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# 1 Important information about these instructions

## 1.1 Scope

This document applies to the modular high-voltage storage system STORAGE-67-TS-10 in conjunction with the battery inverter Sunny Tripower Storage 60 (STPS 60-10).

Read these installation and operating instructions carefully to ensure error-free installation, initial commissioning and maintenance of the STORAGE-67-TS-10. Installation, initial commissioning and maintenance must be carried out by a qualified and authorized specialist. The installation and operating instructions should be kept near the unit and must be readily available to all persons involved in the installation or maintenance of the unit.

Make sure that you comply with local legal regulations and standards. Standards and other legal regulations in other countries may conflict with the specifications in this manual. In such a case, please contact our service center.

## 1.2 Explanation of symbols

The following types of warnings and notices are used in this manual:



**DANGER!** Indicates a warning which, if not observed, may result in an electric shock even if the unit is disconnected from the grid, as there is a time delay before the unit is voltage-free.



**DANGER!** Indicates a warning which, if not observed, will directly result in death or serious injury.



**CAUTION!** Indicates a warning which, if not observed, may result in personal injury.

**ATTENTION!** Indicates a warning that, if not observed, may result in damage to property.



**NOTE** Indicates instructions on how to handle the unit.

### Symbols on the unit

The following types of warnings, prohibitions and commands are also used on the unit:



#### **CAUTION! RISK OF CHEMICAL BURNS**

If the battery is damaged in the event of an error, electrolyte may leak out and hydrofluoric acid may be produced in small concentrations and quantities. Contact with these fluids may cause chemical burns.

- Do not subject the battery modules to violent impacts.
- Do not open, disassemble or tamper with the battery modules.

In case of contact with electrolyte, immediately wash the affected area with water and seek medical advice without delay.



#### **CAUTION! EXPLOSION HAZARD**

If improperly handled or in the event of a fire, lithium battery cells may ignite or explode, causing serious injury.

- Never install or operate the battery modules in potentially explosive environments or areas with relatively high humidity levels.
- The battery modules must be stored in a dry place and within the temperature ranges specified in the data sheet.
- Do not open, perforate or drop the battery cells or modules.
- Do not expose the battery cells or modules to high temperatures.

- Do not throw the battery cells or modules into a fire.
- In the event of a fire originating from the battery, extinguish it with a CO<sub>2</sub> fire extinguisher. In the event of a fire in the vicinity of the battery, use an ABC fire extinguisher.
- Do not use defective or damaged battery modules.



#### **CAUTION HOT SURFACE!**

Should a malfunction occur, components may become very hot and cause serious injury if touched.

- Switch off the storage system immediately in case of defects.
- Exercise particular caution when handling the unit in the event of malfunctions or defects.



#### **NO OPEN FIRES!**

Open fires and ignition sources are prohibited in the immediate vicinity of the storage system.



#### **DO NOT INSERT ANY OBJECTS INTO OPENINGS IN THE CASING OF THE STORAGE SYSTEM!**

Do not insert any objects, such as screwdrivers, through openings in the casing of the storage system.



#### **WEAR SAFETY GOGGLES!**

Safety goggles must be worn when work is conducted on the unit.



#### **FOLLOW THE INSTRUCTIONS!**

These installation and operating instructions must be followed when work is conducted on the unit and it is operated.

## 1.3 General safety information



#### **Danger! Risk of death due to non-observance of the safety instructions!**

Improper use can lead to fatal injuries. Every person assigned to work on the system must have read and understood these instructions, especially chapter "2 Safety" on page 8.

**All safety instructions must be followed.**

The instructions in this manual must be observed by all persons working on the STORAGE-67-TS-10.

This manual cannot describe every conceivable situation. The applicable standards and corresponding regulations on occupational health and safety therefore always take precedence.

The assembly of the unit also poses residual dangers in the following cases:

- Assembly is not carried out properly.
- Assembly is carried out by personnel who have not been trained or given proper instructions.
- The safety instructions provided here are not followed.

## 1.4 Limitation of liability

TESVOLT GmbH accepts no liability whatsoever for personal injury, damage to property, damage to the product or consequential damage attributable to the following causes:

- Failure to comply with these instructions,
- improper use of the product,
- repairs, opening of the cabinet and other actions performed on or with the product by unauthorized and/or unqualified personnel,
- the use of unauthorized spare parts.

It is prohibited to carry out unauthorized reconstructions or technical modifications to the product.

## 1.5 Intended use

STORAGE-67-TS-10 is a modular battery storage system based on lithium-ion technology. The components reflect the current state of the art and meet product-specific standards.

STORAGE-67-TS-10 is designed for operation with the 3-phase battery inverter Sunny Tripower Storage 60 (STPS 60-10) manufactured by SMA. Any other use must be approved by the manufacturer and, if necessary, the local utility company.

The unit may be operated only in closed rooms. The STORAGE-67-TS-10 works in an ambient air temperature range of -10°C to 50°C and at a maximum humidity of 85 %.

The battery cabinet must not be exposed to direct sunlight and must not be placed directly next to heat sources.

The battery cabinet must not be subjected to corrosive atmospheres.

When installing the battery storage system, ensure that it is standing on a sufficiently dry, horizontal and flat surface with sufficient load-bearing capacity.

The battery cabinet may not be installed at a location more than 2,000 m above sea level without the written approval of the manufacturer.

In areas prone to flooding, the battery cabinet must always be installed in an elevated location where it is protected from making contact with water.

Pursuant to IEC 62619, the storage system must be installed in a fire-proof room. This room must be fitted with an independent fire alarm unit which complies with local regulations and standards and must be free of fire loads. The room must be separated from other rooms by class T60 fire doors. Similar fire protection requirements also apply to other openings in the room (e.g. windows).

Intended use also includes compliance with these instructions.

Essentially, the STORAGE-67-TS-10 may not be used:

- for mobile use on land or in the air (it may only be used on water in agreement with and with the written consent of the manufacturer).
- for use with medical equipment
- as a UPS system.

## 1.6 Requirements for installers

Local regulations and standards must be followed for any work carried out.

The battery storage system may only be installed by qualified electricians who have the following qualifications:

- training in dealing with hazards and risks associated with the installation and operation of electrical devices, systems and batteries,
- training in the installation and commissioning of electrical devices,
- knowledge of and adherence to the locally applicable technical connection requirements, standards, directives, regulations and laws,
- knowledge of the proper handling of lithium-ion batteries (transport, storage, disposal, and sources of danger)
- knowledge of and adherence to these installation and operating instructions as well as other applicable documents.

## 2 Safety

The STORAGE-67-TS-10 meets the requirements of IEC 61508 parts 1 to 7 and complies with safety integrity level (SIL) 1.



### **DANGER! Life-threatening electric shock from damaged components or short circuit**

Bridging the battery poles causes a short circuit resulting in a flow of electrical current. A short circuit of this type must be avoided under all circumstances. You should therefore observe the following points:

- Use insulated tools and insulated gloves.
- Do not place any tools or metal parts on the battery modules or the APU.
- Always remove watches, rings and other metal objects when working with the batteries.
- Never operate or install the battery system in explosive environments or areas with relatively high humidity.
- Before beginning any work on the battery storage system, first switch off the charge controller and then disconnect the battery from the voltage supply and secure them from being switched on again.



### **DANGER! Chemical burns and poisoning due to electrolyte or toxic gases**

During normal operation, no electrolyte can leak from the battery and no toxic gases can form. Despite careful design, damage to the battery in the event of an error can result in electrolyte leakage, or toxic gases, organic solvent gases and hydrofluoric acid may form in small concentrations and quantities. The following instructions must therefore be observed:

- Do not subject the battery module to violent impacts.
- Do not open, disassemble or tamper with the battery module.

In case of contact with electrolyte, immediately wash the affected area with water and seek medical advice without delay.



### **DANGER! Life-threatening burns as a result of improper handling**

Improper handling can cause lithium battery cells to ignite. It is therefore essential that you observe the following instructions for handling lithium battery cells:

- Never install or operate the battery modules in potentially explosive environments or areas with relatively high humidity levels.
- The battery modules must be stored in a dry place and within the temperature ranges specified in the data sheet.
- Do not open, perforate or drop the battery cells or modules.
- Do not expose the battery cells or modules to high temperatures.
- Do not throw the battery cells or modules into a fire.
- In the event of a fire originating from the battery, extinguish it with a CO<sub>2</sub> fire extinguisher. In the event of a fire in the vicinity of the battery, use an ABC fire extinguisher.
- Do not use defective or damaged battery modules.



### **DANGER! Risk of death due to misuse**

Any use of the battery storage system beyond the intended use or any other type of use can result in considerable danger.



### **DANGER! Risk of death due to unqualified operation**

Incorrect handling of the battery storage system can result in considerable danger to the operator. Any action requiring the battery cabinet to be opened must therefore only be carried out by qualified personnel in accordance with the instructions in section "1.6 Requirements for installers" on page 7.





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**ATTENTION! Improper handling may result in damage to the battery cells**

- Do not expose battery cells or modules to rain or immerse them in liquids.
  - Do not expose battery cells to corrosive atmospheres (e.g. ammonia or salt).
  - Do not use any battery inverters other than STPS 60-10.
  - Commission STORAGE-67-TS-10 battery storage systems within **six months** of delivery at the latest.
-

## 3 Preparatory work

### 3.1 Required tools

TOOL	USE
5–30 Nm torque wrench with a 10 and 13 mm socket, hexagon socket size 8 with extension $\geq 120$ mm	For tightening the ground connections and the AC and DC connecting cables to the STPS 60-10
TX 25/30 Torx screwdriver	For fastening the battery modules and SMA HV APU in the battery cabinet
PH 3 cross-head screwdriver	For dismantling the transport safeguard For assembling the base panels Optional: For dismantling the battery cabinet halves
35 mm <sup>2</sup> to 50 mm <sup>2</sup> crimping tool	For crimping the wire end ferrules for the DC connecting cable
Voltage measuring device (min. 1000 V <sub>DC</sub> )	For measuring the grid and battery voltage (battery voltage up to 1000 V <sub>DC</sub> ); For testing the battery modules' state of charge
8 mm wrench	Optional: For dismantling the cable aperture panel on the cabinet cover
19 mm wrench	Optional: For lifting the cabinet cover and fitting the spacers

### 3.2 Transport to the end customer

#### Transport regulations and safety instructions

All the requirements under GGVSEB and ADR must be met.

- The battery modules may only be transported by the manufacturer or a logistics company engaged by the manufacturer. Should transport on public roads nevertheless be necessary, this may only be carried out by personnel who have received appropriate training and instruction. Such instructions must be documented and given at regular intervals.
- Smoking is prohibited in the vehicle during the journey as well as in the immediate vicinity of the battery modules during loading and unloading.
- Two tested fire class D metal fire extinguishers (minimum capacity 2 kg) as well as equipment for dangerous goods in accordance with ADR are to be carried in the vehicle.
- The freight carrier is prohibited from opening the outer packaging of the battery module.



#### **DANGER! Risk of injury due to improper transport in a vehicle.**

Improper transport and/or inadequate transport safeguards can cause the load to slide or tip over, resulting in injuries. You should therefore position the cabinet vertically and in such a way that it cannot slide around in the vehicle. Use retaining straps to prevent the cabinet from tipping over and sliding!



#### **CAUTION! Risk of injury due to tilting battery cabinet.**

The cabinet weighs about 120 kg and can tip over or slide away uncontrollably causing injuries if it is tilted too far. Therefore, do not tilt the cabinet more than 45°.



#### **CAUTION! Risk of injury if steel-toe boots are not worn when transporting the cabinet.**

Injuries such as crushing injuries can occur in hazardous situations due to the components' heavy dead weight when the cabinet or battery modules are being transported. All persons involved must therefore wear protective steel-toe boots.



#### **NOTE**

You should also follow the safety instructions in the following section "3.3 Transport at end customer site" on page 11, especially when loading and unloading.

#### **ATTENTION! Risk of damage during transport with installed battery modules.**

Transporting the cabinet with the battery modules already installed will cause damage to the unit. Battery modules and cabinet must therefore always be transported separately from each other. Never move a cabinet once it has been fitted with battery modules, even using lifting gear.

### 3.3 Transport at end customer site



**CAUTION! Risk of injury due to improper transport of the battery modules.**

Battery modules are heavy (36 kg) and can cause injuries if they topple over or slide around. Ensure that the modules are transported safely and that only suitable means of transport are used.



**CAUTION! Risk of injury due to tipping battery cabinet during transport.**

The cabinet weighs about 120 kg and may tip over if tilted, causing injuries and damage.



**CAUTION! Risk of injury if steel-toe boots are not worn when transporting the cabinet.**

Injuries such as crushing injuries can occur in hazardous situations due to the components' heavy dead weight when the cabinet or battery modules are being transported. All persons involved must therefore wear protective steel-toe boots.



**CAUTION! Risk of injury from sharp edges and metal panels when transporting the cabinet.**

When the unpacked cabinet is being transported and installed, there is an increased risk of injury particularly from sharp-edged metal panels. All persons involved must therefore wear protective gloves.

**ATTENTION! Damage from transport with installed battery modules.**

Transporting the cabinet with the battery modules already installed will cause damage to the unit. Battery modules and cabinet must therefore always be transported separately from each other. Never move a cabinet once it has been fitted with battery modules, even using lifting gear.



**NOTE To be transported by at least three people.**

The use of a hand truck is recommended. Caution: Do not damage the casing!

The individual components of the STORAGE-67-TS-10 can weigh up to 120 kg and are therefore should not be transported by a single person. It is recommended that the system be installed by at least two people. The assistance of a hand truck is helpful.

**No more than five battery modules may be stored on top of one another.**



Abbildung 3.1 Permissible and impermissible storage positions of a packaged battery module

### 3.4 Installation location

#### Necessary requirements

Section "1.5 Intended use" on page 7 lists all the requirements and conditions for the installation of a STORAGE-67-TS-10.

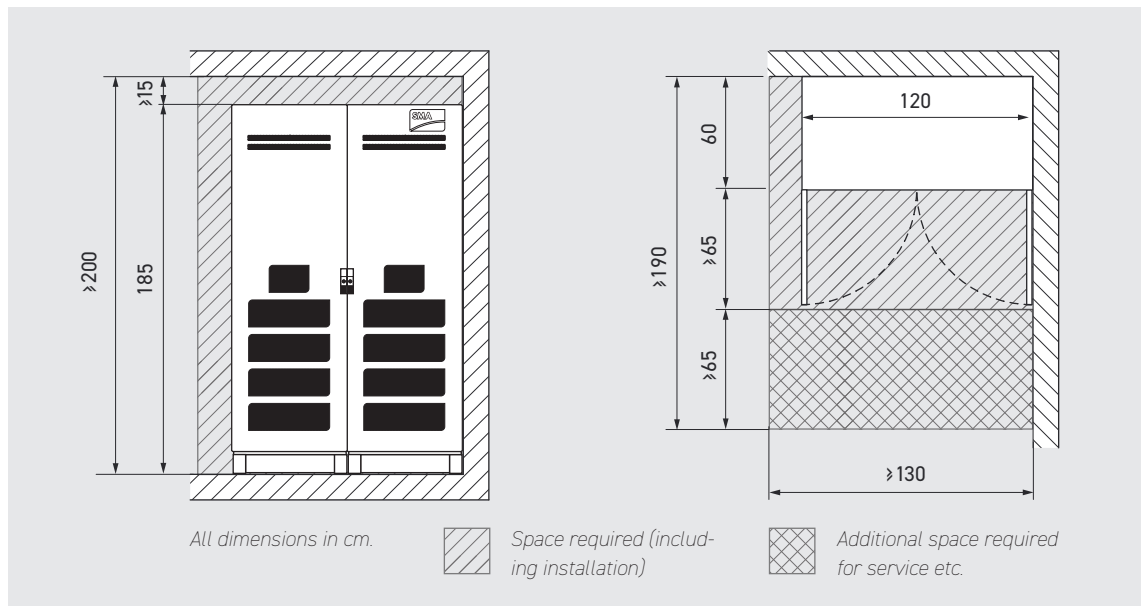
When selecting the installation location, also consider the transport routes and the necessary building clearance.



#### **ATTENTION! Damage to the building possible due to static overload.**

When fully installed, the battery storage system weighs up to 823 kg. Make absolutely sure that the installation location has sufficient load-bearing capacity. When in doubt, consult a structural engineer.

#### Dimensions



## 4 Technical specifications

### 4.1 Sunny Tripower Storage 60 (STPS 60-10)

The STORAGE-67-TS-10 has been optimized for use with the 3-phase STPS 60-10 battery inverter. The overall system is perfectly matched to the needs of trade and industry. Thanks to the SMA Inverter Manager's flexible energy management system and its high C-rate, STORAGE-67-TS-10 storage systems can be used for an extremely wide variety of applications. This paves the way for projects up to the megawatt range.

