modules for transport.

# 16 Storage

## 16.1 Specifications for Battery Storage

**⚠ WARNING**

**Danger to life due to fire or explosion when batteries are deeply discharged**

A fire may occur due to incorrect charging of deeply discharged batteries. This can result in death or serious injury.

- Put the battery into operation no longer than twelve months after production date or six months after conditioning/delivery date SMA.
- If the battery cannot be put into operation within twelve months after production or six months after conditioning, request reconditioning of the battery from SMA Solar Technology AG.
- Before commissioning the system, verify that the battery is not deeply discharged.
- If the battery is deeply discharged, contact Service.

**⚠ WARNING**

**Danger to life due to fire or explosion when batteries are damaged**

Storing batteries incorrectly may result in a fire. This can result in death or serious injury.

- The specifications of the local fire protection regulations must always be observed.
- Store as few battery modules in one place as possible.
- Storage permissible in dry locations only.
- Clearly label the storage room from the outside as a lithium-ion battery storage location.
- Avoid transporting the battery modules unnecessarily.
- Handle the packages with care.

**Also see:**

- Procedure in case of fire ⇒ page 59

## 16.2 Climatic Requirements for the Storage Location

- Storage conditions **up to 1 month**: between -20 °C und 45 °C
- Storage conditions **up to 6 months**: between 0 °C und 45 °C
- Maximum permissible value for relative humidity (**non**-condensing): 5% to 95%
- Maximum altitude above MSL (Mean Sea Level): ≤ 3000 m

## 16.3 Procedure in case of fire

In case of fire, call the fire department immediately. Before use, refer to the storage conditions for lithium-ion batteries.

# 17 Disposal

## 17.1 Critical and non-critical battery modules

The condition of a battery module after a status change or an error may be critical or non-critical. A qualified person must assess on site whether a battery module is critical or non-critical.

☐ Critical battery modules are potentially dangerous. The following symptoms serve as orientation:
- The battery module has a notable smell, e.g., of plastic or gas.
- Gases are leaking from the battery module.
- The battery module enclosure is swollen, or the interior of the battery module is visible and/or is very hot.

☐ Non-critical battery modules are battery modules, for example, whose storage capacity is no longer sufficient.

## 17.2 Providers for the disposal of batteries

The latest version of this document including the following table can be found in PDF format at www.SMA-Solar.com.

| Country | Supplier | Procedure |
|---|---|---|
| Germany | GRS Batterien: www.grs-batterien.de<br>SMA Solar Technology AG is cooperating with the Stiftung Gemeinsames Rücknahmesystem Batterien (Foundation Joint Collection Scheme for Batteries, known as GRS Batterien) for the disposal of old lithium-ion batteries. All batteries put on the market by SMA Solar Technology AG can be disposed of via GRS Batterien. | As a battery installer, you are obliged to take back and dispose of this battery.<br>After registering on the website of **GRS Batterien** and your registration as a disposal point, batteries can be collected at your location according to the Batteriegesetz (BattG)/ Batteries Act. |
| Italy | SMA Solar Technology AG: logistica@sma-italia.com | As an end user, please contact your installer for more information on proper battery disposal.<br>As an installer, please contact the e-mail address provided for more information on proper battery disposal. |
| Australia, Austria, Belgium, Czech Republic, Denmark, Finland, France, Hungary, Netherlands, New Zealand, Poland, Portugal, Romania, Spain, Sweden, Switzerland | - | As an end user, please contact your installer for more information on proper battery disposal.<br>As an installer, please contact your distributor for more information on proper battery disposal.<br>As a distributor, you are obliged to take back and dispose of this battery. |

## 17.3 Specifications for Battery Disposal

Batteries from PV systems can only be returned via specialist dealers. The special disposal conditions for lithium batteries must be observed. Just like all other batteries, lithium-ion batteries must under no circumstances be disposed of with residual waste. Please note the regulations for the disposal of old batteries that apply at the time of disposal:

- There is a legal obligation to return used batteries. Batteries must not be disposed of with household waste.
- Used batteries may contain harmful substances which may harm the environment or your health if not properly stored or disposed of.

