KSTAR科士达 零件规格书

第1页共 页

料号: 4257-0018	料号: 4257-0018 物料描述: 用户手册 BC100DE 285*210mm 157g 铜版纸+80g 书纸 英文 KSTAR C 版 RoHS (2023 版)					
最初使用机种: BC100D	•		性: RoHS □非 RoHS			
说明: 🗌 电气规格 🔲 结	结构尺寸 □辅料类 ■其	其他				
变更记录			版本	修改人	审核人	日期
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制作人:林艳萍 主;在规格书里应尽量避	免出现供应商的信息;		审	核人:张新	谱	

材料规格、尺寸等附页放在首页后; 变更需把变更记录写上,并写上 ECN 编号;



BC100DE Series User Manual for Industrial and Commercial Battery Cabinet



Version V01 Date of Release

Overview

This Manual introduces the main features, performance indicators, system principles, appearance and structure of the BC100DE industrial and commercial battery cabinet, and also provides installation, use and operation instructions, maintenance management, etc.

Target readers

This document is primarily intended for the following engineers:

Sales engineer

Technical support engineer

System engineer

Hardware installation engineer

Commissioning engineer

Maintenance engineer

Convention of Symbols

The following symbols may appear in this document, and their meanings are as follows.

Symbol	Description		
	Indicates a hazard with a high level of risk which, if not avoided, will		
	result in death or serious injury.		
	Indicates a hazard with a medium level of risk which, if not avoided,		
	could result in death or serious injury.		
∧ CAUTION	Indicates a hazard with a low level of risk which, if not avoided, could		
	result in minor or moderate injury.		
NOTICE	Used to convey equipment or environmental safety warning		
NONCE	information. If not avoided, it could result in equipment damage, data		
	loss, degraded equipment performance, or other unpredictable results.		
	"NOTICE" does not cover personal injury.		
	Supplementary explanation of key information in the main text.		
	"NOTE" is not safety warning information, and does not involve		
	personal, equipment and environmental damage information.		

Revision History

Version	Revision date	Content	Internal Document Number
V00	2023/02/16	First edition	/
V01	2023/05/08	Change parameter	/
V02	2023/12/08	Add the average recharge time and 2.1 EMS	/
V03	2024/03/11	3-8、3-10、3-12 Change image	/



Contents

1. General Safety Precautions	1
1.1 General Safety	1
1.2 Personnel Requirements	5
1.3 Electrical Safety	5
1.4 Requirements of Installation Environment	8
1.5 Machinery Safety	10
1.6 Battery Safety	13
1.7 Others	15
2. Overview	17
2.1 Product Introduction	17
2.1.1 Product Appearance	17
2.1.2 Product Structure	19
2.1.3 Product model and naming scheme	22
2.2 Battery System Parameters	22
2.2.1 Cell Parameters	22
2.2.2 Battery Module Parameters	23
2.2.3 Battery Cluster Parameters	23
2.2.4 Battery Cabinet Parameters	24
2.2.5 Interfaces of High-voltage box	25
2.2.6 Recharge interval for Battery Cabinet	26
3. Installation	27
3.1 Site Planning	27
3.1.1 Dimensions of Battery Cabinet	27
3.1.2 Precautions for Installation	28
3.1.3 Space Reservation	28
3.2 Preparation of Tools and Instruments	29
3.3 Preparation of Power Cables	30
3.4 Unpacking	30
3.5 Single Cabinet Installation	30
3.5.1 Installation Environment	30
3.5.2 Installing the Cabinet	31
3.5.3 Installation Instructions for Copper Bars between Battery Modules	32
3.6 Electrical Connection	35
3.6.1 AC Input Connection	35
3.7 Cabinet Installation	36
3.7.1 Parallel Connection of Battery Clusters in the Cabinet	36
3.7.2 Parallel Connection of Battery Cabinets	38
3.8 Communication Wiring Instructions	39
4. Operation Guide	41
4.1 Inspection after Installation	41
4.2 Running Environment Check	42

KSTAR

4.3 Power-on Operation	42
4.3.1 Prerequisites	42
4.3.2 Operation Steps	42
4.4 Power-off Operation	43
4.4.1 Power-off Steps	43
4.4.2 Emergency Power-off	44
4.5 Test Run of Battery Cabinet	44
5. Routine Maintenance	46
5.1 Monthly Maintenance	46
5.2 Quarterly Maintenance	47
5.2 Quarterly Maintenance	48
5.2 Quarterly Maintenance5.3 Annual Maintenance	48 49
5.2 Quarterly Maintenance5.3 Annual Maintenance6. Troubleshooting and Maintenance	48 49 54

1. General Safety Precautions

1.1 General Safety

Statement

Please read this manual before installing, operating and maintaining the equipment, and follow the marks on the equipment and all safety precautions in the manual.

The "Caution", "Warning" and "Danger" items in the manual do not represent all safety items that should be observed, but are only supplements to all safety precautions. KSTAR does not assume any responsibility caused by violation of general safety 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 design specifications, or it may cause equipment failure, and the resulting abnormal equipment function or component damage, personal safety accidents and property losses are not within the scope of equipment quality assurance.

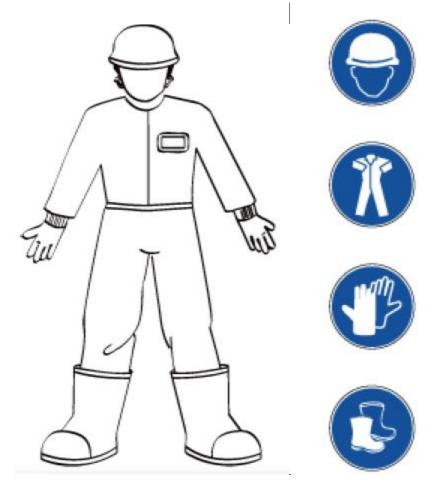
Comply with local laws, regulations and norms when installing, operating, and maintaining the equipment. The safety precautions in the manual are only a supplement to local laws, regulations and norms.

KSTAR is not liable for any of the following situations.

- Fail to operate under the conditions of use described in this manual.
- The installation and use environment doesn't comply with the regulations in relevant international or national standards.
- Unauthorized dismantling, changing the product or modifying the software code.
- 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.).
- Damage caused by the customer's own transportation.
- Damage caused by storage conditions not meeting documentation requirements.

General requirements

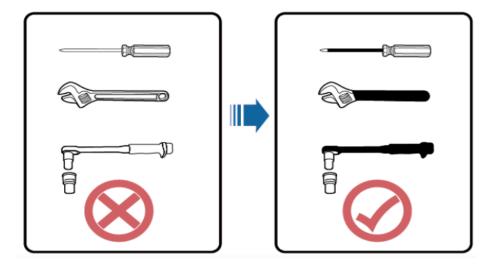
- It is strictly forbidden to install, use and operate outdoor equipment and cables (including but not limited to moving equipment, operating equipment and cables, plugging/unplugging signal interfaces connected to outdoor, working at heights, outdoor installation, etc.) in severe weather such as lightning, rain, snow, and 6-scale wind.
- Do not wear watches, bracelets, rings, necklaces or other conductive objects during installation, operation and maintenance, so as to avoid electric shock.
- Special protective equipment must be used during installation, operation and maintenance, such as wearing insulating gloves, goggles, safety clothing, safety helmet, safety shoes, etc., as shown in the figure below.



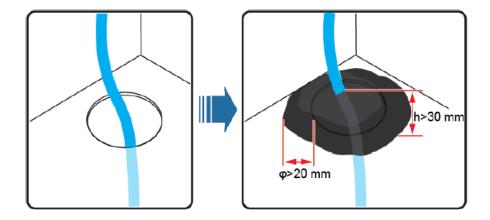
- Installation, operation and maintenance must be carried out in accordance with the sequence of steps in the instruction manual.
- Before touching any conductor surface or terminal, measure the voltage at the contact

point to confirm that there is no risk of electric shock.

- After the equipment is installed, empty packing materials in the equipment area, such as cartons, foam, plastic and cable ties, should be removed.
- In case of fire, evacuate the building or equipment area and press the fire alarm bell, or call the fire alarm. Re-entry into a burning building is strictly prohibited under any circumstances.
- Do not disable protective devices and ignore warnings, cautions and precautions in the manual and on equipment. Timely replace hazard signs that have become unclear due to long-term use.
- Except for the personnel who operate the equipment, other personnel are not allowed to approach the equipment.
- The handle of the tool used needs to be insulated and protected, or use an insulated tool, as shown in the figure below.



• The wiring holes with cables routed need to be sealed with fire putty, and un-routed wiring holes need to be sealed with the cover that comes with the cabinet. The correct construction standard for fire putty plugging is shown in the figure below.