TECHNICAL SPECIFICATIONS STPS 60-10	
Nominal charging power (AC)	60 kVA
Nominal discharging power (AC)	75 kVA
DC voltage range	575 to 1,000 V
Dimensions (H x W x D)	740 x 570 x 306 mm
max. efficiency	98.8%
Self-consumption	< 3 W
Operating temperature	-25 to 60°C
Weight	77 kg
Protection class	IP65
Communication	Modbus TCP/IP
Topology	Transformerless



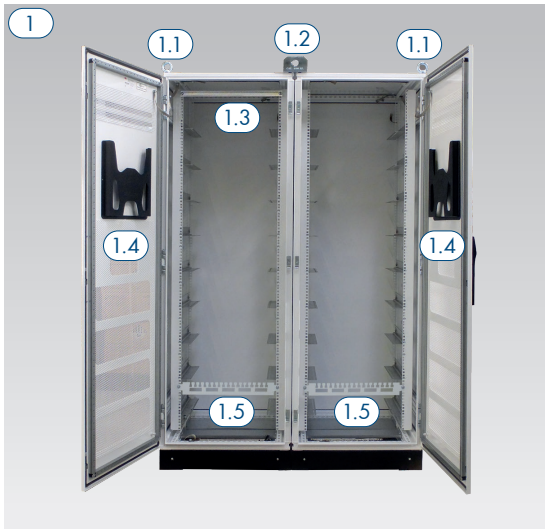
Abbildung 4.1 Sunny Tripower Storage 60 with SMA Inverter Manager

### 4.2 STORAGE-67-TS-10

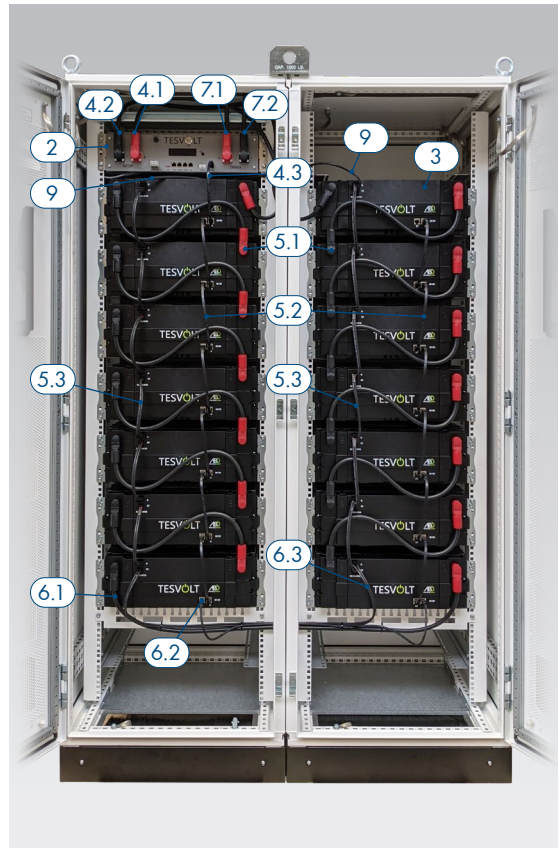
TECHNICAL SPECIFICATIONS STORAGE-67-TS-10	
Energy (14   16 battery modules)	67 kWh   76 kWh
C-rate	1C
Cell	Lithium NMC prismatic (Samsung SDI)
Max. charging/discharging current	94 A
Cell balancing	Active Battery Optimizer
Expected cycles at 100% DoD   70% EoL   23°C +/- 5°C 1C/1C	6000
Expected cycles at 100% DoD   70% EoL   23°C +/- 5°C 0.5C/0.5C	8,000
Efficiency (battery)	Up to 98%
Self-consumption (standby)	5 watts
Operating voltage	666 to 930 V <sub>DC</sub>
Operating temperature	-10 to 50°C
Humidity	0 to 85% (non-condensing)
Max. elevation of the installation location	2,000 m above sea level
Total weight (14   16 battery modules)	742 kg   823 kg
Weight per battery module	36 kg
Weight per cabinet	120 kg
Dimensions (H x W x D)	1,900 x 1,200 x 600 mm
Certificates/standards	Cell IEC 62619, UL 1642, UN 38.3
Product	CE, UN 38.3, IEC 62619, IEC 61000-6-1/2/3/4, Battery Directive 2006/66/EC
Recycling	Free battery take-back scheme from SMA
Protection class	IP20

# 5 Battery storage system STORAGE-67-TS-10

## 5.1 Layout and components



Cabinet with pre-installed accessories



Assembled STORAGE-67-TS-10



APU SMA HV (top view)  
Battery module HV1000



APU connector set HV1000



Module connector set HV1000



Cabinet connector set HV1000



DC connector set APU for  
BatWR/BatBreaker HV1000



Switch



Rack balancing  
cable 0.75 m



Type plate



Cabinet accessories



SMA Inverter Manager (left)  
with external 24 V power  
supply



Janitza network analyzer



BatBreaker (supplied with  
orders of two or more  
STORAGE-67-TS-10 units)



DC connector set BatBreaker/  
STPS



Installation guide



USB drive

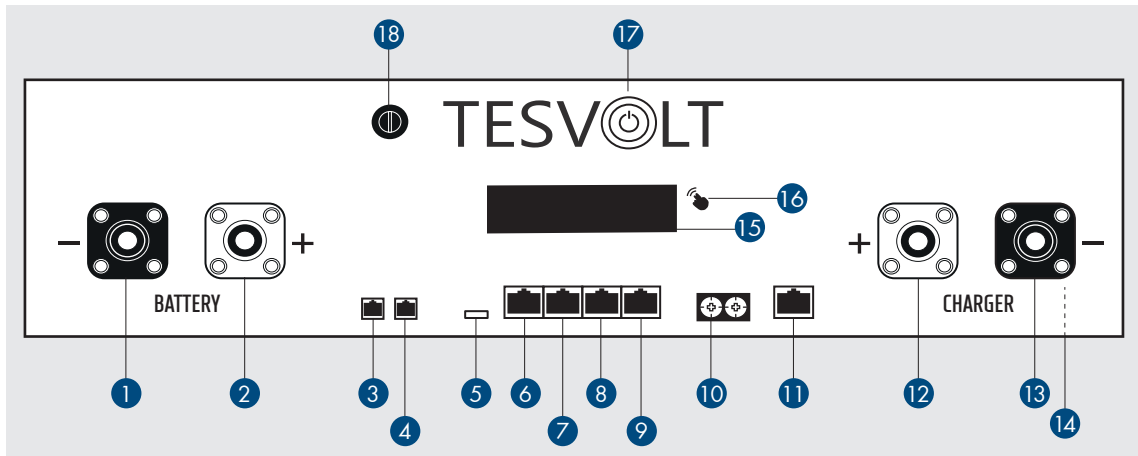


Sticker for  
battery chamber

## 5.2 Scope of delivery STORAGE-67-TS-10

ITEM	QUANTITY	DESCRIPTION
1	1	<b>Battery cabinet</b> TS HV
1.1	4	↳ <b>Crane lifting eye</b> pre-fitted
1.2	2	↳ <b>Crane bracket</b> pre-fitted
1.3	1	↳ <b>C-rail</b> pre-fitted
1.4	2	↳ <b>Document pouch</b> pre-fitted
1.5	2	↳ <b>Comb busbar</b> pre-fitted
2	1	<b>SMA HV APU</b> (APU HV1000-S)
3	14 or 16	<b>Battery module HV1000</b> (battery module 4.8-1C-HV1000) incl. Active Battery Optimizer (ABO)
4	1	<b>APU connector set HV1000</b> from the APU to the first and last (14th/16th) battery module
4.1	1	↳ <b>DC connecting cable</b> 950 mm, 35 mm <sup>2</sup> (red on red)
4.2	1	↳ <b>DC connecting cable</b> 1150 mm, 35 mm <sup>2</sup> (black on black)
4.3	1	↳ <b>Patch cable</b> CAT6, 300 mm
4.4	1	↳ <b>APU ground</b> 700 mm, 16 mm <sup>2</sup> , green-yellow, M6- M8
5	1	<b>Module connector set HV1000</b> (for 16 battery modules, extra pack each with 2 additional cables)
5.1	12	↳ <b>DC connecting cable</b> 550 mm, 35 mm <sup>2</sup> (red on black)
5.2	12	↳ <b>Patch cable</b> CAT6, 300 mm
5.3	12	↳ <b>Rack balancing cable</b> 240 mm
6	1	<b>Cabinet connector set HV1000</b>
6.1	1	↳ <b>DC connecting cable</b> 1,200 mm, 35 mm <sup>2</sup> (red on black)
6.2	1	↳ <b>Patch cable</b> CAT6, 1,000 mm
6.3	1	↳ <b>Rack balancing cable</b> 1,100 mm
7	1	<b>DC connector set HV1000</b> APU to battery inverter/BatBreaker
7.1	1	↳ <b>DC connecting cable</b> 5,000 mm, 35 mm <sup>2</sup> with red plug on one side
7.2	1	↳ <b>DC connecting cable</b> 5,000 mm, 35 mm <sup>2</sup> with black plug on one side
7.3	2	↳ <b>Wire end ferrules</b> 35 mm <sup>2</sup> insulated
7.4	1	↳ <b>Patch cable</b> CAT6, 5,000 mm
7.5	1	↳ <b>Ground cable</b> 5,000 mm, 16 mm <sup>2</sup> , M 8 ring terminal
8	2	<b>Switch</b> Netgear GS 308
9	2	<b>Rack balancing cable</b> 750 mm
10	3	<b>Type plate STORAGE-67-TS-10</b>
11	1	<b>Cabinet accessories</b>
11.1	8	↳ <b>screw M12 x 25</b> for the optional lifting of the cabinet cover
11.2	4	↳ <b>Plastic washer</b> for M12 screw for the optional lifting of the cabinet cover
11.3	8	↳ <b>Spacer M12</b> for the optional lifting of the cabinet cover
11.4	100	↳ <b>Pan head screw M6 x 16 Tx with washer</b>
11.5	2	↳ <b>Cable retention clip for strain relief</b> for mounting on C-rail
12	1	<b>SMA Inverter Manager</b>
13	1	<b>CLCON power supply</b>
14	1	<b>Janitza network analyzer UMG 604E-Pro</b>
15	optional	<b>BatBreaker</b> optional, included in scope of delivery for master/slave systems
16	optional	<b>DC connector set BatBreaker for the Bat-INV (battery inverter) HV1000</b> 2x 1000 mm, 35 mm <sup>2</sup>
17	1	<b>Installation and Operating Manual STORAGE-67-TS-10</b>
18	1	<b>TESVOLT USB drive</b>
19	1	<b>Battery chamber sticker</b>

### 5.3 Connections and layout of the SMA HV APU



NO.	DESIGNATION	DESCRIPTION
1	BATTERY -	DC connection of the battery for the negative pole (black)
2	BATTERY +	DC connection of the battery for the positive pole (red)
3	24 V AUX PWR	Not used in this system
4	E-STOP	Two-pin plug for the optional connection of a potential-free emergency off switch (pre-fitted with bridge on delivery)
5	TERM	CAN bus termination TERM must be activated (ON) for the first and last CAN bus nodes.
6	CAN IN	SMA HV APU Master/slave communication (input)
7	CAN OUT	SMA HV APU Master/slave communication (output)
8	CAN SMA	Not used in this system
9	LAN	Modbus TCP/IP transmission for communication between battery and Inverter Manager
10	ADDRESS	Further information can be found in the section "LAN2 wiring for systems with multiple master and slave storage systems" on page 39.
11	BAT COM	Communication connection to the first battery module
12	CHARGER +	DC connection of the STPS 60-10 or BatBreaker for the positive pole (red)
13	CHARGER -	DC connection of the STPS 60-10 or BatBreaker for the negative pole (black)
14	GROUND	Ground connection (M6 thread bolt on the rear of the unit)
15	DISPLAY	Display
16	MARKING	Marking for activating and changing the display by tapping
17	SWITCH	On/off switch for the battery
18	APU Fuse (F1)	Fuse element to protect the SMA HV APU (2 A time-delay fuse (T) 5 x 20 mm, in accordance with DIN 41571-2 type 521.020 from ESKA, 250 V <sub>AC</sub> ). System cannot be operated with a defective fuse.

### 5.4 Connections and layout of the battery module

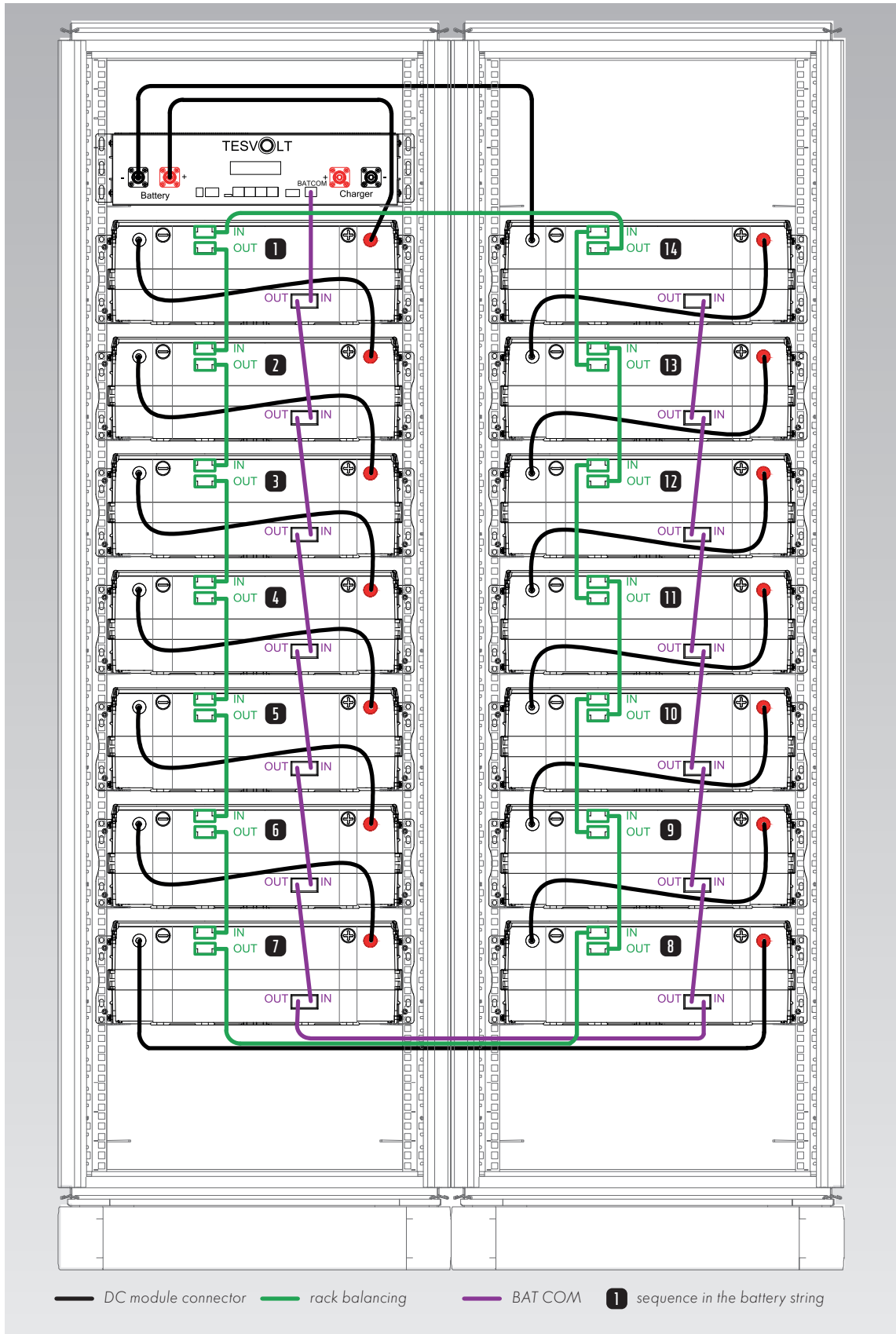


DESIGNATION	DESCRIPTION
19 - POLE	Negative pole on battery (black)
20 + POLE	Positive pole on battery (red)
21 RACK BALANCING IN	Rack balancing (input)
22 RACK BALANCING OUT	Rack balancing (output)
23 BAT COM OUT	Communication connection for battery module (output)
24 BAT COM IN	Communication connection for battery module (input)

