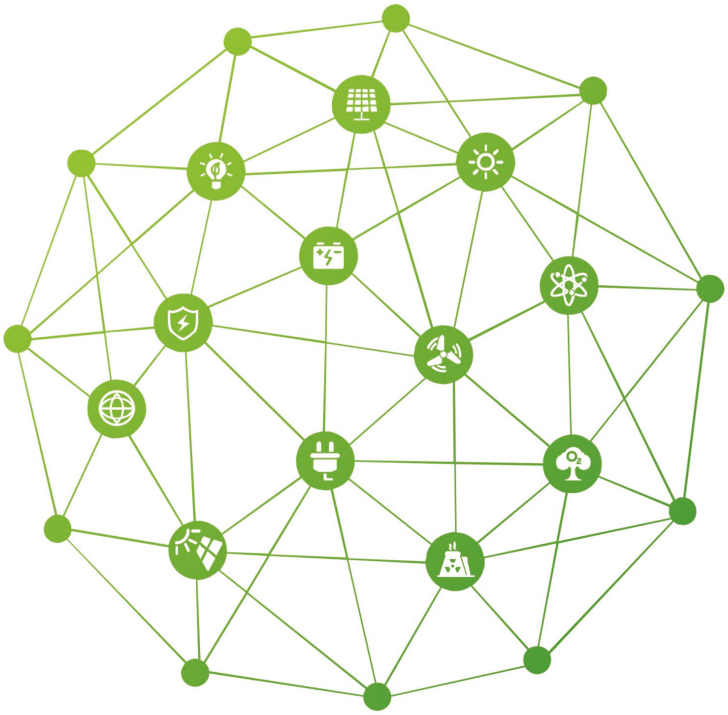
KOYOE



Home Energy Storage System-Battery

User Manual

KY-102V40AH/ KY-204V40AH/ KY-306V40AH/ KY-408V40AH/ KY-510V40AH

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This manual focuses on product information, installation guides, operation and maintenance. This manual cannot contain complete information about photovoltaic systems.

Scope of application

This manual only applies to KY-102V40AH/ KY-204V40AH/ KY-306V40AH/ KY-408V40AH/ KY-510V40AH. Do not use as a reference manual for other products.

How to use this manual

Before using or operating the inverter, please read this manual and other relevant documents carefully。

Please keep this manual and other relevant documents safe for reference.

Preface

Overview

This document mainly introduces the KOYOE home energy storage battery management system, divided into battery pack and main control, the document is mainly the product introduction, application scenarios, installation instructions, system maintenance and related technical data of these two products.

Symbol Description

The following flags may appear in this article, and they represent the following meanings.

Symbol	Instruction
Danger	Indicates hazards with a high risk of death or serious injury, if not avoided
Warning	Represents a hazard with a medium risk that, if not avoided, could result in death or serious injury
Caution	Indicates a hazard with a low level of risk that, if not avoided, could result in minor or moderate injury
Notice	Used to deliver equipment or environmental safety alert information. Failure to avoid this may result in device damage, data loss, reduced device performance, or other unpredictable results. "Notice" does not involve personal injury.
🕮	A supplemental explanation of the key information in the text . "Instructions" are not safety warning information and do not involve information about persons, equipment and environmental harm .

Modify Records

Modification records accumulate a description of each document update. The latest version of the documentation contains updates for all previous document versions.

Document Version

V1 First official release 2023-1-04

V2 Second official release 2023-5-23

Contents

1 Security Considerations

1.1 Universal Security

Statement

When installing, operating and maintaining equipment, you must first read this manual and follow the identification on the equipment and all safety precautions in the manual. When a new product is first unpacked, check the product and packing list first, and contact your local distributor if the product is damaged or missing parts.

The terms "Notices", "Precautions", "Warnings" and "Hazards" in the manual do not represent all safety precautions to be observed, but only supplement all safety precautions. KOYOE Energy does not assume any responsibility caused by violation of general safe operation requirements or violation of safety standards for design, production and use of equipment.

This equipment should be used in an environment that meets the requirements of the design specifications, otherwise it may cause equipment failure, and the equipment function abnormality or component damage, personal safety accidents, property damage, etc. caused by this equipment are not within the scope of equipment quality assurance.

Installation, operation and maintenance of equipment should comply with local laws, regulations and norms. All safety precautions explained in the manual are intended to supplement local laws, regulations and norms only.

In the event of any of the following circumstances, KOYOE Energy is not liable.

- Does not operate under the conditions of use described in this manual
- The installation and use environment exceeds the provisions of relevant international or national standards.
- Disassemble, alter the product or modify the software code without authorization.
- Failure to follow the operating instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, etc.).
- Shipping damage caused by the customer's own transportation.
- Damage caused by storage conditions not meeting product requirements.
- Do not use in the areas and environments required by the product contract.
- Exceeding product life.

General Requirements

⚠ Danger

It is strictly forbidden to operate with electricity during the installation process, and the battery module must be placed in the box in an unassembled state.

- 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 recommended to use the original box for packing when handling, and it is not allowed to lift and handle through the battery terminals.
- 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.

Personal Safety

- Appropriate personal protective equipment should be worn during the operation of the equipment. If a malfunction is found that may cause personal injury or equipment damage, the operation should be terminated immediately, reported to the person in charge, and effective protective measures should be taken.
- To ensure personal safety and normal use, reliable grounding should be carried out before use.
- Do not open or damage the battery module, the released electrolyte is harmful to the skin and eyes, and should be avoided.
- Do not place extraneous items on top of the device or insert them anywhere on the device.
- Do not place flammable items around the appliance.
- The battery is strictly forbidden to be placed in fire to avoid explosion and endanger personal safety.
- Do not place the battery module in water or other liquids.
- Do not short-connect the battery module docking terminals, as short connections to the battery will cause combustion.
- The battery can cause the danger of electric shock and large short-circuit currents. When using batteries, the following precautions should be noted：

  1) Remove watches, rings or other metal objects.
  2) Tools using insulated handles.
  3) Wear rubber gloves and boots.
  4) Do not place small tools or metal parts on top of the battery module.
- Do not wash internal and external electrical parts with water or detergent.
- Do not stand or lean or sit on the device.
- When installing the battery module, if the battery module is dropped or strongly impacted, it will cause damage to the equipment and it is strictly forbidden to continue to use it, otherwise there will be safety risks (cell leakage, electric shock injury, etc.)

Battery Leakage Treatment Measures

- In the event of electrolyte leakage, the following emergency measures can be taken depending on the severity of the leakage.
- Ensure adequate ventilation. Clear all ignition sources.
- Quickly evacuate personnel to a safe area, away from the leak area and in an upwind direction.