- It is strictly forbidden to alter, damage or cover the identification and nameplate on the equipment.
- Use tools to tighten the screws when installing the equipment.
- Live operation is strictly prohibited during the installation process.
- Paint scratches that occur during equipment transportation and installation must be repaired in time; it is strictly prohibited to expose the scratched parts to the outdoor environment for a long time.
- Before operation, securely fix the equipment on the floor or other stable objects, such as a wall or a mounting bracket.
- Do not wash the electrical components inside and outside the cabinet with water.
- Do not change the structure and installation sequence of the equipment without authorization.

Personal safety

- If a fault that may cause personal injury or equipment damage is found during the operation of the equipment, terminate the operation immediately, report to the person in charge, and take effective protective measures.
- To avoid the risk of electric shock, it is forbidden to connect the safety extra low voltage (SELV) circuit to the telecommunication network voltage (TNV) circuit.
- Do not power on the equipment until it is installed or confirmed by a professional.

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1.2 Personnel Requirements

- The personnel responsible for the installation and maintenance of KSTAR equipment must first undergo strict training to comprehend the safety precautions and master the correct operation methods.
- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.
- Only qualified professionals are allowed to remove safety devices and repair equipment.
- The personnel who operate the equipment, including operators, trained personnel, and professionals, should have the special operation qualifications required by the local government, such as high-voltage operation, climbing, and special equipment operation qualifications.
- Professionals: People who have experience in training or operating equipment, and who can clearly understand the potential sources and levels of danger in the process of equipment installation, operation, and maintenance.
- Trained personnel: A person who has received appropriate technical training and has the necessary experience can be aware of the dangers that may be brought to him when performing a certain operation, and can take measures to minimize the danger to him or other personnel.
- Operators: Operators who may come into contact with the equipment except trained personnel and professionals.
- Replacement of equipment or components (including software) must be done by professionals or authorized personnel.

1.3 Electrical Safety

Grounding requirements

• When installing equipment that needs to be grounded, the protective ground wire must be installed first; when removing the equipment, the protective ground wire must be removed last.



- Do not damage the grounding conductor.
- Do not operate the equipment without a grounding conductor installed.
- The equipment should be permanently connected to the protective earth. Before operating the equipment, check the electrical connection of the equipment to ensure that the equipment is reliably grounded.

General requirements

• When performing high-voltage operation, please use special insulated tools.

AC and DC operating requirements

A DANGER

It is forbidden to install or remove the power cord while it is live. When the power wire core touches the conductor, an arc or electric spark will be generated, which may cause fire or personal injury.

- If the equipment is marked with "High Leakage Current", the protective grounding terminal of the equipment case must be grounded first before connecting the AC input power to prevent the leakage current of the equipment from causing electric shock to the human body.
- Before installing or removing the power cord, the power switch must be turned off.
- Before connecting the power cord, make sure the label on the power cord is correct.
- If the equipment has multiple inputs, all inputs should be disconnected, and the equipment can be operated only after it is completely powered off.
- It is not recommended to configure an air switch with leakage protection function.
- If the power cord is damaged, it must be replaced by the manufacturer, service agent or professionals to avoid risks.
- Personnel performing high-voltage operations and installing AC equipment must have high-voltage and AC work qualifications.

Wiring requirements

• Use of the cable in a high-temperature environment may cause aging and damage to the insulation layer. The distance between the cable and the outer periphery of the heating



device or heat source area must be at least 30 mm.

- Cables are not allowed to pass through the air inlet and outlet of the equipment.
- The cables should meet the VW-1 flame retardant requirements.
- Cables of the same type should be bundled together, and cables of different types should be laid at least 30 mm apart. Intertwining or crossing of cables is prohibited.
- When the temperature is too low, severe impact and vibration may cause the plastic sheath of the cable to be brittle and crack. To ensure construction safety, the following requirements should be followed:
 - All cables should be laid and installed above 0°C. When moving cables, especially when constructing in low temperature environments, they should be handled with care.
 - If the storage environment temperature of the cables is below 0°C, the cables must be stored at room temperature for more than 24 hours.
 - It is forbidden to push the cables directly from the truck or have other non-standard operations.
 - The selection, installation, and routing of cables must comply with local laws, regulations, and specifications.

Static protection requirements

NOTICE

The static electricity generated by the human body will damage the static-sensitive components on the board, such as large-scale integrated circuits (LSI).

- The static electricity generated by the human body will damage the static-sensitive components on the board, such as large-scale integrated circuits (LSI). Before touching the equipment, holding a board or an application-specific integrated circuit (ASIC) chip, you must wear ESD gloves or ESD strap. The other end of the ESD strap should be properly grounded.
- When holding the board, you must hold the edge of the board that does not contain components, and do not touch the components with your hands.
- The disassembled board must be packed in ESD packaging materials before storage or



transportation.



Fig. 1-1 Diagram of wearing ESD strap

Neutral ground voltage

• It is recommended that the user balance the three-phase load so that the neutral-ground voltage is less than 2V and meets the power distribution requirements.

1.4 Requirements of Installation Environment

- When the equipment is running, do not cover the vents or heat dissipation system in order to prevent fire due to high temperature.
- The equipment should be installed in an area away from liquids; it is forbidden to install it under water pipes, air outlets and other places that are prone to condensation, or under places that are prone to water leakage, such as air-conditioning outlets, vents, and outlet windows in the machine room, so as to prevent liquids from entering the inside of the equipment and causing malfunction or short circuit.
- If any liquid enters the equipment, please turn off the power immediately and notify the administrator.
- Do not place the equipment in an environment with flammable or explosive gas or smoke, and do not perform any operations in such environment.
- The equipment should be installed away from desert or sandy environment.

High-altitude installation

- The operations carried out more than 2m above the ground are all high-altitude operations.
- The high-altitude operations must be stopped in case of one of the following situations: the rainwater on the steel pipe is not dry, and other situations that may cause danger. When the above-mentioned situation has passed, the company's safety director and relevant technical personnel must check the operating equipment, and the operation can only be carried out after confirmation and approval.
- High-altitude operations must meet the requirements of local laws and regulations on operations at heights.
- The person must accept relevant training and obtain relevant certificates before taking up work and perform high-altitude operations.
- Before high-altitude operations, carefully check the climbing tools and safety appliances, such as safety helmets, safety belts, ladders, springboards, scaffolding, lifting equipment, etc. Any incompliance must be improved immediately or the high-altitude operations should be stopped. Take appropriate safety protection, wear a safety helmet, safety belt or waist rope, and tie it to a solid structural member. It is strictly forbidden to hang on an unstable object or metal with sharp edges and corners to prevent the hook from slipping and causing a fall accident.
- At the high-altitude operation site, the dangerous restricted area should be marked out, and obvious signs should be set up to strictly prohibit irrelevant personnel from entering.
- Carry the operating equipment and tools properly to prevent the tools from falling and hurting others.
- It is strictly forbidden to throw objects from high altitude to the ground or throw objects from the ground to high altitude. Strong cables, hanging baskets, elevated vehicles or cranes should be used to transport objects.
- Guardrails and signs should be set up at the edges and holes of high-altitude operations to prevent stepping into the air.
- On the ground below the high-altitude operation area, it is strictly forbidden to pile up scaffolding, springboards, and other sundries. Ground personnel are strictly prohibited

from staying or passing directly under the high-altitude operation area.

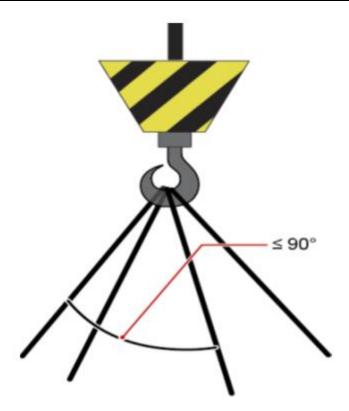
- Scaffolding, springboards and workbenches for high-altitude operations must be inspected and appraised for safety in advance to ensure that the structure is firm and the scaffolding is not overloaded.
- If the person in charge of the site and the safety officer find that the construction personnel working at heights do not operate according to the regulations, they should immediately ask them to make corrections; otherwise, their operations must be stopped.

1.5 Machinery Safety

Hoisting safety

- When hoisting heavy objects, it is strictly forbidden to walk under the boom and the hoisting objects.
- The personnel who carry out the hoisting operation must accept relevant training and can only work after passing the qualification.
- The hoisting tools must be inspected and can only be used if they are complete.
- Before hoisting, ensure that the hoisting tools are securely fixed to load-bearing fixtures or walls.
- During hoisting, ensure that the angle between the two cables is not greater than 90°, as shown in the figure below.



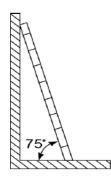


• During hoisting, it is forbidden to drag the steel wire rope and lifting gear, or hit with hard objects.

Ladder use safety

- Use wooden ladder or fiberglass ladder when climbing operations may be involved.
- When using a herringbone ladder, the rope must be firm, and the ladder must be held by dedicated personnel during operation.
- Before using the ladder, please confirm that it is intact and the load capacity meets the requirements. Overweight use is strictly prohibited.
- The ladder should be placed in a stable place. The inclination of the ladder is preferably 75°, which can be measured with a square, as shown in the figure below. The ladder should be used with the wide legs pointing down or with protection at the bottom of the ladder to prevent slipping.