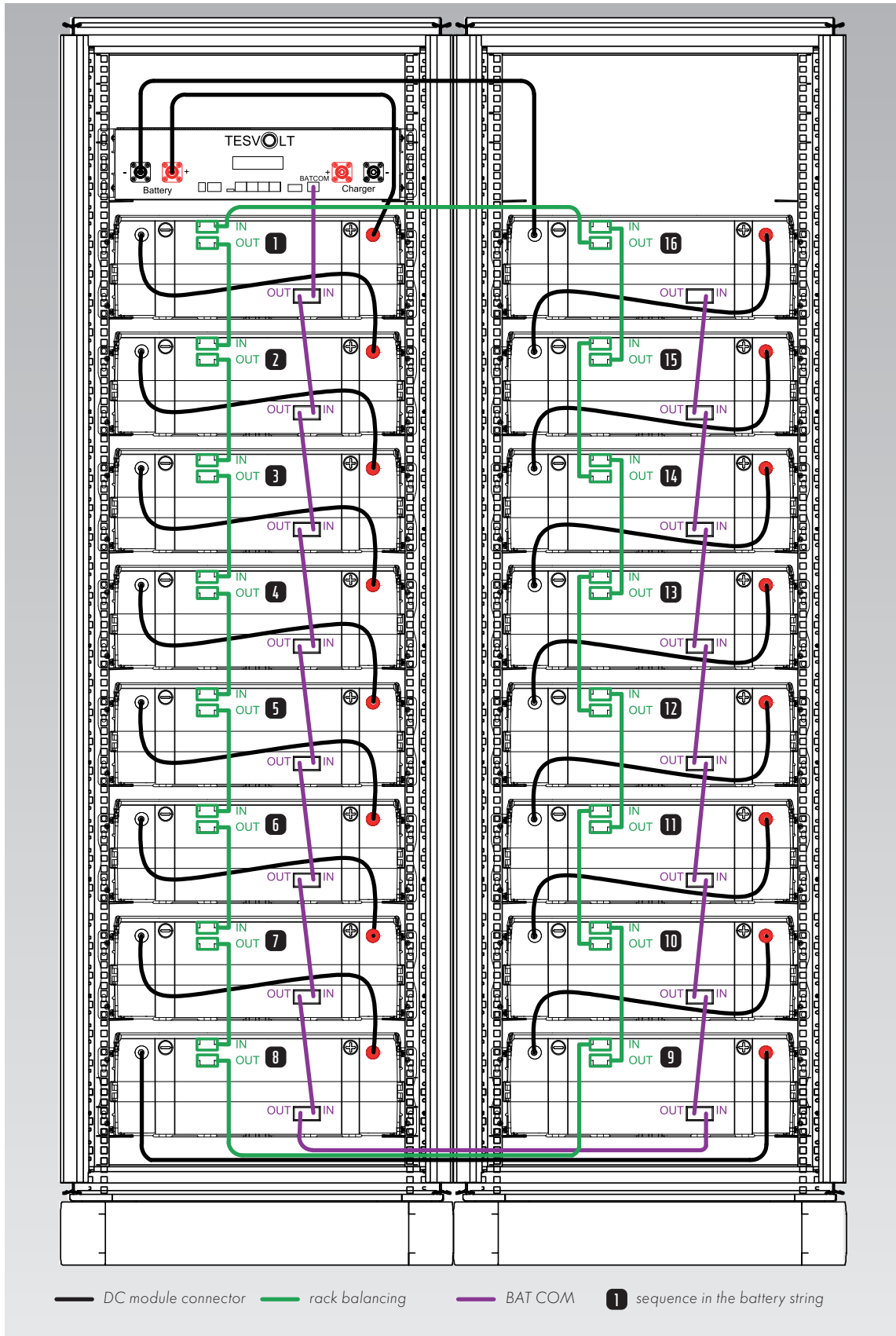


## 5.5 Battery module wiring

### Wiring of 14 battery modules



### Wiring of 16 battery modules

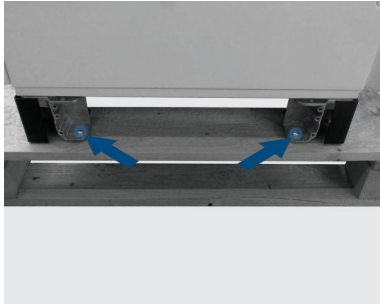


## 6 Installation

### 6.1 Disassembly and assembly of the cabinet

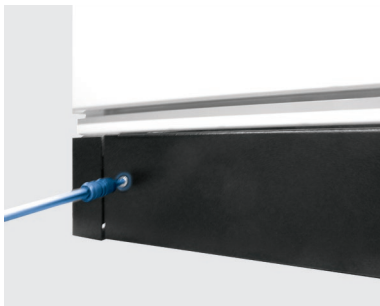
Remove the packaging and transport safeguards from the cabinet. The cabinet consists of two halves that are connected to each other. If necessary for transporting the cabinet to the installation location, the cabinet can be quickly and easily divided into two halves.

1



First, remove the transport safeguards. To do this, remove the cross-head screws that connect the cabinet feet on the right and left sides of the cabinet to the pallet.

2



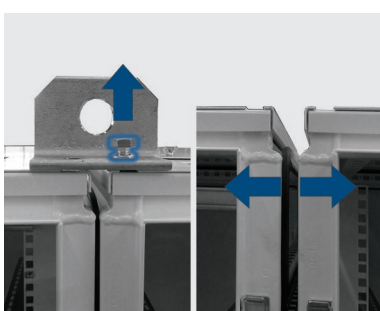
Then, attach the side cover panels in the base area of the storage system using two M 6 x 16 screws. (11.4)

3



Now, disassemble the cabinet connections by removing the six cross-head screws at the marked points.

4



Remove the crane brackets (1.2). The cabinet halves are now separated and can be moved to the installation location. Connect the cabinet halves in the reverse order of disassembly described in steps (1) to (3). Place the cabinet in its final position pursuant to the specifications for the installation location in section "3.4 Installation location" on page 12.

## 6.2 Optional: Lifting the top of the cabinet

The cabinet's top cover can be raised by about two centimeters to improve the ventilation and heat dissipation of the STORAGE-67-TS-10.

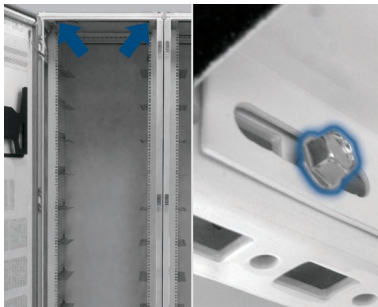
1



### Optional – lift the cabinet's top cover for additional ventila-

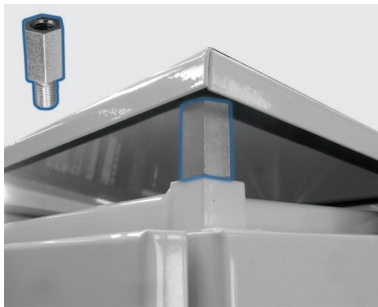
**tion:** First, remove all crane lifting eyes (1.1) and then the crane brackets (1.2). Place the plastic washers (11.2) you have removed aside for later use.

2



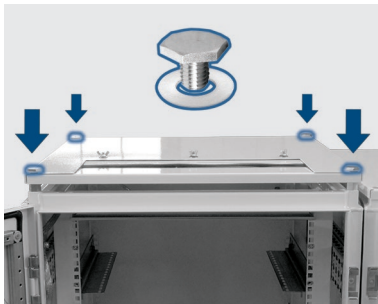
Remove the two locking screws (8 mm) of the cable bushing panel in the left-hand half of the cabinet at the marked points.

3



Screw a spacer (11.3) in the threaded hole at each of the four corners of both cabinet halves to fix the crane lifting eyes (1.1) and the crane bracket (1.2). The tightening torque must not exceed 50 Nm. Then, place the cabinet's top cover on the spacers (11.3).

4



Secure the cabinet covers using the M12 x 25 mm screws (11.1) and plastic washers (11.2) provided as well as the ones previously removed in step 1.

### 6.3 Installation of the components



**DANGER! Life-threatening electric shock if ground is insufficient or absent!**

If an error occurs in the unit, an insufficient or absent ground can cause damage to the unit. This poses the risk of a lethal electric shock.

1

First, ground the battery cabinet. To do this, connect the ground cable (7.5) to one of the grounding points of the cabinet.



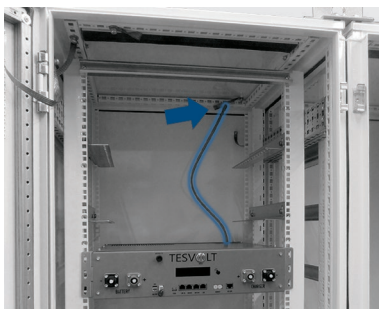
**NOTE** Before installing the SMA HV APU, note its serial number. This is located on a sticker on the underside of the cabinet.

2



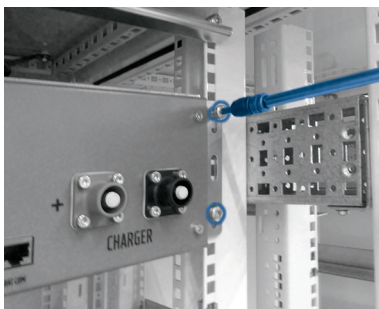
Grounding the SMA HV APU is absolutely essential. Connect the ground cable (4.4) to the grounding bolt on the back of the SMA HV APU (14) via the M 6 ring terminal. Use a torque wrench and a tightening torque of 6 Nm.

3



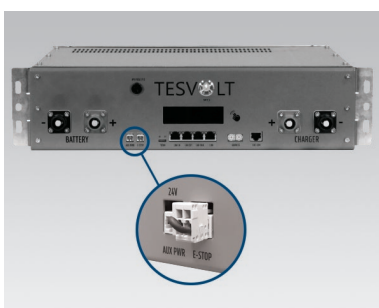
Place the SMA HV APU in the left half of the cabinet onto the third slide rail from the top. Connect the M 8 ring terminal at the free end of the ground cable (4.4) to the grounding point on the rear upper cabinet frame (see marking in the figure). Use a torque wrench and a tightening torque of 10 Nm.

4



Now place the SMA HV APU in the left half of the cabinet on the uppermost slide rail. Fasten it to the pre-fitted cage nuts with four M 6 x 16 (11.4) screws incl. washers.

5



The two-pin plug for the e-stop connection on the SMA HV APU must be plugged in for operation. The SMA HV APU will remain inactive until the plug is connected. For more information on the e-stop, please refer to section "6.4 E-stop contact" on page 27 of these installation and operating instructions.

6

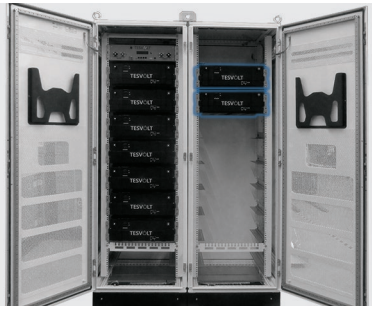
All battery modules in a STORAGE-67-TS-10 battery storage system must have exactly the same state of charge. Make sure you check the voltage of the battery modules before assembly. The correct voltage of a battery module upon installation must be 50.0 +/- 0.1 V<sub>DC</sub>. Should you identify any discrepancies, please contact our service center.

7



Insert the first battery module into the slide rails below the SMA HV APU. Attach the module to the pre-fitted cage nuts using four M6 x 16 pan head screws (11.4) (cross head) incl. plastic washers (11.2). Now mount the remaining modules in the left half of the cabinet. If 16 battery modules are used, the lowest position will also be occupied.

8



Once the left half of the cabinet has been fully equipped, install the battery modules on the right side. Start at the height of the uppermost left module (keeping the position at the APU level free). Attach the module to the pre-fitted cage nuts using four M6 x 16 screws (11.4) incl. washers. Then place the next module below the one that has already been installed, attach it as described and continue until all the modules have been installed.



**DANGER! Improper DC wiring can lead to life-threatening injuries.**

Improperly connecting the DC cables can cause short circuits in one or several battery modules. This can cause components to massively overheat and potentially ignite, which could lead to serious injuries. Pay particular attention therefore to the following points:

- Ensure that the wiring has been properly carried out in accordance with section "5.5 Battery module wiring" on page 17 et seq.
- Make sure that the plugs of the DC cables click audibly into place when they are attached.



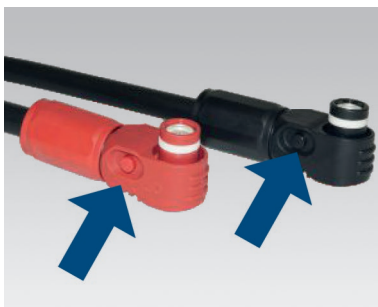
**DANGER! Risk of death due to electric shock even before grid connection**

The battery modules have a voltage of  $50.0 \pm 0.1 V_{DC}$  upon installation. When the DC connectors are installed, the voltage of the battery modules increases as they are connected in series. If all modules are connected, parts of the unit will have an operating voltage of up to  $930 V_{DC}$  before grid connection/commissioning. Contact with the live components can lead to serious or fatal injuries. Therefore, make sure that you comply with the relevant health and safety regulations.

**ATTENTION! Improper wiring can lead to damage to the unit.**

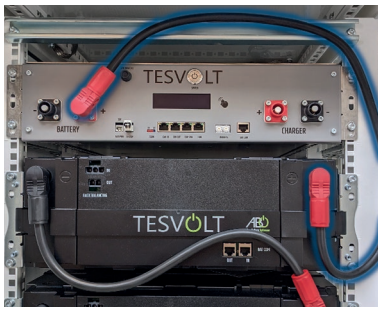
Incorrect DC wiring will cause a short circuit and the battery modules will have to be replaced. Damage to the SMA HV APU may also occur.

9



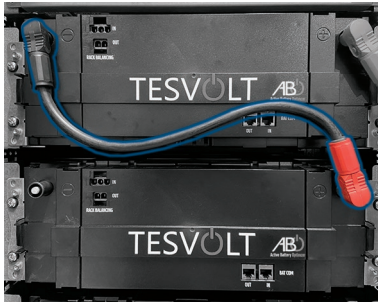
When installing the DC wiring, please note the following: **The plugs must audibly click into place.** The plugs can be released by pressing the push button on the side of the plug (see markings in the figure).

10



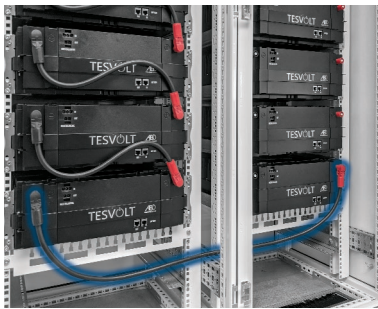
When connecting all DC connecting cables, note that the battery modules of the STORAGE-67-TS-10 are connected in series. It is essential that the colors of the plugs match the colors of the sockets on the battery module, i.e. red plug to red jack, for example. **The plugs must audibly click into place.** Start on the left side of the cabinet with the APU, the first battery module and the connecting cable (4.1).

11



Then, connect the remaining battery modules in this half of the cabinet to the DC connecting cables (5.1).

12



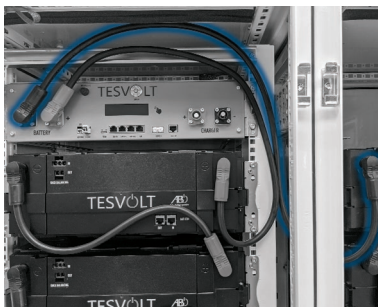
Connect the bottom two battery modules using the long DC connecting cable (6.1) from the cabinet connector set (6).

13



Install the remaining DC connecting cables (5.1) between the modules on the right side. Start with the bottom module.

14

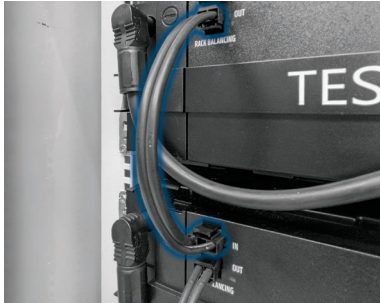


Connect the last module and the SMA HV APU using the connecting cable (4.2). Be certain to follow the instructions in section "5.5 Battery module wiring" on page 17.

**ATTENTION! Risk of damage to the unit due to faulty rack balancing cabling.**

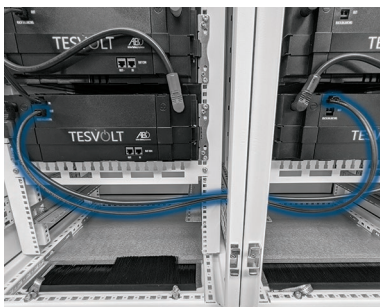
Improper connection of the rack balancing cables will damage the Active Battery Optimizer, which must then be replaced. Ensure that connection is carried out properly in accordance with section "5.5 Battery module wiring" on page 17 et seq.

