USER MANUAL

ALL-IN-ONE

STACKED ENERGY STORAGE SYSTEM

INTRODUCTION ▶▶▶

◆ ATTENTION

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◆ SUMMARIZE

This document mainly introduces the JOYKOO Stacked all-in-one storage system, guarantee product introduction, application scenarios, installation instructions, system maintenance, and related technical data.

◆ APPLICABLE OBJECT

Intended Audience This document is intended for:

- Sales engineer
- System engineer
- Installation and after-sales engineer

SYMBOL STIPULATIONS

There may be following symbols herein, and their meanings are as follows.

Symbols	Description
DANGER!	Indicate a hazard with a high level of risk which, if not avoided, will result in death or serious injuries.
WARNING	Indicate a hazard with a medium level of risk which, if not avoided, could result in death or serious injuries.
ATTENTION	Indicate a hazard with a low level of risk which, if not avoided, could result in minor or moderate injuries.
NOTICE	Warning information about device or environment safety. If not avoided, equipment damage, data loss, performance degradation or other unanticipated results may be resulted in. The "NOTICE" does not involve any personal injuries.

CONTENTS

Universal security

statement

When installing, operating, and maintaining the device, read this manual and follow the labels on the device and all safety precautions in this manual. When unpacking a new product for the first time, check the product and packing list, and contact your local distributor if the product is damaged or missing parts.

The "Notice", "Attention", "Warning" and "danger" in this manual do not represent all the safety precautions to be followed, but only serve as a supplement to all the safety precautions. JOYKOO accepts no liability for any violation of the general safety operating requirements or the safety standards for the design, production and use of equipment.

The device must be used in an environment that meets the design specifications. Otherwise, the device may be faulty, and the resulting abnormal functions, component damage, personal accidents, and property losses are not covered by the quality guarantee.

When installing, operating, and maintaining the device, comply with local laws, regulations. All safety precautions described in this manual are only supplements to local laws, regulations

JOYKOO is not responsible for any of the following situations.

- Do not operate under the conditions of use described in this manual.
- Installation and use of the environment beyond the relevant international or national standards.
- Disassemble or change the product or modify the software code without authorization.
- Do not follow the instructions and safety warnings in the product and documentation.
- Equipment damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, etc.).
- Transportation damage caused by customer's own transportation.
- Damage caused by storage conditions that do not meet product requirements.
- Not to be used in the areas and environments specified in the product contract.
- Out of product life.

Routine requirement

Do not operate with power on during installation. Turn off the switch when the battery module is not assembled.

- Do not install, use, or operate outdoor devices and cables (including but not limited to transporting devices, operating devices and cables, plugging and unplugging signals connected to outdoor ports, working at heights, or installing outdoor devices and cables) in severe weather such as thunder, rain, snow, and strong winds.
- After installing the device, remove empty packaging materials, such as cartons, foam, plastic, and cable ties, from the device area.

- In case of fire, evacuate the building or equipment area and press the fire alarm bell, or call the fire alarm number. Under no circumstances is it permitted to re-enter a burning building.
- It is strictly prohibited to alter, damage or block the logo and nameplate on the equipment.
- When installing devices, use professional tools to tighten all screws.
- Fully familiar with the composition and working principle of the entire grid-connected photovoltaic power generation system, and the relevant standards of the country/region where the project is located.
- Paint scratches in the process of equipment transportation and installation must be repaired in time, and it is strictly prohibited to expose the scratched part to outdoor environment for a long time.
- Do not remove the components of the device, including the outer box and the switch display.
- In any case, do not change the structure of the equipment, installation sequence, etc., without the permission of the manufacturer.
- You are advised to use the original packing case to pack the goods. Do not lift the goods through the battery docking terminal.
- Do not reverse engineer, decompile, disassemble, disassemble, adapt, implant or other derivative operations on the device software, do not research the internal implementation of the device in any way, obtain the source code of the device software, steal intellectual property rights, etc., and do not disclose the results of any device software performance test.

Personal safety

- Wear appropriate personal protective equipment when operating the equipment. If a fault is found that may cause personal injury or equipment damage, terminate the operation immediately, report the fault to the responsible person, and take effective protective measures.
- Before using the tools, learn how to use the tools correctly to avoid injury and device damage.
- When the device is running, the temperature of some internal shells is too high, which may cause burns. Do not touch them.
- To ensure personal safety and normal use, reliable grounding should be carried out before use.
- When the battery module fails, the temperature may exceed the burn threshold of the touchable surface, and contact should be avoided.
- Do not open or damage the battery module. The electrolyte released is harmful to the skin and eyes, and should be avoided.
- Do not place irrelevant items on top of the device or insert them anywhere.
- Do not place flammable materials around the device.
- The battery must not be placed in the fire, so as not to explode and endanger personal safety.
- Do not place the battery module in water or other liquids.
- Do not short-circuit the battery module docking terminal. Short-circuit the battery will cause combustion.

- Batteries can cause a danger of electric shock and large short-circuit currents. When using batteries, you should pay attention to the following precautions:
  ① Remove watches, rings or other metal objects.
  ② Use tools with insulated handles.
  ③ Put on rubber gloves and boots.
  ④ Do not place small tools or metal parts on top of the battery module.
  ⑤ Disconnect the charging power supply before connecting or disconnecting the battery terminal.
  ⑥ Determine whether the battery is accidentally grounded. In case of unexpected grounding, remove the power supply from the ground. Contact with any part of the grounded battery can result in electric shock. If these grounding are removed during installation and maintenance, the possibility of such an electric shock can be reduced.
- Batteries can cause a danger of electric shock and large short-circuit currents. When using batteries, you should pay attention to the following precautions:
- Do not use water or detergent to clean electrical components inside or outside the cabinet.
- Do not stand or lean on or sit on equipment.
- Do not damage any module of the device.
- If the battery module falls or is strongly impacted when installing the battery module, the device may be damaged. Do not continue to use the battery module; otherwise, safety risks may occur, such as battery leakage and electric shock.
- When installing the battery module, tighten the screws to prevent the battery from falling from the base.

Measures to deal with battery leakage

When an electrolyte leak occurs, take the following emergency measures according to the severity of the leak.

- Ensure adequate ventilation. Remove all ignition sources.
- Quickly evacuate personnel to a safe area, away from the spill area and in an upwind direction.
- Use personal protective equipment. Avoid inhalation of steam, smoke, gas or dust.
- Take measures to prevent further leaks or spills while ensuring safety.
- When a small amount of leakage, dry sand or inert adsorption materials can be used to absorb the leakage, and a large number of leaks need to be built to control.
- Attachments or collections shall be stored in suitable airtight containers and disposed of in accordance with relevant local laws and regulations.
- Remove all ignition sources, and use fire retardant tools and riot control 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. If you come into contact with battery electrolyte, take the following actions.

- Inhalation: Evacuate the contaminated area and immediately transfer to fresh air to 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 the breathing stops. Immediate CPR; And seek immediate medical help.

- Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes, do not rub, 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, do not feed anything from the mouth of an unconscious person, and seek medical help immediately.
- First aid worker protection: Ensure that health care workers are aware of the hazardous properties of products and take self-protective measures to protect themselves and prevent the spread of contamination.

Fire treatment measures

- In the event of a fire, power off the system as long as it is safe to do so.
- Use carbon dioxide, FM-200 or ABC dry powder fire extinguishers. Avoid using too strong water vapor to extinguish the fire, as it may spread and disperse the flames.
- Firefighters need to avoid contact with high-voltage components when fighting a fire, otherwise it may lead to the risk of electric shock.
- When fighting a fire, wear a breathing mask (MSHA/NIOSH compliant or equivalent) and full body protective clothing.
- Extinguish the fire at a safe distance with adequate protection.
- Prevent fire pollution of surface and groundwater systems.

If the battery temperature is too high, the battery will be deformed, damaged, and the electrolyte will overflow, leaking toxic gases. Keep away from the battery to avoid skin irritation and chemical burns.

Flood emergency measures

- To ensure personal safety, power off the system.
- If any part of the battery is submerged by water, do not touch the battery to avoid electric shock.
- Do not use flooded batteries. Contact a battery recycling company for disposal.

Battery recycling

- Dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as domestic garbage.
- If the battery leaks or bulges, contact technical support or a battery recycling company for scrapping.
- When the battery is out of service life, contact the battery recycling company for scrapping.
- Avoid exposing the battery to high temperatures or direct sunlight.
- Avoid exposing the battery to high humidity or corrosive environment.