- When climbing a ladder, please pay attention to the following actions to reduce danger and ensure safety.
- Keep your body steady.
- The maximum height at which workers can stand on their feet should not exceed the fourth step from the top to the bottom of the ladder.
- Make sure that the center of gravity of the body does not deviate from the edge of the ladder frame.

Drilling safety

• When drilling holes on walls and ground, consider the following safety precautions:

NOTICE

Drilling holes in the equipment is strictly prohibited. Drilling will damage the electromagnetic shielding performance of the equipment, internal components, and cables, and metal shavings generated by drilling will enter the equipment and cause a short circuit on the circuit board.

- The consent of the customer, the contractor and KSTAR should be obtained before drilling.
- Wear goggles and protective gloves when drilling.
- During the drilling process, the equipment should be covered to prevent debris from falling into the equipment, and the debris should be cleaned in time after drilling.

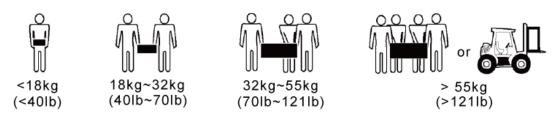
Safety when handling heavy loads

DANGER

When pulling the equipment out of the cabinet, be careful of equipment that may be unstable or heavy on the cabinet to avoid being crushed or smashed.

 When handling heavy objects, be prepared to bear the weight to avoid being crushed or sprained.





When carrying the equipment by hand, wear protective gloves to avoid injury.

- When moving or lifting the equipment, hold the handle or the bottom edge of the equipment instead of the handle of the module installed in the equipment.
- Avoid scratching the surface of the cabinet or damaging the components and cables of the cabinet when moving the equipment.
- When using a forklift to transport, the fork must be in the middle position to prevent overturning. Before moving, please use ropes to fasten the equipment on the forklift; when moving, special care is required.
- When transporting, try to choose railway, sea or roads with good conditions to ensure the safety of the equipment. Bumps and tilts should be minimized during transportation.
- Move the cabinet carefully to avoid equipment damage caused by any impact or drop.

1.6 Battery Safety

Basic requirements

Before working on the battery, you must carefully read the safety precautions for operation and master the correct connection method of the battery.

A DANGER

- Do not expose the battery to high-temperature environments or heat-generating devices, such as sunshine, fire, transformers, heaters, etc. Batteries may explode if overheated.
- Do not incinerate the battery, or it may cause an explosion.
- It is strictly forbidden to disassemble, modify or destroy the battery (such as inserting foreign objects, immersing in water or other liquids), so as to avoid electrolyte leakage, overheating, fire or explosion.
- Wear goggles, rubber gloves, and protective clothing to prevent harm caused by electrolyte spillage. If the electrolyte leaks, do not let the skin or eyes come into contact with the electrolyte. If it touches the skin or eyes, rinse with clean water immediately and go to the hospital for medical treatment.

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- Please use special insulation tools.
- When moving the battery, carry in the direction required by the battery; it is strictly forbidden to invert or tilt it.
- During installation and maintenance operations, the battery circuit should be kept disconnected.
- Please use the specified type of battery, or it may cause damage to the battery.
- Please dispose of used batteries according to local laws and regulations, and do not dispose as domestic waste. Improper battery disposal may cause the battery to explode.
- There must be fire-fighting facilities that meet the requirements on site, such as firefighting sand and dry powder fire extinguishers.

NOTICE

In order to ensure the safety of battery use and the accuracy of battery management functions, please use the battery provided with the PCS host by KSTAR. KSTAR will not be responsible for any battery-related failures caused by using batteries not provided by KSTAR.

Battery installation specifications

- Before installing and operating the battery, the following basic precautions should be observed in order to ensure safety:
- The battery should be installed in a ventilated, dry and cool environment, away from heat sources, flammables, humid, large amounts of infrared radiation, organic solvents, and corrosive gases, and fire prevention measures should be taken. The battery should be placed and fixed horizontally.
- Pay attention to the battery polarity during installation. It is strictly forbidden to shortcircuit the positive and negative poles of the same battery or the same battery string, or it will cause a short circuit.
- Check the battery connection terminal screws regularly to make sure they are tight and not loose.
- It is strictly forbidden to place installation tools on the battery during installation.

Battery short circuit protection

DANGER

A short circuit of the battery will generate an instantaneous large current and release a large amount of energy, which may cause personal injury and property damage.

In order to avoid battery short circuit, the battery does not allow online maintenance.

Lithium battery special scene

Refer to lead-acid batteries for the safety precautions of lithium battery operation. In addition, the following matters need to be noted.

There is risk of explosion if battery is replaced by an incorrect type.

- Replace only with the same or similar type battery recommended by the manufacturer.
- Inversion, tilting and collision are prohibited when handling the lithium batteries.
- During installation, maintenance and other operations, the circuit of the lithium battery module should be kept disconnected.
- Charging is prohibited when the lithium battery is lower than the lower limit of the working temperature (charging is prohibited at 0°C), so as to avoid internal short circuit of the battery due to low temperature charging crystallization.
- Do not exceed the temperature range, which will affect the performance and safety of the battery.
- Do not throw the lithium battery module into a fire source.
- After the maintenance is completed, return the used lithium battery module to the maintenance site.

1.7 Others

Transportation, storage and maintenance

- For long-term storage, charge and discharge every 6 months according to the method specified in the manual.
- Be careful not to drop the battery when loading and unloading it during transportation.



Do not turn it over.

Warnings and precautions

Please read the specifications and the warning signs on the surface of the battery box carefully before using the battery. Improper use of the battery may cause overheating and damage to the battery. KSTAR will not be responsible for any accidents caused by failure to operate according to the specifications. In order to ensure the safe use and disposal of the battery, please read the operating instructions carefully before use.

2. Overview

2.1 Product Introduction

The industrial and commercial battery cabinet includes high-voltage box, battery module, EMS, MBMU(optional) and other modules, which can store and release electric energy according to the requirements of the EMS energy management system. The input and output ports of battery cabinet use high-voltage direct current.

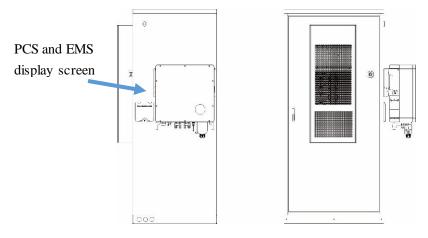
- Battery charging: The output of the battery cabinet is connected to the energy storage terminals (BAT+, BAT-) of the energy storage converter. Under the control of the energy storage converter, it charges the battery, and transfers the energy in the photovoltaic or mains to the battery.
- Battery discharging: When the photovoltaic energy is not enough to supply power to the load, the system needs to control the battery to supply power to the load, and output the stored battery energy to the load through the energy storage converter.

According to the functional configuration, industrial and commercial battery cabinet can be divided into master battery cabinet and slave battery cabinet. Each battery cabinet contains 2 battery clusters with independent output. Wherein:

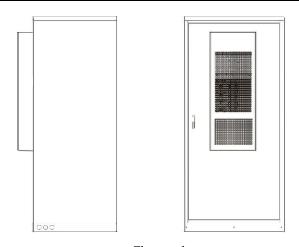
Master battery cabinet includes 2 battery clusters, EMS module, and MBMU battery array management module.

Slave battery cabinet includes 2 battery clusters, MBMU battery array management module (optional).

2.1.1 Product Appearance



Master battery cabinet



Cluster slave Fig. 2-1 Battery cabinet

Functions of the master battery cabinet: manage battery clusters, communicate with PCS, display and save all system data, EMS management, modify system parameters, etc. There is an EMS display on the side panel of the cabinet of the master battery cabinet.

Functions of the cluster slave: accept the energy management of the master battery cabinet, judge the fault information and report it to the master battery cabinet, perform protection actions, obtain the current and voltage information of the battery cluster, and perform fault judgment, etc. The cabinet of the cluster slave does not contain a display screen.