15



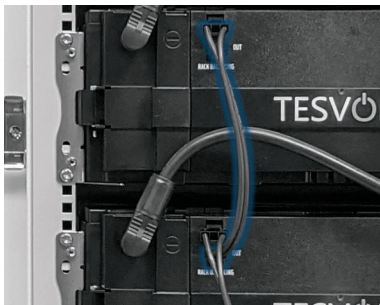
Connect the rack balancing "OUT" connection of the first battery module below the SMA HV APU to the rack balancing "IN" connection of the next battery module below it using a rack balancing module connector (5.3). Repeat this procedure and connect all battery modules in the left half of the cabinet.

16



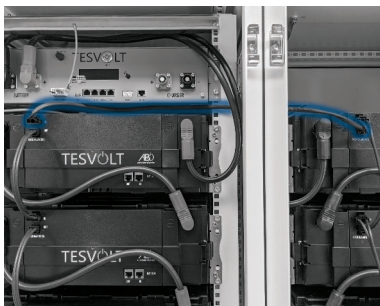
Use the 1.10-m long balancing connecting cable (6.3) to connect the lowest modules in the left and right halves of the cabinet.

17



Now connect the remaining battery modules on the right side starting from the bottom. Follow the specifications in section "5.5 Battery module wiring" on page 17 et seq.

18



Now connect the remaining battery modules on the right side starting from the bottom. Follow the instructions in section "5.5 Battery module wiring" on page 17 et seq.

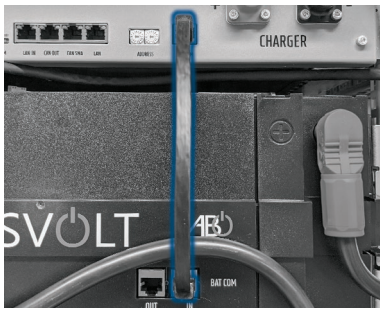
Finally, using the 0.75-m (9) rack balancing cable, connect the rack balancing "OUT" connector of the uppermost module on the right half of the cabinet to the rack balancing "IN" connector of the uppermost module on the left side.

**ATTENTION! Risk of unit malfunction due to faulty BAT COM wiring.**

Incorrectly connecting the BAT COM communication cable will cause the battery to malfunction. Ensure that connection is carried out properly in accordance with section "5.5 Battery module wiring" on page 17 et seq.

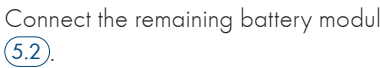


19



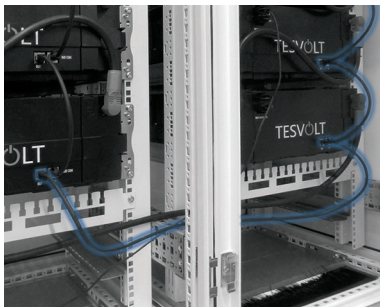
Connect the BAT COM communication cable using the patch cables (5.2) and (4.3) provided. Using a patch cable (4.3), connect the connection points of the SMA HV APU [BAT COM (11)] with the BAT COM "IN" of the battery module placed under the SMA HV APU. You can then use a patch cable (5.2) to connect the BAT COM "OUT" connection of the same module to the BAT COM "IN" connection of the next module.

20



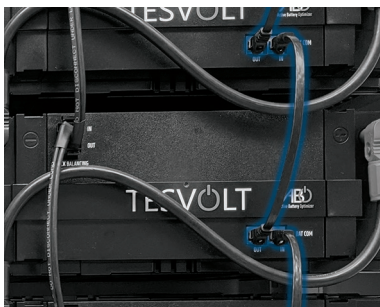
Connect the remaining battery modules in the left half of the cabinet in the same way using the patch cables (5.2).

21



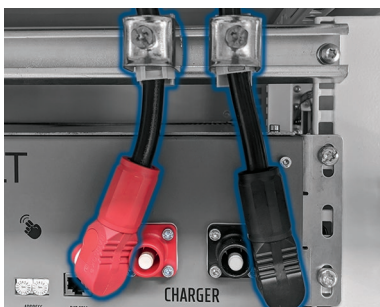
Establish the connection between the lowermost battery modules using the longer patch cable (6.2).

22



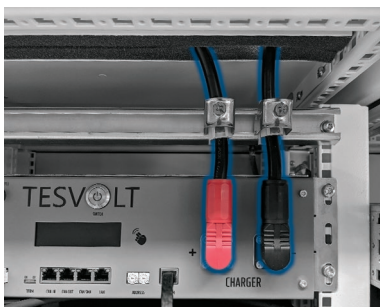
Next, connect the remaining modules in the right half of the cabinet using the patch cables (5.2), starting from the bottom. The BAT COM "OUT" connector of the last battery module remains open.

23



Now, lay the DC cables (7.1) and (7.2) from the SMA HV APU to the STPS 60-10 (CHARGER (12) (13)) and to the BatBreaker. Note that the cable can only be shortened on the STPS 60-10 or BatBreaker side. Finally, to fix and relieve strain on the DC cables, attach two cable clamps (11.5) above the CHARGER connectors of the SMA HV APU to the C-rail (1.3).

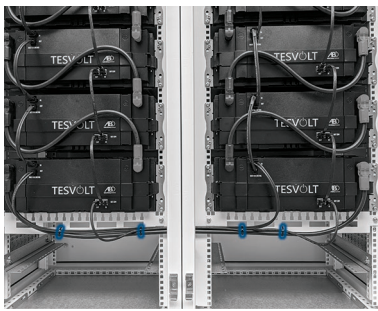
24



The STPS 60-10 must be fully connected before you connect the battery inverter to the SMA HV APU. The cable with the red plug (7.1) is for connection to the positive pole and the cable with the black plug (7.2) is for connection to the negative pole.

**The plugs must audibly click into place.**

25



Use cable ties to fasten the cabinet connecting cables in the bottom part of the cabinet to the cable clamp rails (1.5). Ensure that the cables are not crushed or damaged in the process.

26



Use patch cables (7.4) to connect the LAN connection point (9) of the SMA HV APU to one of the two switches supplied (8) via the jack labeled "LAN." This switch is connected to the "LAN-2" jack of the SMA Inverter Manager and will henceforth be referred to the "LAN-2 switch." The STPS 60-10 will also still be connected to it (see section "7 Connection to the Sunny Tripower Storage 60" on page 28 et seq.).

27

**Only for master/slave systems:** Run the CAN bus cabling between the "CAN OUT" (7) and "CAN IN" connections (6) on the APUs of the storage systems in the master/slave configuration in accordance with the specifications in section "5.5 Battery module wiring" on page 17 et seq. Use the patch cable(s) (7.4) from the scope of delivery of the slave storage system.

28

Finally, fill out the commissioning protocol. You will find a template for this on the TESVOLT USB drive (18). Also document the serial numbers of the battery inverter and the peripheral devices such as the SMA Inverter Manager. Send the completed commissioning protocol to the SMA Service center.

## 6.4 E-stop contact

The STORAGE-67-TS-10 has a quick shutdown (e-stop) function. An externally accessible two-pin plug (type 734-162 manufactured by WAGO) is provided on the device for this purpose. This electrical connection can be connected to an external control system via the corresponding WAGO 734-102 socket. If necessary, the external control system can switch off the unit as quickly as possible using a separate, i.e. completely independent, switching path. This shutdown is considerably faster than the normal shutdown process. The switching may only occur via a potential-free contact.

### ATTENTION! Risk of damage to the unit through use of the e-stop!

The e-stop is used to quickly shut down the system. Since the battery storage system is not switched off properly when the e-stop is used, damage may be caused to components of the STORAGE-67-TS-10. You must therefore never use the e-stop to switch off the unit under normal circumstances.

### ATTENTION! Risk of damage to the APU or external components due to an unsuitable switching unit.

The e-stop contact has a voltage of 24 V<sub>DC</sub> relative to the potential of the casing. The voltage is drawn by the power supply unit of the SMA HV APU from the battery voltage. Connecting a potential-free switching device can cause damage to the APU and/or the external component.

### E-stop states

1. Contacts 1 and 2 of the Wago plug are connected, e.g. via an external relay, the e-stop is inactive and the SMA HV APU is therefore switched on.
2. Contacts 1 and 2 from the Wago plug are open, e.g. after activation of the external switch, the e-stop is active (shown on the display of the SMA HV APU), the DC connection between STORAGE-67-TS-10 and STPS 60-10 is interrupted.

### Requirement for the external control system

Since the e-stop uses an internal voltage of 24 V<sub>DC</sub>, external (relay) switching via a potential-free contact must be employed to ensure proper functioning. This switching can be adapted to match the requirements of the external control system. The possible electrical connections are shown in the figures below.

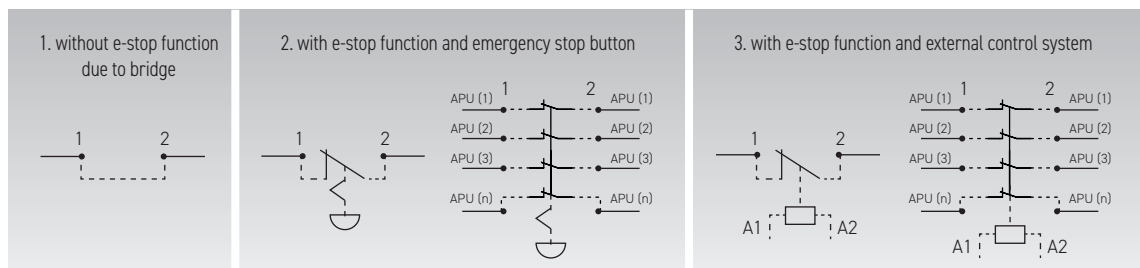
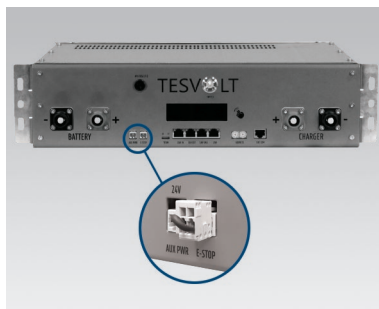


Abbildung 6.1 Different e-stop wiring options



**NOTE** If you do not use the e-stop function, the bridged plug must be fitted to the e-stop connection ④, as the storage system will otherwise remain inactive!



E-stop connection ④ on the SMA HV APU with Wago plug with bridge between contacts 1 and 2.

# 7 Connection to the Sunny Tripower Storage 60

**ATTENTION!** Possible damage to the STORAGE-67-TS-10 and/or the STPS 60-10 by additional consumers in the DC intermediate circuit.

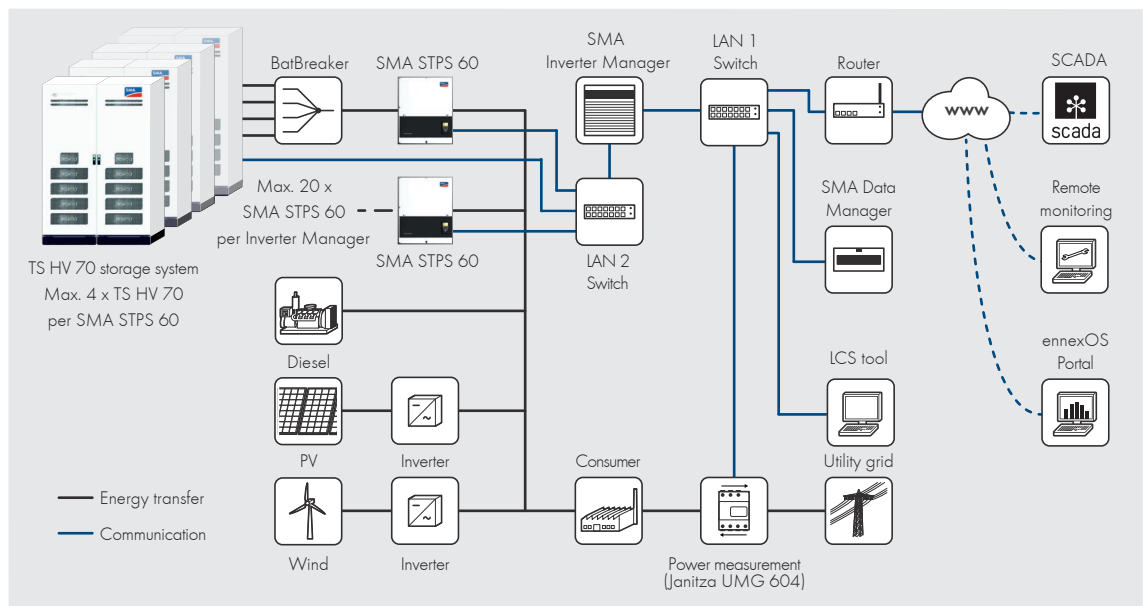
Always follow the specifications for connecting the STORAGE-67-TS-10 and the STPS 60-10. For example, no additional consumers or components may be included in the DC intermediate circuit between the battery and inverter. You must always consult the SMA Service center about any changes you would like to make to the system setup.



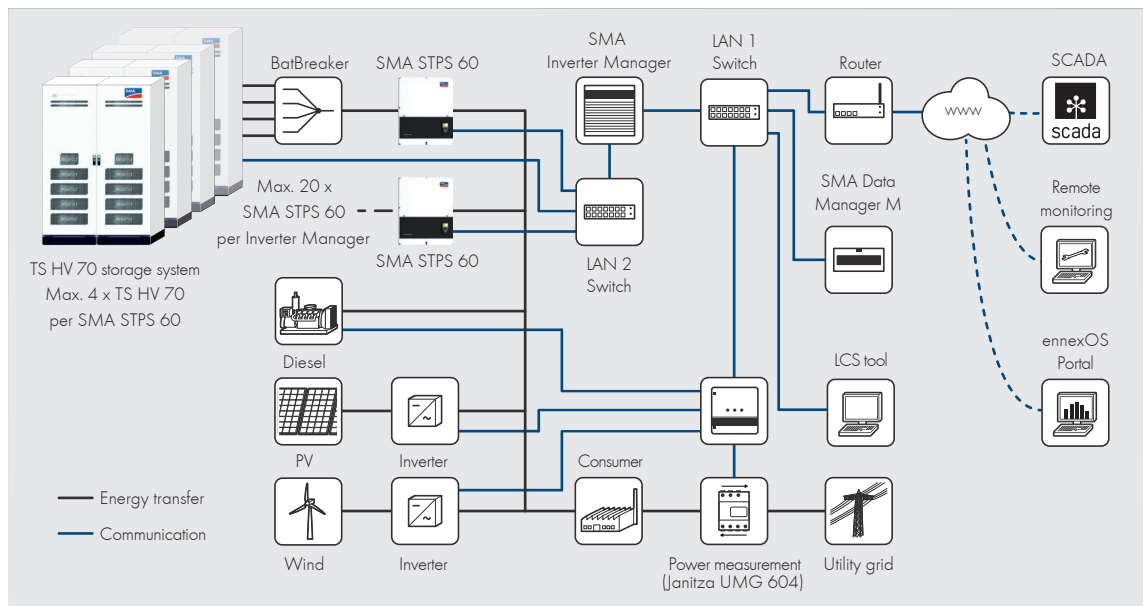
**NOTE** Up to 20 STPS 60-10s can be operated in parallel per SMA Inverter Manager.

## 7.1 System setup

### Standard system setup



### System setup with SMA Hybrid Controller



## 7.2 Diagram of connections STPS 60-10



**DANGER! Risk of lethal electric shock or damage to the unit due to incorrect connection.**

The STPS 60-10 installation guide provides authoritative information for correctly connecting the STPS 60-10. The information provided in the instructions before you are therefore not binding.

**ATTENTION! Risk of damage to the unit if the installation requirements are not met.**

Before connecting the STPS 60-10, the installation of the STORAGE-67-TS-10 must be completely finished.