Personnel requirement

- The personnel responsible for installing JOYKOO products must read the user manual carefully or be trained by engineers to understand various 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 facilities and repair equipment.
- The personnel who operate the equipment, including the operators, trained personnel, and professionals, must have the special operation qualifications required by the local country, such as high pressure operation, climbing, and special equipment operation qualifications.
- Replacement of equipment or components (including software) must be done by a professional or authorized person.

Electrical safety

- Professional: A person who has training or experience in operating equipment and knows the potential sources and magnitude of hazards during installation, operation, and maintenance of equipment.
- Trained personnel: A person who has received appropriate technical training and has the necessary experience to be aware of the risks that may be posed to him in performing an operation and to take steps to minimize the risks to himself or other personnel.
- Operators: Operators other than trained personnel and professionals who may come into contact with the equipment.

Grounding requirement

- When installing a device that needs to be grounded, install the PGND cable first. When removing a device, remove the PGND cable at the end.
- Do not damage the ground conductor.
- Do not operate the device without a ground conductor installed.
- The equipment shall be permanently connected to the protected area. Before operating the device, check the electrical connections of the device to ensure that the device is reliably grounded.

Routine requirement

Before electrical connection, ensure that the device is not damaged; otherwise, electric shock or fire may occur.

- All electrical connections must meet national electrical standards.
- Cables prepared by customers must comply with local laws and regulations.
- When performing high voltage operations, use special insulation tools.

DC operation

DANGER!

Do not install or remove power cables with power on. Transient contact between the core of a power cable and the conductor generates electric arcs or sparks, which may cause fire or personal injury.

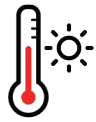
- Before electrical connection of the device, if live parts may be encountered, the corresponding breaking device must be disconnected from the front of the device.
- Before connecting a power cable, ensure that the label on the power cable is correct.
- If the device has multiple inputs, disconnect all inputs and perform operations on the device only after the device is powered off.

Wiring requirement

- The insulation layer may be aged or damaged when cables are used in high temperatures. The distance between the cables and the heating device or the heat source area must be at least 30mm.
- Cables of the same type must be bound together and laid at least 30mm apart from each other. Do not intertwine or cross cables.

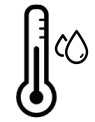
Installation environment requirements

- It should be installed in a dry and well-ventilated environment to ensure good heat dissipation.
- It is recommended to choose a sheltered installation site or build an awning.
- Avoid direct sunlight or rain, the surrounding environment is clean, there is no large amount of infrared radiation, organic solvents and corrosive gases.
- Installation position away from fire source.
- Installation position Not accessible to children.
- The installation location is away from water sources such as taps, sewer pipes, and sprinklers.
- The cabinet must be fixed on the wall or a fixed object with a similar load bearing capacity to avoid tipping.
- The device must be on a solid, flat support surface.
- Do not place flammable or explosive materials around the device.
- When the device is running, do not block the vent or heat dissipation system to prevent fire at high temperature.
- Do not place the device in an environment with flammable or explosive gas or smoke, and do not perform any operations on the device.

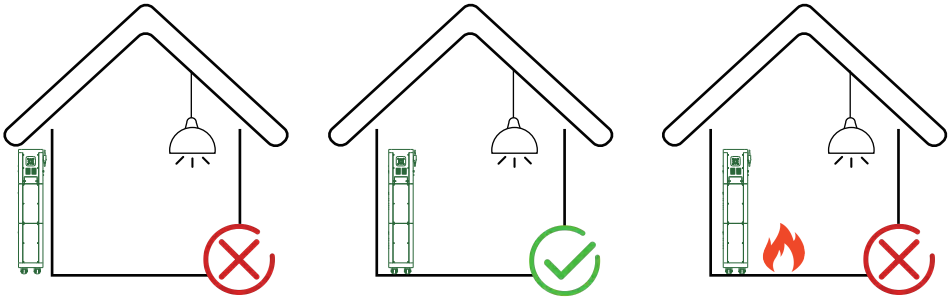


Max+50°C

Min-10°C



RH.+5%~+95%



Transport requirement

- The operation and service life of the energy storage are related to the operating temperature. Therefore, install the energy storage at a temperature equal to or better than the ambient temperature.
- The operating environment temperature of the system is -20~ 55℃, among which some functions of the products can not work at -20~0℃, and the system may run at a reduced load when the environment exceeds 40℃.
- If stored in a cold environment (e.g. 0°C) before installation, the battery modules require additional heating to be recharged. It is recommended to place the battery module in a relatively warm position before installation to help efficient commissioning.
- When the ambient temperature of the product is higher than 45 ° C or lower than -10 ° C, the battery charging and discharging power may be derated.

By 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) certification (This product belongs to Class 9 dangerous goods).

The products meet the transportation requirements of cars and ships. The transport box must be firm, and the outside of the box should comply with the provisions of the national standard and should be marked "handle with care" and "moisture-proof". Due to the external environment (such as temperature, transportation, storage, etc.), the product specifications are subject to the specific factory date.

Avoid:

- A direct hit by rain or snow or falling into water
- Fall or mechanical impact

ATTENTION

Do not transport batteries if they leak or bulge. Contact a battery recycling company for handling

Installation and debugging

- When moving heavy objects, be prepared to bear them to avoid being crushed or sprained.

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

- When the device is powered on for the first time, professionals need to set correct parameters. Incorrect Settings may cause device failure or device damage.

Maintenance and replacement

DANGER! If the battery temperature is too high, the battery will be deformed, damaged, and the electrolyte will overflow, leaking toxic gases. Keep away from the battery to avoid skin irritation and chemical burns.

- Maintain the equipment when you are familiar with the contents of this manual and have appropriate tools and test devices.
- Before performing maintenance, power off the device and wait for the required time according to the delayed discharge label.
- During the maintenance process, avoid irrelevant personnel from entering the maintenance site. Temporary warning signs or fences must be erected for isolation.
- If the equipment fails, please contact your dealer in time.
- Power on the device only after the fault is rectified. Otherwise, the fault may expand or the device may be damaged.
- Do not open the cover plate without authorization, otherwise there will be a risk of electric shock, and the resulting failure is not covered by the warranty.
- Operation and maintenance personnel and professional and technical personnel should be fully trained in the safe use and maintenance of the equipment, and should be equipped with adequate preventive measures and personal protective equipment.
- When you need to move or reconnect cables, cut off the power supply. Wait 5 minutes for the energy leakage to complete, and check that there is no dangerous voltage between the DC bus and the parts inside the machine to be repaired using a multimeter.
- Battery maintenance should be performed or supervised by someone familiar with the battery and its required precautions.
- When replacing the battery, replace the battery module with the same type.
- Immediately after the maintenance operation is complete, check to ensure that no tools or other parts are left out of the equipment.
- If you do not use the device for a long period of time, store batteries and replenish power according to this manual.

Product introduction

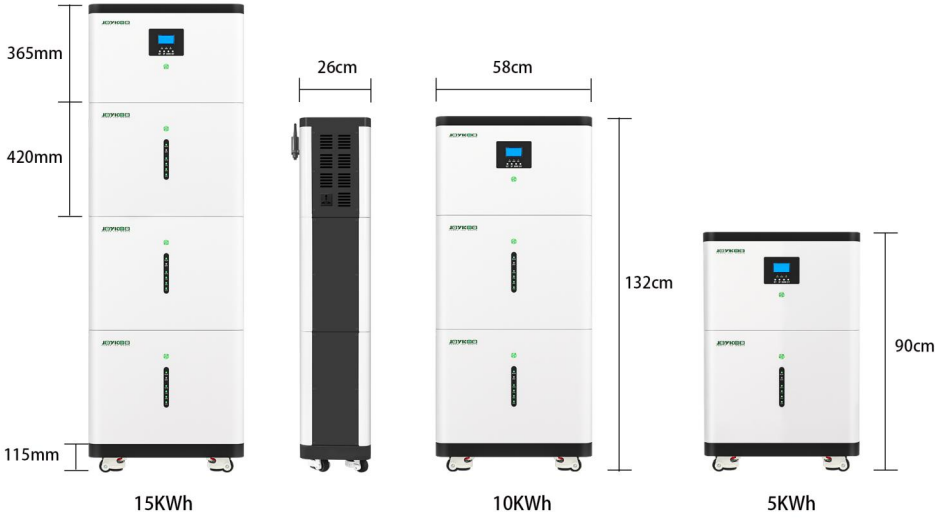
Feature

The JOYKOO all-in-one system contains a photovoltaic inverter and a stacked battery module, which can store and release power according to the requirements of the inverter energy management system. The input of the stacking machine is high voltage direct current. The output port is AC.

