vBox

User Manual

Version A1

Date 2025-01-14

Legal Notice

The information presented in this guide is subject to change without prior notice.

The technical specifications indicated here do not constitute a contractual obligation.
In case of any doubt regarding a subject described or if you discover an error in this manual, please contact us.

Contents

1 Manual Description

1.1 Scope of Use

This document mainly introduces the vBox series residential energy storage system (hereinafter referred to as "product", "equipment" or "energy storage"). The vBox consists of one power module called vBox-7KW-C and 2 to 6 battery modules called vBox-3.5-M. This manual includes the product introduction, application scenarios, installation commissioning, system maintenance and technical data.

1.2 Intended Audience

This manual is intended for

- Sales engineers
- System engineers
- Technical support engineers
- End users

And specially for electricians with electrical operation certificates, and the operation content described in the manual must be operated and performed by trained and experienced electricians in accordance with basic electrical safety protection requirements.

1.3 Supplier

1.3.1 Europe

Star Charge Europe GmbH
Am Prime Parc 17, 3.OG, Raunheim 65479, Germany
Customer service hotline: +44 20 7096 1752
Customer service E-mail: Service.europe@starcharge.com
Homepage: www.starcharge.com

1.3.2 APAC

Starcharge Energy Pte., Ltd.
2 Kung Chong Road, #05-01 AA Centre, Singapore 159140
Customer service hotline: +60 15 4600 0603
Global customer service E-mail: service.global@starcharge.com
Homepage: www.starcharge.com

1.3.3 Australia

VOLTX COMMERCIAL PTY LTD

block g2/391c Park Rd, Regents Park NSW 2143

ABN: 50 661 999 328

Contact number: 0426823157

1.4 Symbol Description

The following is a list of safety instructions and general information on symbols that may be used in this manual.

	**DANGER** "DANGER" means a highly potentially dangerous situation which, if not avoided, may cause death or serious injury.
	**WARNING** "WARNING" indicates a moderate potentially hazardous situation that may cause death or serious injury.
	**CAUTION** "CAUTION" indicates a lower hazardous situation that, if not avoided, may cause minor or moderate injury.
	**High temperature danger** The temperature of the device will increase during the operation process, and the contact should be avoided.
	**High voltage danger** Due to the high voltage present in the device, it is very likely to endanger the life.
	**Capacitor discharge** The energy storage must be disconnected from the inverter before opening the cover. Wait at least 5 minutes for the energy storage to discharge completely.
	Read the user manual before performing any operation on the product.
	The product should not be treated as household waste.
	**Earthing identification** Indicates the position for connecting the PE cable.

2 Safety Instructions

2.1 General Safety

When installing, operating, and maintaining equipment, please read this manual first and follow all safety precautions marked on the equipment and in the manual.

The "instructions", "precautions", "warnings", and "dangers" in the manual do not represent all safety precautions that should be followed, but only serve as a supplement to all safety precautions. Our company does not assume any responsibility for violating general safety operation requirements or violating safety standards for design, production, and use of equipment.

This equipment should be used in an environment that meets the design specifications, otherwise it may cause equipment malfunction, resulting in equipment functional abnormalities or component damage, personal safety accidents, property losses, etc., which are not within the scope of equipment quality assurance.

Local laws, regulations, and specifications should be followed when installing, operating, and maintaining equipment. The safety precautions in the manual are only used as local laws and regulations supplement to regulations.

Our company shall not be responsible for any of the following situations:

- Not operating within the usage conditions specified in this manual.
- The installation and use environment exceeds the provisions of relevant international or national standards.
- Unauthorized disassembly, modification of products, or modification of software codes.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environments (such as earthquakes, fires, storms, etc.).
- Transportation damage caused by the customer’s own transportation.
- Damage caused by storage conditions that do not meet product documentation requirements.

Live operation is strictly prohibited during installation:

- It is strictly forbidden to install, use and operate outdoor equipment and cables (including but not limited to handling equipment, operating equipment and cables, plugging and unplugging signal interfaces connected to outdoors, aerial work, outdoor installation, etc.) in bad weather such as lightning, rain, snow, and winds above grade 6.
- After installing the equipment, empty packaging materials in the equipment area should be removed, such as cartons, foam, plastic, cable ties, etc.
- In the event of a fire, evacuate the building or equipment area and ring the fire alarm bell, or call the fire alarm. Under no circumstances is it strictly forbidden to re-enter the burning building.
- It is strictly forbidden to artificially alter, damage or obscure the markings and nameplates on the device.
- When installing the device, a tool is used to tighten the screws to the gauge torque.
- Fully familiar with the composition and working principle of the entire photovoltaic grid-connected power generation system, as well as the relevant standards of the country/region where the project is located.
- Paint scratches that occur during the transportation and installation of equipment must be repaired in time, and it is strictly forbidden to expose the scratched part to the outdoor environment for a long time.
- Do not open the host panel of the device.
- Do not reverse engineer, decompile, disassemble, disassemble, adapt, implant or other derivative operations on the equipment software, do not study the internal implementation of the equipment in any way, obtain the source code of the equipment software, steal intellectual property rights, etc., nor disclose the results of any equipment software performance test.
- During the operation of the equipment, if a fault that may lead to personal injury or equipment damage is found, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.
- Before using the tool, please master the correct use of the tool to avoid injury and damage to the equipment.
- When the device is running, the case temperature is high, there is a risk of burns, do not touch.

Installation environment description:

- The equipment installation environment should be well ventilated, it is recommended to choose a sheltered installation site, or build a sunshade.

- Do not install the device under adverse environmental conditions, such as near flammable or explosive substances; Corrosive environments; exposure to extreme high or low temperatures; or places with high humidity.
- Do not cover vents or heat dissipation systems while the device is running to prevent high temperature fires.

2.2 Personnel Requirements

- Personnel responsible for the installation and maintenance of equipment must first undergo strict training, understand various safety precautions, and master the correct operation methods.
- Only qualified professionals or trained personnel are permitted to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety facilities and access equipment.
- Personnel operating equipment, including operators, trained personnel, and professionals, should have local or national requirements for special operation qualifications, such as high-voltage operation, climbing, and special equipment operation qualifications.
- The replacement of equipment or parts, including software, must be done by a professional or authorized person.

2.3 Electrical Safety

2.3.1 Earthing Requirements

- When installing equipment that needs to be earthed, the protective earth wire must be installed first; when dismantling equipment, the protective earth wire must be removed last.
- It is prohibited to damage the earthing conductor.
- It is prohibited to operate equipment without installing earthing conductors.
- The equipment should be permanently earthed for protection. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that it is properly earthed.

2.3.2 General Requirements

Before making electrical connections, please ensure that the equipment is not damaged, otherwise it may cause electric shock or fire.

- All electrical connections must meet the electrical standards of the country/region where they are located.
- It is necessary to obtain permission from the power department of the country/region in order to connect to the grid for power generation.
- User provided cables should comply with local laws and regulations.
- When performing high-voltage operations, please use specialized insulation tools.

2.3.3 DC Operation

It is forbidden to install or remove the power cord with live electricity. The moment the power cord core touches the conductor, it will generate an arc or electric spark, which can cause fire or personal injury.

- Before the electrical connection of the equipment, if there is a possibility of encountering live parts, the disconnecting device corresponding to the front stage of the equipment must be disconnected.
- Before connecting a power cord, you must verify that the power cord label is correctly identified before connecting.
- If the device has multiple inputs and outputs, disconnect all inputs and output to the device and operate the device only after the device is completely powered down.

2.3.4 Wiring Requirements

- The use of the cable in a high temperature environment may cause aging and damage to the insulation layer, and the distance between the cable and the heating device or the periphery of the heat source area is at least 30 mm.
- Similar cables should be tied together, and different types of cables should be arranged at least 30 mm apart, and it is forbidden to entangle or cross arrange each other.
- The cables used in photovoltaic grid-connected power generation systems must be firmly connected, well insulated, and of appropriate specifications.

2.4 Mechanical Safety

2.4.1 Handling Safety

- When carrying heavy objects, you should be prepared to bear the weight to avoid being crushed or sprained by heavy objects.
- When handling the device by hand, protective gloves should be worn to avoid injury.

2.4.2 Using Ladders

- When you need to perform live-line working at heights, wooden ladders or fiberglass ladders should be used.
- When a step ladder is used, ensure that the pull ropes are secured and that the ladder is held firm during operation.
- Before using a ladder, check that it is intact and confirm its load bearing capacity. Do not overload it.
- When a ladder is used, the wide foot of the ladder should be facing down or protective measures should be applied at the bottom of the ladder to prevent slipping.
- The ladder should be placed on a stable surface and its inclination should be 75°.

2.5 Battery Safety

- Do not expose batteries to extreme heat or environments with sparks.
- Do not short-circuit, overcharge, or over-discharge batteries.
- Protect batteries from mechanical impacts, punctures, blows, or crushing.
- Do not immerse batteries in seawater or other liquids, and ensure them do not absorb moisture.
- Do not reverse the positive and negative poles of a battery.
- Do not disassemble or alter batteries.
- Do not connect the battery to a socket.
- Do not use welding tools to weld the battery.
- Do not use the battery in other devices.
- Do not mix this product with batteries of different models or types.
- Do not expose batteries to direct sunlight.
- Keep batteries out of reach of children and ensure appropriate protective measures are in place.
- Do not use or store batteries at high temperatures, as this may lead to overheating, functional failure, or reduced lifespan.

2.6 Environment Requirements

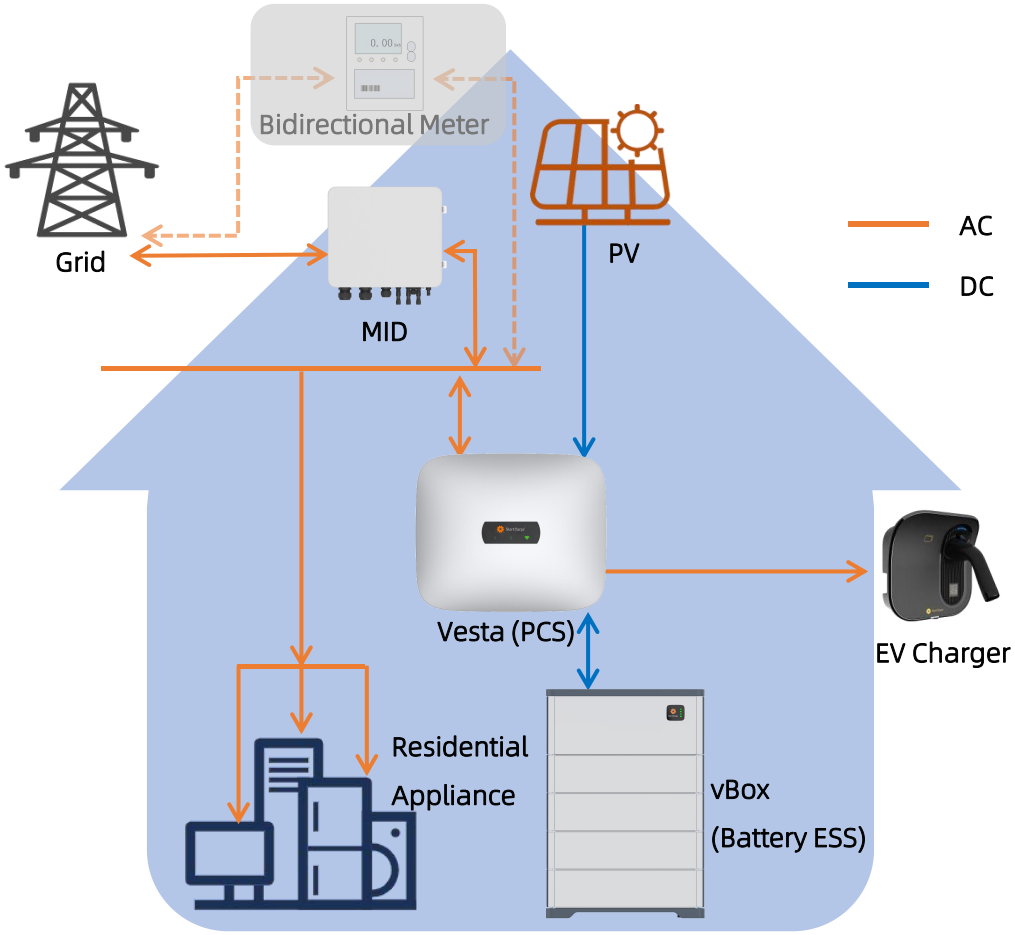
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
- Do not store any flammable or explosive materials in the equipment area.
- Do not place the equipment near heat sources or fire sources, such as smoke, candles, heaters, or other heating devices.

3 Introduction of Residential Energy Storage System

3.1 System Introduction

A complete residential solar energy storage and charging system integrates photovoltaic, energy storage, and EV chargers, utilizing solar power to supply electricity for household use and charge electric vehicles.