2.1.2 Product Structure

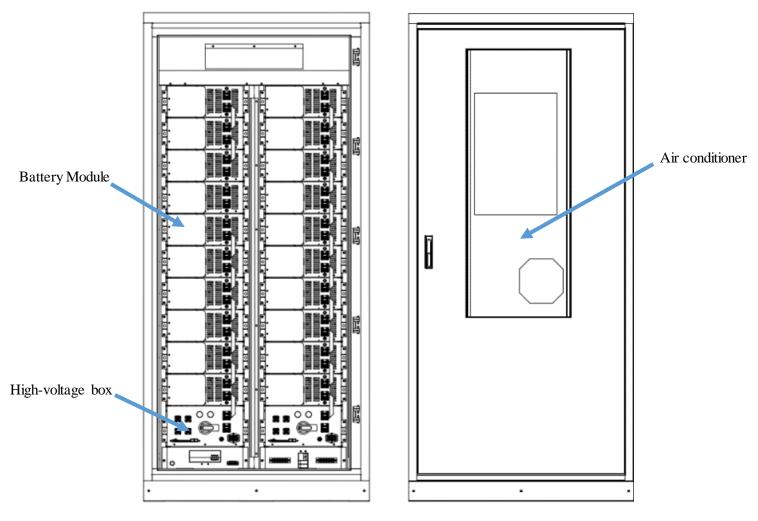


Fig. 2-2 Product structure

2.1.2.1 High-voltage box

The high-voltage box contains the protection components of the whole system, such as relays, MCCBs (Molded case circuit breaker), fuses, SPDs (surge protection device), etc.

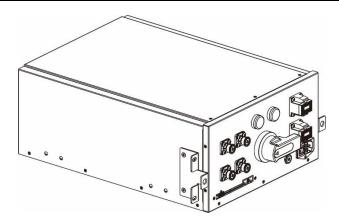


Fig. 2-3 High-voltage box

Features

The High-voltage box is used to collect information such as cluster voltage, current, temperature, and external digital input signals, and cooperates with the BMS to implement system operation strategies. The dimensions of the High-voltage box are as follows:

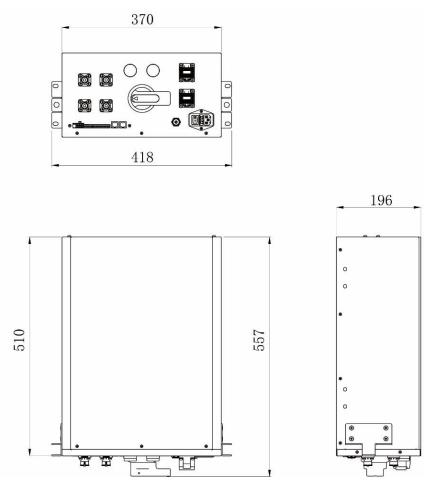


Fig. 2-4 Dimensions of High-voltage box (mm)

2.1.2.2 Battery Module

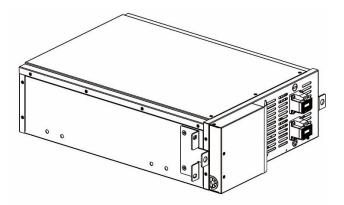


Fig. 2-5 Battery module

Features

The battery module composed of cells, which is the power source of the entire system. The BMU unit is used to collect information such as the voltage and temperature of the lithium battery, and upload the information to the SBMU control unit. There is also a firefighting unit for automatic fire extinguishing inside the battery module. The battery module dimensions are as follows:

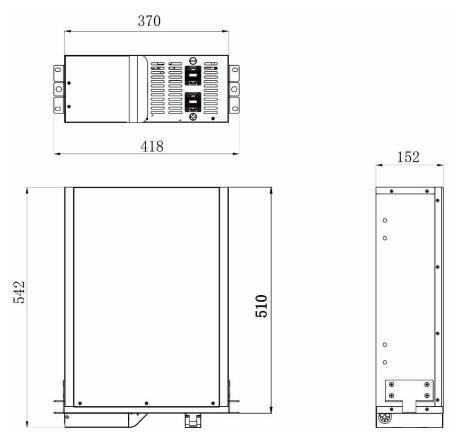


Fig. 2-6 Dimensions of the battery module (mm)

2.1.3 Product model and naming scheme

2.1.3.1 Naming scheme of Battery cabinet:

BC	XXX	D	Е
Part1	Part2	Part3	Part4
I GI UI	10102	1 di 00	rurt

Part1	Part2	Part3	Part4
BC: Battery cabinet	Energy 100: 100KWH 090:90KWH 080:80KWH	D: Outdoor	E: EMS unit Blank: No EMS unit

2.1.3.2 Naming scheme of Battery Module :

BC	-	PACK	-	5.1	-	16S	_	100A
Part1		Part2		Part3		Part4		Part5

Part1	Part2	Part3	Part4	Part5
BC: Battery	Battery Pack	Energy	16S: 16 cells	100A: The max
cabinet		5.1: 5.1KWH	in series	current of
				Cell

2.2 Battery System Parameters

2.2.1 Cell Parameters

No.	Item	Characteristics
1	Cell type	LFP(LiFePO4)
2	Rated voltage	3.2V
3	Rated capacity	100AH
4	Rated energy	320WH
5	Maximum continuous charging current	1C



6	Recommended charging current	≤0.5C
7	Maximum continuous discharging current	1C
8	Recommended discharging current	≤0.5C

2.2.2 Battery Module Parameters

No.	Item	Characteristics
1	Cell connection	16S1P
2	Rated voltage	51.2V
3	Rated capacity	100AH
4	Rated energy	5.1KWH
5	Rated charging voltage	57.6V
6	Recommended charging and discharging current	≤50A @25±5°C
7	Weight	About 44kg

Charging instructions for battery module:

If the user wants to charge a separate battery module, it is necessary to set the charger parameters in strict accordance with the above battery module parameters, otherwise the battery module may be damaged.

2.2.3 Battery Cluster Parameters

No.	Item	Characteristics
1	Cell connection	160S1P
2	Rated voltage	512V
3	Rated capacity	100AH
4	Rated energy	51.2KWH
5	Rated charging voltage	576V
6	Recommended charging and discharging	≤50A @25±5°C

KSTAR

current

2.2.4 Battery Cabinet Parameters

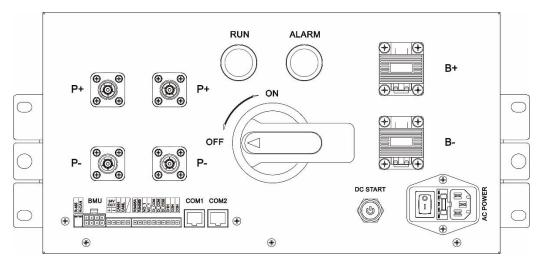
No.	Item	Characteristics
1	Total Energy	102.4KWh
2	Rated Voltage	512VDC
3	Depth of Discharge (DOD)	90%
4	Operating Voltage Range	456VDC - 576VDC
5	QTY of Battery Cluster Per Cabinet	2
6	Maximum Charging Current	50Ad. c. +50Ad. c. (0. 5C)
7	Maximum Discharging Current	50Ad.c.+50Ad.c. (0.5C)
8	Monitoring Parameters	Battery cluster voltage, current, cell voltage, cell temperature, ambient temperature, etc.
9	Communication	CAN/Ethernet
10	Operating Temperature Range	-30℃ - +50℃
11	Storage Temperature Range	-30℃ - +55℃ (Recommended temperature 25℃ for long term storage)
12	Related Humidity	5%~95%, no confidence
13	Ventilation Type	Air conditioner
14	Net Weight	About 1400Kg
15	Dimension	1100mm*1100mm*2380mm
16	IP degree	IP54

Charging instructions for battery cabinet:

Rated charging voltage: 576V

Charging current: The charging current limit of each cluster in the battery cabinet is calculated and

defined by BMS system according to voltage and temperature. When the cell voltage is lower than 3.5V, the recommended charging current of the system is 50A; When the cell voltage is higher than 3.5V, the battery enters the floating charge mode, and the charging current recommended is 0.1C~0.5C. At this time, the specific charging current is calculated and defined by BMS according to the system working state.



2.2.5 Interfaces of High-voltage box

Fig. 2-7 Panel of High-voltage box

Definition of components on panel:

Port	Description
P+	Positive terminal of DC output
P-	Negative terminal of DC output
B+	Positive terminal of battery modules in series
В-	Negative terminal of battery modules in series
DC START	DC start button/black-start button
AC POWER	220VAC input
RUN	Run indicator
ALARM	Warning indicator
MCCB switch	DC output switch

Definition of weak current/communication ports



Port	Description
R-485	Resistor DIP of RS485 communication terminal
R-CAN	Resistor DIP of CAN communication terminal
BMU	Battery modules communication port
24VOUT	24V power output port
CANH/L	CAN communication interface
RS485A/RS485B	Air conditioner communication interface
NO_1/NC_1	Switch output port 1
DI1H	Digital input port 1
DI2H	Digital input port 2
DI3H	Digital input port 3
DI_COM	Digital input negative common terminal
COM1/COM2	Communication ports between high-voltage boxes inside or outside the cabinet

2.2.6 Recharge interval for Battery Cabinet

Recharge interval for KSTAR Battery Cabinet:BC100DE		
6 months	$-10^{\circ}C \sim +40^{\circ}C$, 0~95%, without condensation	

*All dates are counted from shipment date and until the Warranty Commencement Date; Kstar will provide permanent degra dation impact over time,and compiete charging

procedure(including specifying a commercially available charging device) no later than 1 month after the execution of this contract.