- Battery charging: The battery module is connected to the inverter energy storage terminal (BAT+, BAT-), and charges the battery under the control of the inverter to store excess photovoltaic energy in the battery. Or when the photovoltaic energy continues to be insufficient, the strong charge mode can be started to charge the grid energy into the battery and stop the battery from overdischarging.
- Battery discharge: When the photovoltaic energy is insufficient 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 inverter.
- Photovoltaic & battery off-grid: The off-grid output outlet of the cabinet can be connected to household appliances and other loads, so pay attention to avoid overload.

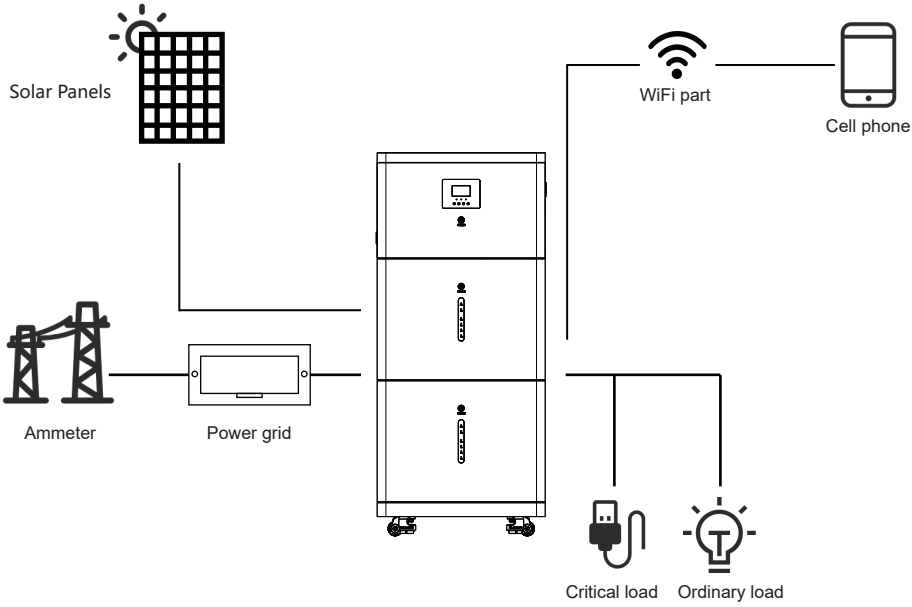
Energy storage capacity specification

The JOYKOO all-in-one system supports capacity expansion. For battery capacity expansion, increase the number of battery modules.



Networking application

JOYKOO all-in-one machine is suitable for off-grid system of domestic rooftop power station. The system is generally composed of photovoltaic series, JOYKOO stacking machine, AC switch and power distribution unit.



JOYKOO all-in-one communication modes include:

- The inverter is connected through CAN interface to realize the communication and control between the inverter and the battery management system.
- Communicate with smart meters or energy management via RS485.
- Connect the inverter directly through the mobile APP or connect the inverter in the same LAN to manage and maintain the JOYKOO all-in-one computer.
- The inverter connects to the public network through the intelligent communication module. The management system manages and maintains the JOYKOO all-in-one computer.

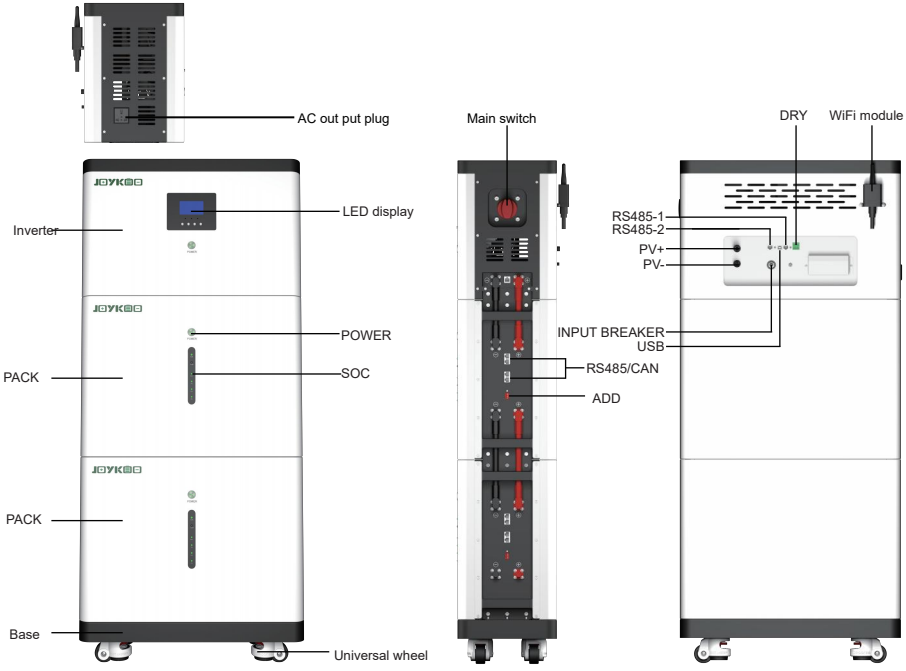
Specification parameter

argument		EPS-5KW-5KWh	EPS-5KW-10KWh	EPS-5KW-15KWh
PV input	Maximum input voltage (Vdc)	500		
	Rated MPPT voltage range (Vdc)	120~450		
	Starting voltage (Vdc)	48		
	MPPT Maximum input Current (A)	12		
	MPPT Short Circuit Current (A)	15		
Battery parameter	Cell type	Li-ion Lithium iron phosphate		
	Cell Capacity (Ah)	102		
	Cell capacity (Wh)	5222	10444	15667
	Discharge depth	90%		
	Voltage range (Vdc)	40~58		
	Maximum current (A)	25		
	Operating temperature (℃)	0~50		
	Communication mode	CAN/RS485		
Off-grid output	Rated voltage (Vac)	230,L/N/PE		
	Frequency (Hz)	50/60		
	Rated output current (A)	21.7		
	Rated power (W)	5000		
	And off-grid switching time	10mS		
	PV reverse protection	YES		
	DC switch	YES		
	Ac overcurrent protection	YES		
	Ground fault detection	YES		
	Temperature detection	YES		
	Island protection	YES		
	Overload protection	YES		
Other parameters	Weight (Kg)	90	150	208
	Altitude (m)	≤4000（2000以上降载）		
	Noise (dB)	≤30dB		

- Battery capacity expansion affects only battery parameters.
- This parameter table is all the functions of the product, and the actual purchase of the product may be deleted according to the actual project requirements.
- Product version optimization replacement may cause actual parameters to be different from this form, such problems can contact JOYKOO or the distributor, this form is for reference only, not as a standard to judge whether the product is qualified.

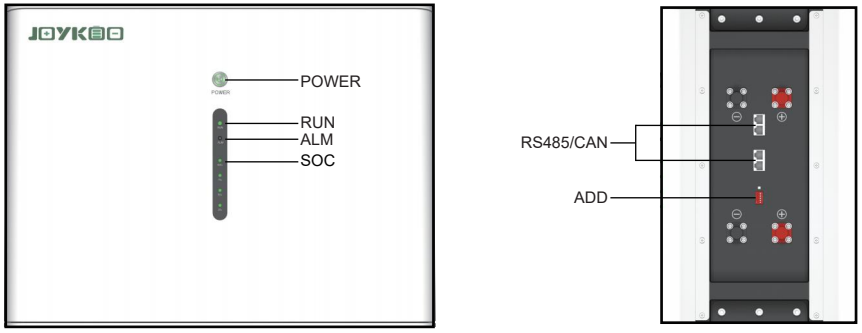
Appearance description

●This section describes the overall appearance of the stacked appliance



● Battery module interface

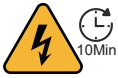
(The battery expansion module has a standard capacity of 5.12kWh.)



RS485A and RS485B are parallel battery communication interfaces, staggered connection, BMS interface and RS485 interface on the side of the inverter to communicate with the inverter

Label description

Box identification

ICON	NAME	IMPLICATION
	Anti-scalding warning sign	When the energy storage is working, the shell temperature is high, which may cause burns. Do not touch it.
	Delay discharge mark	After the energy storage is powered on, there is a high voltage, but after the energy storage is powered off, there is still a residual voltage, and it takes 10 minutes to discharge to the safe voltage.
	High voltage marking	High voltage exists after the energy storage is powered on. Must be carried out by a qualified professional electrical technician.
	Operation warning mark	The product must be powered off during operation.
	Storage identification	Keep it dry.
	Product description identification	Some components can be recycled.
	Check manual identification	Remind the operator to check the instruction manual of the storage tank.
	Earthing mark	PGND cable connection position.