As shown below, the entire system typically includes photovoltaic facilities, smart inverters (PCS), energy storage batteries, micro-grid interconnect device (MID), smart electricity meters, EV chargers, energy management system (APP), and more. Depending on specific requirements, different configurations may be employed, and certain components can be adjusted or omitted based on actual circumstances. The diagram below illustrates the typical total solution for residential energy storage system.



With Star Charge, we offer the complete system solution, including ESS vBox, Vesta inverter, EV charger, and MID device. With these components we can establish a complete residential PV, storage, and EV charger system. The key features of this system are combined and managed PV, Storage & Charger output/input with a single AC cable. The benefits are as follows:

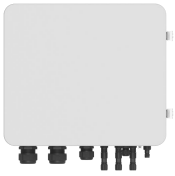
- Save the grid input (main panel) capacity. The capacity would be the maximum capacity among PV, Storage & Charger, rather than the total capacity of them.
- Save the facility cost and construction fee, one step for the whole system.
- Improve self-consumption rate by introducing the EV as an additional storage device through EVSE and appliance management by HEMS.

3.2 Components Introduction

Vesta (PCS): An intelligent inverter in the residential energy storage system, designed and manufactured by Star Charge. It can simultaneously connect to the grid, photovoltaic panels, household loads, batteries, and EV chargers. It serves as the central component of the entire system, capable of performing rectification, inversion, and partial energy management functions. It offers various power options from 3.6kW to 14kW, and supports single-phase, three-phase, and split-phase grid connection methods.

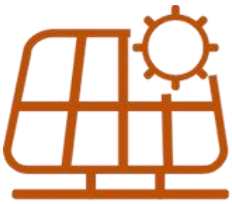
vBox (Battery ESS): The battery in the residential energy storage system, designed and manufactured by Star Charge. It consists of a power module and 2-6 battery modules, with state-of-art LFP cells inside. It offers battery capacity options ranging from 6.9kWh to 20.7kWh. It can store electricity from the grid and photovoltaic panels for household or electric vehicle use.

With Vesta and vBox together, we can offer several EMS functions such as TOU and self-consumption to improve the self-consumption rate of photovoltaic generation.

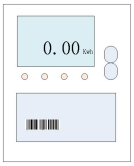


MID: An intelligent micro-grid interconnect device with metering function designed and manufactured by Star Charge. It can intelligently detect the grid status based on voltage levels and disconnects during grid outages, enabling off-grid operation of the residential energy storage system. This feature allows households to maintain power supply for critical loads during grid interruptions. If off-grid operation is required, please purchase the MID. It provides essential safety isolation and ensures that the system can smoothly resynchronize with the grid once power is restored.

EVSE: Electric Vehicle Supply Equipment, or electric vehicle charging equipment, provided by Star Charge with various product options. It allows charging electric vehicles at home. Currently, the mainstream home charging product is the Artemis series, offering power options of single-phase 7kW, three-phase 11/22kW, and split-phase 7/12/19.2kW. The EVSE is an option device only needed when there is requirement for EV charging.



PV: Photovoltaic panels, not currently manufactured by Star Charge. They can convert solar energy into electricity to power homes.



Bidirectional Meter: A bidirectional meter is a type of electricity meter that can measure both the electricity consumed from the grid by a household and the electricity generated by the household and fed back into the grid. Currently, it is an optional device offered by Star Charge. If the energy storage system is not intended to be used as a backup power source during a blackout, an MID is not required. Instead, a bidirectional meter is needed to help the system obtain power information from the grid and the load, in order to implement energy management strategies.

3.3 Application Scenarios

With different combinations of components, we can fulfill requirements for different scenarios. In general, we can separate the scenarios into 2 major categories, the new installation and the retrofit installation which is with the existing photovoltaic system. The EV charger Artemis would always be an option for every residential energy scenario if the electric vehicle is available.

The scenarios for new installation are as follows:

No.	Description	Required Components	Major Benefits (Support Functions)
1	Pure PV	Vesta Inverter PV Panels	PV generation to reduce electricity bill
2	Pure storage without backup	Vesta Inverter vBox ESS	TOU (some region)
3	Pure Storage with backup	Vesta Inverter vBox ESS MID Device	TOU (some region) Backup during grid outage
4	PV with ESS without backup	Vesta Inverter vBox ESS PV Panels	PV generation to reduce electricity bill TOU (some region) Zero Export
5	PV with ESS with backup	Vesta Inverter vBox ESS MID Device PV Panels	PV generation to reduce electricity bill TOU (some region) Zero Export Backup
6	EV charging (optional)	Artemis EV Charger	To charge electric vehicle
7	Installation required without MID	Bidirectional Meter	Measure power of grid for energy management strategies without MID

With existing PV system, the major scenarios for retrofit installation are as follows:

No.	Description	Required Components	Major Benefits (Support Functions)
8	PV with ESS without backup with existing PV system	Vesta Inverter vBox ESS	PV generation to reduce electricity bill Improve self-consumption rate TOU (some region) Zero Export
9	PV with ESS with backup with existing PV system	Vesta Inverter vBox ESS MID Device	PV generation to reduce electricity bill TOU (some region) Zero Export Backup
10	EV charging (optional)	Artemis EV Charger	To charge electric vehicle
11	Installation required without MID	Bidirectional Meter	Measure power of grid for energy management strategies without MID

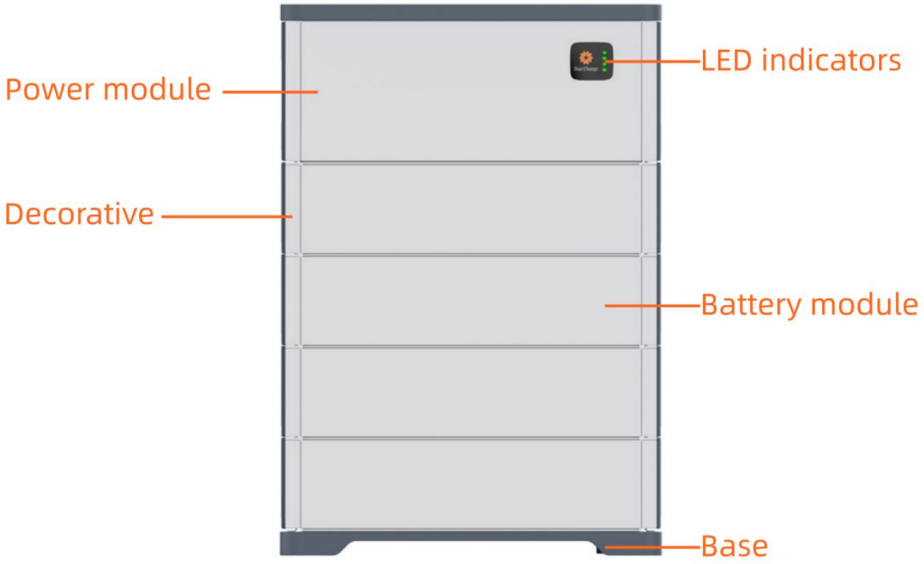
4 Product Description

4.1 Product Introduction

The vBox consists of one power module called vBox-7KW-C and 2 to 6 battery modules called vBox-3.5-M, which can store and release electrical energy according to the requirements of the energy management system (EMS).

Function:

- Battery charging: The power module is connected to the energy storage terminals (BAT+, BAT-) of the inverter. Under the control of the inverter, the battery modules are charged and the excess photovoltaic energy not delivered to the grid is stored in the battery.
- Battery discharging: When the photovoltaic energy is not enough to power the load, the system could to control the battery to discharge to the load through the power module vBox-7KW-C and inverter.

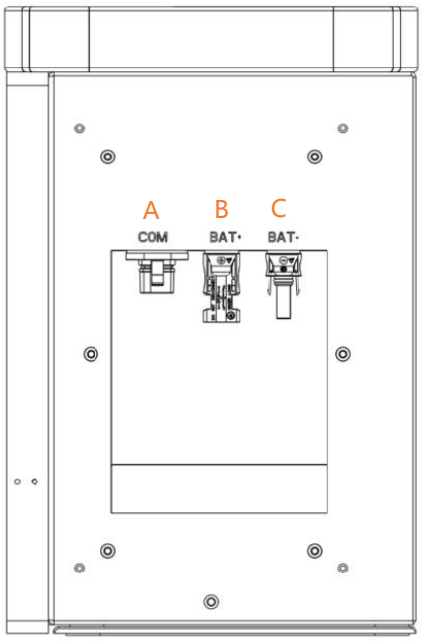


As shown in the figure, the vBox battery is with stackable structure. The vBox consists of one power module vBox-7KW-C and several battery modules vBox-3.5-M.

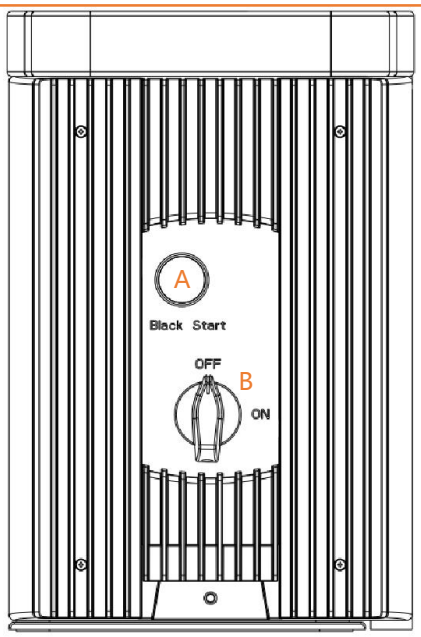
On the bottom, there is a base. The battery modules are stacked in series on top of the base, and the power module is placed on top of the battery modules, with LED indicators at the front for a clear and intuitive display of system status. All electrical connections are made on the contact surfaces of the modules, providing a neat and orderly appearance for the vBox.

4.2 Interface Introduction

Position	Designation
A	COM
B	BAT+
C	BAT-



Position	Designation
A	Black Start
B	DC Switch



4.3 Description of Energy Storage Capacity

The vBox features scalability, allowing for flexible configuration of the number of battery modules to meet various energy storage needs. One power module, the vBox-7KW-C, supports up to six battery modules for charging and discharging.

Each battery module contains several LFP cells connected in parallel and series to form a 3.46 kWh battery module. The combinations and installed energy are provided in the table below.

Combination	Number of Power Module	Number of Battery Module	Installed Energy
VBox-7	1	2	6.9kWh
VBox-10	1	3	10.3kWh
VBox-14	1	4	13.8kWh
VBox-17	1	5	17.2kWh
VBox-20	1	6	20.7kWh

The vBox can work with Vesta series inverter perfectly and can be connected to single-phase, split-phase, or three-phase inverters to enable all operating modes of the energy storage system. The power module automatically adapts to the voltage level of the inverter through communication between Vesta and vBox, eliminating the need for additional external devices to identify different system types.

Product Features:

Support multi-scenario, multi-working mode:

- Support multiple working modes such as grid-connected, off-grid, pure off-grid, self-consumption, TOU, and emergency standby modes.
- Support users to query the total discharge information of the product life cycle in real time.

Intelligent operation and simple operation:

- Works in tandem with inverter, plug and play, mobile APP and management system integration.

Simple installation and replacement:

- The system connection adopts standard energy storage DC terminals.
- Modular battery design.
- Operable by one or two people.

Intelligent operation and maintenance:

- The factory settings meet the default settings of the main target market, can be turned on with one click, and support Cold Boot.
- LED indicator provides status indication, and the mobile app can be used for remote and local operations.
- The cloud data management system is adopted to realize the management of the energy storage system at anytime and anywhere.

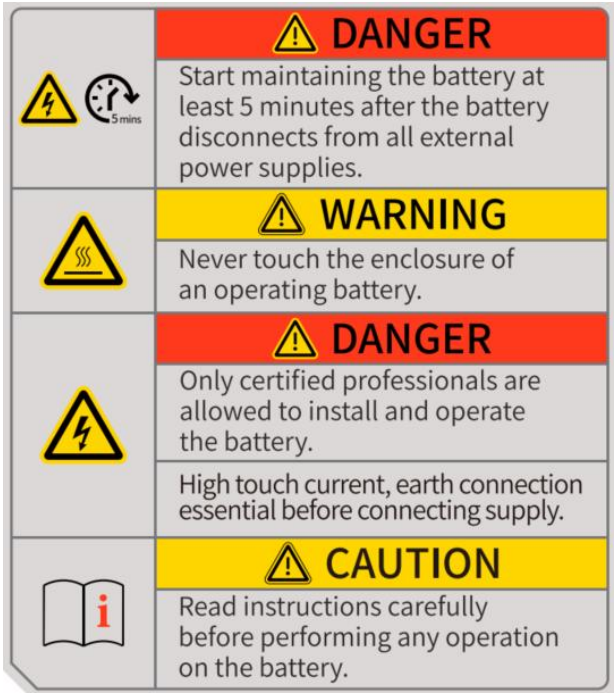
Save investment for users:

- Use the regular installation tool.