3. Installation

3.1 Site Planning

3.1.1 Dimensions of Battery Cabinet

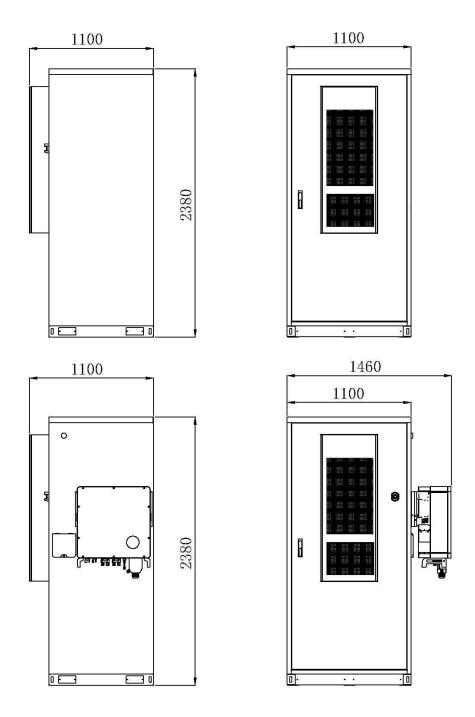


Fig. 3-1 Dimensions of the cabinet (mm)

3.1.2 Precautions for Installation

Please place the battery cabinet on a level ground and ensure it is stable without shaking or tilting.

The bearing and load capacity of the installation ground and floor (according to the requirements of the architectural drawings) should be considered for the installation of the battery cabinet.

Do not cover the ventilation holes with objects, so as not to hinder the heat dissipation of the battery cabinet, which will cause the internal temperature of the system to rise and affect the safety and life of the battery.

Please keep the installation environment of the battery cabinet well ventilated. Avoid installing in places with high or low temperature and high humidity. Keep away from water, flammable gases, corrosive agents, heat sources, and direct sunlight. Keep the air inlet/outlet dust-free.

Please avoid using it in an environment with dust, volatile gas, corrosive gas or high salt content, and do not place flammable and explosive items around the battery cabinet.

In order to reduce the possibility of fire and reduce the damage, the walls, ceilings and floors of the room where the battery cabinet is placed should be made of fireproof materials as much as possible, and should be provided with portable dry powder fire extinguishers.

During the installation process, please refer to the relevant applicable safety regulations for installation.

3.1.3 Space Reservation

A certain space for operation and ventilation should be reserved around the cabinet:

- At least 1200mm of space for ventilation and operation must be reserved in front.
- At least 1200mm of operating space must be reserved on the back.
- At least 600mm of operating space must be reserved on the side.

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3.2 Preparation of Tools and Instruments

▲ DANGER

Use insulated tools to avoid electric shock.

Table 3-1 Preparation of tools and instruments

Tools and instruments			
Electric forklift	Manual forklift	Ladder	Rubber hammer
Impact drill	Manual impact drill	Alloy hole saw	Heat gun
Diagonal cutters	Crimping tool	Wire stripper	Electro-hydraulic press
Clamp ammeter	Multimeter	Cable ties	Measuring level
Insulating tape	Cotton cloth	Label	Electrician's knife
ESD gloves	Lead rubber gloves	Heat insulation gloves	Insulation protective shoes



	Cutur.		Cellin
Torque screwdriver	Cable cutter	Brush	Flat head screwdriver (2-5mm)
Phillips screwdriver (M3/M4/M5/ M6/M8)	Insulated torque wrench (M6/M8/M12/M16)	Heat shrink tube	Insulated adjustable wrench

3.3 Preparation of Power Cables

The cables between the cabinets should be 25 mm², low-smoke, halogen-free and flame-retardant cables.

3.4 Unpacking

Steps

Step 1 Transport the battery cabinet to the designated location with a forklift.

Step 2 Remove the outer packaging of the battery cabinet.

Step 3 After confirming that the equipment is in good condition, remove the bolts fixing the battery cabinet and the pallet and remove the battery cabinet from the pallet.

3.5 Single Cabinet Installation

3.5.1 Installation Environment

• Do not install the battery cabinet in a place with high temperature, low temperature or



humidity beyond the technical specifications.

- Keep the battery cabinet away from water sources, heat sources, and flammable and explosive items.
- Avoid installing the battery cabinet in the desert or the surrounding environment of the desert;
- Avoid installing the battery cabinet in an environment with direct sunlight, dust, volatile gas, corrosive substances, and high salt content.
- Avoid installing the battery cabinet on unstable or vibrating foundations.
- Do not install the battery cabinet in a working environment with metal conductive dust.
- The optimum temperature for battery operation is 20°C~30°C. Working in an environment with a temperature higher than 30°C will reduce the service life of the battery, and working in an environment lower than 20°C will shorten the battery backup time.

3.5.2 Installing the Cabinet

Step 1 According to the design requirements, determine the installation position of the cabinet on a flat ground and draw a line mark.

Step2 Transport the battery cabinet to the designated location by means of a forklift and install it at the marked location.

Step 3 After the installation is complete, check whether the cabinet body is tilted and whether the gap between cabinets meets the requirements.

Fix the battery cabinet on the foundation with fastening bolts. After fixation, U-shaped angle steel shall be treated with anti-rust treatment, such as spraying anti-rust paint.

--- Installation ends

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3.5.3 Installation Instructions for Copper Bars between Battery Modules

3.5.3.1 Battery Module

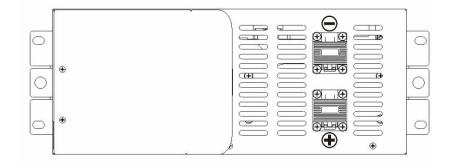


Fig. 3-2 Battery module

NOTE:

: The negative terminal of the battery module;

: The positive terminal of the battery module;

3.5.3.2 Instructions for Battery Module Power Connection

The connection between the battery modules has been completed before the battery cabinet is shipped. If the customer still needs to maintain the connection between the battery modules, please refer to the following:

Part	specifications:
------	-----------------

Name	Description	
Soft copper bar -1	Connecting soft copper bar between battery modules	
Power cable "B-"	Connection cables of module 01 "B-" and High-voltage box "B-"	
M8*12 combined bolts	Used to fix copper bars and "B-" power cables	
Cable tie	Used to fix "B-" power cable	

Copper bar connection between battery modules:

Wear insulating gloves, and lock the copper bars from the top battery module to the bottom. Place the soft copper bars on the "+" of the top battery module 01 and the "-" of the battery module 02, and fix the copper bars (M8*12 combined bolts, torque 5.5~6.0 N.M). Lock the battery modules 02, 03...10 down in this order until the "B+" connection of the High-voltage box is completed.

Note: Do not open the covers of all the DC connection terminals at the same time in order to avoid short circuit caused by misuse. It is recommended to only open the terminals on both sides of the copper bar (or power cable) to be locked, and close the cover of the terminal after the copper bar (or power cable) is fixed.

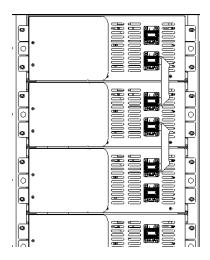


Fig. 3-3 Copper bars connected in series

Step 3 Install the "B-" **power cable**. One end of the "B-" power cable is connected to the "-" position of the battery module 01 on the top, the other end is connected to the "B-" terminal position of the High-voltage box, and fastened with bolts (M8*12 combined bolts, torque 5.5~6.0 N.M). Secure the "B-" power cable with the cable tie from the accessory bag.

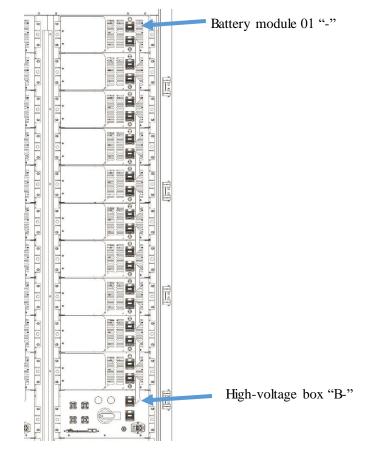


Fig. 3-4 Slot diagram of the battery module

Step 4 Install another cluster of battery modules. Repeat steps 1~3 to complete the connection and fixation of the power cables and soft copper bars of another cluster of battery modules in the battery cabinet in sequence, as shown in Fig. 3-5.

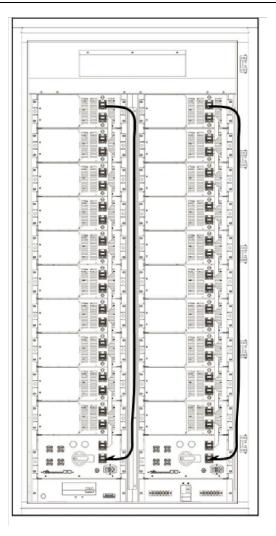


Fig. 3-5 "B-" power cable connection

3.6 Electrical Connection

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Before installation, make sure MCCB breaker switch on the High-voltage box is off

3.6.1 AC Input Connection

Step 1 Confirm that the AC Switch is in the OFF state.