The ICONS are for reference only.

Product characteristics

Supports multiple scenarios and multiple working modes

- Support off-grid scenarios, self-use, peak cutting and valley filling, self-maintenance of a variety of working modes.
- Support users to query real-time product life cycle total discharge information.

Intelligent operation, simple operation

- Modular components, stacked placement, easy installation, mobile APP and management system integration.

Easy to install and replace

- Standard energy storage terminals are used for system input and output connections.
- Modular design, stacked installation.
- Two people can operate.

Flexible extension

- The battery capacity of the stacked appliance is expanded

Intelligent operation and maintenance

- The factory Settings meet the default Settings of the main target market, and can also be configured on site.
- PCS display screen operation display, battery module LED indicator status indication, while the mobile phone APP can be used to view real-time information, to achieve all remote and near-end operations.
- Using the cloud data management system, you can view and manage the fusioncube anytime and anywhere.

Save investment for users

- Use stacked installation, no complex tools are required, and the external wiring harness is customized according to the system.
- High efficiency, high power density, optional installation environment, and save installation space.
- Simple operation and maintenance, easy module replacement.

Working mode

The main function of the JOYKOO stacked machine is to convert the high-voltage direct current generated by the photovoltaic series into low-voltage direct current through the inverter and store it in the battery, and it can also convert the battery's direct current into alternating current through the inverter for load use.

All-in-one system status

JOYKOO machine has six working states, respectively: sleep, standby, self-check, fault, running, programming.

Working condition	Instructions
dormancy	The PV voltage is lower than 180V, and there is no BAT input or power grid input.
Bide one's time	When the PV&BAT input voltage is low, the inverter will be in standby mode.
self-inspection	When the PV&BAT input voltage is higher than 260V, it enters the self-check mode.
breakdown	The system reports an error without any output. The display displays a fault information.
operation	Normal output.
programming	In addition to sleep mode, when the system programming requirements appear, the inverter will enter the programming mode and upgrade the product software program.

Pre-installation inspection

Check the outer packing

Before unpacking the outer package of each energy storage system component, check the outer package for visible damage, such as holes, cracks, or other signs of possible internal damage, and check the model. If there is any abnormal packaging or model discrepancy, do not open it and contact your dealer as soon as possible.

Check deliverables

After unpacking the outer packaging of the energy storage, check that the deliverables are complete and there is no obvious external damage. If anything is missing or damaged, contact your dealer.
(For the quantity of deliverables shipped with the box, see the Packing List in the box.)

Prepare tools and meters

Tools and meters		
 Percussion drill (drill diameter 4mm)	 Torque socket wrench	 Torque wrench
 Diagonal pliers	 Wire stripper	 Torque screwdriver
 Rubber mallet	 Utility knife	 Wire cutter
 Crimping pliers	 Cord end terminal crimping pliers	 M5 Hex key 5mm

 Cable tie	 Dust collector	 multimeter
 Marker pen	 Steel tape measure	 Spirit level
 Hydraulic tongs	 Heat shrink bushing	 Heat gun
 Safety gloves	 goggle	 Dust mask
 Safety shoes		

Select installation location

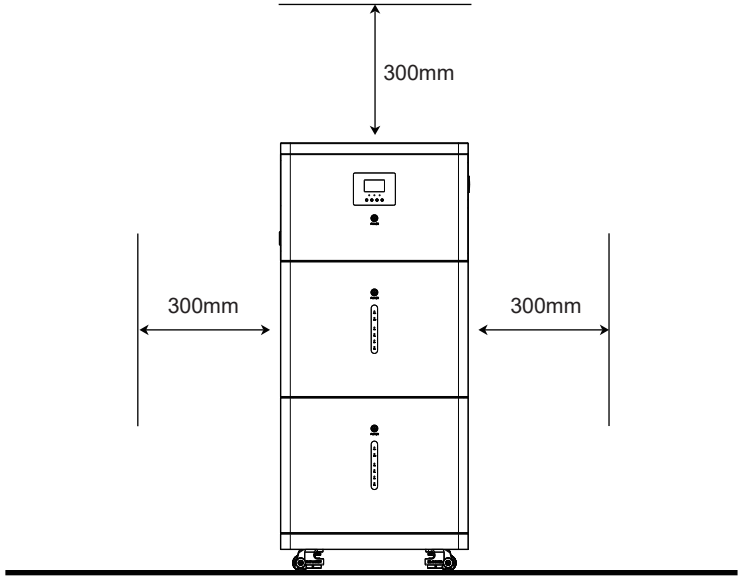
Basic requirement

- Energy storage During the running, the temperature of the chassis and heat sink is high. Do not install it in a position that is easy to touch.
- Do not install in an area where flammable and explosive materials are stored.
- Do not install energy storage outdoors in salt-affected areas because it may be corroded and may cause fire. A salt-affected area refers to an area within 500 meters of the coast or affected by sea breezes. The area affected by sea breezes varies according to meteorological conditions (e.g. typhoons, seasonal winds) or topographical conditions (dikes, hills).

- Do not install in a position accessible to children.
- The cabinet must be placed horizontally and secured to a solid ground such as concrete. Do not tilt the cabinet forward, horizontally, upside down, backward, or sideways.

Installation space requirement

Ventilation and heat dissipation are important to the energy storage system of the fusioncube. In any case, leave at least 300mm between the left and right sides of the cabinet and at least 300mm above the cabinet to ensure sufficient space for installation and heat dissipation.



(The preceding space requirements are the minimum. The actual space requirements can be increased based on actual environment conditions.)

Equipment installation

Installation notice

DANGER!

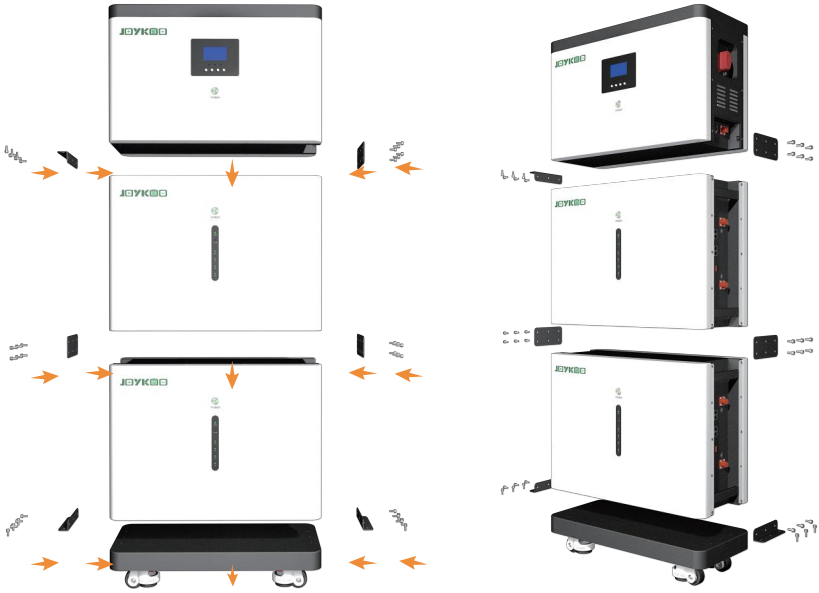
Make sure to avoid the buried line before drilling, so as to avoid danger.
The device cannot be lifted with straps. It may fall off, causing a fall hazard.

(Each module is packed separately and wrapped in a carton. Ensure that the cabinet floor meets the load-bearing requirements (one battery module weighs 50kg and one PC weighs 24kg). You need to calculate the load-bearing capacity based on the purchased product.)

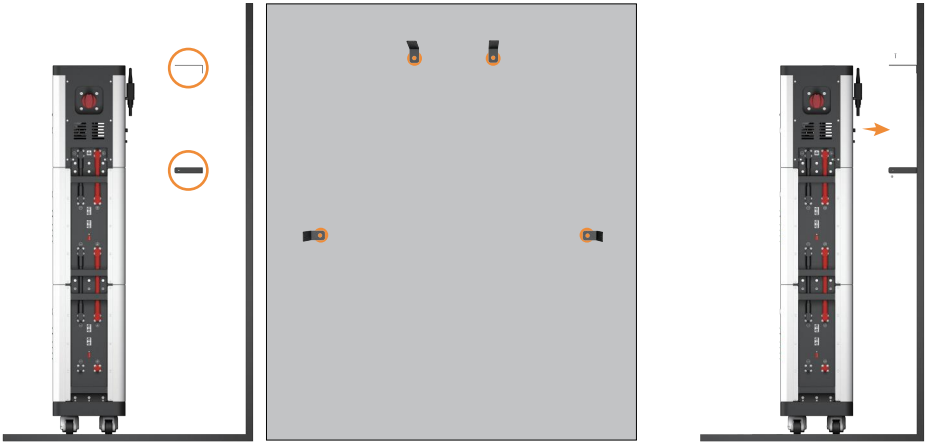
- In order to prevent dust from entering the human respiratory tract or falling into the eyes during drilling, the operator should wear protective goggles and dust masks.
- Use a vacuum cleaner to clean the dust inside and outside all holes, and then measure the hole spacing. If the error is large, reposition and drill holes.
- The ground on which the device is to be installed must be level and free from protruding. Otherwise, the ground may be uneven and may cause tipping hazards.