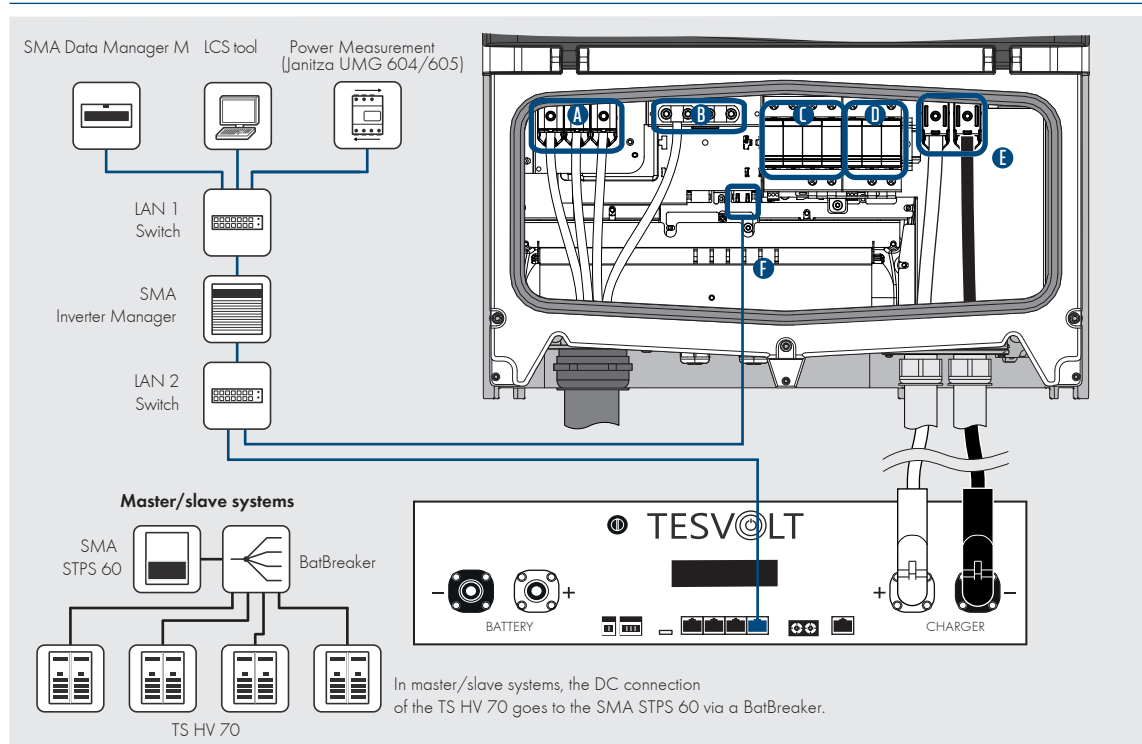


**ATTENTION! Possible system malfunction due to improper cable routing**

Communication, measuring and control cables must always be routed separately from AC/DC cables, as electromagnetic coupling can otherwise cause interference during data transmission and consequently lead to system malfunctions.



**NOTE:** When using a BatBreaker (15) in master/slave systems, use the DC connector set (16) to connect the BatBreaker to the STPS 60-10.



ITEM	DESIGNATION	DESCRIPTION	
A	AC terminal clamps	The tightening torque must be 20 Nm for conductor cross-sections of 35 to 95 mm <sup>2</sup> and 30 Nm for conductor cross-sections of 96 to 150 mm <sup>2</sup> . Note: When using flexible or very flexible cables, wire end ferrules must be used for the connection.	
B	Unit ground		
C	Protection against AC overvoltage	Surge Protection Device SPD	
D	Protection against DC overvoltage	Surge Protection Device SPD	
E	DC terminal clamps	On/off switch for the battery: The tightening torque for a conductor cross-section of 35 to 50 mm <sup>2</sup> is: 20 Nm. Note: When using flexible or very flexible cables, wire end ferrules must be used for the connection.	
F	Ethernet interface 2x	Communication interface to the SMA Inverter Manager	

## 8 Commissioning

### 8.1 Commissioning of a single unit

#### **ATTENTION! Risk of damage to the battery due to incorrect configuration.**

Improper configuration can result in damage to the battery. The parameters settings affect the charging behavior of the STPS 60-10. It is therefore important to set the parameters correctly during commissioning.

#### Requirements

The STPS 60-10 has been installed in accordance with the installation and connection specifications.

#### Procedure

- 1 Check the cabling of the STPS 60-10 and the STORAGE-67-TS-10 (also see the STPS 60-10 installation guide).
- 2 Check the cabling of the components in accordance with section "5.5 Battery module wiring" on page 17 et seq. If the cabling is correct, all live components will be protected against physical contact. Switch DC circuit breaker in the BatBreaker (if applicable) to "ON." Make sure that the STPS 60-10 DC load-break switch is set to "ON."

#### **ATTENTION! Risk of damage to the APU due to undetected errors during installation.**

Carry out the check carefully in accordance with step 2, as deviations may damage the APU.

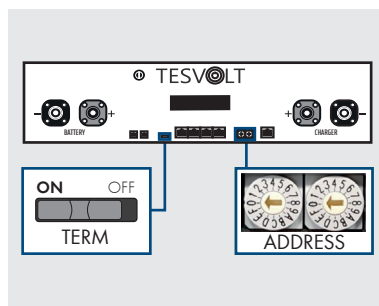
#### **ATTENTION! Risk of damage to the APU due to improper operation.**

If you tap on the APU to activate it or confirm an action, be sure to comply with the following instructions to avoid damaging the APU:

1. Do not use objects to tap on the unit under any circumstances.
2. Do not tap the casing too hard with your fingers to the right of the display at the 16 marking. **Never tap on the display under any circumstances.**

- 3 Now commission the SMA Inverter Manager 12.

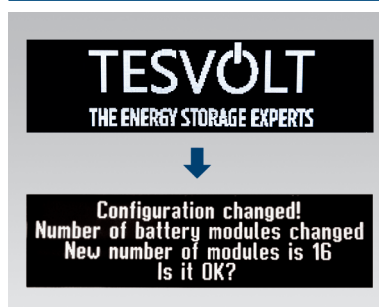
4



Check and, if necessary, correct the settings for the termination and addressing of the STORAGE-67-TS-10 (TERM 5 and ADDRESS 10). TERM must be set to "ON" when operating a single STORAGE-67-TS-10 and ADDRESS must be set to "0" and "0."

- 5 Press the on/off switch (SWITCH) 17 on the SMA HV APU.

6



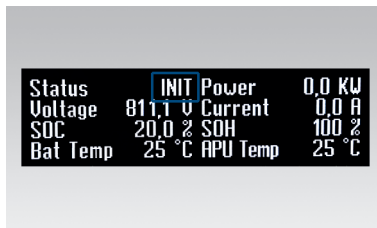
The number of recognized battery modules (14 or 16) will be displayed on the screen. Confirm the correct number by tapping the marking 16 next to the display twice. If the number of modules displayed differs from the actual number, take the unit out of operation and check the BAT COM cabling. If the error persists, please contact the service center.

7



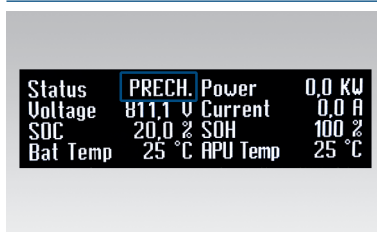
Tap next to the display once more to call up the next menu item. The display will now show the assigned IP address which must start with 192.168.4. ...

8



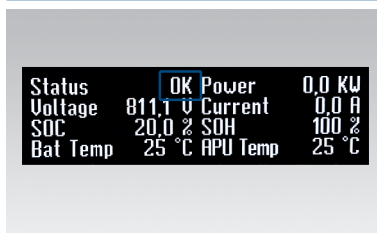
The STORAGE-67-TS-10 will switch to INIT mode and "SWITCH" **17** will start flashing.

9



Start the commissioning process of the STPS 60-10 with the LCS tool. The software and instructions are located on the USB drive **18**. When the commissioning process is successfully completed, the STORAGE-67-TS-10 will enter pre-charge mode (PRECHG).

10



Once pre-charging has completed, "SWITCH" **17** will remain lit. The status "OK" will be shown on the display of the SMA HV APU. The STORAGE-67-TS-10 is now ready for operation.



**NOTE** The display will remain active for about two minutes before being deactivated. It can be reactivated by tapping twice.

## 8.2 Commissioning of STORAGE-67-TS-10 systems following the master/slave principle

### **ATTENTION! Risk of damage to the battery due to incorrect configuration.**

Improper configuration can result in damage to the battery. The parameters settings affect the charging behavior of the STPS 60-10. It is therefore important to set the parameters correctly during commissioning.

### Requirements

The STPS 60-10 has been installed in accordance with the installation and connection specifications.

### Procedure

1

Check the cabling of the STPS 60-10 and the STORAGE-67-TS-10 (see the STPS 60-10 installation guide).

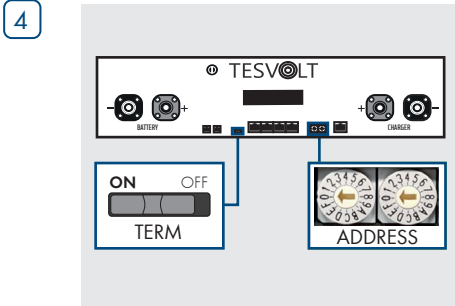
2

Check the cabling of the components in accordance with section "5.5 Battery module wiring" on page 17 et seq. If the cabling is correct, all live components will be protected against physical contact. Switch DC circuit breaker in the BatBreaker (if applicable) to "ON." Make sure that the STPS 60-10 DC load-break switch is set to "ON."

**ATTENTION! Risk of damage to the APU due to undetected errors during installation.**

Carry out the check carefully in accordance with step 2, as deviations may damage the APU.

3 Now commission the SMA Inverter Manager 12.



Now you can determine the settings for the termination and addressing of the STORAGE-67-TS-10 ("TERM" 5 and "ADDRESS" 10) in accordance with the section "Overview of all addressing options" on page 40 and the figures in "10.2 Capacity expansion using additional STORAGE-67-TS-10 units" on page 36 et seq. For master/slave systems, set TERM 5 to "ON" for the SMA HV APU of the master and the last storage system in the master/slave configuration. Set TERM 5 to "OFF" for the remaining slave APUs in the configuration.

**ATTENTION! Risk of damage to the APU due to improper operation.**

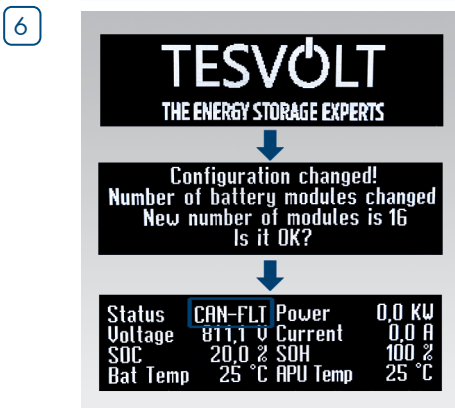
If you tap on the APU to activate it or confirm an action, be sure to comply with the following instructions to avoid damaging the APU:

1. Do not use objects to tap on the unit under any circumstances.
2. Do not tap the marking on the casing to the right of the display too hard. **Never tap on the display under any circumstances.**



**NOTE** The display will remain active for about two minutes before being deactivated. It can be reactivated by tapping twice.

5 You can now commission all the slave storage systems. Proceed in reverse order according to their position in the master/slave configuration. Start with the last slave of the master/slave configuration and switch the on-off "SWITCH" 17 on the SMA HV APU to on.



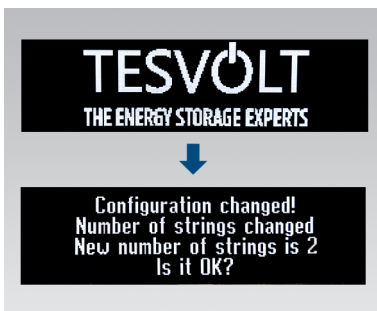
The number of recognized battery modules (14 or 16) will be displayed on the screen of the slave storage system. Confirm the correct number by tapping the marking 16 next to the display twice. If the number of modules displayed differs from the actual number, take the STORAGE-67-TS-10 out of operation and check the BAT COM cabling. If the error persists, contact the service center. After successful commissioning, the status will change to "CAN FLT."

7 Switch on the next slave storage system and proceed as described in step 4 and 5, i.e. repeat the steps already taken to commission the first slave.

8 When all slave storage systems have been commissioned, the master cabinet can be started up. To do this, switch the on-off "SWITCH" 17 of the SMA HV APU to on.

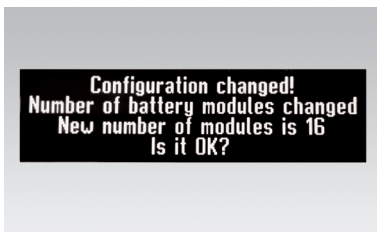


10



In contrast to the slave APUs, the number of strings is retrieved first for the master. The number of strings corresponds to the number of storage systems in the master/slave configuration (e.g. master + slave 1 = 2 strings). Confirm the correct number by tapping next to the display twice. In the event of discrepancies, check the CAN OUT > CAN IN cabling, the termination and the addressing. If the error persists, contact the service center.

11



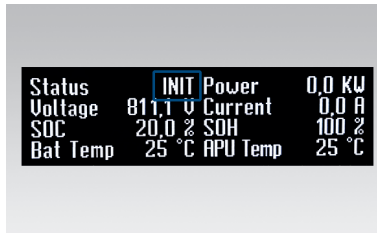
The number of recognized battery modules (14 or 16) will be displayed on the screen of the master SMA HV APU. Confirm the correct number by tapping twice. In the event of discrepancies, take the STORAGE-67-TS-10 out of operation and check the BAT COM cabling. If the error persists, contact the service center.

12



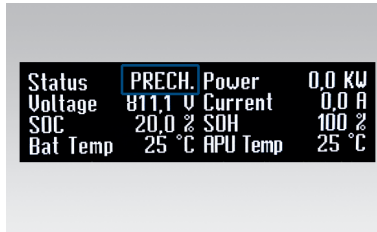
Tap next to the display once more time to call up the next menu item. You will now see the assigned IP address. It must start with 192.168.4. ...

13



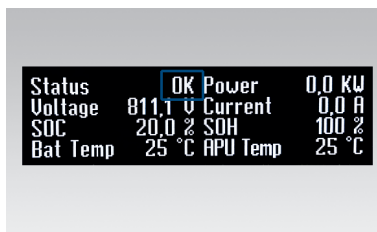
The STORAGE-67-TS-10 will switch to "INIT" mode and the on-off "SWITCH" 17 will start flashing.

14



Start the commissioning process of the STPS 60-10 with the LCS tool. The software and instructions are located on the USB drive 18. When the commissioning process has been successfully completed, all STORAGE-67-TS-10s will change to the "PRECHG" pre-charge mode.

15



After successful completion of the pre-charge, the on-off "SWITCH" 17 on all SMA HV APUs in the master/slave configuration will remain permanently lit. The status "OK" will be shown on the display of the SMA HV APU. Now all STORAGE-67-TS-10s are now ready for operation.

## 9 Shutdown



### **DANGER! Risk of death due to electric shock after shutdown.**

Large parts of the battery system remain under full voltage even after shutdown. There is therefore a risk of a fatal electric shock if the live parts of the storage system are touched.




### **DANGER! Risk of injury due to electric shock after shutdown.**

- It can take several minutes for the inverter's capacitors to discharge, even after the system has been switched off. There is a continued risk of an electric shock until they are discharged. You should therefore wait 15 minutes until the system is largely discharged.
- The DC auxiliary circuit is not completely voltage-free after shutdown, the voltage is merely low ( $U_{DC} \leq 60 \text{ V}$ ), meaning that a lethal shock can no longer occur if operators touch live parts in the DC intermediate circuit.

### **ATTENTION! Possible damage to the unit due to improper shutdown.**

For standard shutdown, the power output must be 0 kW before the APU is taken out of operation using the off switch. Use the LCS tool to reduce the output to 0 kW.

**The DC isolating switch on the underside of the STPS must remain in the "ON" position and must not be set to "OFF" under any circumstances.**

- 1 Reduce the power output of the STPS 60-10 to 0 kW. To do this, open the LCS tool and access the Inverter Manager.
- 2 Press the "Plant Stop" button at the top right of the LCS tool. The Inverter Manager will then lower the power output of the STPS to 0 kW, open the AC contactor of the STPS and give the command to the SMA HV APU to disconnect from the DC path. Wait until you hear the audible opening of the contactors in the STPS and the SMA HV APU. For more information, please consult the SMA product documentation or visit [www.sma.de](http://www.sma.de).
- 3 Disconnect the AC fuses of the STPS 60-10.
- 4  Now press the on-off switch "SWITCH" 17 on the SMA HV APU. The green LED must then go out.  
**For systems with multiple STORAGE-67-TS-10s, each SMA HV APU must be switched off.**
- 5 On the APU, disconnect the DC cables (7.1) and (7.2) from the unit at the CHARGER connection (12 / 13).
- 6 Wait 15 minutes until the system is largely voltage-free, as it takes several minutes for the capacitors in the inverter to discharge.

## 10 Expansion of the storage system

Both the capacity and the charging and discharging power of the STORAGE-67-TS-10 battery systems can be expanded.