- Use personal protective equipment. Avoid inhaling vapors, fumes, gases or wind dust.
- Take steps to prevent further leaks or spills while ensuring safety.
- When a small amount of leakage, dry sand or inert adsorption material can be used to absorb the leakage, and a large amount of leakage needs to be controlled by embankment.
- Attachments or collections should be stored in suitable closed containers and disposed of in accordance with relevant local laws and regulations.
- Remove all ignition sources and employ anti-spark tools and vandal equipment.
- In the event of a leak, avoid contact with the leaking liquid or gas. The electrolyte is corrosive and contact may cause skin irritation and chemical burns. In case of contact with battery electrolyte, the following measures need to be taken.
- Inhalation: evacuate the contaminated area, immediately transfer to fresh air, and keep breathing smooth; If breathing is difficult, give oxygen; If the patient ingests or inhales this substance, mouth-to-mouth artificial respiration shall not be performed; If breathing stops. Immediate CPR; And seek medical help immediately.
- Eye contact: Immediately rinse eyes with plenty of water for at least 15 minutes, without rubbing, and seek medical help immediately.
- Skin contact: Remove contaminated clothing immediately, wash skin-contact areas with plenty of water and soap, and seek medical help immediately.
- Ingestion: Do not induce vomiting, never feed anything from the mouth to the unconscious person, seek medical help immediately.
- Protection of first respondors: Ensure that healthcare workers understand the hazard characteristics of the product and take their own protective measures to protect themselves and prevent the spread of contamination.

Battery Recycling Treatment

- Please dispose of used batteries in accordance with local laws and regulations, and do not dispose of batteries as household waste.
- If the battery leaks or bulges, please contact technical support or the battery recycling company for disposal.
- When a battery is not available beyond its useful life, contact the battery recycling company for end-of-life disposal.

Personnel Requirements

- The personnel responsible for the installation and maintenance of KOYOE products and 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.
- The personnel who operate the equipment, including operators, trained personnel, and professionals, should have the special operation qualifications required by the local country, such as high-pressure operation, climbing, and special equipment operation qualifications.
- 🕮 **Instruction**

1.2 Electrical Safety

Grounding Requirements

- Equipment to be grounded, when installing, must first install a protective ground wire; When removing equipment, the protective ground wire must be removed last.
- The device should be permanently connected to the protected area. Before operating the equipment, the electrical connection of the equipment should be checked to ensure that the equipment is reliably grounded.

General Requirements

⚠ Danger

Before making an electrical connection, make sure that the device is not damaged, otherwise it may cause electric shock or fire

- All electrical connections must meet the country's electrical standards.
- User-supplied cables should comply with local laws and regulations.
- When performing high-voltage operation, use a special insulation tool.

1.3 Installation Environment Requirements

- It is recommended to choose a sheltered installation site or build a sunshade.
- Avoid direct sunlight or areas prone to water accumulation, the surrounding environment is clean, and there is no large amount of infrared radiation, organic solvents and corrosive gases.
- The installation location is away from fire and water sources.
- The device needs to be on a strong, flat support surface.
- Do not place flammable and explosive materials around the device.

1.4 Shipping Requirements

- The operation and service life of the equipment are related to the operating temperature, please install the equipment at the same or better than the ambient temperature.
- The upper charge temperature of this system is 55 °C, the lower charge temperature of this system is 0 °, Che upper discharge temperature of this system is 50°C and the upper discharge temperature of this system is 0 °C
- When the ambient temperature of the product exceeds 45°C or falls below -10°C, the battery charge and discharge power may be derated.
- Certified to UN38.3 (UN38.3:Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) (this product is classified as Class IX DZG).
- The products meet the transportation requirements of vehicles, ships and so on. The transport packaging box must be firm, and the outside of the box should comply with the provisions of the national standard and should have signs such as "careful handling" and "moisture-proof". Subject to external environmental influences (such as temperature, transportation, storage, etc.), the specifications of the product shall be subject to the specific

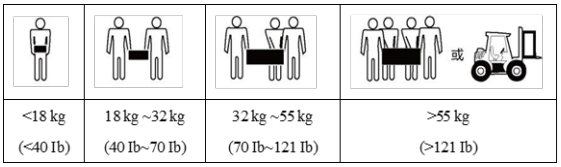
factory date.

- Should be avoided during transportation：
- Direct exposure of rain and snow or falling into the water.
- Drops or mechanical impacts.

> **Caution**
>
> If the battery leaks or bulges, it is forbidden to transport it, so please contact the battery recycling company for disposal.

Installation and Handling

- you should be prepared to bear the weight to avoid being crushed or sprained by heavy objects.



<18 kg (<40 Ib)	18 kg ~32 kg (40 Ib~70 Ib)	32 kg ~55 kg (70 Ib~121 Ib)	>55 kg (>121 Ib)

- When handling the device by hand, protective gloves should be worn to avoid injury.
- When the equipment is powered on for the first time, it needs to be operated correctly by a professional.

1.5 Maintenance and Replacement

> **Danger**
>
> During the operation of the equipment, there is a high voltage, which may produce electric shocks, resulting in death, serious personal injury or serious property damage. Therefore, before any maintenance work can be carried out, the equipment must be turned off and the safety precautions listed in this manual and other relevant documents must be strictly followed.

- Please maintain the equipment if you are familiar with the contents of this manual and have the appropriate tools and test equipment.
- Before performing maintenance work, ensure that the equipment is turned off before operating the equipment.
- The fault must be dealt with before the device can be powered back on, otherwise it may cause the fault to expand or the equipment to be damaged.
- When it is necessary to move or rewire, the product must be powered off.
- The repair of the battery should be performed or supervised by a person familiar with the battery and the precautions it requires.
- When replacing the battery, replace the same type of battery module.
- If the device is not used for a long time, it is necessary to store the battery and replenish power according to this manual.

2 Product Introduction

2.1 Product Introduction

Function

cylindrical cells for series and parallel connection to form modules, which is small in size and light in weight, easy to install and transport, and very convenient for family use; The system contains a battery BCU control unit and a cylindrical cell battery module, which can stack battery packs in series according to the required voltage level, and support up to 5 battery pack stacks with a voltage of 500V.

Model Name

Control unit BCU model：**KY-BCU020K**

Figure 2-1 model designation

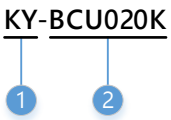


Table 2-1 Model description

No.	Meaning
1	Company Abbreviations
2	Maximum series battery capacity 20kwh

280AH Battery pack model：**KY-102V40AH**

Figure 2-2 model designation

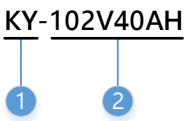


Table 2-2 Model description

No.	Meaning
1	Company Abbreviations
2	Battery voltage 102V, battery capacity 40AH

Specifications

Table 2-3 Battery pack model parameters

Parameter	KY-102V40AH
Cell type	Li-ion (LFP)
Cell capacity（Ah）	40
Grouping mode	2P32S
Rated voltage（Vdc）	102.4
Maximum voltage（Vdc）	113.6
Charge the maximum voltage（Vdc）	113.6
Discharge cut-off voltage（Vdc）	80
Rated current（A）	20
Maximum current（A）	30
Rated capacity（Wh）	4096
Size（mm）	425*340*449
Communication method	CAN
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Humidity	< 95%
Weight（kg）	42
Degree of protection	IP65
Elevation（m）	≤2000（More than 2000 load reduction）