Module installation

The two modules to be installed are inverter and battery pack. Install them from bottom to top.



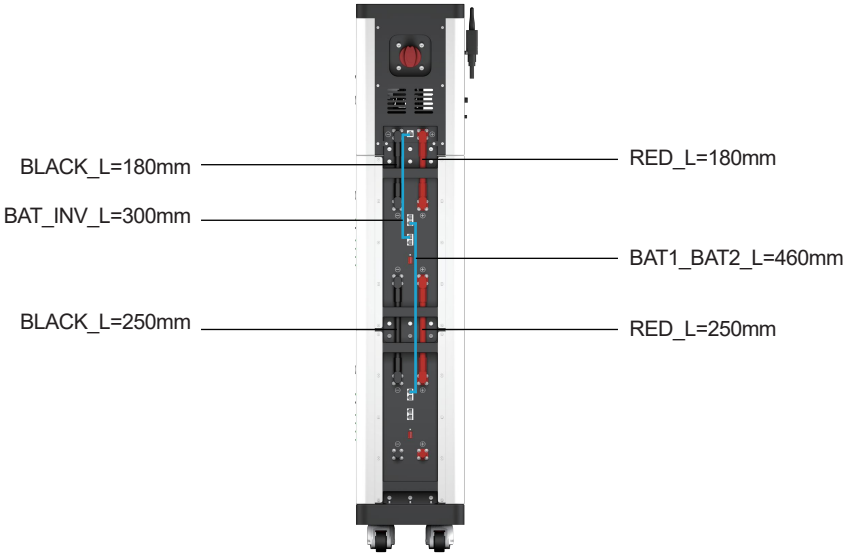
Place the product in front of the wall and mark the installation position of the fixed piece, drill holes to install the fixed piece on the wall, and move the product to the fixed piece position for installation.



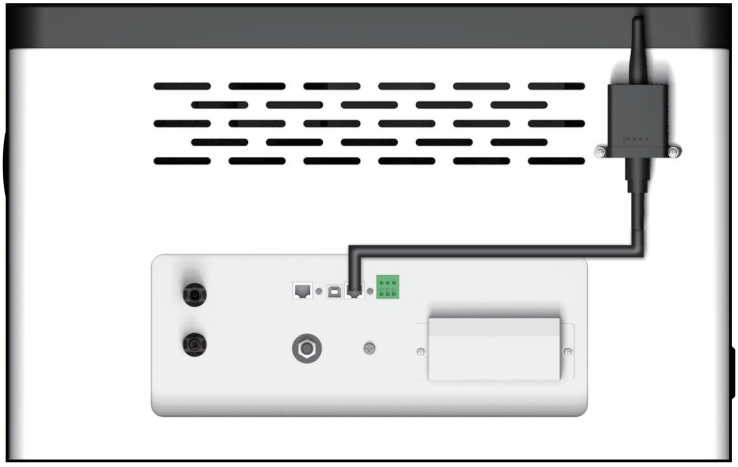
CAUTION

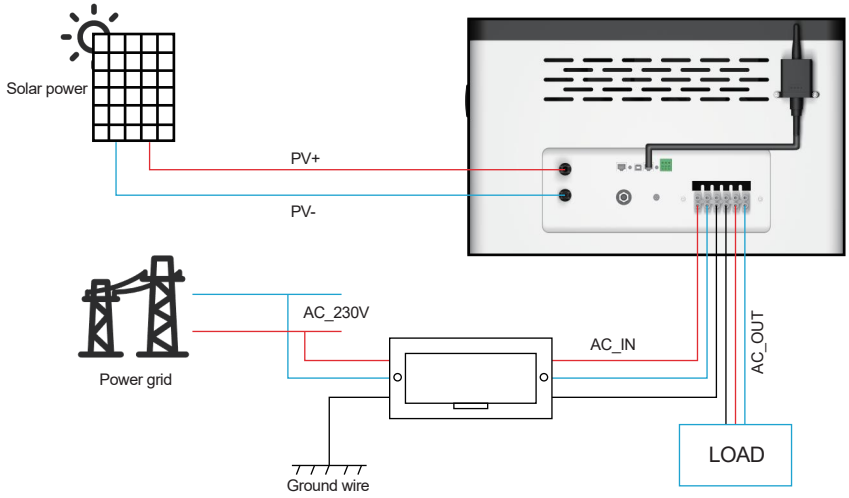
After placing a module, tighten the screws before installing the next module to stop the fall.

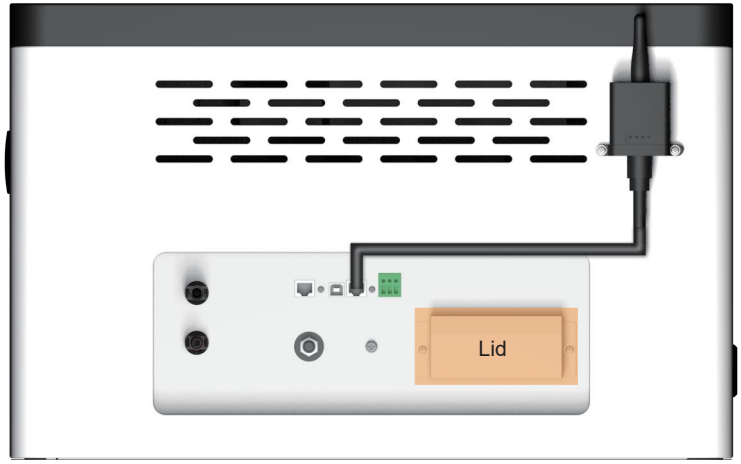
Refer to the instructions in the figure to fix the connecting plates on both sides Insert the positive and negative connecting wires and communication wires into the corresponding interfaces according to the instructions in the figure. (Note that the color of the plug and the socket must be the same. After alignment, press firmly until the "click" sound indicates that the installation is in place. When taking it out, first press the side button of the plug and then pull it out forcefully. It is strictly forbidden to cross-insert plugs and sockets of different colors, otherwise will cause a short circuit in the battery and cause a fire)



Connect the WIFI module with reference to the instructions in the figure, and insert the communication line into the corresponding interface.







Connect the photovoltaic input terminal and the mains output and output wires according to the instructions in the figure. After the installation is complete, please cover the AC protective cover and the side cover of the battery.

Notice:

The output of the machine is high voltage, and non-professionals should not install it privately to avoid safety accidents

Matters needing attention

DANGER!

Before electrical connection, ensure that the DC SWITCH of the energy storage system and all the switches connected to the energy storage cabinet are in the OFF state. Do not operate with power on. Otherwise, the high voltage of the energy storage system may cause electric shock.

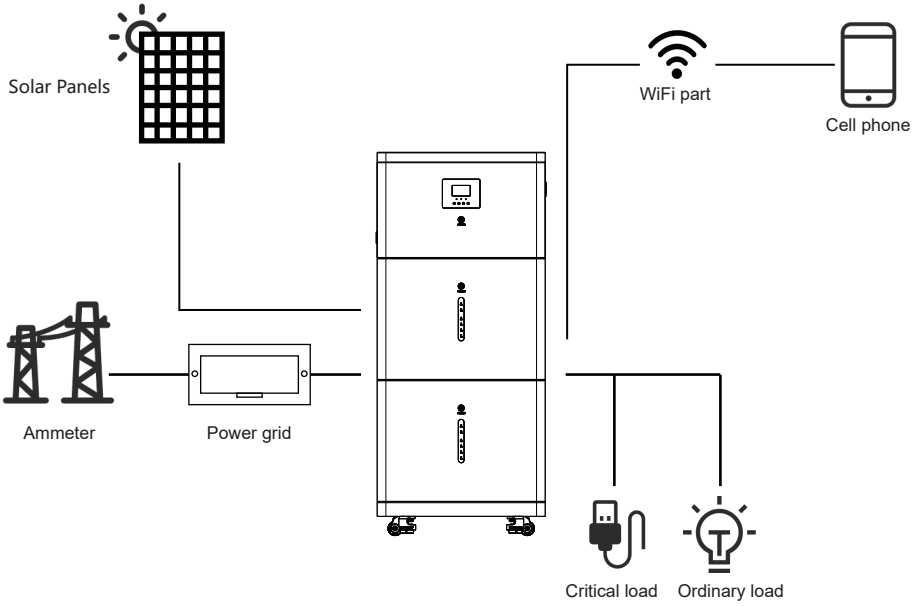
CAUTION

- Equipment damage caused by incorrect wiring is not covered by the equipment warranty.
- Electrical connections must be performed by professional electrical technicians.
- When making electrical connections, the operator must wear personal protective equipment.