### 10.1 Capacity expansion using an expansion module

#### Installation of the expansion modules

**ATTENTION! Risk of damage to the unit and/or battery inverter if the expansion and original battery modules have different states of charges.**

If a battery module is installed in a STORAGE-67-TS-10 battery storage system and this module's state of charge differs from that of the battery modules already present, this can cause damage to the battery modules or the SMA HV APU.

- 1 New battery modules are delivered with a state of charge (SoC) of approx. 20 %. Before you integrate a new battery module into an existing battery system, the existing system must be brought to the same voltage level. First, check the state of charge of the new battery modules by measuring the voltage, which must be exactly  $50.0 \pm 0.1 V_{DC}$ . In the event of any discrepancies, please contact our service center.
- 2 Adjust the voltage of the original battery modules of the STORAGE-67-TS-10 so that it matches the voltage of the new battery modules exactly. Use the LCS tool. Further information on the procedure can be found in the following section "Adjusting the battery voltage via the LCS tool" on page 36.
- 3 Take the battery cabinet out of operation in accordance with section "9 Shutdown" on page 34.
- 4 Prepare the battery cabinet for the installation of the battery modules. Remove the cabinet connector set cables from the two lowermost battery modules (6). Start with the DC cables (6.1). Continue with the patch cable (6.2) and the rack balancing cable (6.3).
- 5 Now remove the two cable clamp rails and (1.5) reattach them below the bottom slide rails. Leave two holes free on the rack frame below the slide rails and fit the cable clamp rails (1.5) on the third hole.



**ATTENTION! Risk of damage to the unit due to faulty cabling.**

Faulty connection of the DC or BAT COM cables will cause damage to components of the battery management system and/or the battery modules of the STORAGE-67-TS-10, necessitating replacement. Ensure that connection is carried out properly in accordance with section "5.5 Battery module wiring" on page 17 et seq.

- 6 Now insert the new battery modules in the lowermost position.
- 7 You can now connect the new modules to the old ones. Start on the left side of the cabinet with the DC cables (5.1) of the module connector set (5). Continue with the patch cable (5.2) and the rack balancing cable (5.3). Then connect the cables of the cabinet connector set (6) to the new modules. Start with the DC cables (6.1). Continue with the patch cable (6.2) and the rack balancing cable (6.3). Then connect the new and old battery modules in the right half of the cabinet using the module connector set (5).
- 8 Finally, ensure that the electrical connection is correct in accordance with section "5.5 Battery module wiring" on page 17 et seq.
- 10 You can now recommission the storage system in accordance with section "8 Commissioning" on page 30.

## Adjusting the battery voltage via the LCS tool



**NOTE** For authoritative instructions on the LCS tool, please consult the applicable product documentation.

1

Enter your *SMA Grid Guard Code* in the "Service" > "Grid Guard" tab. If you do not have the code, please contact our service center.

2

Access the active power input field in the "Inverter Parameters" > "Support Settings" > "Immediate controls" > "Active power [P\_Ref]" tab and set active power to 0 % > Put the STPS on standby and save the settings ("Save").

3

Access the active power input field in the "Inverter Parameters" > "Support Settings" > "Immediate controls" > "Active power [P\_Ref]" tab and set active power to 0 % > Put the STPS on standby and save the settings ("Save").

4

Set the following parameters under the "Power Management" tab:  
*Limited Export enabled "Off" | Peak Load Shaving "Off" | Time of Use "Off."*

5

Determine the ACTUAL DC voltage using the APU or STPS display or the LCS tool and compare this with the TARGET voltage of 700.0 V<sub>DC</sub> (14 battery modules with 50.0 V<sub>DC</sub> each).



**Note:** The stored energy must be prevented from being fed back into the utility grid. The energy fed in from the battery storage system must therefore not exceed the current consumption in the local utility grid.

6

If you have to reduce the voltage of (discharge) the STORAGE-67-TS-10, enter a value between 0 and 100 % [positive number] for "Active Power [P\_Ref]."

7

If you have to increase the voltage of (charge) the STORAGE-67-TS-10, enter a value between 0 and -100 % [negative number] for "Active Power [P\_Ref]."

8

Monitor charging or discharging to the target voltage of 700.0 V<sub>DC</sub>.

9

When the target voltage is reached, slowly reduce the charging/discharging power to 0 %.

10

Compare the voltage of one of the existing modules in the storage system with the module voltage of the expansion modules. Both values must be 50.0 +/-0.1 V<sub>DC</sub>.

11

Adjust the voltage of the storage system until the new and original modules are at the same voltage.

## 10.2 Capacity expansion using additional STORAGE-67-TS-10 units

**ATTENTION! Risk of damage to the unit and/or battery inverter if the unit is expanded by different capacities.**

If you wish to use multiple STORAGE-67-TS-10 battery storage systems with one STPS 60-10, it is imperative that they all have the same capacity.