Parameter	KY-204V40AH
Cell type	Li-ion (LFP)
Cell capacity（Ah）	40
Grouping mode	2P64S
Rated voltage（Vdc）	204.8
Maximum voltage（Vdc）	227.2
Charge the maximum voltage（Vdc）	227.2
Discharge cut-off voltage（Vdc）	160
Rated current（A）	20
Maximum current（A）	30
Rated capacity（Wh）	8192
Size（mm）	425*340*691
Communication method	CAN
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Humidity	< 95%
Weight（kg）	72
Degree of protection	IP65
Elevation（m）	≤2000（More than 2000 load reduction）

Parameter	KY-306V40AH
Cell type	Li-ion (LFP)
Cell capacity（Ah）	40
Grouping mode	2P96S
Rated voltage（Vdc）	307.2
Maximum voltage（Vdc）	340.8
Charge the maximum voltage（Vdc）	340.8
Discharge cut-off voltage（Vdc）	240
Rated current（A）	20
Maximum current（A）	30
Rated capacity（Wh）	12288
Size（mm）	425*340*933
Communication method	CAN
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Humidity	< 95%
Weight（kg）	102
Degree of protection	IP65
Elevation（m）	≤2000（More than 2000 load reduction）

Parameter	KY-408V40AH
Cell type	Li-ion (LFP)
Cell capacity（Ah）	40
Grouping mode	2P128S
Rated voltage（Vdc）	409.6
Maximum voltage（Vdc）	454.4
Charge the maximum voltage（Vdc）	454.4
Discharge cut-off voltage（Vdc）	320
Rated current（A）	20
Maximum current（A）	30
Rated capacity（Wh）	16384
Size（mm）	425*340*1175
Communication method	CAN
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Humidity	< 95%
Weight（kg）	132
Degree of protection	IP65
Elevation（m）	≤2000（More than 2000 load reduction）

Parameter	KY-510V40AH
Cell type	Li-ion (LFP)
Cell capacity（Ah）	40
Grouping mode	2P160S

Rated voltage（Vdc）	512
Maximum voltage（Vdc）	568
Charge the maximum voltage（Vdc）	568
Discharge cut-off voltage（Vdc）	400
Rated current（A）	20
Maximum current（A）	30
Rated capacity（Wh）	20480
Size（mm）	425*340*1417
Communication method	CAN
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Humidity	< 95%
Weight（kg）	162
Degree of protection	IP65
Elevation（m）	≤2000（More than 2000 load reduction）

Table 2-4 BCU Model Parameters

Parameter	**KY-BCU020K**
Start-up voltage（Vdc）	80
Maximum input voltage（Vdc）	600
Rated current（A）	20
Maximum current（A）	30
Match the battery pack model	KY-102V40AH
Number of battery pack strings	1~5
Communication method	CAN
Size（mm）	425*340*117
Weight（kg）	9
Degree of protection	IP65
Communication method	CAN/RS485
Operating temperature（℃）	0~55
Storage temperature（℃）	-20~45
Elevation（m）	≤2000（More than 2000 load reduction）

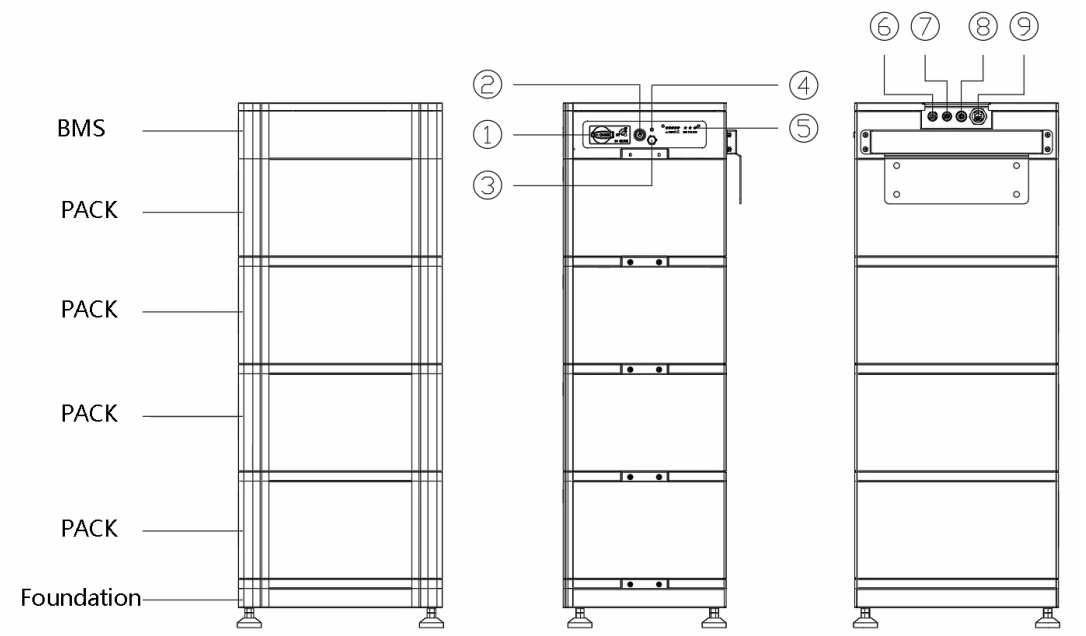
🕮 **Instruction**

2.2 Description of Appearance

System Interface

Introduction to the overall appearance of stacked battery packs。

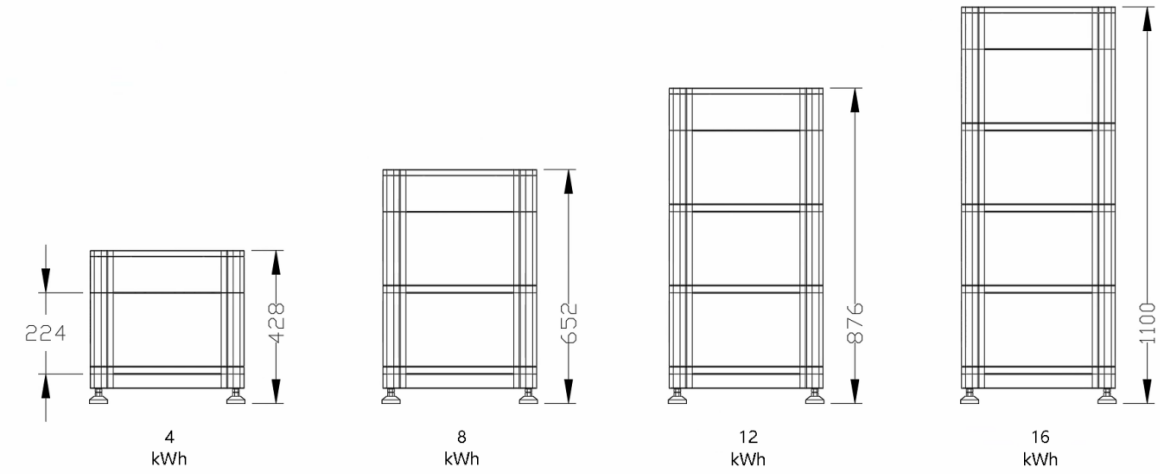
Figure 2-3 Overall appearance of the battery system



(1) DC knob switch **(2)** Pushbutton switch **(3)** Breathable valve
(4) Antenna hole **(5)** SOC power display **(6)** Positive output
(7) Negative output **(8)** CAN interface **(9)** RS485 interface

Description of Atack Capacity

Figure 2-4 Overall appearance of the battery system



As shown in the figure above, the upper limit of the system stack is 20kwh, that is, 5 battery packs are stacked, the figure shows the size of the commonly used 1~4 battery pack stacking system, the connection between the battery packs is connected in series, please pay attention to whether the system voltage after series is in line with the load voltage range.