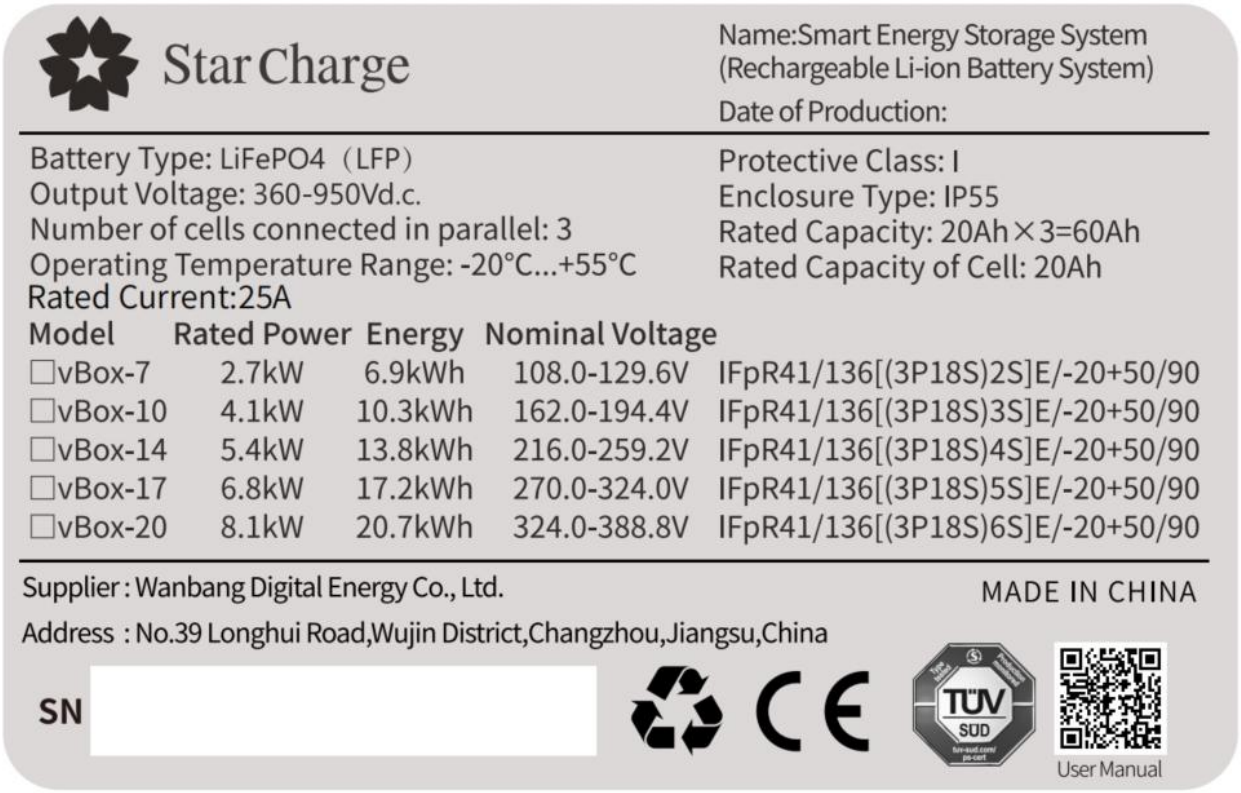
- High efficiency, high power density, and space-saving installation.
- Simple operation and maintenance.

4.4 Label Description

Warning Label



vBox Nameplate



4.5 Working Mode

The main function of vBox series products is to convert and store the energy generated by the photovoltaic system when the PV generation exceeds home consumption or during other periods such as off-peak duration (TOU), and to deliver the energy to the residential load when needed such as black out or peak duration.

The convention is to have the Vesta inverter and the power module vBox-7KW-C together.

Working mode of vBox:

The vBox energy storage system features three working modes: energy-saving mode, standby mode and operating mode.

Working Mode	Description
Energy-saving mode	The internal auxiliary source of the energy storage system and the vBox-7KW-C are not working.
Standby mode	The internal auxiliary source of the energy storage system works, and the vBox-7KW-C does not work.
Operating mode	The internal auxiliary source of the energy storage system works, and the vBox-3.5-M is charged or discharged through the vBox-7KW-C.

5 Technical Parameters

5.1 System

		vBox-7	vBox-10	vBox-14	vBox-17	vBox-20
Performance	Power module	vBox-7KW-C				
	Quantity	1				
	Rated power(1)	≥2.7 kW	≥4.1 kW	≥5.4 kW	≥6.8 kW	≥8.1 kW
	Max. output power(2)	3.2 kW	4.8 kW	6.4 kw	8.0 kW	9.6 kW
	Input/output voltage	360-950 V				
	Max. charge/discharge current	25 A				
	*PCS voltage (single-phase)	437 V				
	*PCS voltage (three-phase)	750 V				
Battery Module	Battery module	vBox-3.5-M				
	Single battery modules capacity	3.46 kWh				
	Number of battery modules	2	3	4	5	6
	DOD	> 90%				
	Rated energy	6.9 kWh	10.3 kWh	13.8 kWh	17.2 kWh	20.7 kWh
	Rated voltage	115.2 V	172.8 V	230.4 V	288.0 V	345.6 V
	Available voltage range	108.0-129.6 V	162.0-194.4 V	216.0-259.2 V	270.0-324.0 V	324.0-388.8 V
	Maximum charging/ discharging current	25 A				
	Charge/discharge Rate	0.42 C				
	Display	LED				
	Communication	RS485				
	Dimensions (W×H×D, mm)	799×767×218	799×959×218	799×1150× 218	799×1342× 218	799×1533× 218
	Weight	80 kg	109 kg	13 8kg	167 kg	196 kg
	Power module dimensions (W×H× D)	798×335×218 mm				
	Power module	20 kg				

General SPEC	weight	
	Battery module dimensions (W×H×D)	795×218×218 mm
	Battery pack weight	29 kg
	Installation method	Floor mounting
	Operating temperature	-20℃ to +55℃ (derated above 45℃)
	Maximum operating altitude	≤2000 m
	Environment	Indoor/outdoor
	Humidity	0%-95%
	Cooling	Natural convection
	IP rating	IP 55
	Audible noise	<30 dB
	Cell technology	LFP
	Compatible inverters	Vesta-2.5/3.6/4.6/5.0/6.0/8.0-S Vesta-6/8/10/12/14-T
Reference standard	Certification	IEC62619, IEC60730-1 Annex H, IEC63056, IEC/EN61000-6-1/-3, IEC/EN62477-1, IEC/EN62040-1, UN38.3+MSDS, Marine Identification Report

(1) The continuous output power of the battery before reaching the discharge cut-off voltage.

(2) The maximum output power when the battery is fully charged.

* Recommended operating environment: For single-phase inverters, it is recommended that the optimal bus voltage at the PCS end be around 437 V; for three-phase inverters, it is recommended that the optimal bus voltage at the PCS end be around 750 V.

6 Installation

6.1 Precautions

DANGER	Note the polarities when installing batteries. Do not connect the positive and negative poles of a battery or battery string together. Otherwise, the battery may be short-circuited. A short circuit not only damages the battery but may also pose safety hazards.
WARNING	Before unpacking batteries, ensure that the outer packaging is intact and undamaged. During storage and transportation, place the batteries according to the markings on the packaging to avoid improper handling, such as placing them upside down, vertically, on their side, or tilted. Additionally, when stacking batteries, strictly adhere to the stacking requirements indicated on the outer packaging. These measures help prevent damage or disposal of batteries due to impacts or drops.
WARNING	After unpacking batteries, place them in the required direction to ensure stability and safety. Do not place the batteries upside down, vertically, on their side, tilted, or stacked. Measures must be taken to prevent the batteries from experiencing any form of impact or fall, as these external forces can lead to damage or disposal of the batteries.
CAUTION	• When moving battery packs, handle them carefully to prevent damage and collision. • To prevent battery packs from falling off, start the pallet truck or forklift after confirming that battery packs are securely bound. • When moving batteries, do not remove protective components such as protective covers or waterproof caps from battery terminals. • Exercise caution when moving batteries to prevent bumping and ensure personal safety. • Install and secure batteries horizontally from the bottom up and from left to right to prevent falling over due to imbalance. • When connecting batteries, ensure that the spring washer on the screw is leveled, that the protruding part of the terminal on the cable faces outwards, and that the cable is intact to ensure reliable and safe connections.
CAUTION	• Tighten the screws on copper bars or cables to the torque specified in this document. Periodically confirm whether the screws are tightened, check for rust, corrosion, or other foreign objects, and clean them if any are found. Loose screw connections will result in excessive voltage drops and heating under high current loads, potentially damaging the batteries. • When installing batteries, do not place installation tools, metal parts, or sundries on the batteries to avoid short circuits or damage. • After the installation is complete, clean up the objects on the batteries and the surrounding area to ensure a clean and safe environment.

6.2 Checking Before Installation

Checking the Outer Packing

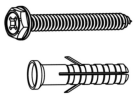
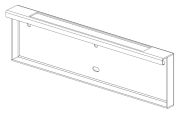
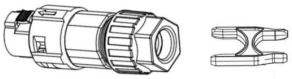
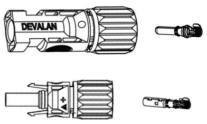
Before unpacking the battery, check the outer packing for damage, such as holes and cracks, and check the battery model. If any damage is found or the battery model is not what you requested, do not unpack the product and contact your dealer as soon as possible.

Checking Deliverables

After unpacking the battery, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your dealer.

The vBox-7KW-C and vBox-3.5-M components of the energy storage product vBox are shipped separately.

The vBox-7KW-C packing list is as follows:

No.	Name	Image	Qty		No.	Name	Image	Qty
1	Power module		1		6	Nylon expansion bolt 8*40 (for wooden walls)		8
2	Wall mounting bracket		1		7	Earthing terminal		1
3	Base		1		8	COM connector		1
4	Energy storage connector (F/M) with metal terminal		2		9	M5*10 screw		2
5	Stainless steel expansion bolt M6*50		8		10	M4*10 Earthing screw		1

The vBox-3.5-M packing list is as follows:

No.	Name	Image	Qty		No.	Name	Image	Qty
1	Battery module		1		2	M5*10 screw		1

Note

For the quantity of deliverables delivered with the package, please refer to the Packing List inside the packaging box.

6.3 Installation

Please ensure that the installation location meets the following conditions:

Outdoor Requirements:

- The foundation of the installation will not be covered by water under raining or other conditions.
- Not in areas exposed to direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in a potentially explosive area.
- Not in a direct stream of cold air.
- Keep away from the TV antenna or other antenna cable.
- The altitude is not higher than 2000 m.
- Avoid precipitation or humid environments.
- Good ventilation.
- The ambient temperature is in the range of -20°C to +55°C.
- The slope of the wall should be within ±5°.

Indoor Requirements:

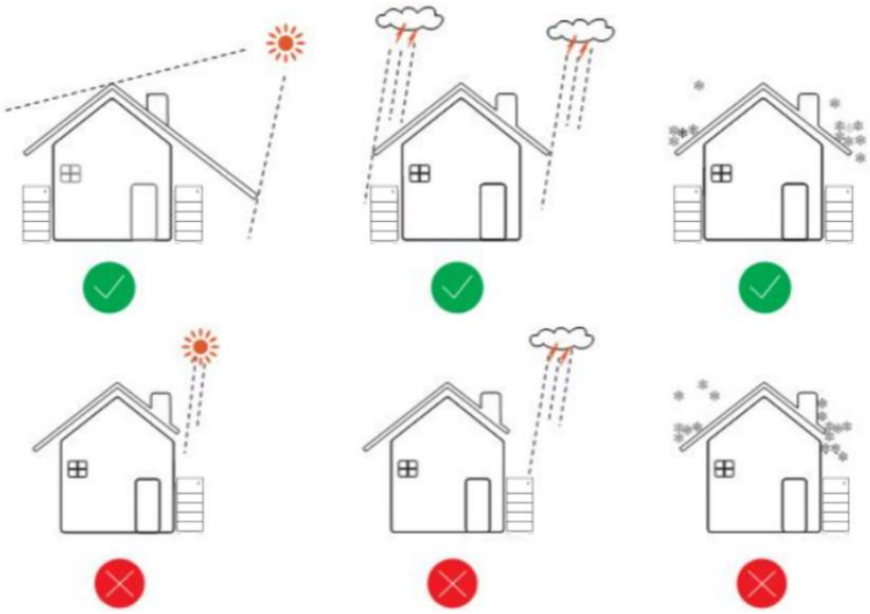
- Do not install the equipment in a place easily touched by children.
- Do not install the equipment in areas with difficult access (including but not limited to attic, basement, etc.).
- Please keep away from the daily work and living places (including but not limited to living room, bedroom, studio, lounge, study, etc.)
- The foundation of the installation will not be covered by water under raining or other conditions.
- Not in areas exposed to direct sunlight.
- Not in areas where highly flammable materials are stored.
- Not in a potentially explosive area.