- Batteries contain important raw materials, such as iron, zinc, manganese, copper, cobalt, or nickel, and can be recycled.
- Batteries may only be disposed of in accordance with the local regulations for used batteries valid at the time of disposal.
- Dangerous goods must be packed, transported and labeled for Europe in accordance with the regulations of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).
- Regional providers for the disposal of used batteries must be contacted.

**Also see:**

- Providers for the disposal of batteries ⇒ page 60

## 17.4 Reporting damaged battery

- If a battery is damaged, immediately contact the installer or sales partner.

## 17.5 Disposing of the Battery

1. Immediately decommission the battery if damaged.
2. To avoid short circuits and a possible fire, the poles, loose cables and cable ends must be covered. To do this, use suitable insulation material (e.g., provided filler plugs or electrical tape).
3. Ensure that the battery is not exposed to moisture or direct sunlight.
4. Ensure that defective batteries are taken away as quickly as possible.

# 18 Technical Data

## 18.1 General Data

| | |
|---|---|
| Width x height x depth of a battery module | 530 mm x 133 mm x 405 mm |
| Height of 3 battery modules with BMS unit<br>Height of 12 battery modules with BMS unit | 605.5 mm<br>1802.5 mm |
| Weight of battery module | 35.8 kg |
| Weight of BMS unit | 11.3 kg |
| Maximum installation height above MSL | 3000 m |
| Degree of protection (according to IEC 60529) | IP66 |
| Protection class (according to IEC 62109-1) | I |
| Warranty when registering | 10 years |
| Warranty (without registration) | 2 years |
| Registration number of the Stiftung Elektro-Altgeräte Register (EAR) | 65232744 |
| Recycling | Section 17, page 60 |
| Certificates and approvals (more available on request) | CE, UN 38.3, IEC 62619, IEC 62477, VDE 2510-50 |
| Cell technology | Lithium Iron Phosphate (LiFePO4) |

## 18.2 Equipment

| Type designation | SMA Storage M 12.3 | SMA Storage M 16.4 | SMA Storage M 20.5 |
|---|---|---|---|
| Number of battery modules | 3 | 4 | 5 |
| DC connection | MC4 Evo 2 | | |
| Communication terminal | RJ45 (CAN) | | |
| Communication protocols | SMA battery interface | | |
| Compatible with SB-SExx-50 | yes | yes | yes |
| Compatible with STPHxx-60 | yes | yes | yes |
| Compatible with STPHxx-70 | yes | yes | yes |

| Type designation | SMA Storage M 24.6 | SMA Storage M 28.7 | SMA Storage M 32.8 |
|---|---|---|---|
| Number of battery modules | 6 | 7 | 8 |
| DC connection | MC4 Evo 2 | | |

| | | | |
|---|---|---|---|
| Communication terminal | RJ45 (CAN) | | |
| Communication protocols | SMA battery interface | | |
| Compatible with SB-SExx-50 | yes | yes | no |
| Compatible with STPHxx-60 | yes | yes | yes |
| Compatible with STPHxx-70 | yes | yes | yes |

| **Type designation** | **SMA Storage M 36.9** | **SMA Storage M 40.9** | **SMA Storage M 45.0** | **SMA Storage M 49.1** |
|---|---|---|---|---|
| Number of battery modules | 9 | 10 | 11 | 12 |
| DC connection | MC4 Evo 2 | | | |
| Communication terminal | RJ45 | | | |
| Communication Protocols | SMA battery interface | | | |
| Compatible with SB-SExx-50 | no | no | no | no |
| Compatible with STPHxx-60 | yes | no | no | no |
| Compatible with STPHxx-70 | yes | yes | yes | yes |