Note: The AC input is 220VAC single-phase alternating current. Please confirm whether it is live before wiring.

The 220VAC power supply will be used for power the air conditioner and the AC/DC power supply module.

Step 2 Connect the L/N/PE cables of the 220VAC power cable to the corresponding terminals according to the marks in the figure below, and fasten them with bolts (torque ≤ 2 N.M).

Note: The 3 terminals (L/N/PE) at the right side of the "INPUT" side are reserved AC input terminals which can be used as AC power source when connected to the another battery cabinet. The two groups of terminals at the "OUTPUT" side are used for internal wiring to power the High-voltage box and the air conditioner.

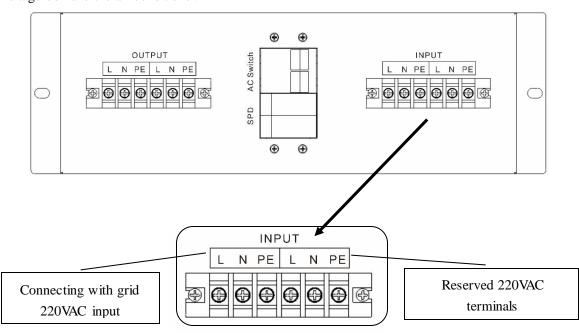


Fig. 3-6 AC input connection

3.7 Cabinet Installation

3.7.1 Parallel Connection of Battery Clusters in the Cabinet

Step 1 Connect the P+/P- ports of the High-voltage box 01 and the High-voltage box 02 with the parallel power cable (accessory 5), and connect the P+/P- power cable connected to the PCS to the P+/P- port of the High-voltage box 01 or 02. The connection method is shown in the figure below.

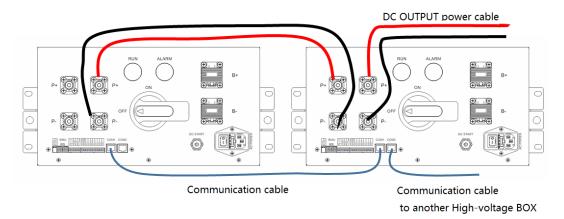


Fig. 3-7 Parallel power cable connection

Step 2 When the number of battery cabinets in the energy storage system is greater than or equal to 2, connect one end of the parallel CAN/power communication cable (accessory 04) to the COM2 port of the high-voltage box shown above (both high-voltage box 01 and 02 are acceptable), and connect the other end to the COM2 port of the High-voltage box in other battery cabinets.

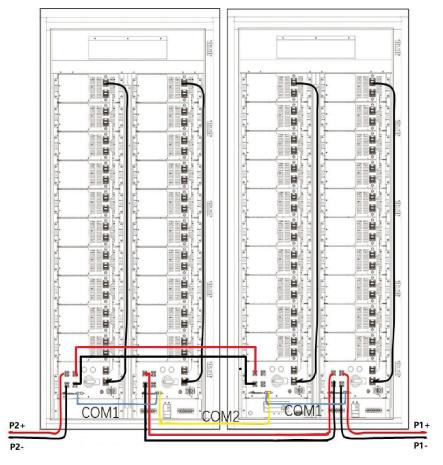
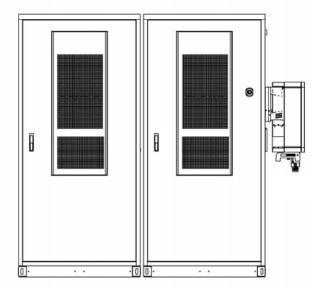


Fig. 3-8 Parallel wiring cable connection when Qty of battery cabinets ≥ 2



3.7.2 Parallel Connection of Battery Cabinets

Fig. 3-9 Master/slave battery cabinet placement

Step 1 Connect the P+/P- ports of the High-voltage box 01 and the High-voltage box 02 with the parallel power cable (accessory 5), and connect the power cable (accessory 5) connected to the P+/P- of the other cabinet to the High-voltage box 01 or 02 on the P+/P- port. The connection method is shown in the figure below.



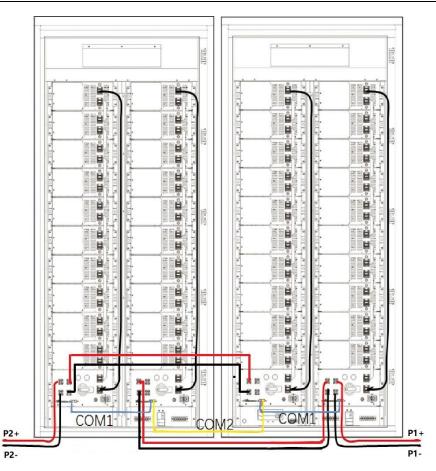


Fig. 3-10 Connection diagram of connecting two battery cabinets in parallel

Step 2 Connect one end of the parallel CAN/power communication cable (accessory 4) to the COM2 port of the high-voltage box in the above picture (both high-voltage box 01 and 02 are acceptable), and connect the other end to COM2 port of the high-voltage box in other battery cabinets.

3.8 Communication Wiring Instructions

1) Network communication interface wiring

The battery cabinet has a built-in network switch, which has been connected to the network port of the EMS controller. The user needs to connect it to the cloud platform or the upper monitoring system, and directly connect to the switch through a standard network cable;

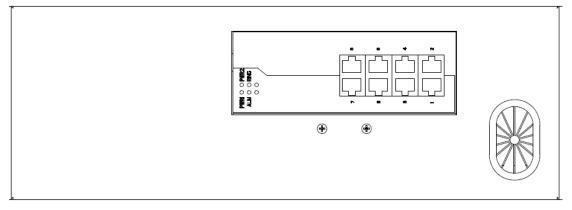


Fig. 3-11 Network switch ports on the panel

2) PCS communication wiring

The four-core signal cable is connected through the position shown in the figure below, and the cable is connected to the PCS communication interface.

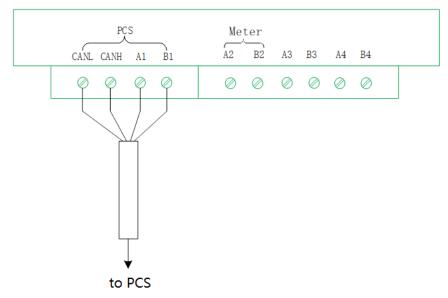


Fig. 3-12 PCS communication cable connection

4. Operation Guide

4.1 Inspection after Installation

1 DANGER

- Personnel responsible for installing and maintaining equipment must first accept strict training to comprehend various safety precautions and correct operation methods.
- Only qualified professionals or trained personnel are allowed to install, operate and maintain the equipment.

Steps of checking:

Step 1 Check fixation of module box

• Check whether the battery module, high-voltage box, and battery cabinet are fixed:

Step 2 Check power cable

- Check whether the copper bars between the battery modules and between the battery modules and the high-voltage box or the fastening bolts of the power cables are missing, loose, or not tightened with recommended torque;
- Check whether the quick plug power cable of P+/P- is reversed, and whether the plug and socket are completely locked;
- Check whether the 220VAC input cable is reversed, and whether the fastening bolts are missing, loose, or not tightened with recommended torque;

Step 3 Check communication cable

- Check whether the communication cable among the battery modules, the high-voltage box, the MBMU module, and the EMS unit is loose or missing;
- Check whether the communication cable between the PCS and the MBMU module is loose or missing;
- Check whether the CAN communication cable between two battery cabinets is correctly connected, and check whether is loose or missing;

Step 4 Check the power supply, drive and communication cable of the firefighting starter



- Check the power supply of the firefight starter, and the power indicator light or flash. If the power indicator can't be lit, please contact KSTAR staff.
- Check whether the firefighting start, power supply, feedback and other wiring cables are loose or missing;

If abnormalities are found and can't be recovered, please contact KSTAR staff.

4.2 Running Environment Check

Check environment temperature: -20°C ~55°C

Check environment humidity: 10%~95%, no condensation

4.3 Power-on Operation

4.3.1 Prerequisites

- Before powering on, make sure that all items to be checked after installation have been checked.
- Before powering on, measure total battery and it should be within the range of 400~576V.
- Before powering on, make sure that all switches are turned off.