- Not in a direct stream of cold air.
- Keep away from the TV antenna or other antenna cable.
- The altitude is not higher than 2000 m.
- Avoid precipitation or humid environments.
- Good ventilation.
- The ambient temperature is in the range of -20°C to +55°C.
- The slope of the wall should be within ±5°.

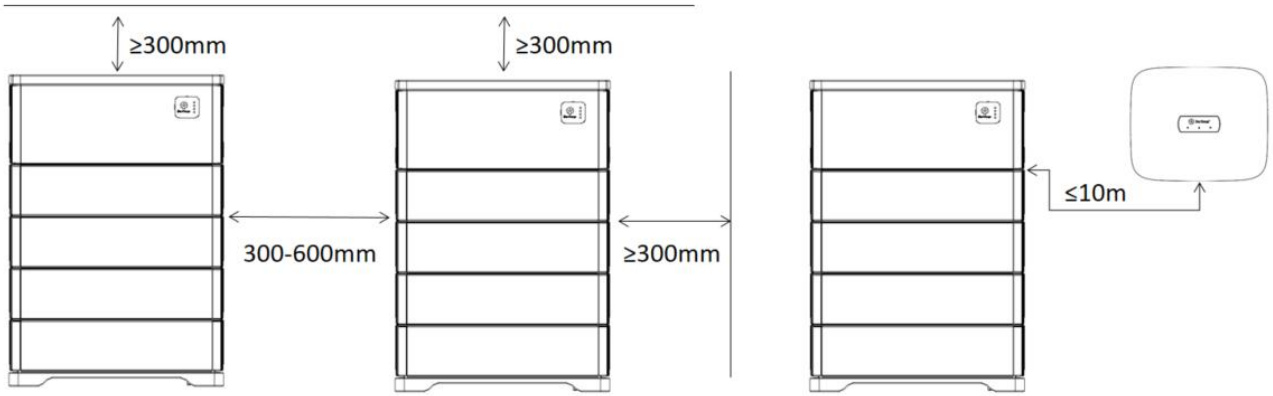
The wall for installing energy storage must meet the following conditions:

- It should be constructed with solid bricks/concrete or have an equally strong mounting surface. If other types of walls and floors are chosen, they must be made of fire-resistant materials.
- If the wall is not made of solid bricks or concrete, it must meet the equipment load-bearing requirements.
- If the strength of the wall is insufficient (such as column walls or walls covered with thick decorative layers), the energy storage must be supported or reinforced.

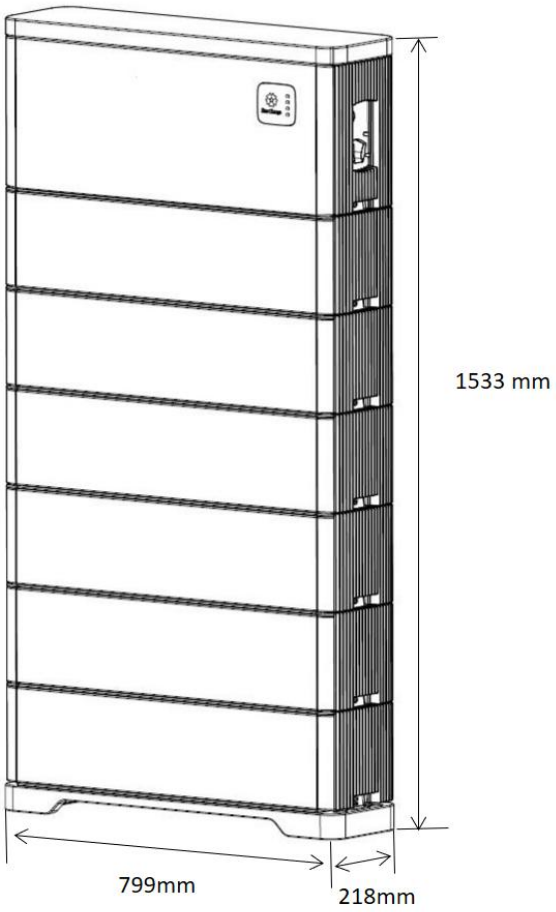
Attention: Avoid direct sunlight, rain or snow during installation and operation.

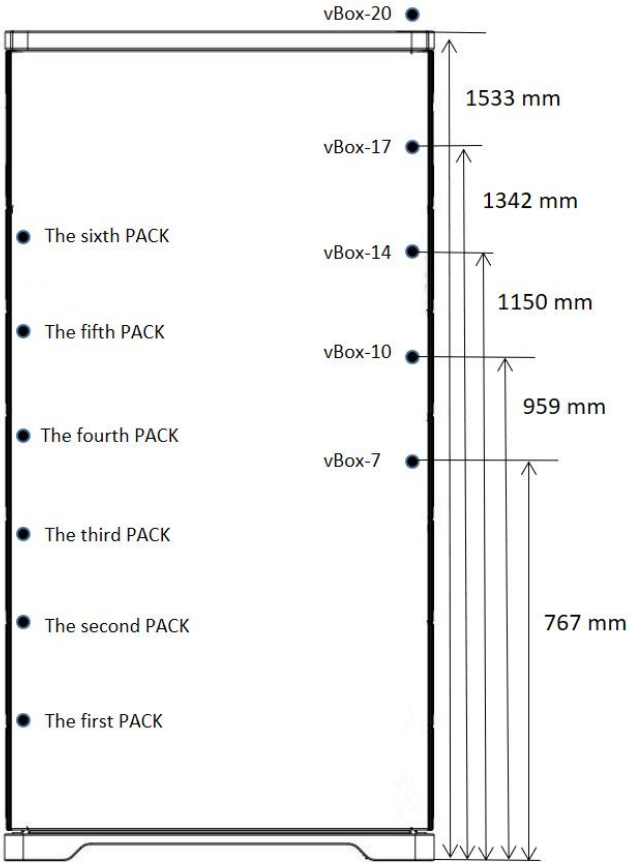


Installation space requirements

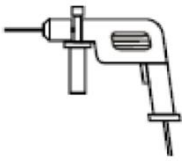
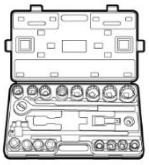
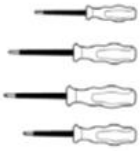
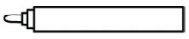
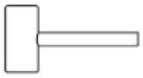
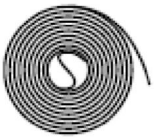
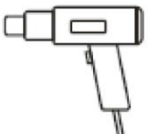
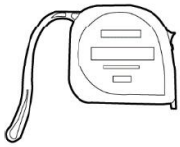
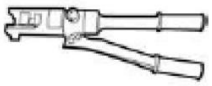
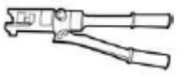
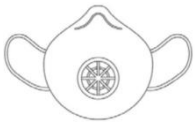
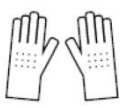


Energy storage installation size



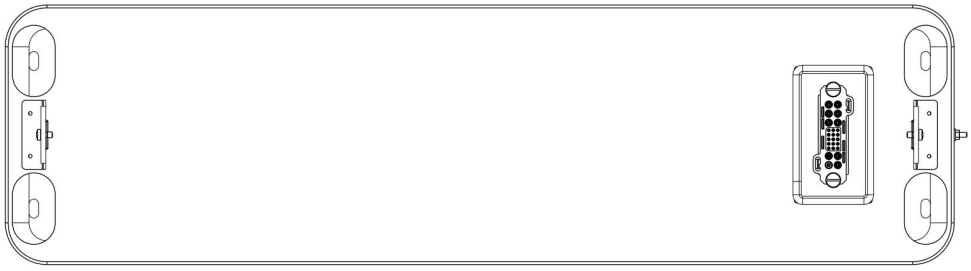


Installation tools and PPE (personal protective equipment):

Type	Tool			
Installation Tools	 Impact drill Drill bit: Φ8 mm	 Socket wrench	 Screwdriver	 Diagonal pliers
	 Adjustable wrench	 Marker pen	 Rubber hammer	 Utility knife
	 Wire cutters	 Cable tie	 Multimeter DC voltage range ≥ 1100V DC	 Spirit level
	 Thermal casing	 Heat gun	 Tape measure	 MC4 terminal crimping plier (2.5-6 mm^2)
	 Heavy-duty crimping plier SATA 91142 (2.5-16 mm^2)	 Torque wrench		
Protective Equipment	 Dust mask	 Safety goggles	 Safety gloves	 Safety shoes

Step 1: Install the base

- The base is shown in the figure below. When installing, place it in the following direction, with the base connector on the right side.

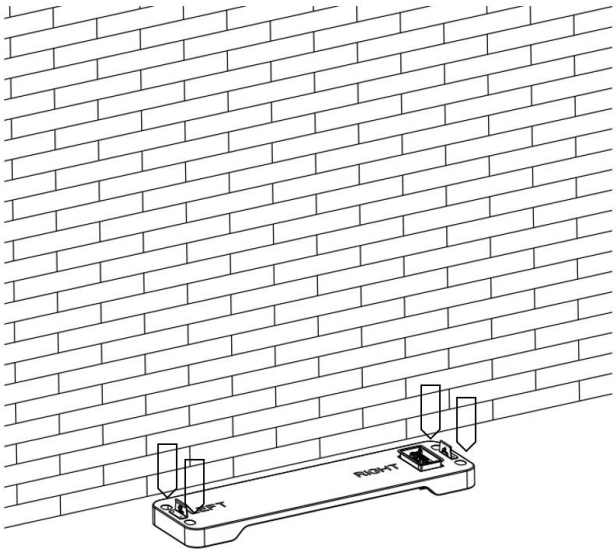


- Choose a suitable location for installing the energy storage unit. Based on the wall angle, select an appropriate distance from the wall and place the base near the wall horizontally. Mark the locations of the 4 installation holes on the ground. The recommended distance between the base and the wall is as follows:

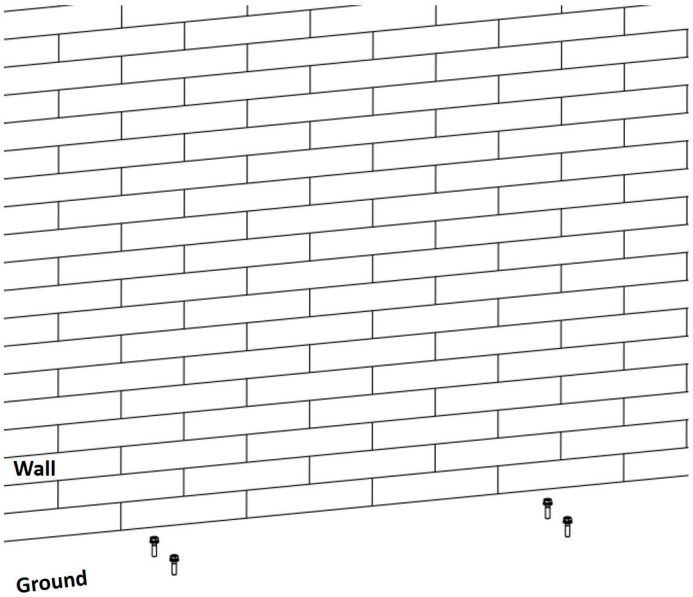
Wall Angles	Distance between the Base and the Wall
0	35 mm
1° to 5° (tilted outward)	35-80 mm
-1° to -5° (tilted inward)	0 mm

- Installation angle requirements: energy storage system should not be tilted forward, horizontal, inverted, backward and rolled.
- Installation location requirements: please choose solid brick-concrete structure, concrete wall and ground, if you choose other types of walls and ground, the wall and ground must be made of fire-retardant materials, and can meet the load-bearing requirements of the equipment.

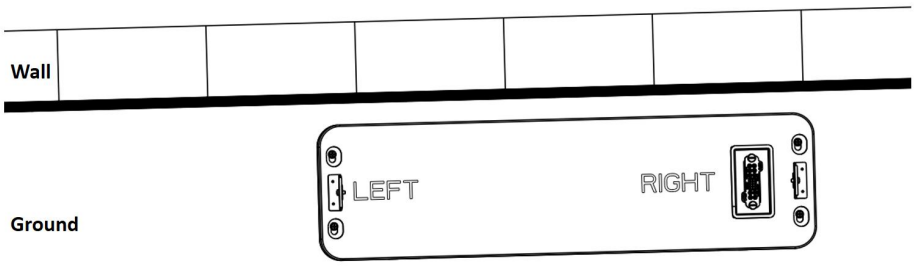
  If it is a wooden wall or floor, it is recommended to use expansion bolts with nylon expansion tubes.



- Use an electric drill to drill holes with a diameter of 8 mm and a depth of 45-50 mm in the ground, and clean up hole debris.
- Use a rubber hammer to knock the expansion bolt into the hole until the head washer of the expansion bolt is flushed with the ground (if the length or number of expansion bolts cannot meet the installation needs, please prepare M6 stainless steel expansion bolts).
- After tightening the nut clockwise, use a wrench to twist the nut 3-5 times to fix the expansion bolt with the ground.
- Finally, unscrew the nut, metal shrapnel and washer counterclockwise, leaving the bolt and expansion tube fixed to the ground.