Nameplate

Battery Pack nameplate

Figure 2-5 Nameplate

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Sample Name	Rechargeable Li-ion Battery
Battery Model	KY-102V40AH
Serial Number	
Cell Type	LiFeP04
Operating Temperature	0°C~55°C
Energy	4096Wh
Nominal Voltage	102.4V
Max Current	30A
Nominal Capacity	40Ah
Voltage Range	89.6~113.6V
Authentication	IFpR/41/135/[3252P]E/0+45/90
Weight	42kg
Ingress Protection	IP65

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Sample Name	Rechargeable Li-ion Battery
Battery Model	KY-204V40AH
Serial Number	
Cell Type	LiFeP04
Operating Temperature	0°C~55°C
Energy	8192Wh
Nominal Voltage	204.8V
Max Current	30A
Nominal Capacity	40Ah
Voltage Range	179.2~227.2V
Authentication	IFpR/41/135/[64S2P]E/0+45/90
Weight	72kg
Ingress Protection	IP65

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Sample Name	Rechargeable Li-ion Battery
Battery Model	KY-306V40AH
Serial Number	
Cell Type	LiFeP04
Operating Temperature	0°C~55°C
Energy	12288Wh
Nominal Voltage	307.2V
Max Current	30A
Nominal Capacity	40Ah
Voltage Range	268.8~340.8V
Authentication	IFpR/41/135/[96S2P]E/0+45/90
Weight	102kg
Ingress Protection	IP65

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Sample Name	Rechargeable Li-ion Battery
Battery Model	KY-408V40AH
Serial Number	
Cell Type	LiFeP04
Operating Temperature	0°C~55°C
Energy	16384Wh
Nominal Voltage	409.6V
Max Current	30A
Nominal Capacity	40Ah
Voltage Range	358.4~454.4V
Authentication	IFpR/41/135/[128S2P]E/0+45/90
Weight	132kg
Ingress Protection	IP65

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Sample Name	Rechargeable Li-ion Battery
Battery Model	KY-510V40AH
Serial Number	
Cell Type	LiFeP04
Operating Temperature	0°C~55°C
Energy	20480Wh
Nominal Voltage	512V
Max Current	30A
Nominal Capacity	40Ah
Voltage Range	448~568V
Authentication	IFpR/41/135/[160S2P]E/0+45/90
Weight	162kg
Ingress Protection	IP65

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KOYOE

Battery Model	KY-BCU020K
Input Voltage Range	80~600V
Operating Temperature	0°C~55°C
Start voltage	80V
Max Current	30A
Communication	CAN/RS485
Weight	9kg±1
Ingress Protection	1P65

Tel: 0086-512-65139308 E-mail: info@koyoe.com
Web: www.koyoe.com
Add: No. 40, Wangwu Road, Wuzhong District, Suzhou, Jiangsu Province, China

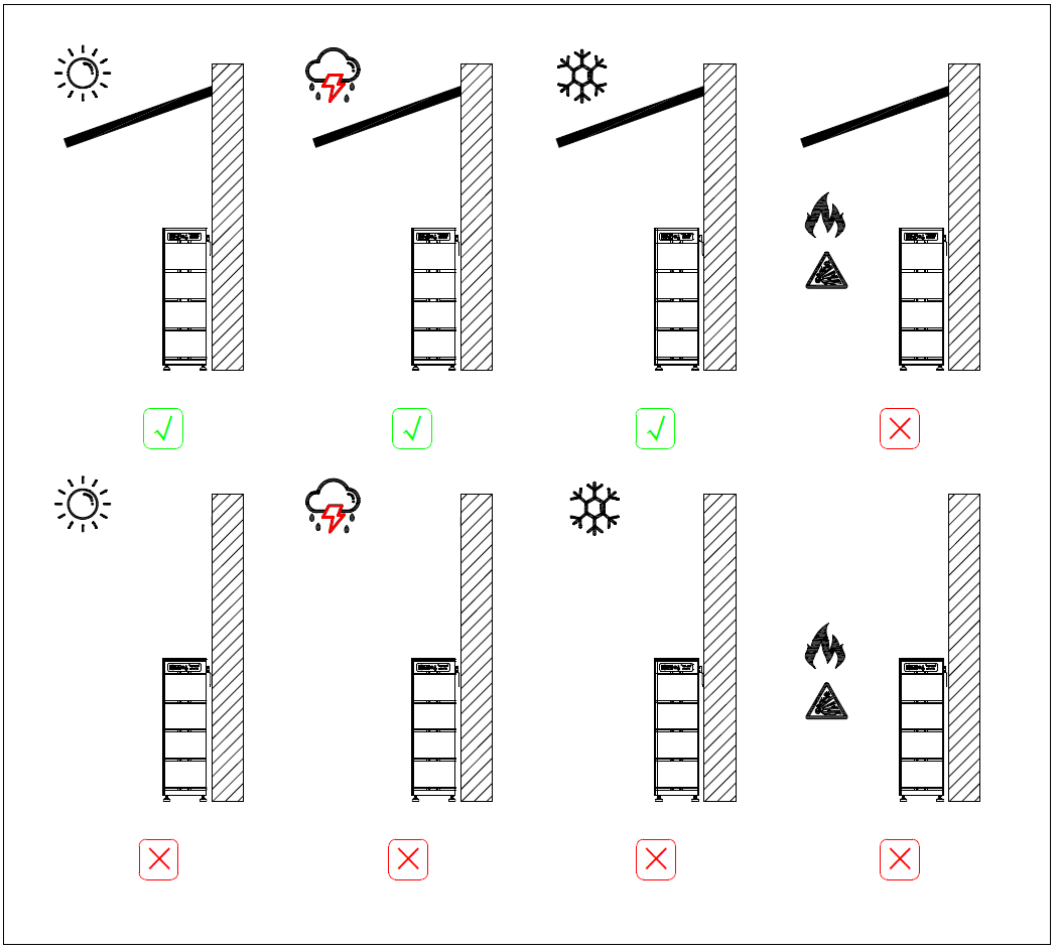
3 Application Scenarios

KOYOE home energy storage stacking battery system is mainly used in daily household use, the overall home appliance style, protection level IP65, indoor and outdoor installation can operate perfectly。

Schematic Installation Environment

KOYOE home energy storage stacking battery system is recommended to be installed indoors or under the eaves and other sheltered places, such an installation environment can maximize product performance, direct exposure to outdoor environment may reduce product service life or product load operation, which is not conducive to the overall system operation.