The cable colors in the electrical connection diagrams in this section are for reference only. The cables must comply with local cable standards. (The yellow and green cables can only be used for grounding protection.)

Prepare cables

System networking diagram



Cables provided by users

Cable	Type	Recommended specification	Source
Dc input line PV- Cabinet	Industry general outdoor photovoltaic cable	● Conductor cross-sectional area: 4mm² ~ 6mm² ● Cable diameter: 5.5mm to 9mm	User provided
Ground wire	Single-core outdoor copper cable	● 6mm² or equivalent	User provided
Ac output line	Multicore cable	● 6mm² or equivalent	User provided

Cables are delivered with the box

Cable	Type	Source
Communication line (between power module and battery module, communication line)	Outdoor shielded twisted pair cable	product-owned
Battery DC power cable	6AWG Red and black lines	product-owned

- The minimum cable diameter must meet the local cable standards.
- The following factors affect the selection of cables: rated current, cable type, laying mode, ambient temperature, and maximum expected line loss.

External electrical connection

External connections of the cabinet

After all components of the JOYKOO Stacked integrated cabinet are stacked and installed, you only need to connect the cables to the corresponding positions based on the cable harnesses supplied with the purchased products. Finally, connect the output cables to the required lengths.

Battery module connection table

Battery module interface	Docking interface	Instructions
BAT+	As a host, connect to INVERTER BAT+ As the slave, connect the previous module BAT-	The positive output of the battery module
BAT-	As the host, connect to the next module BAT+ As the slave, connect INVERTER BAT-	Negative output of the battery module
RS485	Connect battery modules in parallel	Communication port between battery packs
CAN	Connect the INVERTER-BAT port	Communication interface between battery module and INVERTER

The actual product will have a defined identifier for each connection port, and you can connect according to the corresponding identifier when wiring. The interface shown in the figure shows all the functional interfaces of the system. The actual product may be deleted according to the product function. You can select the connection according to the product function you purchased.

CAUTION

The positive and negative values of all interfaces marked with "+" and "-" must be connected as required; otherwise, risks may arise.

Installing cables

Matters needing attention

DANGER!

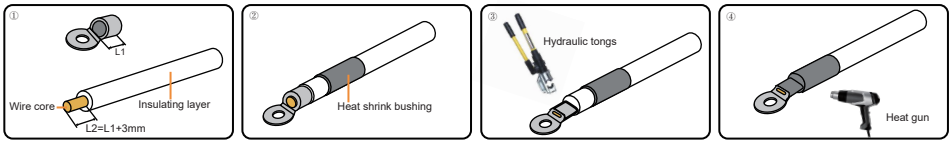
Ensure that the PGND cable is securely connected. If the PGND cable is not connected or loose, electric shocks may occur.

(After installing the ground cable, apply silicone gel or paint to the ground terminal for protection.)

User provided wiring harness production

If you need to crimp the OT terminal, crimp the OT terminal as shown in the following figure. The specifications and models must be selected according to the cable used

Crimp the OT terminal



NOTICE

- Do not scratch the core when stripping the wire.
- The cavity formed by crimping the conductor crimping sheet of the OT terminal should completely cover the wire core, and the wire core should be tightly bound to the OT terminal without loosening.
- The cable can be covered with heat shrink tubing or insulation tape. The heat shrink tubing is used as an example.
- The specifications of the wire and heat shrink tubing used depend on the type of wire harness actually produced.
- When using the heat gun, take precautions to prevent the device from being damaged.
- Hard cables such as armored cables are not recommended for DC input cables.
- Before assembling DC connectors, ensure that the polarity of cables is correct, and label positive and negative cables.
- After crimping the positive and negative metal terminals, pull back the DC input cable to ensure that the cable is securely connected.

After the wiring harness is made, it can be connected according to the wiring sign one by one. After all power wiring harnesses and communication cables are connected, check them according to the wiring diagram to prevent incorrect connections.

Ground mounting

Connect the screw holes marked on the inverter to the ground using a ground cable. Ensure that the ground is reliable.

(After installing the ground cable, apply silicone gel or paint to the ground terminal for protection.)

Check before power-on

Check items and acceptance criteria

	Check item	Acceptance criteria
1	Module installed in place	Install correctly and interconnect reliably.
2	Reasonable cable layout	The cable layout is reasonable and meets customer requirements.
3	Cable tie lashing beautiful	The cable tie should be even and cut without sharp corners.
4	Reliable ground	The ground cable is connected correctly and securely.
5	Disconnect switch	The "DC SWITCH" and all switches with the battery module are in the "OFF" state.
6	Cable connections in place	The AC output line, DC input line, and signal line are connected correctly and securely.
7	The installation environment meets requirements	The installation space is reasonable, the environment is clean and tidy, and there is no construction residue.

System power-on

NOTICE

- After the battery module is unpacked, if it is not installed immediately, the switch must be turned off.
- Press and hold the battery module switch for 3S to start the system. The system power-on procedure starts from the slave computer and starts the host. The battery module adjacent to the PCS must be set as the host for easy connection and operation.

Battery switch Description

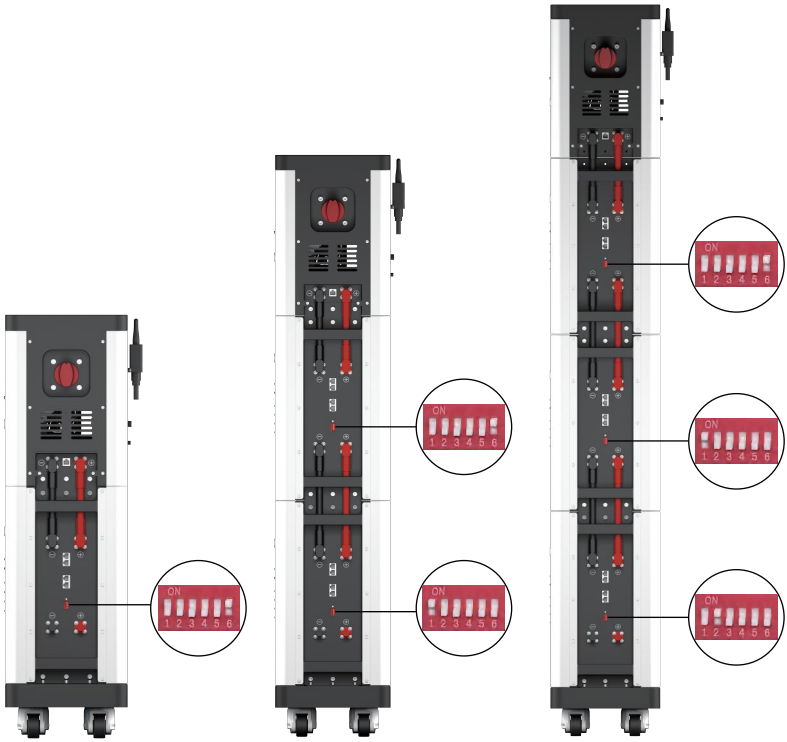
The battery switch is a self-multiple switch and needs to be held down for 3S to start normally. The specific operation is as follows: Hold down the switch and the green indicator on the button will light up. After 3S, the LED indicator RUN will light up, which means that the battery pack starts normally.

When the system is running properly, holding down the slave switch does not shut down the battery module. You need to operate the host to shut down the battery module. In addition, if the communication is normal, all slaves in the host system will also be shut down.

Battery DIP switch description

This dip switch is used to match resistors for communication. This dip switch must be enabled between the host and the lower slave to ensure normal and reliable communication between battery modules.