- Penetrate the mounting hole of the base into the expansion bolt of the ground and keep it flat with the ground, put in the washer and metal shrapnel in turn, screw the nut clockwise, and tighten it with a torque wrench (torque 5 N·m).

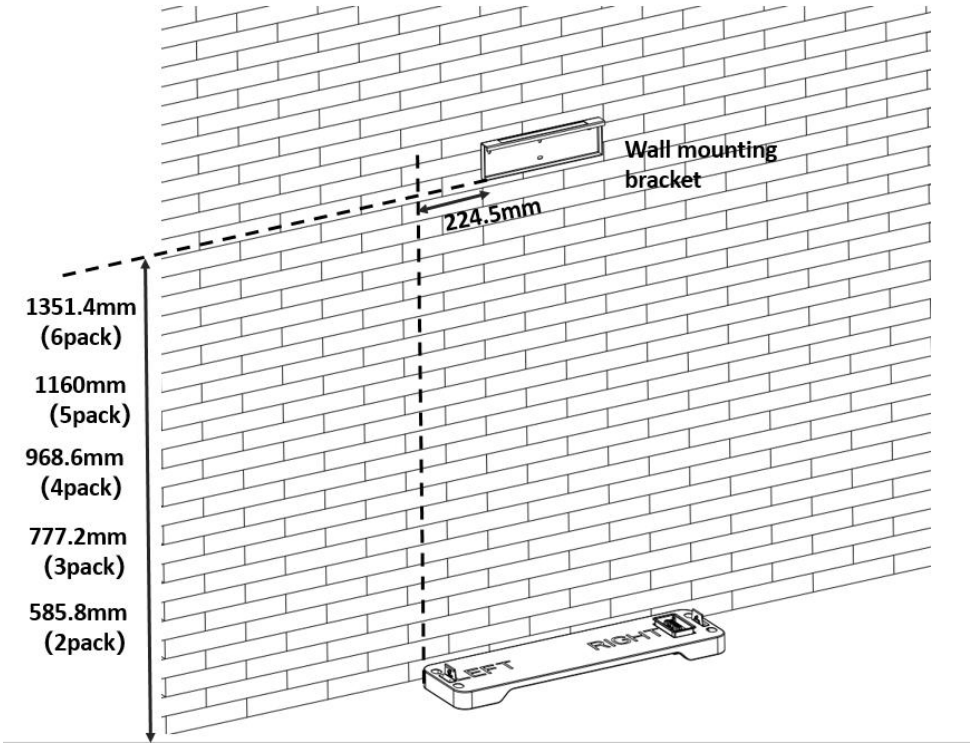


- If installing on a wooden floor, use expansion screws with plastic sleeves, which require a different installation method than stainless steel expansion screws.
  1) Use an electric drill to make a hole with a diameter of 8 mm and a depth of 50-55 mm in the floor, and clean out any debris from the hole.
  2) Hammer the plastic sleeve into the hole until the outer edge is flush with the floor.
  3) Place the base on top and fasten it with an M6*50 cross-slot self-tapping screw, ensuring that the end of the screw is flush with the base (the required torque for screwing in the screw may vary depending on the floor material, but it should be tightened until it is flush with the base). Finally, use a torque wrench to tighten it again (torque 5 N·m).

Step 2: Install the wall mounting bracket

- According to the number of battery modules, place the power module bracket horizontally according to the diagram (the bracket is 224.5 mm from the edge of the base, and the height is shown in the table below according to the number of battery modules), and then mark the 4 mounting hole locations on the wall.

Number of Battery Module	Height of the Power Module Mounting bracket from the Ground
2	585.8 mm
3	777.2 mm
4	968.6 mm
5	1160.0 mm
6	1351.4 mm



1) Use an electric drill to create holes in the wall with a diameter of 8 mm and a depth of 45-50 millimeters. Clean the holes of any debris.
2) Use a rubber mallet to tap the expansion bolts into the holes until the washer on the bolt head is flush with the wall surface.
3) Turn the nuts clockwise, then use a wrench to turn the nuts 3 to 5 times to secure the expansion bolts to the wall.
4) Lastly, unscrew the nuts, metal spring plates, and washers counterclockwise, leaving the bolts and expansion sleeves fixed to the wall.
5) Insert the installation holes of the bracket onto the wall's expansion bolts, keeping them flush with the wall surface. Place washers and metal spring plates in sequence, then clockwise tighten the nuts using a torque wrench (torque 5 N·m).

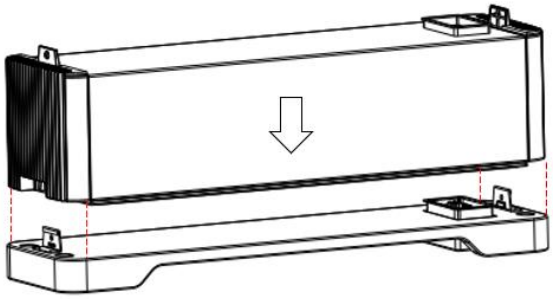
- If installing on a wooden floor, use expansion screws with plastic sleeves, which require a different installation method than stainless steel expansion screws.

1) Use an electric drill to make a hole with a diameter of 8mm and a depth of 50-55 mm in the floor, and clean out any debris from the hole.
2) Hammer the plastic sleeve into the hole until the outer edge is flush with the floor.
3) Place the bracket and fasten it with an M6*50 cross-slot self-tapping screw, ensuring that the end of the screw is flush with the bracket (the required torque for screwing in the screw may vary depending on the floor material, but it should be tightened until it is flush with the rack). Finally, use a torque wrench to tighten it again (torque 5 N·m).

Step 3：Install the first battery module

CAUTION	Due to the weight of the battery, when moving and installing the vBox-3.5-M battery pack, it is necessary to prevent the battery pack from tilting or falling. It is recommended to operate with both hands, with one hand grabbing the bottom handle and the other hand holding the box to prevent tilting.

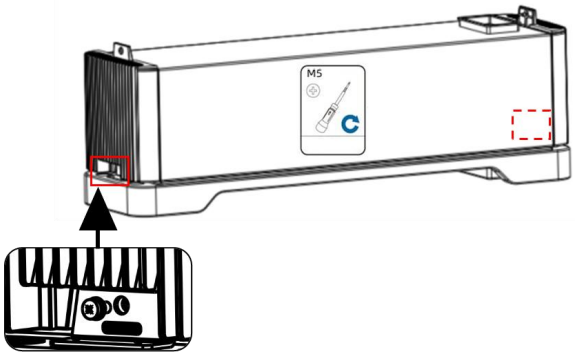
- After this, please take out the first battery module. Clean the surface and adjust the direction to the same as the base to make sure the horizon of the battery module is correct.
- Align the first battery module on the floor stand, and place it carefully with the orientation direction on top of the base. The connection of the battery module and base will automatically be done by the connectors on both sides. After installation, please double check the battery module is level and stands well and stable on the base.
- Install the battery module and align it with the connector and limit on the base as shown in the figure below.



Align the first battery module on the base.

Step 4：Fix the screws

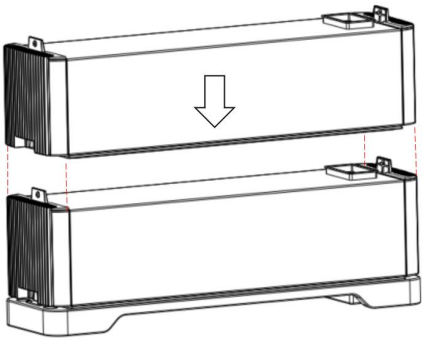
- After placing the battery module, fix and tighten the screws on both sides of the battery modules. Ensure that the battery modules are securely fixed before stacking other modules.
- After each battery is installed, lock it with an M5*10 screw from the side with a torque of 2.2-2.8 N·m.



After placing the battery module, tighten the screws on both sides.

Step 5: Install the other battery modules

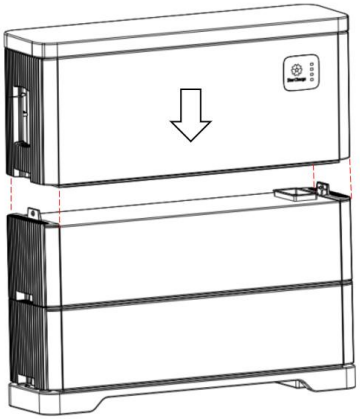
- Repeat step 3 and step 4 to install all the other battery modules. Place the battery modules in turn and tighten the screws on both sides.



Place the battery modules in turn and tighten the screws on both sides.

Step 6: Install the power module

- Finally, place the power module on the battery modules and tighten the M5*10 screws on both sides with a torque of 2.2-2.8 N·m.



Place the power module on the battery modules and tighten the screws on both sides.

7 Electrical Connections

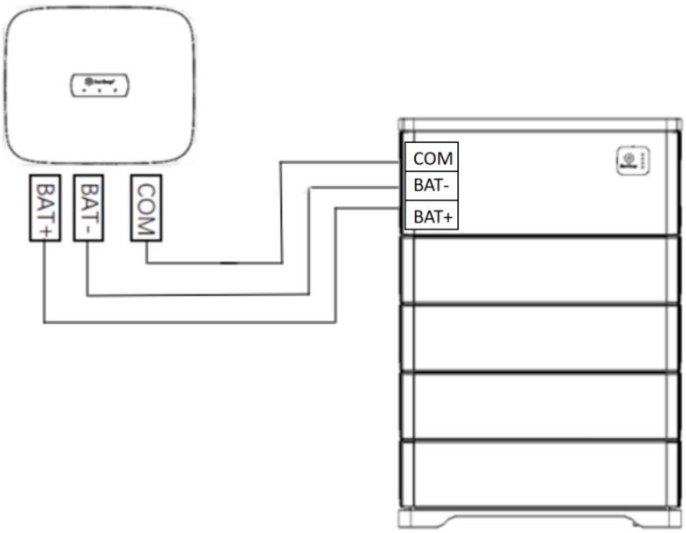
7.1 Precautions

DANGER	Before connecting cables, ensure that the PE cable is securely connected. Otherwise, electric shocks may occur.
DANGER	Before connecting cables, ensure that the DC switch of the power module and all the switches connected to the battery are set to OFF. Otherwise, electric shocks may occur.
CAUTION	Do not connect two or more cables to the positive or negative power port of a battery in parallel to avoid overload and short circuits, which may lead to battery damage or safety incidents. Stay away from the equipment when preparing cables to prevent cable scraps from entering the equipment. Cable scraps may cause sparks and result in personal injury and equipment damage.

7.2 Preparation for Cable Installation

The vBox battery can only be used with inverters. Each vBox requires the following three types of cables for connection:

1. DC Power Cable: Used for power transmission between the vBox and the Vesta inverter.
2. Signal Cable: Used to connect the inverter to the battery signal port, enabling internal communication and control within the system.
3. Earth Cable: Used to safely earth the system to prevent electrical faults and ensure personnel safety.



Cables prepared by the user:

Cable Name	Cable Type	Cable Specifications	Source
DC input cable	Common outdoor PV cable in the industry	• Conductor cross-sectional area: 4-6 mm^2 • Cable outer diameter: 5-8 mm	User-provided
Signal cable	Outdoor shielded twisted	• Conductor cross-sectional area:	User-provided

	pair cable (8 cores)	0.2-0.5 mm^2 • Cable outer diameter: 7-14 mm	
Earth cable	Single-core outdoor copper cable	• Conductor cross-sectional area: 10 mm^2	User-provided

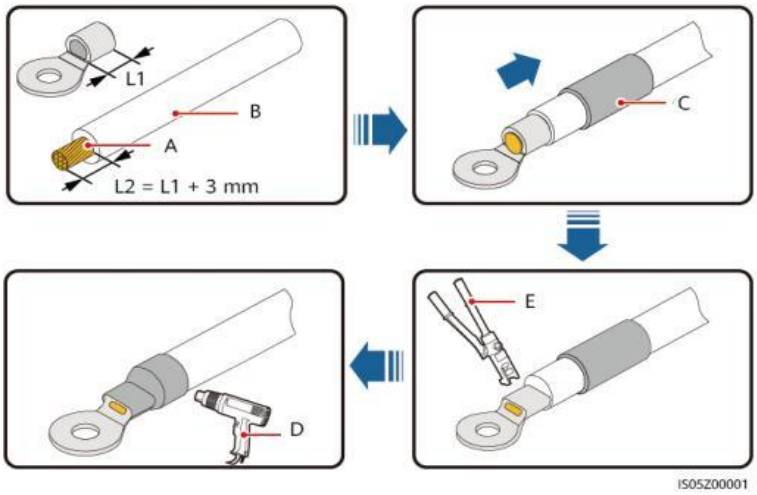
CAUTION

- The minimum cable diameter must comply with local cable standards。
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.
- The length of the power and signal cables between the battery and the inverter should not exceed 20 m.