Figure 3-1 Recommended installation environment



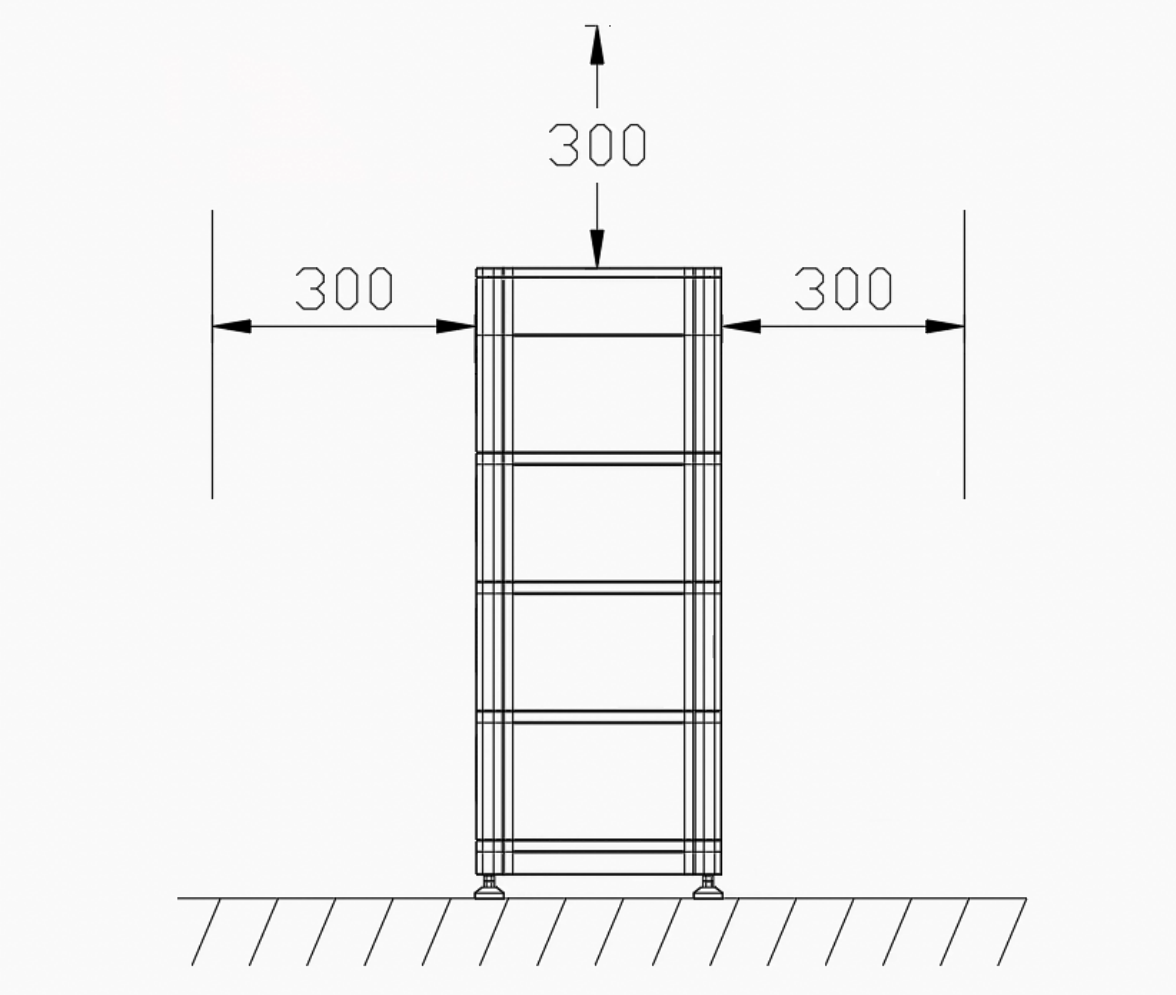
Warning

When installed in high-risk environments, such as high temperature, high radiation, near water sources, etc., the system may work abnormally, reduce the service life, or even be damaged and scrapped.

Space Schematic

KOYOE home energy storage stacked battery system has the following space environment requirements, reserve the following space is conducive to the heat dissipation of the overall system, smaller installation space will not lead to abnormal product function, but may cause the system temperature to be too high and reduce load operation.

Figure 3-2 Installation space requirements



4 System Installation

4.1 Pre-installation Check

Check the Outer Packaging

Before unpacking the battery system components, check the outer packaging for visible damage such as holes, cracks, or other signs of possible damage inside, and check the model number. If there are any packaging abnormalities or model numbers that do not match, do not open and contact your dealer as soon as possible.

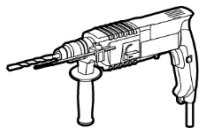
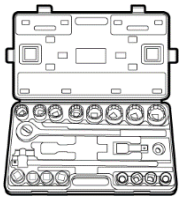
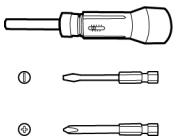
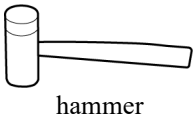
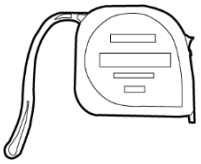
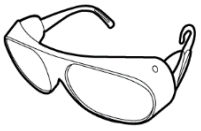
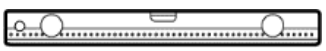
Check Deliverables

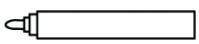
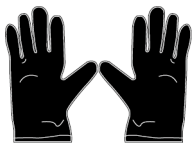
After unpacking the battery system, check that the deliverables are complete and free of any visible external damage. If any items are missing or there is any damage, please contact your dealer.

🕮 Instruction

For the number of deliverables shipped with the box, please refer to the Packing List inside the box.

4.2 Tool Meter Preparation

Tools		
 drills（Φ8mm）	 Torque socket wrench	 Torque screwdriver
 hammer	 Steel tape measure	 multimeter
 Cable ties	 Protective goggles	 Horizontal ruler