Dip signal of the battery module



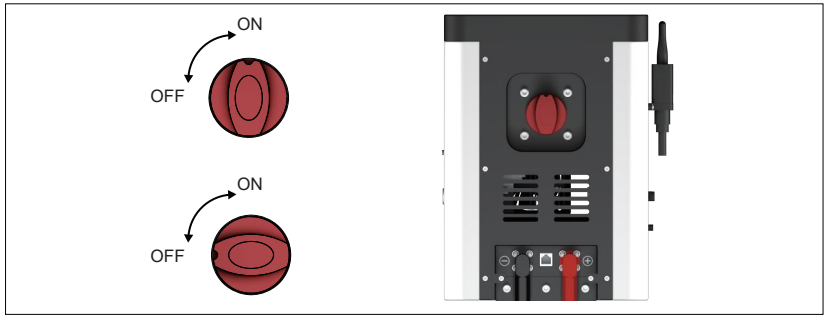
LED indicator Description

LED indicator

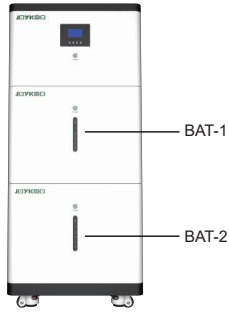
sort	status		Indication definition
PCS indication	Steady green	NA	Running mode/Standby mode
	Green flicker	NA	Self-check mode
	Green flicker	Yellow light flashing	Upper computer communication/programming mode
	Steady green	The red light is steady on.	Failure mode
Host PACK indication	RUN light flashing	COM light flashing	PACK is assigning an address
	NA	COM light flashing	Failure mode
	The RUN light is on.	The SOC is displayed and the COM indicator blinks	In normal mode, SOC represents 20% per cell
Slave PACK indication	The RUN light is on.	The SOC is displayed and the COM indicator blinks	In normal mode, SOC represents 20% per cell
	The RUN light is on.	SOC does not display	PACK is assigning an address
	The RUN light is on.	The red light is steady on.	Failure mode

Boot up steps

1.First, check the closing state of the red battery main switch on the side of the main engine. (the horizontal side is closed)



2.Turn on the power switch of the battery box (1), the switch indicator light and the power indicator light are on, and the red light is flashing at this time, wait for about 3 seconds, wait for the red light to stop, and the green light of the operation and power display is always on, at this time The battery system has completed the self-inspection and can work normally; open the next battery box (2) in the same way to complete the self-inspection of the battery system;



3. After the self-inspection of all battery box systems is completed, turn on the main switch of the battery (vertical is on), turn on the power switch of the host, the indicator light is on, wait for about 30 seconds, the AC indicator light flashes, and the display shows AC-230V Output, at this time, the host self-test is completed and the load can be started normally

Shutdown steps

1. First, turn off the electrical equipment in use;
2. Turn off the host voltage switch;
3. Close the side battery main switch;
4. Finally, turn off the battery box power switch in turn.

Pay attention to:

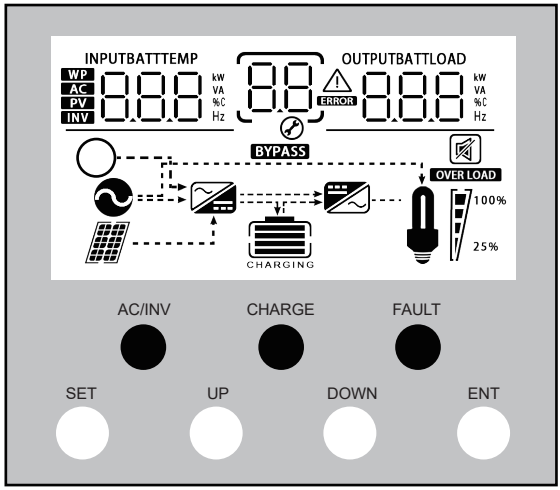
1. When opening the battery box, you must wait for the previous battery system to complete the self-test before opening the next battery box. Otherwise, the system self-test will fail and need to be reopened.

2. When the equipment is not in use for a long time, the power supply of the host and the battery main switch must be turned off to avoid safety accidents.

3. When the battery is low power alarm, please make up the power in time to avoid the damage caused by the battery loss and the failure to charge.

Operation and display panel

The operation and display panel is shown in the figure below, including 1 LCD screen, 3 signal lights and 4 operation keys



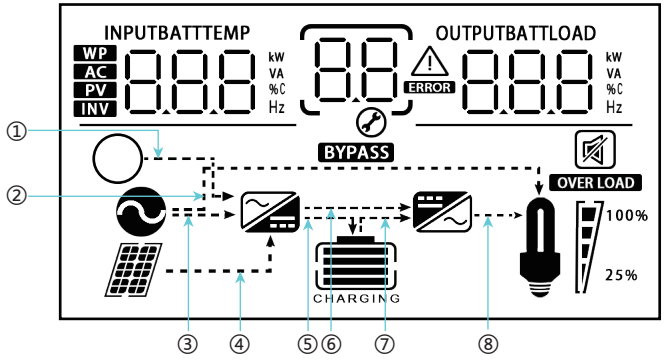
Key-press operation instructions

Function key	Explain
Set up (UP)	Switch to the previous option
Upward (DOWN)	Switch to the next option
Down (BACK)	Exit the options menu settings
Enter (ENTER)	Confirm / enter the next item in the Settings menu

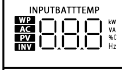
Signal light description

Signal lamp	Color	Explain
AC/inverter (AC/INV)	Yellow	Often bright: the mains electricity output
		Blink: Inverter output
Charging (CHARGE)	Green	Flashing: Fast charging
		Often bright: floating charge
Fault (FAULT)	Red	Blink: Fault status

LCD display description



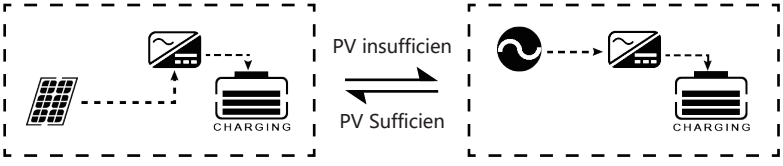
Icon	Function	Icon	Function
	Indicates that the AC input port is connected to the mains power		Indicates that the inverter circuit is running
	In the AC input mode is APL mode (wide voltage range)	BYPASS	It means that the equipment is on the mains power bypass
	Indicates that the PV input port is connected to the solar panel	OVER LOAD	Indicates that the AC output is in an overloaded state
CHARGING	Indicates that the device is connected to the battery:		Represents the percentage of the AC output load
	CHARGING Indicates that the battery remaining power is 0% to 24%		Represents a percent load ranging from 0% to 24%
	CHARGING Represents the remaining battery power From 25% to 49%		Indicate load percentage of
	CHARGING Represents the battery surplus is 50%~75%		Indicates the load percentage ranging from 50% to 75%
	CHARGING Represents the battery remaining 75%~100%		Represents a load percentage ranging from 75% to 100%
LI	The battery type of the indicated device is a lithium battery		Indicates that the alarm device is not enabled
SLA	The battery type of the indicated device is a lead-acid battery		Indicates an alert for the device
CHAPGING	Indicates that the battery is in a charging state	ERROR	Indicates the device is in a faulty state
	Represents that the AC / solar charging circuit is running		Indicates that the device is in the setup mode

	Indicates that an AC voltage output exists at the AC output port		Parameters displayed in the center of the screen; 1. In unset mode Report or fault code 2. In the setting mode, display the current situationSet the parameter code for the item
P	In parallel operation, the icon indicates that the inverter is the only valid host in parallel mode		
Parameters displayed on the left side of the screen: Input parameters			
AC	Indicates the communication input		
PV	PV input		
INV	Represents the inverter circuit		
WP	The icon is not shown		
	Display battery voltage, battery total charging current, mains charging power, AC input voltage, AC input frequency, photovoltaic input voltage, internal radiator temperature, software version		
Parameters displayed on the right side of the screen: Output parameters			
	Represents the output voltage, output current, output active power, output dependent power, battery discharge current,Software version; in the setting mode, when the current setting parameter item code, display the setting parameter.		
Arrows are shown			
①	Arrows are not shown	⑤	Indicates the charging circuit toward the battery port charge
②	Represents the mains power supply to the load	⑥	Arrows are not shown
③	It means that the mains power supplies power to the charging circuit	⑦	Indicates that the battery port is charged to the inverter Road energy supply
④	It means that the solar module provides power to the long point circuit	⑧	Indicates that the inverter circuit supplies power to the load

Description of the operation mode

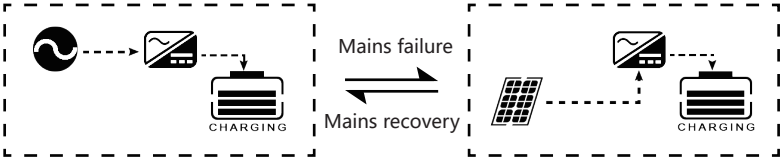
1 Solar priority:

Solar components will give priority to charge battery, and battery only in photovoltaic system, through the mains charge, during the day, to charge the solar energy, night, charging power source for city electricity, this can maintain the battery level, and the grid is relatively stable,



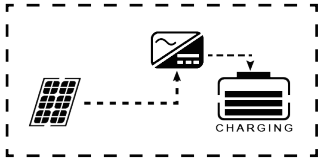
2 Mains power priority:

The mains power will give priority to charging the batteries, and only the photovoltaic charging is activated when the mains power is weakened.