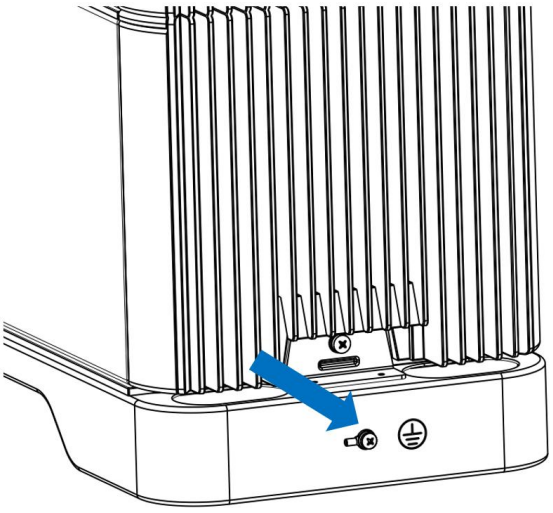
7.3 Installation of Earthing Protection

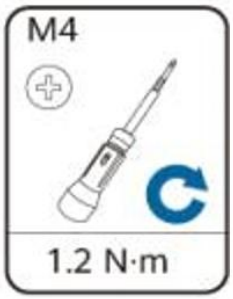
Step 1: Crimp the OT terminals (recommended 10 mm² wire as earth wire)

- When stripping the wire, do not scratch the wire core.
- The cavity formed by the conductor crimping piece of the OT terminal should completely cover the wire core, and the wire core should be tightly and firmly combined with the OT terminal without looseness.
- Heat shrink tubing or insulation tape can be used to cover the crimping area. Heat shrink tubing is used as an example for demonstration.
- When using a heat gun, please pay attention to protection to prevent equipment from being burned.



Step 2: Connect the earthing point of vBox to the external earthing point. Use M4 screws to tighten with a torque of 1.2 N·m.

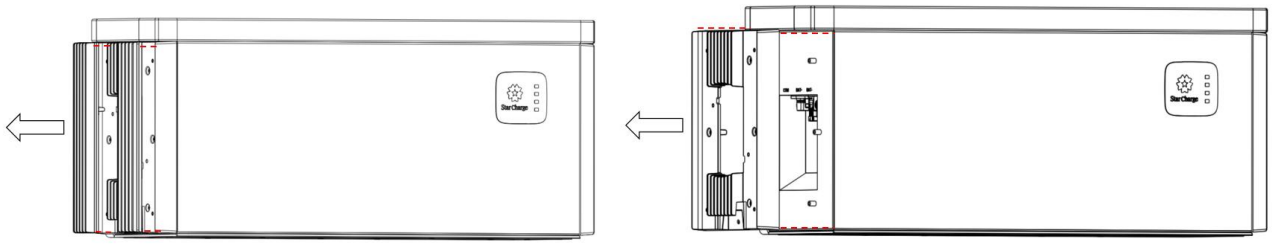


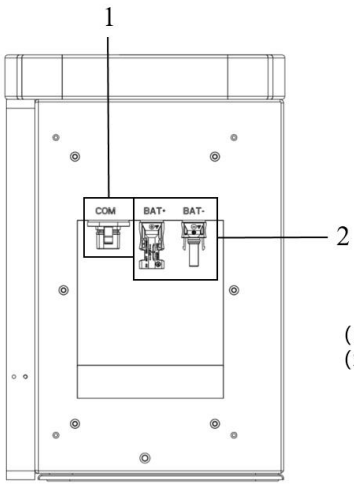


In order to improve the corrosion resistance of the terminals, it is recommended to apply silicone or paint to the earthing terminals for anti-corrosion treatment after assembly.

7.4 DC Connection

- First, remove the end cap and its decorative components in sequence.



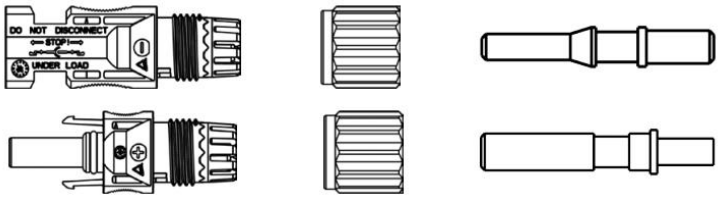


(1) COM end interface
(2) Energy storage terminal(BAT+/BAT-)

- Open the DC terminal package, the connector accessories are as follows:

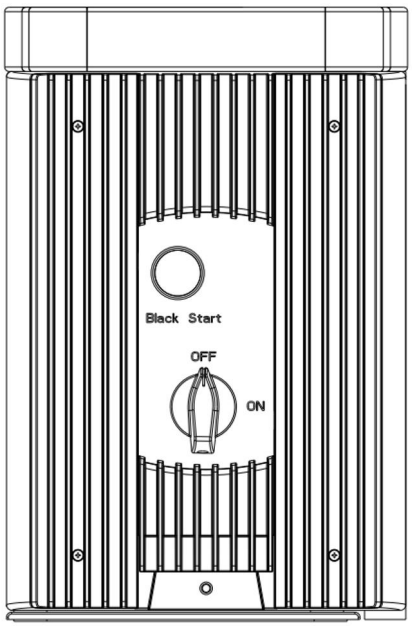
DC Connector (F)

DC Connector (M)

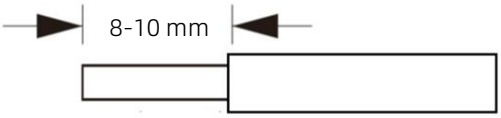


Connector plug　　Waterproof nut　　Latch terminal

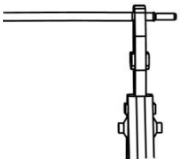
- Turn off the DC switch.



- For connecting the photovoltaic modules, we recommend using a 4 mm² wire with a cable outer diameter between 5-8 mm. It is advisable to use an outdoor PV cable that is commonly used in the industry.
- Use wire strippers to strip the insulation sheath of the cable, exposing the conductor by approximately 8-10 mm.

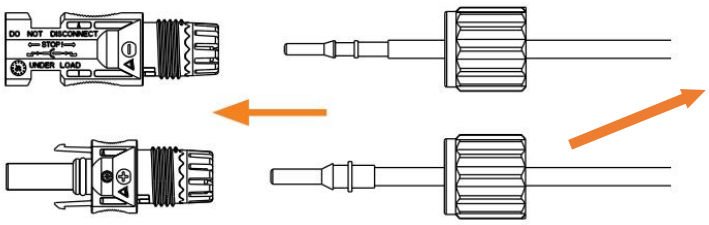


- Insert the bare part of the cable into the pin terminal and make sure all wire harnesses are stuck inside the pins.
- Use crimping pliers to crimp the pin contact points to ensure that the cable copper wire is firmly crimped with the pin terminal (recommended: heavy-duty crimping tool SATA 91142).



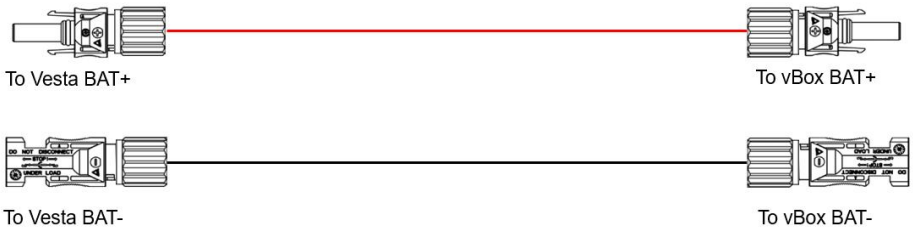
Terminal crimping pliers

- Insert the crimped cable through the nut and into the plug. When you hear a 'click' sound, it indicates that the pin is properly secured in the connector plug.
- Tighten the waterproof nut clockwise (torque 2.6-2.9 N·m).

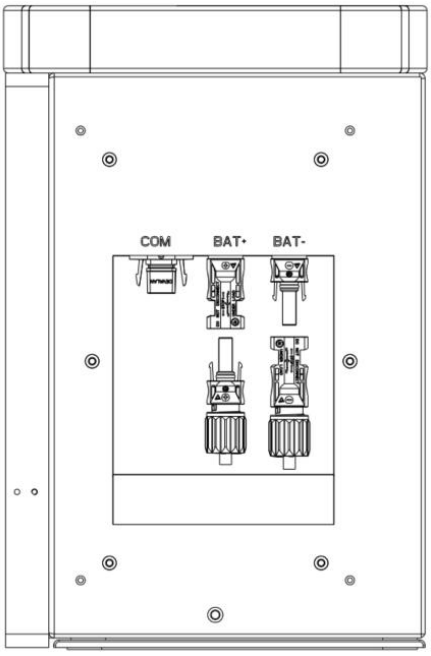


Before inserting, be sure to thread the waterproof nut onto the wire first.

- After the wire harness assembly is completed, the overall effect is as follows (please note that both ends of the BAT+ wire harness are male, and both ends of the BAT- wire harness are female):



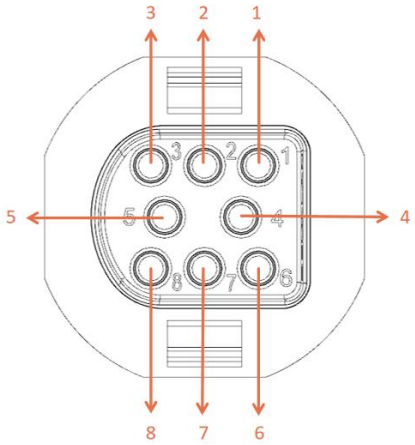
- Remove the dust cap from the DCDC BAT connector socket, insert the connector into the socket, and secure it by fastening the latch.



Note: The distance between the battery and the PCS should not exceed 10 m.

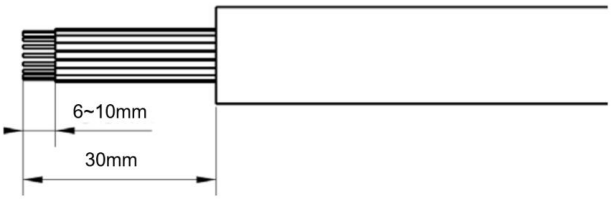
7.5 Communication Connection

The signal definitions for the communication port:

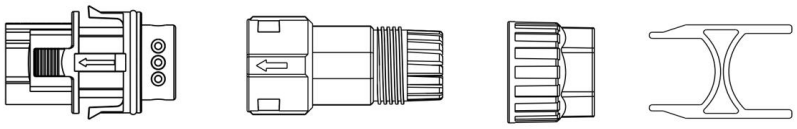


Pin	Definition	Function	Description
1	RS485_A	RS485A RS485 differential signal +	RS485 signal interface for communication with the inverter
2	GND_SLV	Earth	Empty, temporarily not connected
3	RS485_B	RS485B RS485 differential signal -	RS485 signal interface for communication with the inverter
4	GND_SLV	Earth	Empty, temporarily not connected
5	RS485_A	RS485A RS485 differential signal +	RS485 communication port A line, connected to pin 1, forming a daisy chain
6	RS485_B	RS485B RS485 differential signal-	RS485 communication port B line, connected to pin 3, forming a daisy chain
7	CAN_L	CAN_L CAN communication low-bit data line	Reserved, not connected
8	CAN_H	CAN_H CAN communication high-bit data line	Reserved, not connected

- Select a suitable multi-core communication cable (conductor cross-sectional area of 0.2-0.5 mm², cable outer diameter range of 7-14 mm) and strip the wires with a stripping length of 6-10 mm. If connecting with a Vesta inverter, a two-core communication cable can be used to connect to communication port 1 and communication port 3.

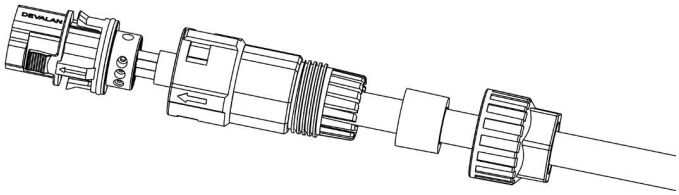


- Open the communication terminal package, the connector accessories are as follows.

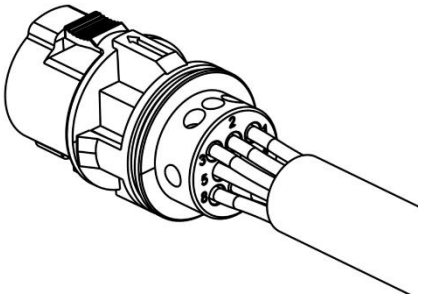


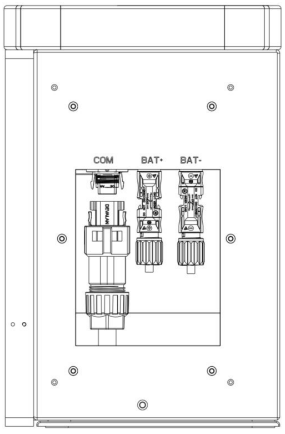
Wire end housing Threading housing Waterproof nut Dismantling wrench

- Route the communication cable through each part as shown in the figure below.