4.3.2 Operation Steps

• If there is 220VAC input

Step 1 Supply the grid 220VAC to the battery cabinet;

Step 2 Turn on the "AC Switch" in the cabinet, and close the "AC POWER" switch on the panel of high-voltage box;

Step3 Turn the switch handle of the high-voltage box to the "ON" position, and check whether the indicator light turn green;

Step 4 Confirm whether the air conditioner is powered on;

Step 5 Check whether EMS screen on the right side of the battery cabinet is power on, and whether there is any fault;

Step 6 Repeat steps 2~3 to turn on another cluster of batteries in the battery cabinet;

----End

• If there is no 220VAC input

Step 1 Turn the switch handle of the High-voltage box to the "ON" position;

Step 2 Press the "DC START" button on the high-voltage box for 3-6 seconds. After the indicator light is on, release the button to realize DC black start;

Step 3 Confirm whether the run indicator light turn green;

Step 4 Turn on the "AC POWER" switch of the High-voltage box;

Step 5 Check whether EMS screen on the right side of the battery cabinet is power on, and whether there is any fault;

Step 6 Close the "AC Switch" inside the cabinet,

Step 7 Repeat steps 2~4 to turn on another battery cluster in the cabinet;

----End

After the battery clusters in the battery cabinet have successfully self-checked, set the EMS unit and send the control command to close the relays in the battery cabinet. Check whether fault occur during the process, if all the relays are closed successfully, that means the power-on operation of the system is completed.

4.4 Power-off Operation

4.4.1 Power-off Steps

Step 1 Setting the EMS unit, and turn off the relays in the battery cabinet by the control command.

Step 2 Turn the switch handle on the High-voltage box to the "OFF" position;

Step 3 Turn off the "AC POWER" on the High-voltage box;

Step 4 Repeat steps 2~3 to disconnect the DC output and AC input of another cluster in the cabinet;

Step 5 Disconnect the "AC Switch" in the cabinet;

----End

4.4.2 Emergency Power-off

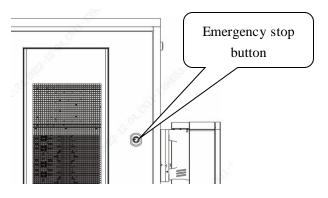


Fig. 4-1 Emergency stop button

Step 1 Press the emergency stop button.

Step 2 Turn the switch handle on the High-voltage box to the "OFF" position;

Step 3 Turn off the "AC POWER" switch on the High-voltage box;

Step 4 Repeat steps 2~3 disconnect the DC output and AC input of another cluster in the cabinet.

Step 5 Disconnect the "AC Switch" in the cabinet;

----End

Note: The emergency stop button can only be configured on the master battery cabinet.

4.5 Test Run of Battery Cabinet

The battery cabinet exchanges energy with the outside through the PCS.

The precautions during test run are as follows:

Capacity calibration: to ensure that the battery can finish a complete normal charge and discharge cycle. By default, the rated capacity will be corrected in the first ten times of the initial operation of the system, so deep charging and discharging should be performed during test run and joint debugging. It is recommended to do a capacity calibration during the test run with the charge and discharge depth DOD=100%, and test according to the rated power of the product. The default process is "empty + stand still (2h) + fully charge". The specific description is as follows:

• Empty: discharged battery to SOC=0%.

- Stand still: Stand still for more than 2 hours (for SOC correction). When standing still, there must be no charging or discharging current, the aux power supply is allowed to run during the standing still.
- Fully charge: After the standing time is up. charge battery to SOC=100%.

After the battery is empty, if it is not used for a long time, it should be recharged in time (in 6 months) to >50% SOC.

Operational stability: All components in the power circuits, communication circuits, and sampling circuits should be validated when run testing if conditions permit. It is used to determine whether there is any abnormality in each link of the system installation, especially in the case of over-temperature, overcurrent, overvoltage, over-discharge and other abnormal conditions, it should be dealt with in time to avoid potential safety hazards.

5. Routine Maintenance

NOTICE

• All maintenance work inside the battery cabinet must use insulated tools and should be performed by personnel who have received relevant training. Components behind protective covers that require tools to be opened are not user-serviceable. If maintenance is required, please consult KSTAR for details.

• The battery cabinet must be regularly maintained according to the following requirements, or the normal operation of the battery cabinet will be affected and the normal service life of the battery cabinet will be shortened.

5.1 Monthly Maintenance

The battery system needs to be checked at least once a month to see if the cell voltage is normal and the temperature is normal. Check the historical data to see if there are serious failures.

Table 5-1 Monthly maintenance

Content of check	Baseline requirements	Handling method
Cell voltage	The cell voltage is between 2.55V~3.60V	Contact KSTAR staff
Cell temperature	The temperature is between -20∼65 °C	Contact KSTAR staff
Voltage difference within a single cluster	The voltage difference is less than 500mV	Contact KSTAR staff
During the standing process of the battery system, the cell voltage fluctuation range is small	The voltage jump is less than 10mV when standing still	Contact KSTAR staff
System fault data, is there a cell overvoltage fault	No level-4 fault	Contact KSTAR staff
System fault data, is there a cell under-voltage fault	No level-4 fault	Check the cause of the level-3 fault; Feedback level-4 fault;
System fault data, is there an over-temperature fault	No level-4 fault	Check the cause of the level-3 fault; Feedback level-4 fault;
System fault data, is there an under-temperature fault	No level-4 fault	Check the cause of the level-3 fault; Feedback level-4 fault;
System fault data, is there a fault of discharge overcurrent	No level-3 fault	Check the cause of the level-2 fault; Feedback level-3 fault;



System fault data, is there a fault of abarging overcurrent	No level-3 fault	Check the cause of the level-2 fault;
fault of charging overcurrent		Feedback level-3 fault;
System fault data is there a law		Check the cause of the level-2
System fault data, is there a low insulation fault	No level-3 fault	fault;
		Feedback level-3 fault;
System fault data, is there a		Check the cause of the level-3
fault of cluster voltage too high	No level-4 fault	fault;
Tauk of cluster voltage too high		Feedback level-4 fault;
System fault data, is there a		Check the cause of the level-3
fault of cluster voltage too low	No level-4 fault	fault;
Tauk of cluster voltage too low		Feedback level-4 fault;
System fault data, is there an		Check the cause of the level-2
excessive temperature	No level-3 fault	fault;
difference fault		Feedback level-3 fault;
System fault data, is there a		Check the cause of the level-2
charging over-temperature fault	No level-3 fault	fault;
		Feedback level-3 fault;
System fault data, is there a		Check the cause of the level-2
charging under-temperature	No level-3 fault	fault;
fault		Feedback level-3 fault;
Is the fault indicator normal	Fault indicator can be	Contact KSTAR staff
	lit	
Is the running indicator normal	Running indicator can always be on	Contact KSTAR staff

5.2 Quarterly Maintenance

Table 5-2 Quarterly maintenance

Content of check	Baseline requirements	Handling method
Cell voltage The cell voltage is between 2.55V~3.60V		Contact KSTAR staff
Cell temperature	The temperature is between - $20 \sim 65^{\circ}$ C	Contact KSTAR staff
History fault content	Check the cause of level-1/2 fault; Feedback level-3/4 fault;	Contact KSTAR staff
Is the fault indicator normal	Fault indicator can be lit	Contact KSTAR staff
Is the running indicator normal	Running indicator light can always be on	Contact KSTAR staff
Can the system perform	The system can perform a	Contact KSTAR staff

a complete charge- discharge cycle	complete charge-discharge cycle	
Cabinet status	The cabinet has no obvious rust, no traces of water ingress, and no abnormal bending	Contact KSTAR staff
Cabinet firefighting starter box	The power indicator can be lit.	Contact KSTAR staff

5.3 Annual Maintenance

Table 5-3 Annual	maintenance
------------------	-------------

Content of check Baseline requirements Handling method				
Content of check	Baseline requirements	Handling method		
Cell voltage	The cell voltage is between	Contact KSTAR staff		
	2.55V~3.60V			
Cell temperature	The temperature is between -	Contact KSTAR staff		
	20~65℃	Contact RSTAR starr		
	Check the cause of level-1/2			
History fault content	fault;	Contact KSTAR staff		
	Feedback level-3/4 fault;			
Is the power cable		D 1 1 1 11		
normal	The power cable is normal	Replace the wiring cable		
Is the communication	The communication cable is			
cable normal	normal	Replace the wiring cable		
Is the fault indicator				
normal	Fault indicator can be lit	Contact KSTAR staff		
Is the running indicator	Running indicator light can			
normal	always be on	Contact KSTAR staff		
Status of fixed power	No rust, no obvious oxidation,			
copper bar screw	no loose.	Replace or tighten the screw		
	The cabinet has no obvious rust,			
Cabinet status	no traces of water ingress, and	Contact KSTAR staff		
	no abnormal bending			
Cabinet firefighting				
starter box	The power indicator can be lit	Contact KSTAR staff		
Accuracy of battery				
system current	Error < 2%	Contact KSTAR staff		
collection				
Accuracy of battery				
system cluster voltage	Error < 2%	Contact KSTAR staff		
collection				
concetion				

6. Troubleshooting and Maintenance

For common faults, refer to Table 6-1 for troubleshooting methods. If you encounter other problems during troubleshooting, you can check the alarm list, or contact KSTAR.