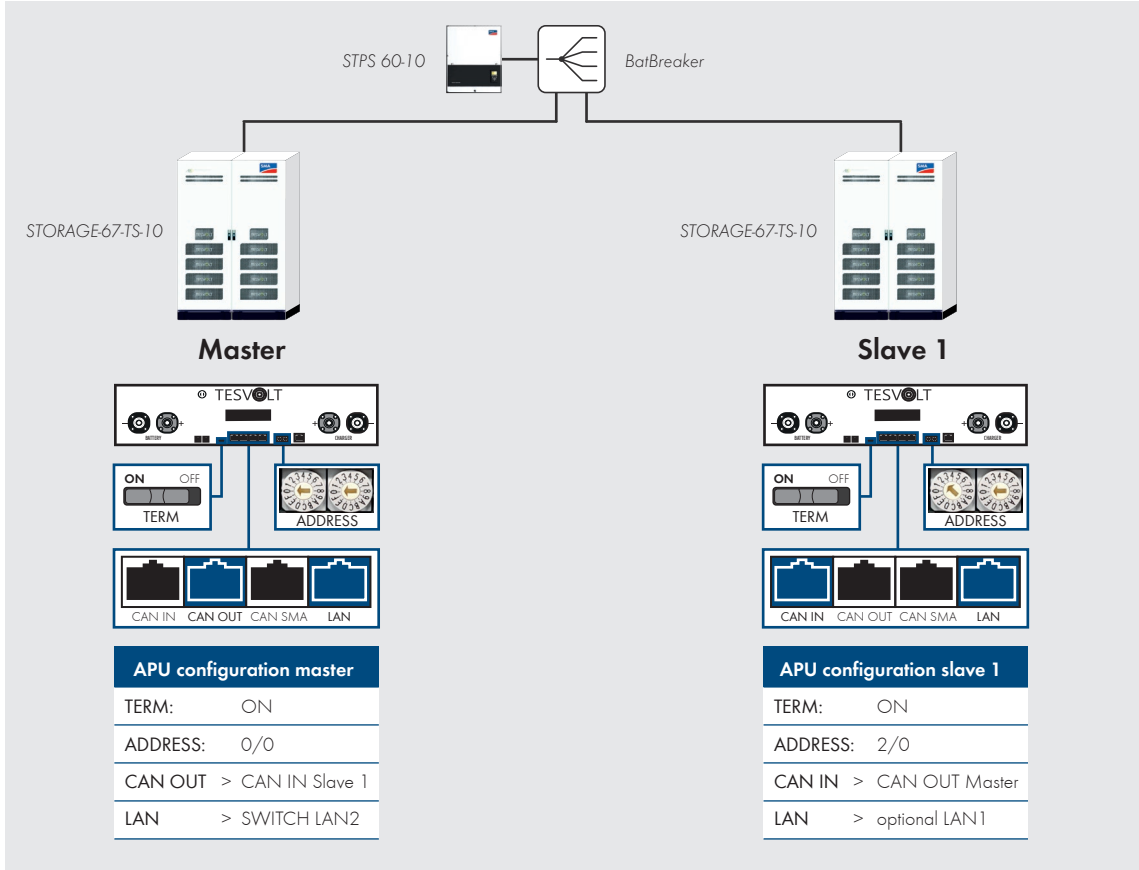


**NOTE** Up to four STORAGE-67-TS-10s per STPS 60-10 may be connected in parallel following the master/slave principle.

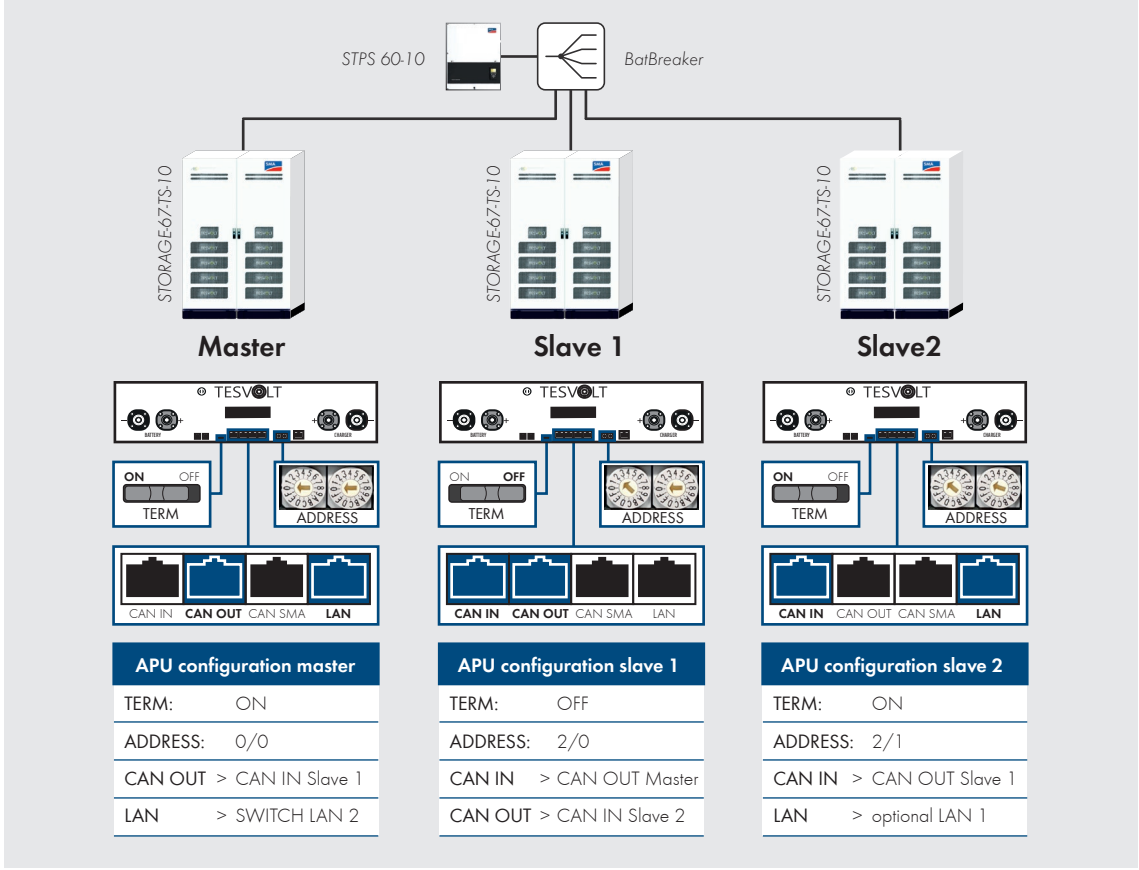


**NOTE** When adding a slave, a BatBreaker must also be ordered and installed.

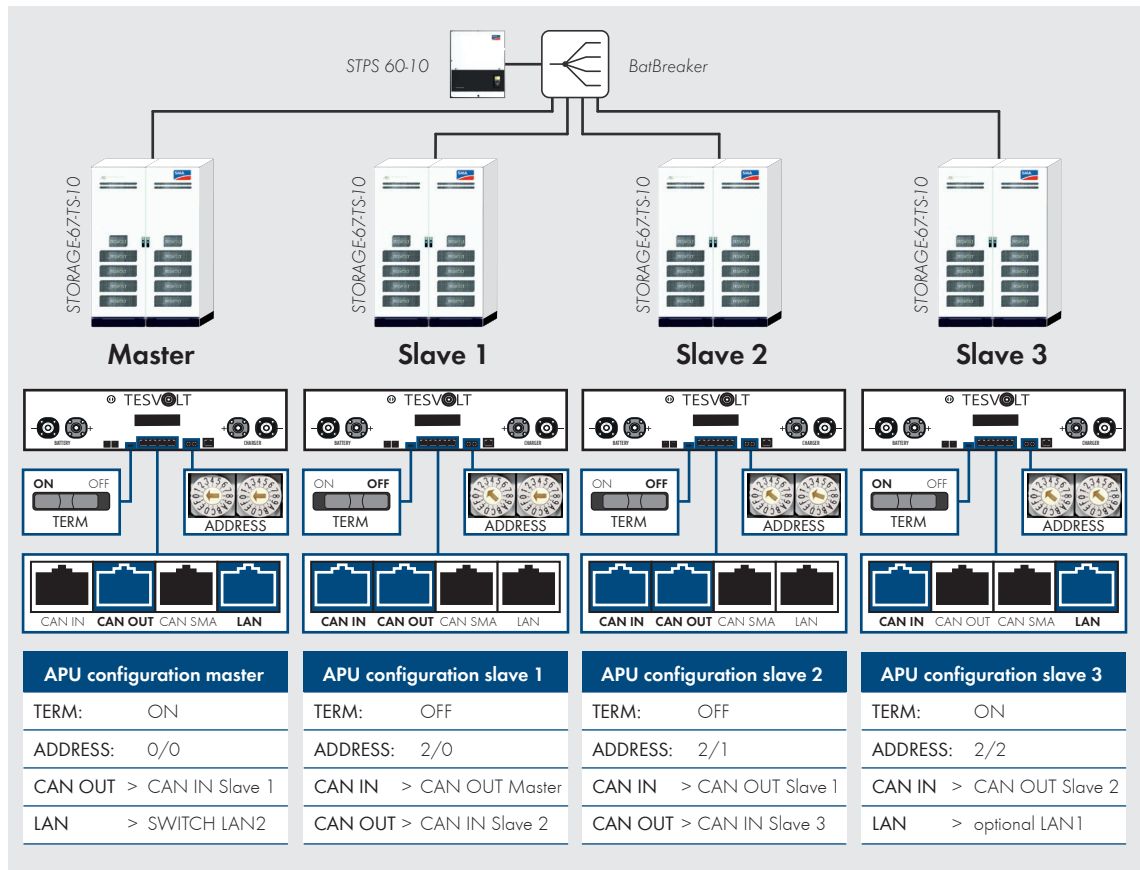
**System with 1 master and 1 slave**



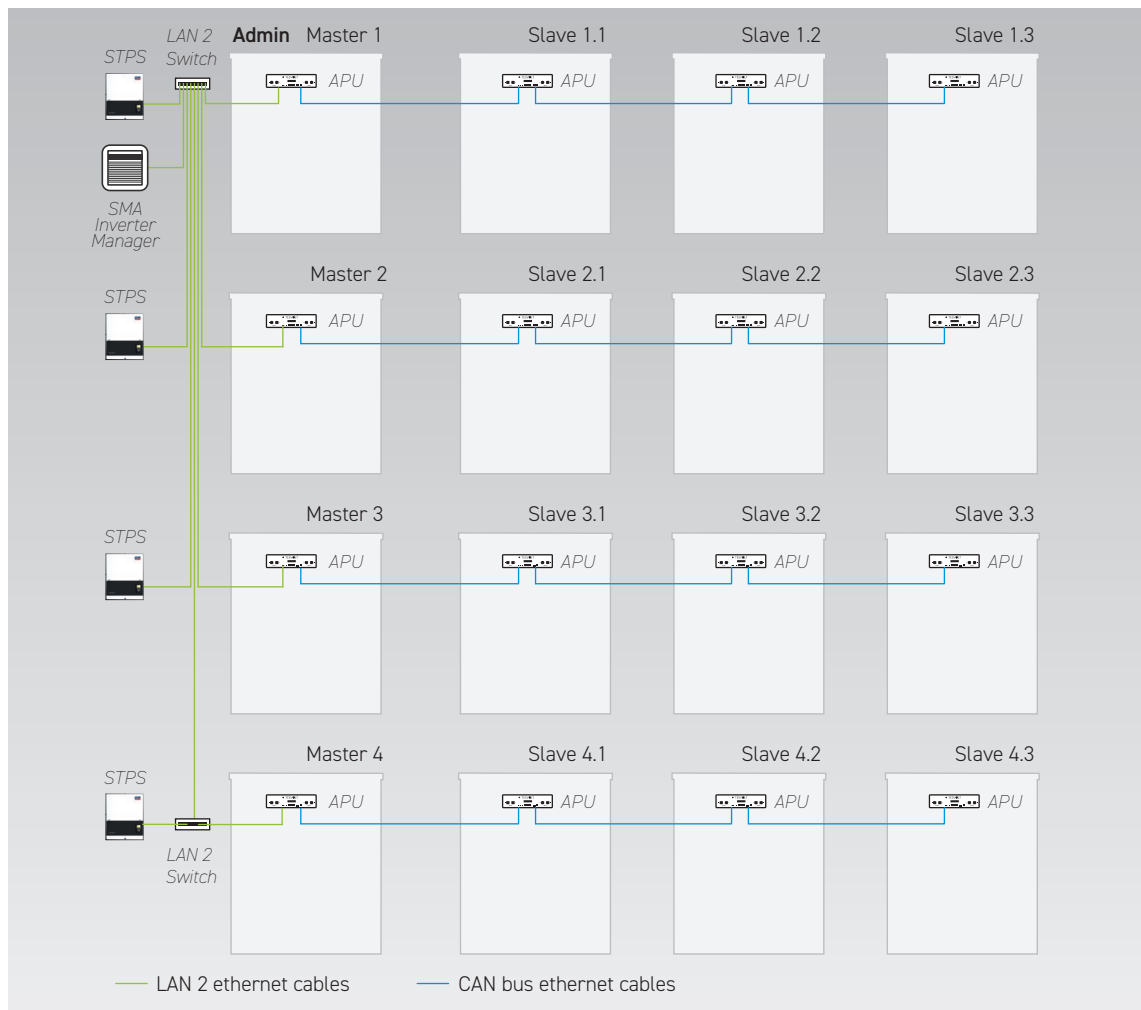
**System with 1 master and 2 slaves**



### System with 1 master and 3 slaves



### LAN2 wiring for systems with multiple master and slave storage systems



### Port assignment of the switches

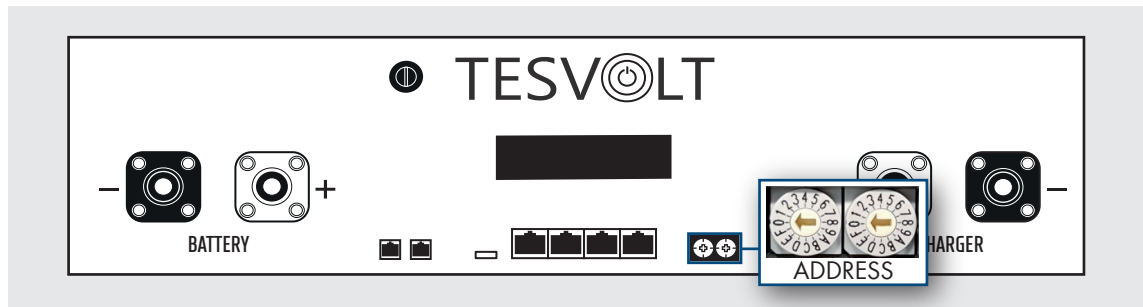
#### LAN 1 switch (8-port)

PORT	DESCRIPTION
1	SMA Inverter Manager (IVM) LAN 1
2	Janitza UMG 604
3	SMA Data Manager M
4	Router/internet
5	Service PC
6	Reserve/optional last slave in the configuration
7	Reserve
8	Reserve

#### LAN 2 switch (8-port)

PORT	DESCRIPTION
1	SMA Inverter Manager (IVM) LAN 2
2	STPS 60-10 (Master 1)
3	APU (Master 1)
4	STPS 60-10 (Master 2)
5	APU (Master 2)
6	STPS 60-10 (Master 3)
7	APU (Master 3)
8	LAN 2 switch (Master 4)/Service PC

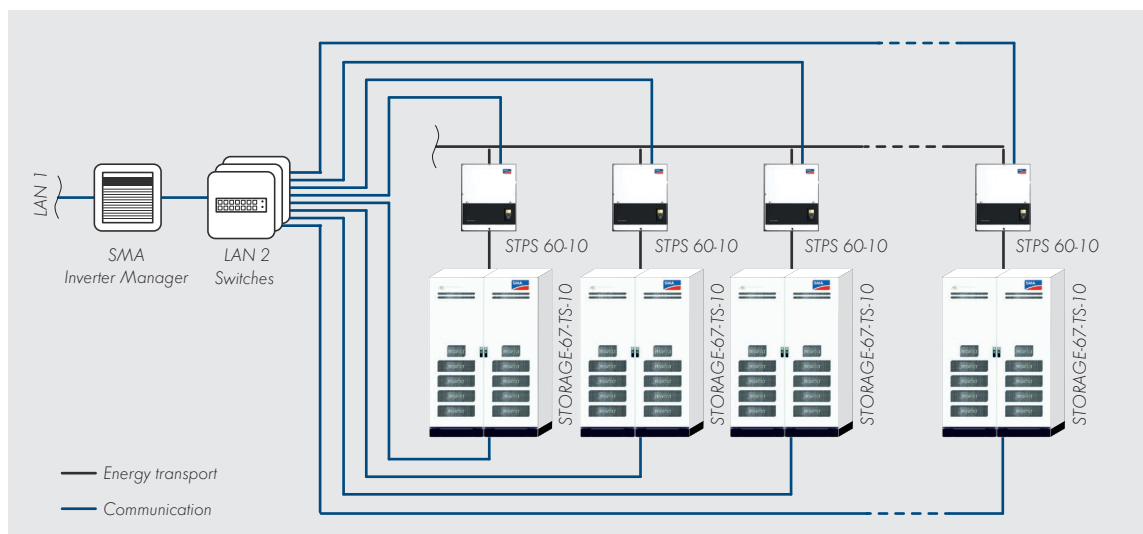
### Overview of all addressing options



Set the address selector on the SMA High-Voltage Active Power Unit (SMA HV APU) to match the configuration and information in the table below.

LEFT SWITCH	RIGHT SWITCH	DESIGNATION
0	0	Master 1
2	0	Slave 1 (of Master 1)
2	1	Slave 2 (of Master 1)
2	2	Slave 3 (of Master 1)
0	0	Master 2
2	0	Slave 1 (of Master 2)
2	1	Slave 2 (of Master 2)
2	2	Slave 3 (of Master 2)
0	0	Master 3
2	0	Slave 1 (of Master 3)
2	1	Slave 2 (of Master 3)
2	2	Slave 3 (of Master 3)
0	0	Master 4
2	0	Slave 1 (of Master 4)
2	1	Slave 2 (of Master 4)
2	2	Slave 3 (of Master 4)

### 10.3 Power expansion using STPS 60-10 units



The charging and discharging power can be increased by increasing the number of STPS 60-10s. Up to 20 STPS 60-10s can be operated per Inverter Manager.



# 11 Battery Monitoring software – BatMon

## 11.1 Views and functions

The BatMon is a piece of software that can be used to analyze and visualize batteries right down to the cell level.



**NOTE** The software can be found on the supplied USB drive (18) and must be installed in a writable folder, e.g. on the “C:” drive, for start-up.

To obtain insights into the battery using the BatMon software, the service laptop’s LAN connection must be connected to the LAN 2 switch (see also “7.1 System setup” on page 28).

After installation, launch the “BatMon.exe” file. Tick all the boxes in the firewall query granting full access to the network. The “System” menu item at the bottom of the BatMon interface includes a “Communication Port” button. Here, the serial number of the SMA HV APU must be selected under “Select APU” (this serial number can be found on a sticker on the underside of the SMA HV APU casing).

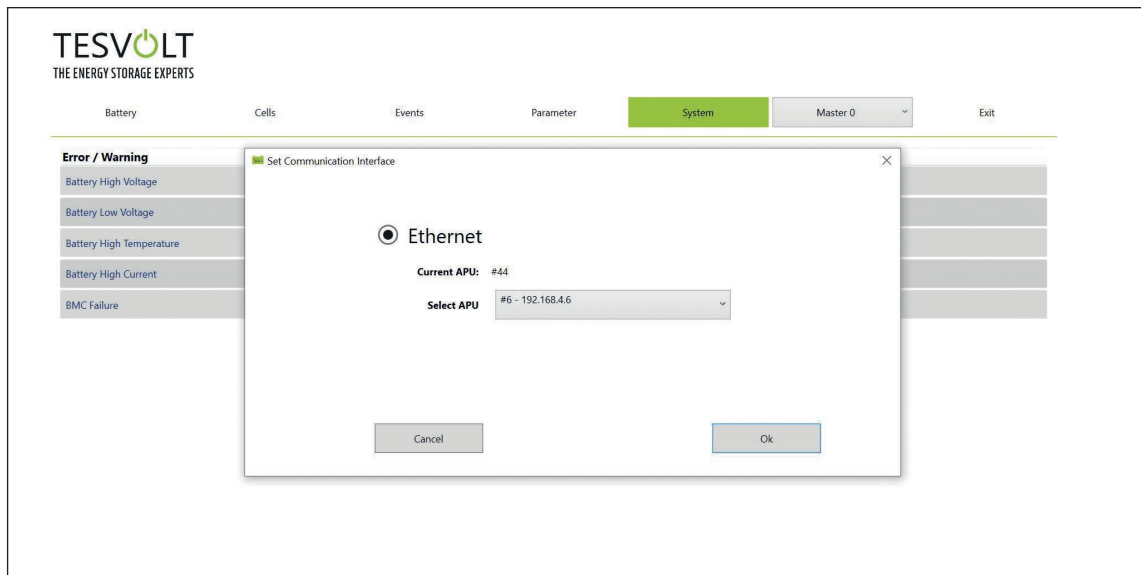


Abbildung 11.1 Screen for setting the network configuration



**NOTE** If the configuration is correct and the connection to the battery is successful, a green spinning circle will appear in the lower right corner of the BatMon interface alongside the indicator “online.”

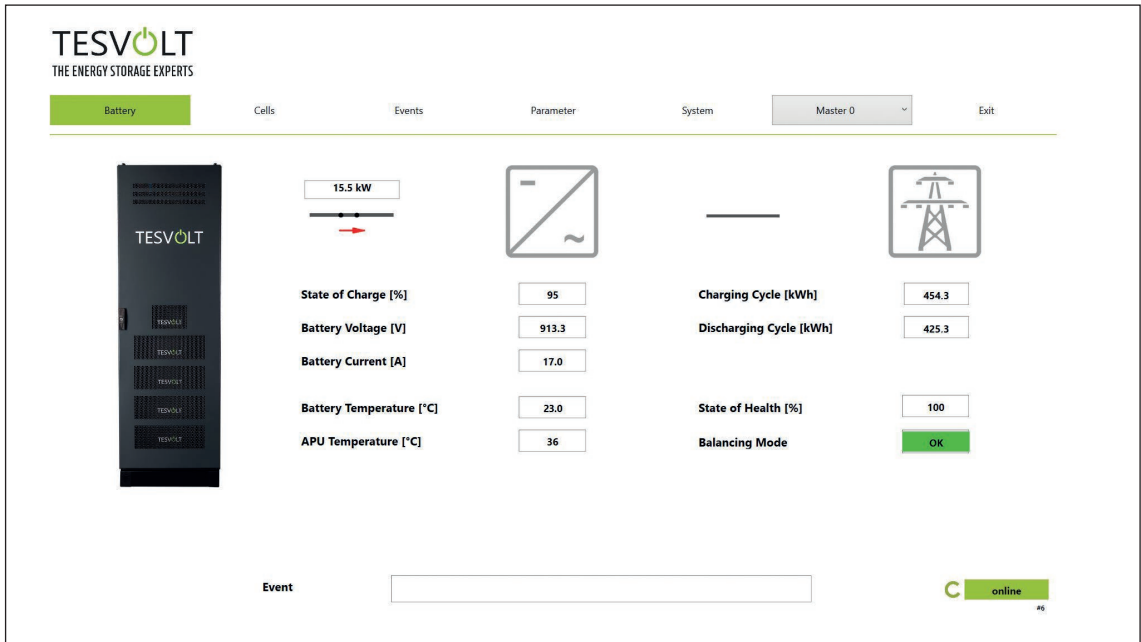


Abbildung 11.2 "Battery" screen

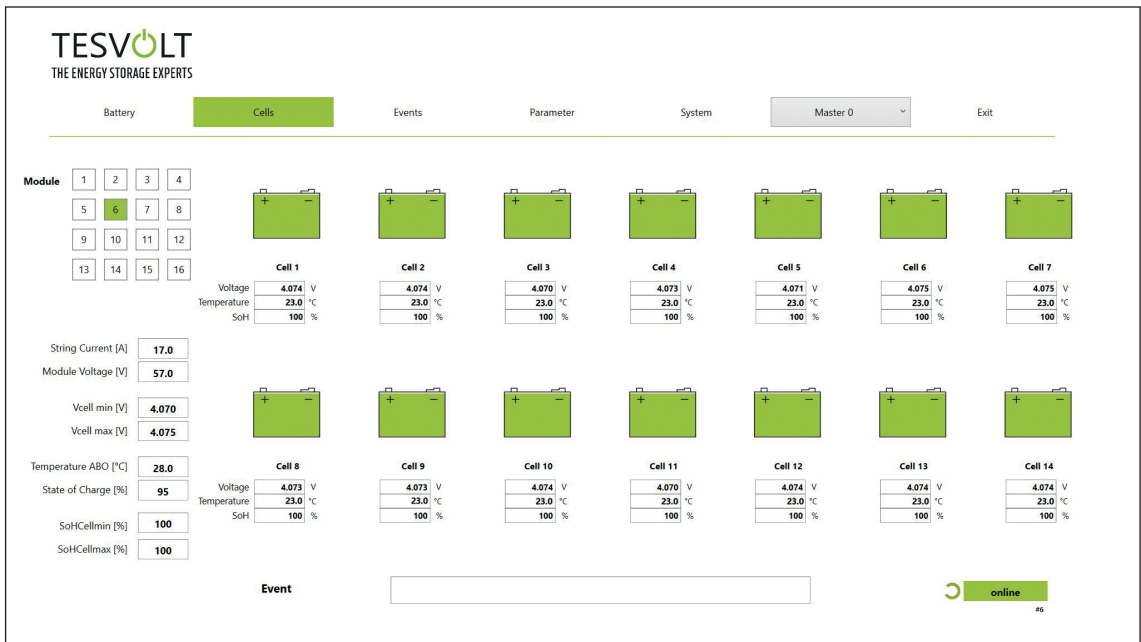


Abbildung 11.3 "Cells" screen

## 11.2 Menu structure

The battery parameters are password-protected. As these parameters directly affect the battery, only certified specialists may configure them. You can request the password from the service center.

BATTERY	CELLS	EVENTS	PARAMETERS	SYSTEM	SELECTION
Charging/discharging power	Cell voltage	Event logbook	Battery parameters	Current errors	Master
Battery voltage	Cell temperature	Clear events	Load default	Version BatMon	Slave
Charging/discharging current	SoC (cell)	Save events (as a PDF)	Save default	Expert level	
Battery temperature	SoH (cell)		Reset APU	Start logging	
Balancing mode	Module voltage			Firmware download	
Charging cycle (kWh)	Charging/discharging current			Communication port	
Discharging cycle (kWh)	ABO temperature				
SoC (state of charge)					
SoC (state of health)					
Warning - time					
APU temperature					

Displayed data	Expert settings only with password	Functions
----------------	------------------------------------	-----------

## 11.3 The key cell parameters

### SoC – state of charge

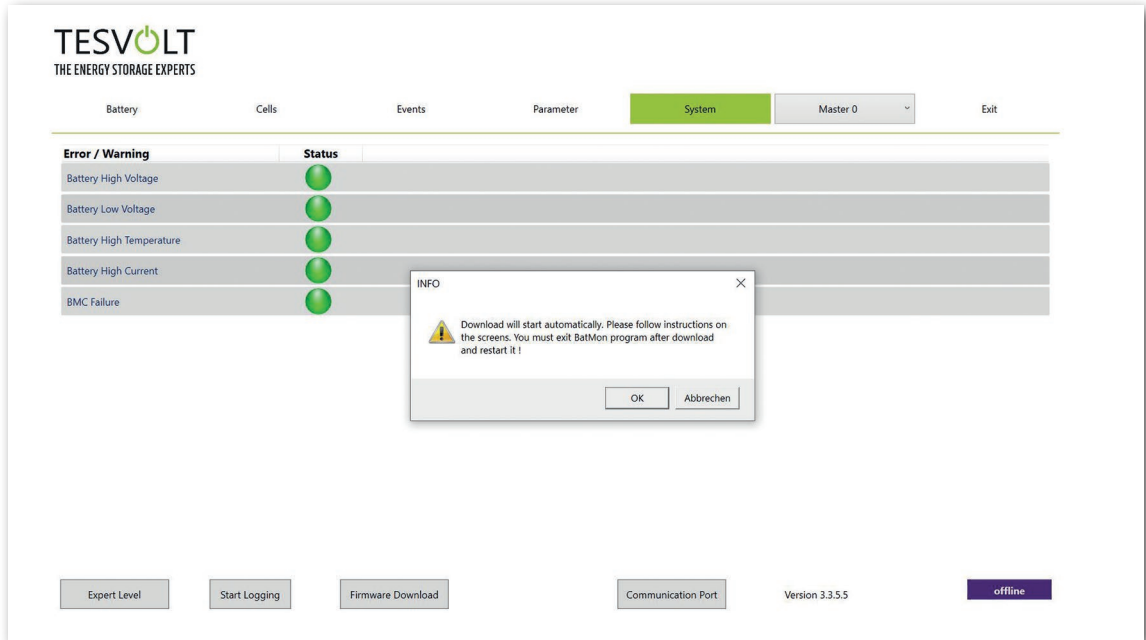
This value indicates the percentage to which the battery has been charged. 100 % means that the battery is fully charged. The SMA HV APU can use the parameters to determine the state of charge of a cell or battery module, and to stop the charging process if necessary, thereby preventing overcharging. The software uses the same function to monitor the discharging process, in order to avoid placing any unnecessary loads on the cells. Battery limit states define the points at which the system stops charging and discharging.