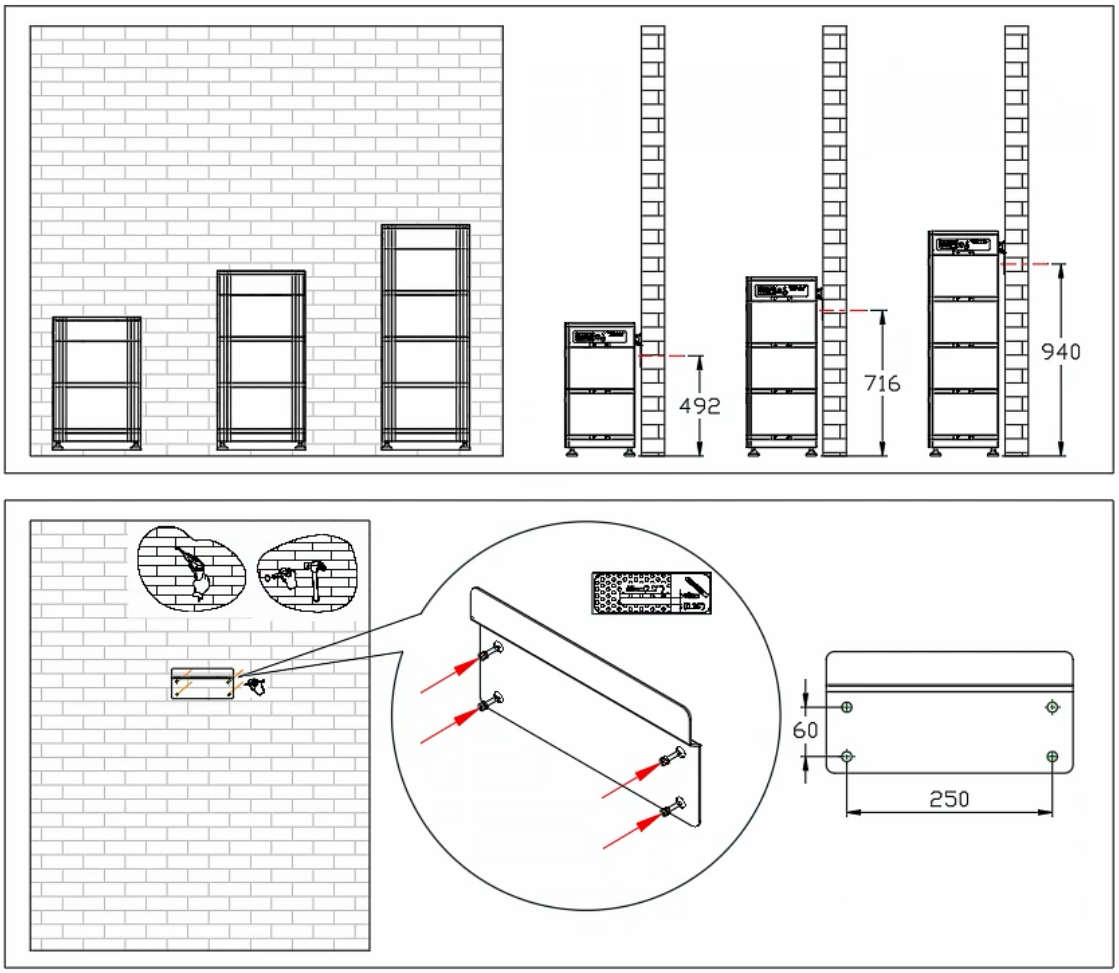
		
Markers	Safety gloves	Safety shoes

4.3 Installation Instructions

Wall Mount Bracket Installation

It is recommended to install against the wall and install wall brackets in the system to prevent accidents caused by dumping; The installation of the wall bracket is shown in the figure below, different stacking systems correspond to different wall bracket installation positions, the height size shown in the figure is the hole position of the wall bracket, because the base has a height adjustment function, the actual height needs to be specifically measured to determine

Figure 4-1 Wall mount bracket installation



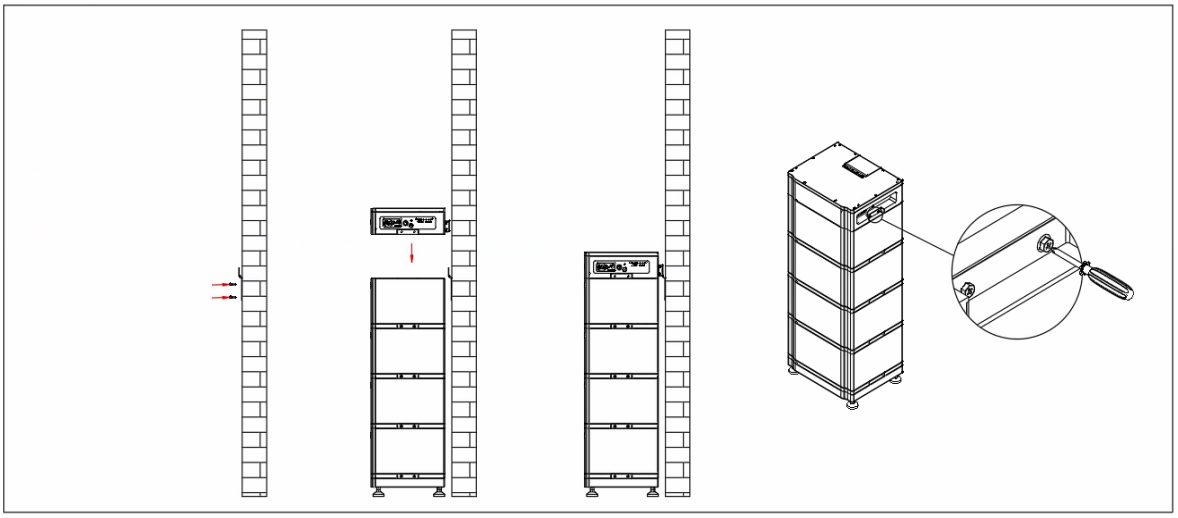
Warning

Systems that do not install wall brackets may tip over, fall on their side, and may cause system damage or even scrap.
When the wall mount is installed, professional drillers are required to operate to prevent damage to lines and water pipes.
The ground at the installation site needs to meet the load-bearing requirements, and the ground is flat and dry.

Illustration of Stacking Installation

The stacking installation steps are from bottom to top, followed by base, battery pack, main control, and finally the stacking of the main control should be stuck into the wall bracket, and after all stacking and installation is completed, screw fixing between the modules is carried out at the side handle position; After all the completion of the wiring harness connection, as well as the installation of the ground wire, the product debugging can be carried out after all are completed.

Figure 4-2 Illustration of stacked installation



It is recommended to use it with our inverter. You can download the real-time monitoring information of the battery from our monitoring platform. If you are connected with other inverter manufacturers, you need to operate according to the inverter use guide.

As shown in the above figure, batteries are stacked without wiring harness connection. User only needs to connect the wiring harness to the main control module, to connect the battery system to the inverter. The main control module is detailed in Section 2.2. The following wiring harness needs to be provided by the user, and the network cable is the standard wiring harness, which needs to be purchased by the user.