Table 6-1 Troubleshooting

Fault Type	Symptom	Analysis of cause	Handling method
Pre-charge timeout	Product not running	The external load is too large, affecting the pre-charging process	Restart the battery system
	Level 1	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
	Level 2	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
Cell overvoltage	Level 3	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
	Level 4	Abnormal charging, Abnormal communication with PCS	Contact KSTAR staff
	Level 1	Abnormal discharging, Abnormal communication with PCS	Charge or check the communication cable
	Level 2	Abnormal discharging, Abnormal communication with PCS	Charge or check the communication cable
Cell under-voltage	Level 3	Abnormal discharging, Abnormal communication with PCS	Charge or check the communication cable
	Level 4	Abnormal discharging, Abnormal communication with PCS	Contact KSTAR staff
Cluster Voltage difference- fault	Level 3	Abnormal sampling circuit	Contact KSTAR staff
	Level 1	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
Cluster overvoltage	Level 2	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
	Level 3	Abnormal charging, Abnormal communication with PCS	Discharge or check the communication cable
	Level 4	Abnormal charging, Abnormal communication with PCS	Contact KSTAR staff
Cluster under- voltage	Level 1	Abnormal discharging, Abnormal communication with PCS	Charge or check the communication cable



	Level 2	Abnormal discharging, Abnormal communication with	Charge or check the
		PCS	communication cable
		Abnormal discharging,	Charge or check the
	Level 3	Abnormal communication with	communication cable
		PCS	
	T 14	Abnormal discharging,	
	Level 4	Abnormal communication with PCS	Contact KSTAR staff
		Abnormal operation of air	
	Level 1	conditioner or the air temperature	clean the air conditioner or lower
		is too high.	the temperature
		Abnormal operation of air	clean the air conditioner or lower
Cell over-	Level 2	conditioner or the air temperature	
temperature when		is too high.	the temperature
discharging		Abnormal operation of air	clean the air conditioner or lower
ensenia ging	Level 3	conditioner or the air temperature	the temperature
		is too high.	1
		Ambient temperature too high or	
	Level 4	battery end of life. A risk of	Contact KSTAR staff
		thermal runaway. Abnormal operation of air	
	Level 1	conditioner or the air temperature	clean the air conditioner or lower
		is too high.	the temperature
	Level 2	Abnormal operation of air	clean the air conditioner or lower
		conditioner or the air temperature	
Cell over-		is too high.	the temperature
temperature when		Abnormal operation of air	-l thindition
charging	Level 3	conditioner or the air temperature	clean the air conditioner or lower the temperature
		is too high.	
		Ambient temperature too high or	
	Level 4	battery end of life. A risk of	Contact KSTAR staff
		thermal runaway.	
	I 1 1	Abnormal operation of air	clean the air conditioner, rise the
Cell under-	Level 1	conditioner or the air temperature is too low.	temperature
		Abnormal operation of air	
temperature when	Level 2	conditioner or the air temperature	clean the air conditioner, rise the
charging		is too low.	temperature
		Abnormal operation of air	1 1 1 1 1 1
	Level 3	conditioner or the air temperature	clean the air conditioner, rise the
		is too low.	temperature
Cell under-	Level 1	Abnormal operation of air	clean the air conditioner, rise the
temperature when	20,011	conditioner or the air temperature	temperature



discharging		is too low.	
	Level 2	Abnormal operation of air conditioner or the air temperature is too low.	clean the air conditioner, rise the temperature
	Level 3	Abnormal operation of air conditioner or the air temperature is too low.	clean the air conditioner, rise the temperature
Cell temperature – difference fault	Level 1	Abnormal cooling channel resistance, abnormal sampling circuit	clean the air conditioner or contact KSTAR staff
	Level 1	Abnormal charging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
Battery cluster charging overcurrent	Level 2	Abnormal charging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
	Level 3	Abnormal charging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
	Level 1	Abnormal discharging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
Battery cluster discharging overcurrent	Level 2	Abnormal discharging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
	Level 3	Abnormal discharging, Abnormal communication with PCS	Check whether the communication cable between the PCS and battery cabinet is missing or unstable, and PCS setting
Insulation fault	Level 1	Water retention in the cabinet, bad grounding	Check whether the grounding is loose and whether there is water in the cabinet.
	r	Water retention in the cabinet, bad	Check whether the grounding is

			BC100DE Oser Mailuar
		grounding	loose and whether there is water in the cabinet.
	Level 3	Water retention in the cabinet, bad grounding	Check whether the grounding is loose and whether there is water
PCS communication fault	Level 2	Abnormal communication with PCS	in the cabinet. Check whether the communication cable between the PCS and battery cabinet is missing or unstable.
Internal communication fault	Level 2	The communication cables in the cabinet is missing or unstable.	Check whether the communication cable between the High-voltage box and battery cabinet is missing or unstable
Positive relay fault	Level 4	Relay damaged	Contact KSTAR staff
Negative relay fault	Level 4	Relay damaged	Contact KSTAR staff
Cell voltage fault	Level 2	Cell sampling circuit abnormal	Check the sampling cables connection of battery module
Cell temperature fault	Level 2	Cell sampling circuit abnormal	Check the sampling cables connection of battery module
AFE IC fault	Level 3	BMU unit damaged	Contact KSTAR staff
Cell voltage balance fault	Level 3	BMU unit damaged	Contact KSTAR staff
Current sensor fault	Level 3	Current sampling circuit abnormal in High-voltage box	Contact KSTAR staff
Battery system fault	Level 3	High-voltage box function failure	Contact KSTAR staff
Cluster voltage fault	Level 2	The power cables in the cabinet is missing or unstable.	Check whether the communication cable between the High-voltage box and battery cabinet is missing or unstable
B+/B- Terminal over-temperature	Level 1	Abnormal discharging, Abnormal communication with PCS	Stop running and lower the cell temperature
	Level 2	Abnormal discharging, Abnormal communication with PCS	Stop running and lower the cell temperature
	Level 3	Abnormal discharging, Abnormal communication with PCS	Stop running and lower the cell temperature
Ambient temperature fault	Level 1	Temperature sampling failure in High-voltage box	Contact KSTAR staff
Ambient Over- temperature	Level 1	Ambient temperature is too high	Change the place of battery cabinet
Ambient under- temperature	Level 1	Ambient temperature is too low	Change the place of battery cabinet



BC100DE User Manual

Fire alarm	Level 4	Battery thermal runaway	Contact KSTAR staff
Waterproof fault	Level 4	Waterproof failure	Contact KSTAR staff
Access control fault	Level 2	The door of cabinet is unlocked	Check the cabinet door and lock it
Cluster voltage- difference fault	Level 2	Connection abnormal between battery module and High-voltage box	Check whether the communication cable between the High-voltage box and battery cabinet is missing or unstable.
B+ terminal temperature fault	Level 1	Sampling circuit abnormal in High-voltage box	Contact KSTAR staff
B- terminal temperature fault	Level 1	Sampling circuit abnormal in High-voltage box	Contact KSTAR staff
SPD fault	Level 3	Abnormal Surge protect device	Contact KSTAR staff

Remark:

Blockage of the air conditioner condenser is the main reason for the decline in cooling capacity. In order to make the air conditioner work better, it is recommended to clean the condenser every 6 months.

7. List of Accessories

A single battery cabinet contains the following accessories (placed in the

accessories box):

No.	Name	Quantity	Purpose
Accessory 1	Fire putty	1SET	Fill the wiring holes for the input and output of the battery cabinet.
Accessory 2	Base baffle	1SET	Battery cabinet base baffle
Accessory 3	PCS power cable	1SET	Power cable connecting the PCS and the battery cabinet
Accessory 4	Communication cable between battery cabinets	Reserved	CAN communication cable for master battery cabinet-slave battery cabinet
Accessory 5	Parallel power cables assembly	Reserved	Cluster parallel and cabinet parallel power cable

8. Terms

1. Cell

A battery cell

2. Battery Module

A combination of multiple cells connected in series, parallel or series-parallel, with only one pair of positive and negative output terminals, used as a power supply.

3. Battery Cluster

Multiple battery modules, a high-voltage box and connecting cables form a complete battery cluster, which can independently complete energy transfer and self-protection functions.

4. Battery Array

Multiple battery clusters form a battery array, and the energy transfer of the following clusters is managed through the BMS with the three-level architecture.

5. Battery Management System (BMS)

An electronic device that controls or manages the electrical or thermal performance of a battery system.

Battery Management Unit (BMU)

Slave Battery Management Unit (SBMU)

Master Battery Management Unit (MBMU)

Energy Management System (EMS)

6. Battery System

Energy storage devices, including integration of battery modules or packs, battery management systems, high voltage circuits, low voltage circuits.

7. Battery Capacity

The size of the battery storage capacity.

8. State of Charge (SOC)

The percentage of the capacity can be released by cell, battery pack or system according to the conditions specified by the manufacturer to the actual capacity, also known as the remaining capacity.

9. State of Health (SOH)

The deviation ratio between the actual performance of the battery and the normal design index.

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