### SoH – state of health

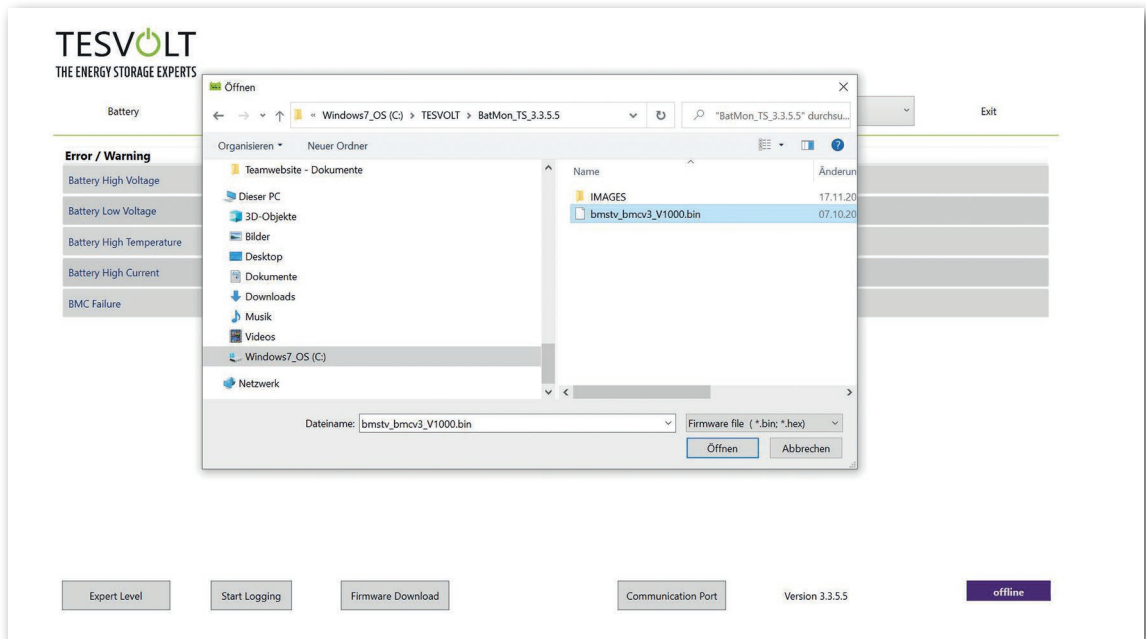
This value indicates how healthy the cell is. Precise monitoring allows the system to detect differences in performance between individual cells and thus identify damaged or faulty cells. Depending on the seriousness of the error, disconnection of the APU and STPS or a cut-off of the storage system may be necessary.

## 12 Firmware update

If required, the firmware update is installed via BatMon in coordination with the TESVOLT Service center. To do this, you must enter the password in the expert level on the “System” page in BatMon. This can only be done in coordination with the service center.

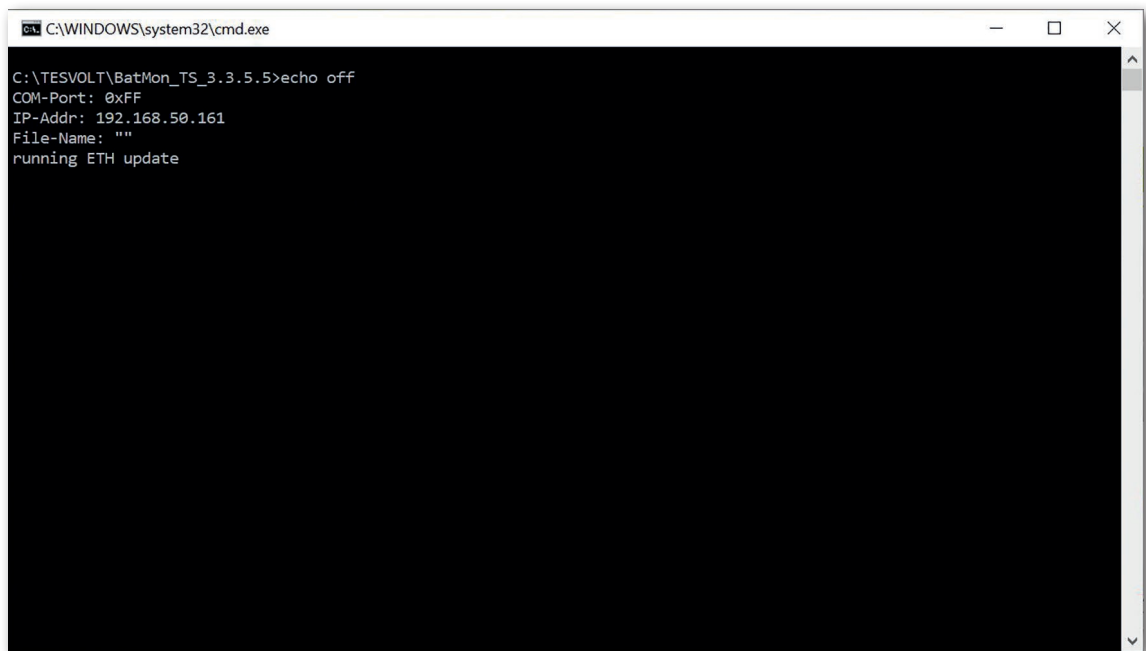


The latest firmware can then be downloaded with the “Firmware download” button on the “System” tab.



In the window that opens, select the firmware file (.bin) and click “Open.”

The update window will open. The update may take up to one minute. Afterwards, BatMon must be restarted.



```
C:\WINDOWS\system32\cmd.exe
C:\TESVOLT\BatMon_TS_3.3.5.5>echo off
COM-Port: 0xFF
IP-Addr: 192.168.50.161
File-Name: ""
running ETH update
```

## 13 Error and warning messages STORAGE-67-TS-10

EVENT	DESCRIPTION	ACTION
-	Storage system does not start	Check battery cabling (polarity reversal or connector not correctly contacted). Check that the 2 A fine-wire APU fuse (F1) located on the front left-hand side of the SMA HV APU is functioning correctly and replace it if necessary. Contact the service center.
W920/W936 General	General battery error	Restart the SMA HV APU using the on/off switch. Check the parameters set on the STPS 60-10.
F921/W937 - Battery High Voltage	Overvoltage in a cell within the battery module	The active battery management system equalises the cell voltages. The battery overvoltage or undervoltage can be an indication of a faulty cell. If a voltage limit (undervoltage/overvoltage) is reached, the battery actively disconnects both poles from the STPS 60-10 by means of a DC relay. Contact the service.
F922/W938 Battery Low Voltage	Undervoltage of a cell in the battery module	
F923/W939 Battery High Temperature	Cell has reached maximum temperature limit	Take the unit out of operation and allow it to cool down to at least 25°C. Check the wiring of the battery modules and the ventilation of the STORAGE-67-TS-10.
F924/W940 Battery Low Temperature	Cell has not been maintained above minimum temperature limit	Switch off the battery and raise the ambient temperature to at least 5°C.
F925/W941 Battery High Temperature Charge	Maximum temperature reached during battery charging	Switch off the battery and let it cool to at least 25°C. Check the battery modules' cabling.
F926/W942 Battery Low Temperature Charge	Minimum temperature reached during battery charging	Switch off the battery and raise the ambient temperature to at least 5°C.
F927/W943 - Battery High Current	Current too high	Switch off the battery and check the parameters of the battery and the STPS 60-10. Restart the battery.
F928/W944 Battery High Current Charge	Charging current too high during battery charging	Switch off the battery and check the parameters of the battery and the STPS 60-10. Restart the battery.
F929/W945 Switch Contactor	Switch has reported an error	Restart the battery.
F930 Short Circuit	Peak current is too high	Take the STORAGE-67-TS-10 out of operation and contact the service center.
F932/W948 Cell Imbalance	Cell voltages deviate too much from each other.	Restart the battery. If the error still occurs after this, check the cell voltages via the BatMon software and contact the service center.
F972 Isolation Fault	DC currents of the +/- lines are different	Check the cabinet ground and APU as well as the cabling. Also check the BAT COM cabling and the CAN bus lines.
F973 Isolation Test Fault	Current sensor error	Take the STORAGE-67-TS-10 out of operation and contact the service center.
E 201 IsoSPO Connection TimeOut	Faulty ABO communication	Check the BAT COM cabling.
E202 Master/Slave Communication Fault	Faulty communication between APUs in the configuration	Check the CAN bus lines.
E203 BMC Master/Slave Error	At least one APU has an error	Check the addressing settings as well as the termination and the CAN bus line. In addition, check the states of all APUs in the configuration. Restart the battery.
E205 Modules Mismatch	Master/slave configuration has different number of modules	Check the BAT COM cabling. Then start up the systems one by one and check the number of modules displayed in each case.
W301/F302 Board High/Max. Temp	Temperature exceeded on BMC Board	Switch off APU and allow to cool down.
W947 BMC internal	Internal error in the controller	Restart the battery.



**NOTE** For further assistance or if errors persist, contact the service center.

## 14 Maintenance



**ATTENTION! Risk of damage to the unit and/or battery inverter if shut down improperly.**

Before carrying out maintenance work, ensure that the STORAGE-67-TS-10 is taken out of operation in accordance with the instructions in section “9 Shutdown” on page 34.



**NOTE:** When cleaning and maintaining the STPS 60-10, always follow the specifications and instructions in the technical documentation for the STPS 60-10.



**NOTE:** Local regulations and standards must be followed for any maintenance work carried out.

There is a template of a maintenance log on the USB drive (18) which you can use as an aid.

The lithium cells used by TESVOLT for the STORAGE-67-TS-10 are low-maintenance. However, to guarantee safe operation, all plug connections must be checked by qualified specialists at least once a year and reinserted if necessary.

The following checks or maintenance work must be carried out once a year:

- General visual inspection
- Check of all screwed electrical connections: Check the tightening torque against the values specified in the following table. Loose connections must be re-tightened to the specified torques.

CONNECTION	TORQUE
Ground SMA HV APU	6 Nm
Central grounding point	10 Nm
STPS 60-10 connections - for conductor cross-sections of 35 to 95 mm <sup>2</sup>	20 Nm
STPS 60-10 connections - for conductor cross-sections of 96 to 150 mm <sup>2</sup>	30 Nm

- Use the BatMon software to check the SoC, SoH, cell voltages and temperatures of the battery modules for irregularities.
- Switch the STORAGE-67-TS-10 off and on again once a year.



**NOTE:** Take a screenshot of the “Battery” and “Cell” pages of each battery module and archive them together with all events as a PDF.

If you would like to clean the battery cabinet, please use a dry cleaning cloth. Avoid bringing the battery connections into contact with moisture. Do not use solvents of any kind.

## 15 Storage



To guarantee a long battery life, the storage temperature should be kept within a range between -20°C and 50°C and the cell should be cycled at least every six months. To minimize self-discharge during longer storage periods, the DC connecting cables should be removed from the “BATTERY” connections 1/2 of the SMA HV APU. This interrupts the power supply of the 24 V power supply built into the SMA HV APU and prevents discharge of the battery.

## 16 Disposal

TESVOLT battery modules installed in Germany are integrated into the free GRS take-back system. For disposal, please contact the service or email [service@tesvolt.com](mailto:service@tesvolt.com). Further information can be found at <http://www.en.grs-batterien.de/index/>.

The batteries may only be disposed of in accordance with the disposal regulations for used batteries applicable at the time of disposal. Immediately decommission any damaged batteries and please contact your installer or sales partner first before disposal. Ensure that the battery is not subjected to moisture or direct sunlight. Ensure quick removal by your installer or TESVOLT.

1. Do not dispose of batteries and rechargeable batteries in household waste! Please note that you are legally obliged to return used batteries and rechargeable batteries.
2. Used batteries may contain pollutants that can damage the environment or harm your health if they are not stored or disposed of properly.
3. Batteries also contain important raw materials such as iron, zinc, manganese, copper, cobalt or nickel and can be recycled.

Further information can be found at <https://www.tesvolt.com/en/products/recycling.html>

**Do not dispose of batteries in household waste!**



**Li-ion**





## 17 Contact

Please contact the SMA Service Line if you encounter any technical problems with our products.

Have the following data at hand to enable us to quickly and efficiently respond to your query:

- Device type
- Serial number
- Firmware version
- Event message
- Installation location and height
- Type and number of PV modules
- Optional equipment, e.g. communication products
- Name of the system in the Sunny Portal (if available)
- Access data for the Sunny Portal (if available)
- Special country-specific settings (if available)

Deutschland	SMA Solar Technology AG	Belgien	SMA Benelux BVBA/SPRL
Österreich	Niestetal	Belgique	Mechelen
Schweiz	Sunny Boy, Sunny Mini Central, Sunny Tripower: +49 561 9522-1499 Monitoring Systems (Kommunikationsprodukte): +49 561 9522-2499 Fuel Save Controller (PV-Diesel-Hybridsysteme): +49 561 9522-3199 Sunny Island, Sunny Boy Storage, Sunny Backup: +49 561 9522-399 Sunny Central, Sunny Central Storage: +49 561 9522-299 SMA Online Service Center: www.SMA-Service.com	België	+32 15 286 730
		Luxemburg	SMA Online Service Center: www.SMA-Service.com
		Luxembourg	
		Nederland	
		Česko	SMA Service Partner TERMS a.s.
		Magyarország	+420 387 6 85 111
		Slovensko	SMA Online Service Center: www.SMA-Service.com
		Türkiye	SMA Service Partner DEKOM Ltd. Şti. +90 24 22430605 SMA Online Service Center: www.SMA-Service.com
France	SMA France S.A.S. Lyon +33 472 22 97 00 SMA Online Service Center : www.SMA-Service.com	Ελλάδα	SMA Service Partner AKTOR FM. Αθήνα +30 210 8184550 SMA Online Service Center: www.SMA-Service.com
		Κύπρος	

España Portugal	SMA Ibérica Tecnología Solar, S.L.U. Barcelona +34 935 63 50 99 SMA Online Service Center: www.SMA-Service.com	United King- dom	SMA Solar UK Ltd. Milton Keynes +44 1908 304899 SMA Online Service Center: www.SMA-Service.com
Italia	SMA Italia S.r.l. Milano +39 02 8934-7299 SMA Online Service Center: www.SMA-Service.com	Australia	SMA Australia Pty Ltd. Sydney Toll free for Australia: 1800 SMA AUS (1800 762 287) International: +61 2 9491 4200
United Arab Emirates	SMA Middle East LLC Abu Dhabi +971 2234 6177 SMA Online Service Center: www.SMA-Service.com	India	SMA Solar India Pvt. Ltd. Mumbai +91 22 61713888
ไทย	SMA Solar (Thailand) Co., Ltd. กรุงเทพฯ +66 2 670 6999	대한민국	SMA Technology Korea Co., Ltd. 서울 +82-2-520-2666
South Africa	SMA Solar Technology South Af- rica Pty Ltd. Cape Town 08600SUNNY (08600 78669) International: +27 (0)21 826 0699 SMA Online Service Center: www.SMA-Service.com	Argentina Brasil Chile Perú	SMA South America SPA Santiago de Chile +562 2820 2101
Other coun- tries	International SMA Service Line Niestetal 00800 SMA SERVICE (+800 762 7378423) SMA Online Service Center: www.SMA-Service.com		