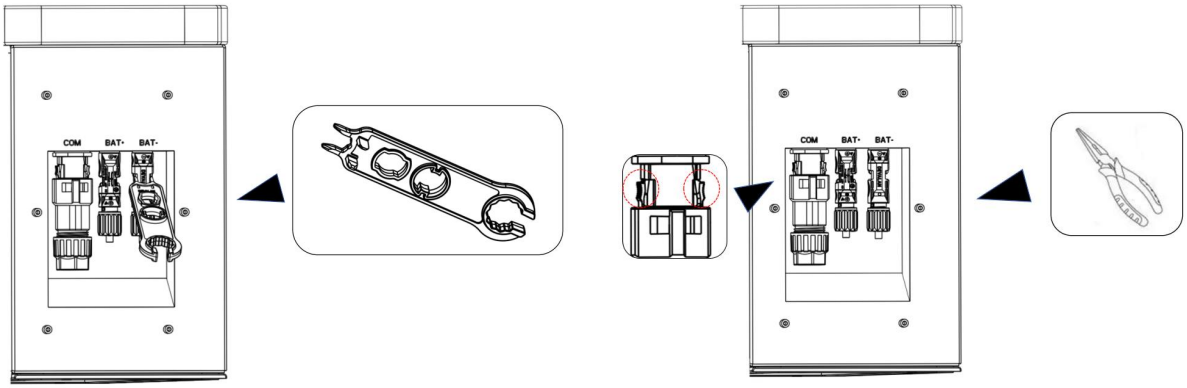
- Connect the communication cables to the terminal holes in accordance with the signal definitions, and then tighten the screws (torque: 0.2-0.4 N·m). The screws are M2 screws, and we recommend using a PH0 screwdriver bit.
- Dock the threading shell with the wire end shell, when you hear a 'click' sound, it indicates that the docking is complete, and tighten the waterproof nut.
- Remove the dust cap from the COM connector socket of the inverter and plug the connector into the socket. Secure the latch to complete the connection.
- Remove the inverter COM connector socket dust cap, plug the connector into the connector socket, and complete the snap lock.



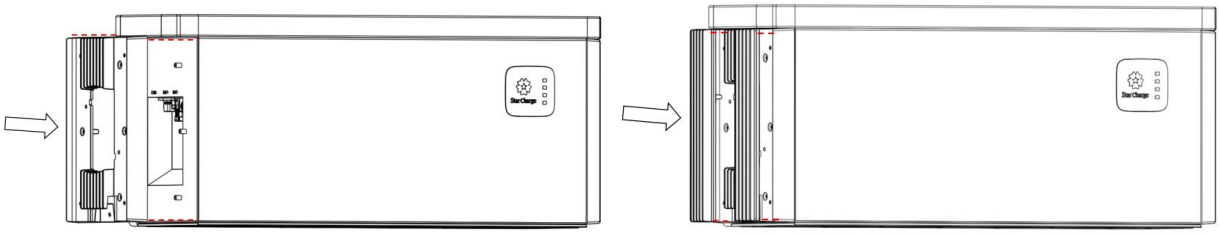


If it is necessary to detach the BAT or communication plug, please refer to the steps below.

- Use the BAT terminal-specific disassembly tool to clamp the latch while detaching the connector. Once this is done, the disassembly is complete.
- Use standard needle-nose pliers to clamp the latches at both ends of the communication terminal while detaching the communication connector. Once this is done, the disassembly is complete.



- Once the DC terminals and communication terminals are properly installed, proceed to sequentially reinstall the end cap and its decorative components.



8 System Commissioning

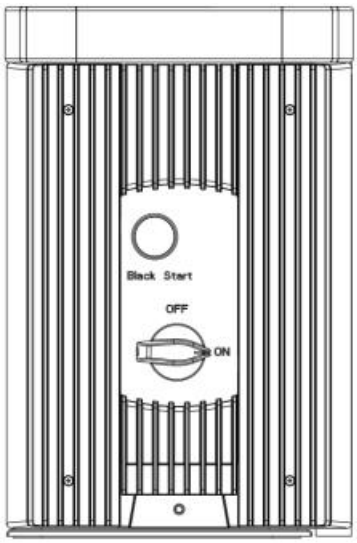
DANGER	Wear specialized protective equipment and use dedicated insulated tools to avoid electric shocks or short circuits.
DANGER	Before the equipment is put into operation for the first time, ensure that the parameters are set correctly by professional personnel. Incorrect parameter settings may result in noncompliance with local grid connection requirements and affect the normal operations of the equipment.
CAUTION	For the initial installation of the vBox, it is necessary to calibrate the battery SOC (State of Charge). This involves a full charge and discharge cycle: fully charge the battery to 100% SOC and then completely discharge it to 0% SOC.

8.1 Check Before Power-On

- Ensure that the battery installation is correct and reliable.
- Ensure that the cables are routed properly and meet the installation requirements mentioned above.
- Ensure that there are no burrs left after cutting the cable ties.
- Ensure that the PE cable is connected correctly and reliably.
- Ensure that all safety switches on the equipment are OFF before powering on.
- Ensure that the installation space is proper and tidy.

8.2 System Power-On

Step 1: Set the safety switch on the right side of the vBox-7KW-C to ON.

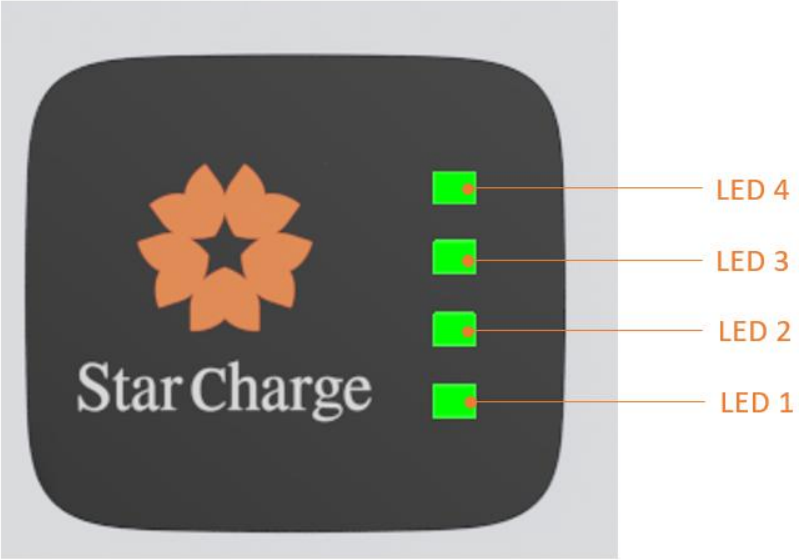


Step 2: Press the "Black Start" button and hold it for 7 to 10 seconds. Release the button when the lights on the front display panel begin to flash in a cycle.

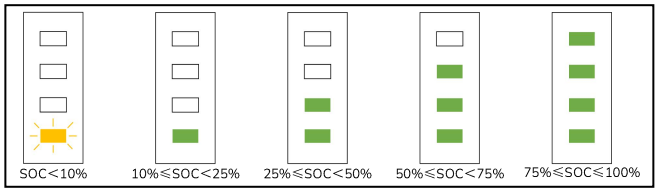
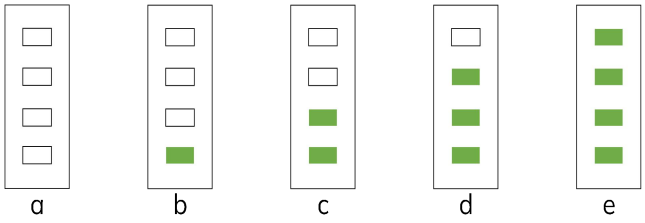
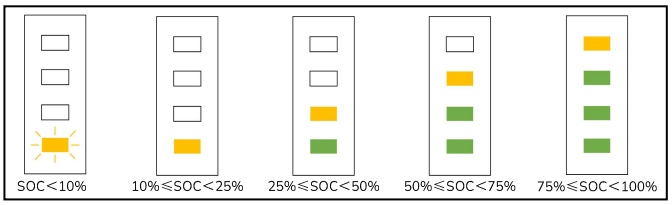
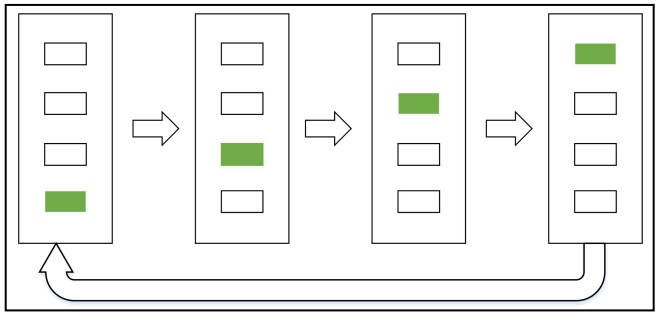
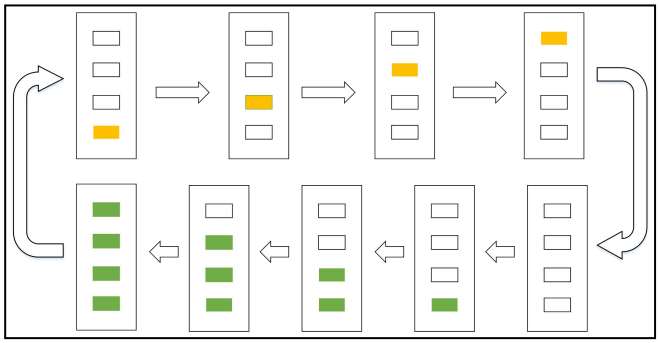
After powering on, the system will take about 1 minute for battery self-check. Once complete, the panel lights will stop flashing, indicating the end of the process. Under normal conditions, the panel will display the current battery level after the process. If any abnormal indicators appear, refer to the fault alarm table for appropriate actions.

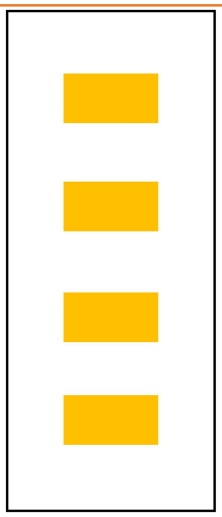
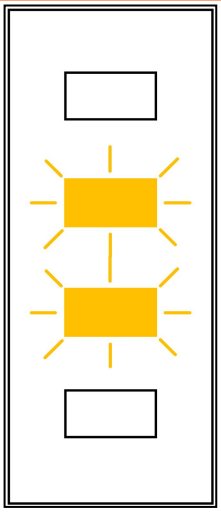
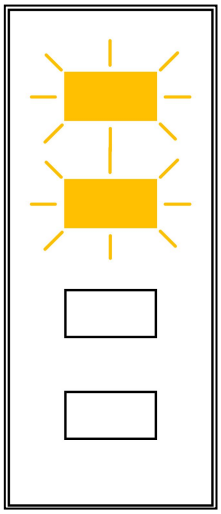
System Operating Status Description

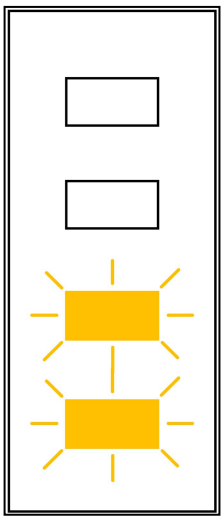
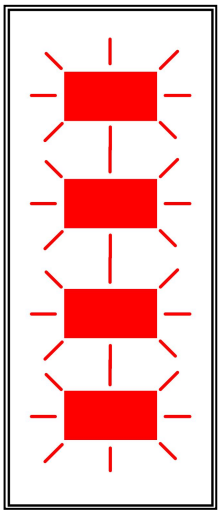
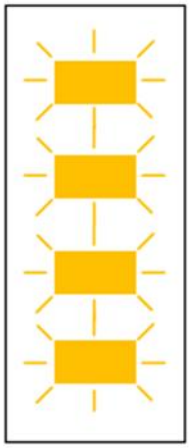
Panel Display



- After the system is powered on, the panel lights will display different statuses based on the charging and discharging status of the vBox-3.5-M.
- Normal status: Steady green light.