## 18.3 DC Connection

| **Type designation** | **SMA Storage M 12.3** | **SMA Storage M 16.4** | **SMA Storage M 20.5** |
|---|---|---|---|
| Usable energy capacity | 12.28 kWh | 16.37 kWh | 20.47 kWh |
| Nominal voltage | 172.8 V | 230.4 V | 288 V |
| Operating voltage range | 151.2 V to 191.7 V | 201.6 V to 255.6 V | 252 V to 319.5 V |
| Max. charging / discharging current | 62 A | 62 A | 62 A |

| **Type designation** | **SMA Storage M 24.6** | **SMA Storage M 28.7** | **SMA Storage M 32.8** |
|---|---|---|---|
| Usable energy capacity | 24.56 kWh | 28.65 kWh | 32.75 kWh |
| Nominal voltage | 345.6 V | 403.2 V | 460.8 V |
| Operating voltage range | 302.4 V to 383.4 V | 352.8 V to 447.3 V | 403.2 V to 511.2 V |
| Max. charging / discharging current | 62 A | 62 A | 62 A |

| Type designation | SMA Storage M 36.9 | SMA Storage M 40.9 | SMA Storage M 45.0 | SMA Storage M 49.1 |
|---|---|---|---|---|
| Usable energy capacity | 36.84 kWh | 40.93 kWh | 45.03 kWh | 49.12 kWh |
| Nominal voltage | 518,4 V | 576 V | 633.6 V | 691.2 V |
| Operating voltage range | 453.6 V to 575.1 V | 504 V to 639 V | 554 V to 702.9 V | 604 V to 766.8 V |
| Max. charging / discharging current | 62 A | 62 A | 62 A | 62 A |

## 18.4 Efficiency

| Type designation | SMA Storage M 12.3 – SMA Storage M 49.1 |
|---|---|
| Maximum battery efficiency | 93.5% at a C rate of 0.2; C rate of 0.5 |

## 18.5 Protective Devices

| | |
|---|---|
| Input-side disconnection point | Available |
| DC reverse polarity protection | Available |
| Overvoltage category battery / inverter | II / II |

## 18.6 Climatic Conditions

| | |
|---|---|
| Operating temperature during charging | -20°C to +50°C |
| Operating temperature during discharging | -20°C to +50°C |
| Humidity (non-condensing) | 5% - 100% |
| Cooling concept | Natural cooling |

# 19 EU Declaration of Conformity

within the scope of the EU directives

- Electromagnetic compatibility 2014/30/EU (29.3.2014 L 96/79-106) (EMC)
- European Battery Regulation (EU) 2023/1542 (2023-07-12)
- Low Voltage Directive 2014/35/EU (29.3.2014 L 96/357-374) (LVD)
- Restriction of the use of certain hazardous substances 2011/65/EU (L 174/88, June 8, 2011) and 2015/863/EU (L 137/10, March 31, 2015) (RoHS)

SMA Solar Technology AG confirms herewith that the products described in this document are in compliance with the fundamental requirements and other relevant provisions of the aforementioned directives. More information on the availability of the entire Declaration of Conformity can be found at https://www.sma.de/en/ce-ukca.

# 20 Contact

If you experience any technical problems with our products, please contact the Service. The following data is required in order to provide you with the necessary assistance:

- Hybrid Inverters
  - Device type
  - Serial number
  - Firmware version
  - Event message
  - Installation site and mounting height
  - Type of the communication products connected
  - Use the name of the system in Sunny Portal (if available)
  - Access data for Sunny Portal (if available)
  - Special country-specific settings (if available)
  - Information on the ripple control receiver (if available)
  - Detailed description of the problem
- Battery
  - Device type
  - Serial number / serial numbers
  - Firmware version
  - Event message
  - Installation site and mounting height

You can find your country's contact information at:

https://go.sma.de/service

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