* For the Australian market, an overcurrent protection and isolation device that operates both positive and negative conductors is required between the battery system and the inverter

Battery and inverter connection mode

Interface	Description	Connection Interface for PCS	Description

Positive output	Positive output of the battery module	BAT+	Connect the battery port of the PCS
Negative output	Negative output of the battery module	BAT-	Connect the battery port of the PCS
CAN interface	Communication interface of battery module	COM	Connect the communication port of PCS
RS485 interface	Communication interface of battery module	/	External USB upgrade
Grounding	Ground connection	Grounding	Ground connection

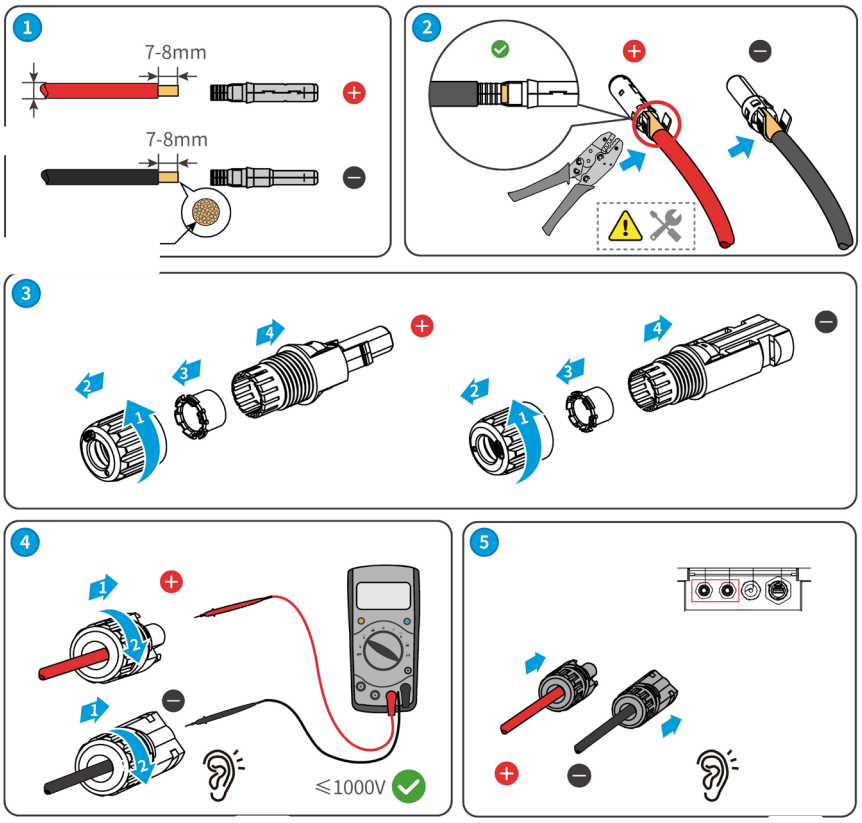
User supplied cables

	Cable	Type	
1	Battery positive cable	UL10070 8AWG red	Only terminals are provided
2	Battery negative cable	UL10070 8AWG red	Only terminals are provided
3	CAN interface	/	Not provided, purchase of finished products
4	RS485 interface	/	Not provided
5	Ground wire	UL10070 12-10AWG yellow green	Not provided

* All wire harnesses are not provided and need to be made by the user

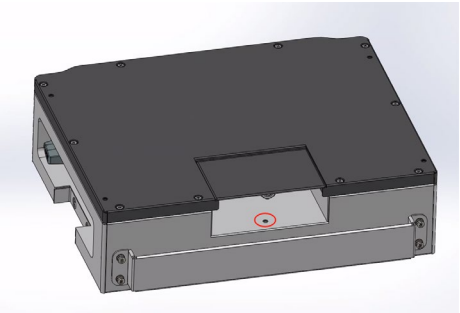
Battery Side

The battery side wire bundle is fabricated as shown in Figure

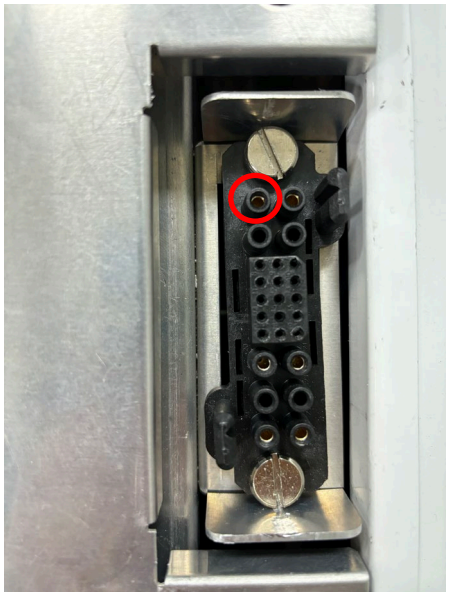


Ground Connection

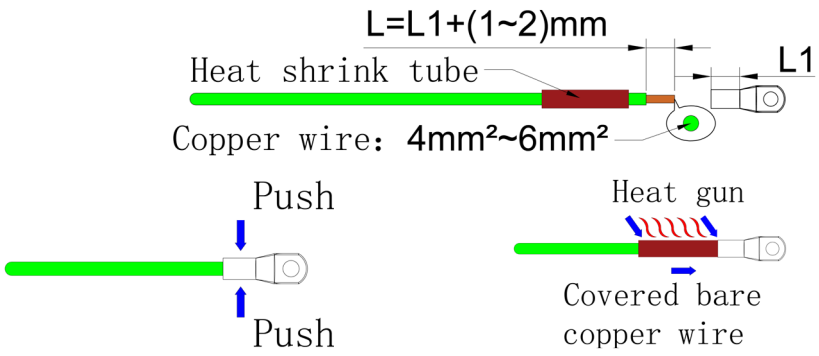
The ground port is shown in the following figure



The batteries are installed by plug-ins, as shown in the figure on the right, which is the ground interface of each battery. When the batteries are installed by plug-ins, the ground wire will be directly connected without additional connection. Finally, all the ground wires will be exported through the ground interface of the main control module and connected with the ground port of the inverter (The battery interface of the main control module is shown in the left picture).



The fabrication of the grounding harness is shown in the figure.



Communication Connection

The communication line of the main control module is shown in the left picture, and the communication line of the battery package is shown in the right picture. The communication connection between the batteries is directly connected through the plug-in installation. Finally, it is exported through the communication interface of the main control module and connected to the communication end of the inverter.

Communication harness users buy by themselves, as shown below

5 System Debugging

5.1 Check Before Powering up

Table 5-1 Inspection items and acceptance criteria

No.	Checking Items	Acceptance Criteria
1	The module is installed in place	Correct installation and reliable docking。
2	Reliable grounding	The ground wire connection is correct and reliable。
3	Disconnect the switch	“DC SWITCH" IS IN THE "OFF" STATE。
4	The installation environment meets the requirements	The installation space is reasonable, the environment is clean and tidy, and there are no construction residues

5.2 Power up the System

Notice

- After the battery module is unpacked, if it is not installed immediately, please do not remove it from the packaging carton.
- Battery BCU switch long press 3S to start, when the system is powered off, please press and hold the button switch until the RUN indicator is off, release the switch, the machine will automatically power off, and finally turn off the DC knob switch.
- Turn on external isolation device between inverter and battery system if required

5.2.1 LED Description

Table 5-2 LED indicators

Classify	State		Indicates the definition
Indication	The RUN light flashes	The COM light flashes	PACK is assigned in the address
	NA	The red light is always on	Failure mode
	The RUN light is always on	SOC display, COM light flashing	Normal mode SOC represents 20% per cell

5.2.2 The System Powers on

Before the battery system is powered on, you need to confirm that the stacking connection between the modules is correct and reliable, check the stacking connection between the base, battery pack, and main control BCU from bottom to top, first turn on the DC knob switch after confirming reliability, wait for the 30S main control BCU to pre-start, long press the button switch 3S, RUN indicator lights up, the system boot is completed, wait for the system self-test to power on. Turn on/off external isolation device between inverter and battery system if required

6 System Maintenance

6.1 The System Shuts Down

Notes

Warning

- After the system is shut down, there is still residual power and heat in the internal chassis, which may cause electric shock or burns. Therefore, after 5 minutes of system shutdown, wear protective gloves before operating the battery system. Ensure that all indicators of the battery system are off and the DC knob switch is off before the battery system can be maintained.
- In the operation of the battery system, only pressing and holding the button switch to close the BCU can not completely shut down the system, and the maintenance operation of the battery system cannot be carried out at this time.