Category	No.	Status	Display	Description
				
Normal Status	1	Standby		
	2	Charging		SOC < 10%: a→b→c→d→e→a; 10%≤SOC < 25%: b→c→d→e→b; 25%≤SOC < 50%: c→d→e→c; 50%≤SOC < 75%: d→e→d; 75%≤SOC≤100%: e
	3	Discharging		
	4	Battery Self-Check		
	5	SOC Auto-Calibration (During Charging)		

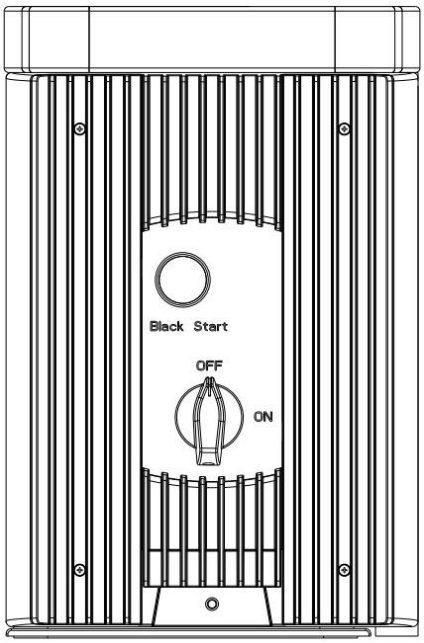
	6	Uncalibrated SOC		
Fault Status	1	Overtemperature Fault/Communication Fault		
	2	PCS Overvoltage/ Undervoltage Fault		

	3	Battery Overvoltage/ Undervoltage Fault		
	4	Low Auxiliary Power Voltage/ Startup Failure		
	5	Other Errors (Battery Overcurrent/ Bus Hardware Overvoltage/ First Line Inductor Overcurrent/ Second Line Inductor Overcurrent/ Battery Cell Over/Undervoltage/BMS Level 2 and Level 3 Faults)		

- Fault state after startup: Four yellow lights flashing.
- Startup failure fault: Four red lights flashing.
- During initial use, SOC automatic calibration is performed, and the four lights light up in yellow from bottom to top in sequence.

9 Maintenance

- When powering off the vBox (including vBox-3.5-M and vBox-7KW-C), rotate the manual isolation switch counterclockwise 90 degrees to the OFF position to disconnect the inverter and other downstream systems from the vBox.
- After the system powers off, wait at least five minutes and always wear protective gloves when performing any operation or maintenance. Residual electricity and heat may still be present and need to dissipate.
- This system does not support deficit power compensation without a photovoltaic system.



9.1 Routine Maintenance

To ensure that the battery can operate properly for a long term, please perform routine maintenance.

vBox does not require pre-scheduled preventative maintenance. The only maintenance required by an owner is to keep the vBox unit free and clear of debris, especially around the air intake and exhaust.

The owner is responsible for ensuring the vBox system is operational; this can be confirmed by the app.

9.2 Troubleshooting

For the vBox system only, we classify faults into two levels: significant faults and minor faults.

- Significant faults: Due to abnormalities in the vBox-3.5-M or the downstream system, the vBox system is unable to operate normally and may experience shutdown or downtime. In addition, the vBox-7KW-C may not operate normally and may experience shutdown or downtime due to damage to critical components in the internal module.
- Minor faults: Some non-critical components of the vBox system fail, and the system can still operate normally as a whole after adjustment.

Fault ID	Fault Name	Fault Severity	Possible Cause	Troubleshooting Suggestion
400/ 401	vBox Inductor Overcurrent Fault	Significant	1. Internal battery component failure in vBox-3.5-M module. 2. Internal circuit or critical component failure in vBox-7KW-C module.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
402	vBox Battery Low Voltage Fault	Significant	1. Abnormal voltage status detected in vBox-3.5-M by vBox-7KW-C. 2. The isolation switch on the vBox-3.5-M side not closed. 3. Contactors on the vBox-3.5-M side not closed.	1. Check the connection of the plug connector in the vBox system. 2. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 3. Sequentially close PV SWITCH, vBox system isolation switch and the AC

				grid-side switch of the downstream system for trial operation. 4. If the fault persists, contact the dealer or StarCharge's customer service center.
403	vBox Battery Voltage High	Significant	1. Abnormal voltage status detected in vBox-3.5-M by vBox-7KW-C. 2. Internal battery component failure in vBox-3.5-M module.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
404	vBox Bus Voltage Too Low	Significant	1. Internal component damage in the power module. 2. Power module self-check not completed, bus voltage not fully established. 3. Bus-side isolation switch not closed. 4. Cables of the vBox system not properly connected.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Refer to the product installation instructions and check some power connection cables of the vBox system. 3. After ensuring the correct power wiring of the vBox system, proceed to sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream for trial operation. 4. If the fault persists, contact the dealer or StarCharge's customer service center.
405/ 413	vBox System Bus Voltage High	Significant	1. High bus voltage established by the downstream system, internal system abnormalities. 2. Cables of the vBox	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Refer to the product installation

			system not properly connected. 3. Abnormal downstream equipment.	instructions and check some power connection cables of the vBox system. 3. After ensuring the correct power wiring of the vBox system, proceed to sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream for trial operation. 4. If the fault persists, contact the dealer or StarCharge's customer service center.
406/ 412	vBox High Current Fault	Significant	1. Internal battery component failure in vBox-3.5-M module. 2. Internal circuit or critical component failure in vBox-7KW-C module.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
408	vBox Auxiliary Power Supply Low	Significant	1. Failure to fully collect battery and bus-side voltage in the auxiliary power supply voltage acquisition. 2. Failure of some components in the auxiliary power supply circuit.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
409/ 410	vBox-7KW-C Internal Module Overtemperatur e	Minor	1. High enclosure sealing and moderate ventilation at the installation position of vBox-7KW-C module. 2. High ambient temperature at the	1. Check whether the ventilation of the installation position of vBox-7KW-C is good, whether there are large objects attached to the radiator part, and whether the ambient temperature exceeds the maximum allowable working environment

			working location of vBox-7KW-C module. 3. Abnormal operation of vBox-7KW-C module.	temperature range. 2. If the ventilation is moderate or the ambient temperature is too high, adjust the environmental ventilation and heat dissipation conditions. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
420/ 426	vBox-7KW-C Internal Module Abnormality	Significant	1. Failure of internal circuit or critical component in vBox-7KW-C module affecting module operation.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.
427/ 428	vBox System BMS Reporting Fault	Significant	1. Faults in internal battery component, connectors, etc. of the vBox-3.5-M module. 2. Faults in internal circuit, critical components, communication module, etc. of the vBox-7KW-C module.	1. Disconnect the AC grid-side switch of the downstream system, PV SWITCH, and vBox system isolation switch. Wait for more than 5 minutes. 2. Sequentially close PV SWITCH, vBox system isolation switch and the AC grid-side switch of the downstream system for trial operation. 3. If the fault persists, contact the dealer or StarCharge's customer service center.

- Tip 1: If you need to replace the power cable during fault maintenance, please replace it according to the cable standard in the instructions for use.
- Tip 2: If you need to replace the communication cable during fault maintenance, please replace it according to the standard cable in the instructions for use.
- Tip 3: Please power on within 24 hours after the first maintenance before use. Please do not power down for more than 24 hours after each maintenance in the later period.

9.3 System Protection

- Do not open the battery system casing for maintenance.
- To avoid direct damage to the vBox system caused by certain faults, in addition to maintenance methods, the vBox system itself is designed with protection function against certain types of faults.
- The protection range includes the system battery voltage, bus voltage, battery-side current, system temperature, and auxiliary power supply.
- The type of protection is divided into recoverable fault protection and non-recoverable fault protection.
- The overcurrent protection is achieved through parallel connection with built-in fuses. The selection and specifications of the fuses are as follows:

Model	Rated Voltage	Rated Current
RS308-PV-3EA30A	DC1000V	30A

Protection Name	Protection Range	Protection Type
Battery-side Overcurrent Protection	1. Overcurrent on the battery side of the vBox system. 2. Overcurrent in the battery-side branch of the vBox system.	Non-recoverable protection
Single-cell Battery Voltage Protection	Undervoltage of single-cell battery in the vBox system	Recoverable protection
Battery-side Overvoltage Protection	Overvoltage of the battery-side voltage in the vBox system	Non-recoverable protection
Bus-side Over/Undervoltage Protection	1. Overvoltage of the bus voltage on the PCS side of the vBox system 2. Under-voltage of the bus voltage on the PCS side of the vBox system	Non-recoverable protection
Auxiliary Power Supply Protection	Under-voltage of the auxiliary power supply within the vBox system	Recoverable protection
Overtemperature Protection Faults	1. Overheating of the operating environment inside the vBox system 2. Overheating of the power dissipation part inside the vBox system.	Recoverable protection

BMS Level 3 Faults	1. Moderate alarm for battery feed current overload in vBox system 2. Moderate alarm for battery pole overtemperature in vBox system 3. Moderate alarm for fast charging overcurrent in vBox battery system 4. Moderate alarm for battery pack terminal overvoltage in vBox system 5. Moderate alarm for battery module overtemperature in vBox system 6. Moderate alarm for battery supply overvoltage in vBox system 7. Moderate alarm for battery supply undervoltage in vBox system 8. Moderate alarm for charging overtemperature in vBox battery system 9. Moderate alarm for large cell voltage difference in vBox system 10. Moderate alarm for single-cell undervoltage in vBox system 11. Moderate alarm for single-cell overvoltage in vBox battery system 12. Moderate alarm for low insulation in vBox battery system 13. Moderate alarm for discharge overcurrent in vBox battery system 14. Moderate alarm for battery module undervoltage in vBox system 15. Moderate alarm for battery module overvoltage in vBox system 16. Moderate alarm for rapid temperature rise in vBox battery system 17. Moderate alarm for large SOC difference in vBox battery system 18. Moderate alarm for large single-cell temperature difference in vBox system 19. Moderate alarm for discharge undertemperature in vBox battery system	Non-recoverable protection

	20. Moderate alarm for discharge overtemperature in vBox battery system 21. Moderate alarm for charging undertemperature in vBox battery system	
Communication Timeout Faults	1. BMS communication lost in vBox system 2. 485 communication lost in vBox system	Recoverable protection

10 Handling the Energy Storage

10.1 Removing the Energy Storage

- Disconnect the Energy Storage from the DC input and AC output. Wait for 5 minutes to ensure that the Energy Storage is completely powered off.
- Disconnect the communication connection and other optional monitoring modules. Remove the Energy Storage from the wall-mounted panel.
- If necessary, remove the wall mounting bracket.

10.2 Packaging

If possible, please use the original packaging to pack the vBox. If the original packaging is not available, an equivalent packaging box that meets the following requirements can also be used:

- Can bear a weight of 30 kilograms.
- Includes handles.
- Can be completely sealed.

10.3 Storage

Please comply with the following storage requirements to ensure safety and prevent potential hazards.

- The batteries should be stored indoors, away from direct sunlight or rain, in a dry and well-ventilated area with a clean surrounding environment. There should be no significant radiation such as infrared rays, no organic solvents or corrosive gases, and no presence of conductive dust. Keep them away from heat sources and open flames.
- In the event of battery malfunctions such as carbonization, leakage, swelling, or water ingress, they should be promptly transferred to a separate storage area for hazardous materials. The distance from combustible materials should be no less than 3 meters, and they should be scrapped and disposed of as soon as possible.
- When storing the batteries, they should be placed correctly according to the markings on the packaging boxes. It is strictly prohibited to store them upside down, on their sides, or in an inclined position. When stacking, follow the stacking requirements indicated on the outer packaging.

- Store the batteries separately and avoid mixing them with other equipment or stacking them too high. For sites with a large number of batteries, it is recommended to have fire-fighting facilities that meet the requirements, such as fire sand and fire extinguishers.

CAUTION

It is recommended to use the batteries in a timely manner. For batteries that are stored for a long time, periodic recharging is necessary to prevent battery damage.

- The storage environment must comply with local regulations and standards.
- Store them in a clean, dry, and well-ventilated area, and protect them from dust and moisture. They should not be exposed to rainwater or standing water.
- The ambient air should not contain corrosive or flammable gases.
- Storage environment requirements:
  Temperature: -20°C to 55°C, recommended storage temperature: 0°C to 25°C.
  Relative humidity: 5% to 95%.
- For batteries that have exceeded their storage period, they should be inspected and tested by professionals before being put into use.
- During storage, relevant documentation that meets the product storage requirements should be kept, such as temperature and humidity logs, photos of the storage environment, and inspection reports.
- When shipping the batteries, follow the principle of first in, first out.
- The storage time should be calculated based on the most recent charging time indicated on the battery's outer packaging. Update the most recent charging time after each recharge.
- The warehouse keeper should collect battery storage information every month and periodically report the battery inventory information to the planning department. The batteries that have been stored for 6 months should be recharged in a timely manner.
- Batteries can be charged for a maximum of three times during storage. Dispose of batteries if the maximum charge times are exceeded.

CUSTOMER SERVICE

For any questions, please contact customer service.

Before contacting the customer service:
View the troubleshooting measures described in the "Troubleshooting" section of this manual.

ABOUT US

China Office: No.39 Longhui Road, Wujin High-tech Zone, Changzhou, Jiangsu, China

Europe Office: Rugbyring 12, 65428 Rüsselsheim, Germany

APAC Office: 2 Kung Chong Road, #05-01 AA Centre, Singapore 159140