System Shutdown Procedure

- First disconnect the inverter or other load connected to the battery system.
- Press and hold the button switch to turn off the BCU master.
- Set the knob switch "DC SWITCH" on the side of the BCU to "OFF".

  *Turn off external isolation device between inverter and battery system if required

6.2 Routine Maintenance

In order to ensure that the battery system can operate well for a long time, it is recommended to perform routine maintenance of the system as described in this section.

Caution

When performing maintenance such as system cleaning, electrical connections, grounding reliability, etc., a system shutdown operation must be performed first.

Table 6-1 Maintenance List

Check the Content	Check the Method	Maintenance Cycles
System operating status	• Observe whether the appearance of the battery system is damaged or deformed. • Listen for abnormal sounds during the operation of the battery system.	1 time every six months。

Electrical connection	• Check whether the connections between modules are detached or loose. • Check the cable for damage, focusing on whether there are any marks of cuts on the skin of the cable in contact with the metal surface. • Check whether unused terminals and interfaces are locked up.	Half a year after the first commissioning, and once every six months to once a year thereafter.
Grounding reliability	Check that the grounding cable is reliably grounded.	Half a year after the first commissioning, and once every six months to once a year thereafter.

6.3 Troubleshooting

Alarm levels are defined as follows：

- Important alarm: The system fails, causing some of the battery system to function abnormally and cannot be restored to normal, and it needs to be shut down and restarted or repaired.
- Secondary alarm: The system is temporarily protected due to some transient surge overshoot, and the fault can be automatically eliminated after returning to the normal range, without shutting down for maintenance。

6.4 Module Storage and Replenishment of Electricity

Battery Module Storage Requirements

- When storing the battery module, it should be placed correctly according to the box marking, and should not be placed upside down or sideways.
- When stacking the battery module packaging box, it should meet the stacking requirements on the outer packaging.
- When handling the battery module, it is required to handle it with care, and it is strictly forbidden to damage the battery module.
- Storage environment requirements:
- Recommended storage temperature: -20°C~45°C.
- Dry, ventilated, clean.
- Avoid contact with corrosive organic solvents, gases and other substances.
- Avoid direct sunlight.
- The distance from the heat source must not be less than two meters.
- The battery module must be disconnected from the outside when stored.
- The inventory of battery modules shall be counted monthly, and the battery modules in demand shall be replenished in time.
- When the stored battery module is used, the first-in-first-out principle should be followed.
- Battery modules need to be replenished to at least 50% SOC before long-term storage.

Expired Storage Judgment Conditions

In principle, long-term storage of battery modules is not recommended and should be used in time. If the battery module is deformed, damaged, or leaked, it will be scrapped directly, regardless of the storage time.

- The storage time is calculated based on the latest charging time marked on the replenishment label on the outer packaging of the battery module, and after the battery module replenishment is qualified, refresh the latest charging time and the next charging time of the supplementary label (next charging time = latest charging time + replenishment cycle).
- The maximum allowable period and frequency of storage replenishment is 3 years or 3 times, such as: 1 replenishment every 8 months, the maximum allowable is 3 times; 1 time replenishment every 12 months, a maximum of 3 times is allowed; It is recommended that the battery module be scrapped after the maximum allowable period and number of times.
- There will be capacity loss for long-term storage of lithium batteries, and after 12 months of storage at the recommended storage temperature, the general irreversible capacity loss is 3%~10%. If the customer conducts the discharge test acceptance according to the specification, there is a risk that the test will fail for the battery module with a capacity of less than 100% of the rated capacity after storage.

Battery Module Pre-replenishment Inspection

- Before the battery module is replenished, the appearance inspection of the battery module needs to be carried out, and the battery module that passes the inspection can be processed in the next step, and the unqualified battery module is scrapped.
- If the battery module does not appear in the following situations, it is judged to have passed the appearance inspection.
- Battery module deformation
- The battery module housing is broken
- Leakage of the battery module

Battery Module Replenishment Instructions

Need to choose professional energy storage battery charging and discharging equipment, and there are professionals to operate, if the battery damage caused by improper use of the equipment is not covered by the warranty.

7 FAQs

7.1 Change Description

1. When the battery is almost full, the SOC rises more and more slowly?

When the SOC is greater than 90%, it will turn into the current limit state, and the charging current will gradually decrease, so the SOC rise rate will slow down, and eventually the SOC will reach 100% and the charging will end.

2. The battery is turned off for a period of time and is not used, and the SOC is different from before?

When the battery sits for a period of time, the battery management system will correct the SOC according to the current temperature and voltage, and occasional SOC changes are normal, which can improve the SOC accuracy.

During the battery charging and discharging, the SOC will suddenly change to 0 or 99%.

During the charging process, the SOC will be forced to correct according to the single-cell voltage, and the sudden SOC mutation to 99% indicates that the current maximum cell voltage reaches 3.55V, which means that the battery is fully charged and the SOC is forced to calibrate; the same discharge reaches 2.9V and SOC low correction is also performed.

7.2 System Dependent

1. The system will not be used for a long time and will be automatically shut down?

The system has a low-voltage protection function, when the system voltage is as low as a certain voltage, the system will carry out protective power off, to prevent over-discharge, it is recommended to place the system for a long time to re-disassemble the system into the package for preservation, which is more conducive to the overall service life.

The charge, charge and discharge power becomes smaller

When the system power approaches the edge of the upper and lower limits, the current will be stepped down, which can extend the battery life; When the cell temperature is too high, it will also enter the load reduction mode, safety assurance means, encounter this phenomenon can shut down the system for a period of time and wait for the temperature to decrease, restart the boot can run normally at full power.

A Abbreviations

A		
APP	application	apply
AC	alternating current	communication
B		
BCU	battery control unit	battery management module
BAT	battery	battery
C		
COM	communication	communication
D		
DC	direct current	direct current
E		
EMI	electromagnetic Interference	electromagnetic interference
P		
PV	photovoltaic	photovoltaic
PACK	battery pack	battery pack
PCS	photovoltaic energy storage grid-connected inverter	photovoltaic energy storage grid-connected inverter
S		
SOC	state of Charge	state of charge