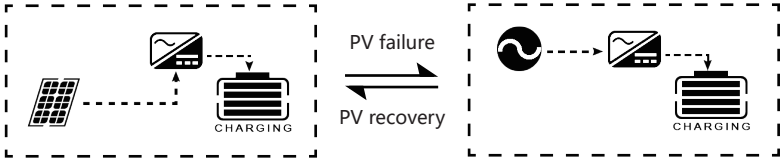
3 Hybrid charging:

Photovoltaic and city hybrid charge, photovoltaic maximum power point tracking charge as a priority, at the same time when solar energy, city as the mains supply, when the solar energy, city to stop charging, the mode for the fastest charging mode, suitable for city electricity unstable



4 With solar energy only:

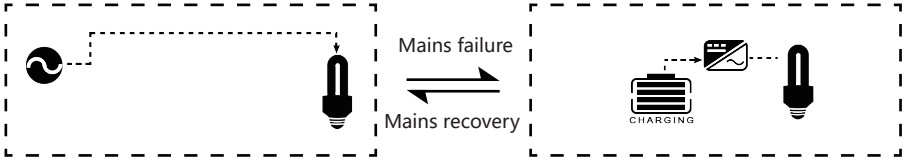
Only solar charging, and not suitable for mains charging. This mode is the most energy efficient method when the battery is charged only by solar panels, and is often used in areas with excellent light conditions.



Output mode

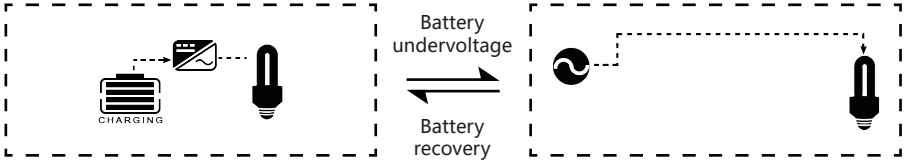
1 Solar Energy Priority Mode:

When the solar energy weakens, switch to supply power to the city. This model maximizes the use of solar energy while maintaining the battery power, and is suitable for areas where mains is relatively stable. Power supply priority: Solar mains battery.



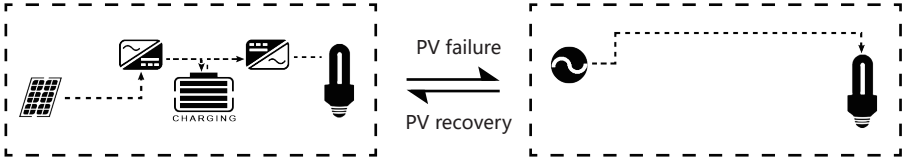
2 Mains Priority Mode:

Only switch the inverter when the mains power is weakened (when the mains power supply units are available, the mains power supply supports charging and energy supply), and then the equipment is equivalent In a standby UPS to apply to unstable areas, switching to municipal electricity, do not affect solar charging.
Supply Power priority: mains power solar cells.



3 Battery Priority Mode:

Only in the battery discharge low voltage below the set point (04 set), switch for city power, when charging battery than set point (05 set) high, switch to battery discharge mode, which can cycle for battery charge and discharge, the mode to maximize the use of the DC can, and suitable for the



Parameter setting

Battery operation instructions:

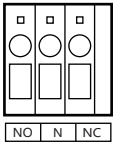
press the "Settings" key to enter or exit the Settings menu. After entering the Settings menu, the parameter number [00] will flash, at this point, press the "up" and "down" keys, select the parameter item code to be set, and then, press the "Enter" key to enter the parameter set series mode, flashing the parameter values, adjust the parameter value through the "Up" and "Down" keys, and

Parameter number	Function	Set up	Explaination
00	Exit Setup Menu	【00】ESC(exit)	Exit Setup Menu
01	Output power supply is preferred	【01】SOL (Solar Energy)	Solar priority mode, switching to the mains when the solar energy weakens, or the battery is below the parameter value set by the program [04]
		【01】UTI (Mains)	mains priority mode only switches to the inverter when the mains weakens
		【01】SBU	Battery priority mode switches only only when the battery voltage is insufficient or below the [04] parameter set point, and only switches to the battery discharge when the battery is full or above the [05] parameter set point
02	Output frequency	【02】50.0HZ	Bypass adaptation: the device automatically adapts to the mains frequency; when the mains is disconnected, the output frequency can be set by this setting item. The default output frequency of the 230V device is 50Hz, and the 120V device is 60Hz
		【02】60.0HZ	
03	The AC-input voltage range	【03】APL (household appliances) 230V	The wide mains input voltage range of the equipment is: 90~280V
		【03】UPS (uninterruptible power supply) 230V	Narrow mains power input voltage range of the equipment; 170~280V
04	Battery switch to the voltage setting point of the electricity	【04】43.6V When parameter (default)	When the parameter [01] = SBU, the battery voltage is lower than the set value, and the output is switched from the inverter to the city, the setting range: 48V~52V
05	The mains power switches to the battery Voltage setting point	【05】56.0V (Default)	When the parameter [01] = SBU, the battery voltage is higher than the set value, and the output is switched from mains to inverter, and the setting range is 48V~60V
06	Charging power supply is preferred	【06】CSO	Solar charging first: start mains charging only when solar charging weakens

Other functional description

1. dry contact

How it works: The dry contact can control the diesel engine on / off to charge the battery.
① Usually the port of the NC-N point is closed state, and the NO-N point is open state.
② When the battery voltage reaches the low voltage disconnection point, the relay coil is energized, and the port is converted, NO-N point is closed state, and NC-N point is open state. At this point, the NO-N point can drive the resistance load: 125 Vac/1A, 230Vac/1A, and 30Vdc/1A.



2. RS485 communication interface

This interface is a RS485 communication interface and has two functions:

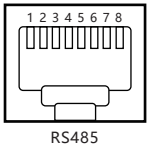
① RS485-2 can communicate directly with the optional host developed by the company through this port, which can monitor the device running status and set some parameters on the host.

② RS485-1 / RS485-2 can also communicate directly with the optional WIFI / GPRS. With this mode, you can connect to the reverse all-in-one machine through the mobile phone APP to browse running parameters and device status.

as shown in the figure:

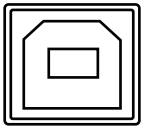
RS485-1: pin 1 is 5V power supply, pin 2 is ground, pin 7 is RS485-A1, and pin 8 is

RS485-2: pin 1 is 5V power supply, pin 2 is ground, pin 7 is RS485-A2, and pin 8 is



3. USB communication interface

The legend shows the USB communication interface, which can communicate with the optional PC host software. Use the connection
When speaking, you need to install the corresponding "USB to series chip CH340T driver" in the computer.



5. Remote monitoring

Google browser, scan the QR code to download the APP.

Search for "Smart ESS" in Google Play Store, download it, and install it.

Item Description	Quantity	Remarks
Inverter main chassis	1	5.5KW
battery box	2	51.2V 100Ah
Base	1	
WIFI module	1	
Right Angle connection frame	3	
Plane connection bracket	3	
Screw HB 5 * 16mm	36	
Screw for PWM 4 * 10mm	5	
Top-wall retaining bracket	2	
Inside hexagon screwdriver	1	
Phillips screwdriver	1	
Positive electrode battery cable (L=180mm)	1	Red
Negative electrode battery connector (L=180mm)	1	Black
Positive electrode battery cable (L=250mm)	1	Red
Negative electrode battery connector (L=250mm)	1	Black
Communication line (L=300mm)	1	Battery-connected inverter host
Communication line (L=460mm)	1	Parallel operation
Dry contact connection line	1	Generator communication
AGV communication line	1	Dilatation
product specification	1	
Photovoltaic plug-in terminals	2	

Precautions

1.Do not put in high temperature environment or the fire, or in the sun;

2.Do not put it in the water or outside in the rain;

3.Do not use it in environments outside the scope of the use environment;

4.When applying the inverter, ask consumers to use the certified electrical and electronic

5.Do not puncture the power supply shell with nails or other sharp objects, or hammer or pedal power supply;

6.Do not break down the power supply in any way;

7.If the power supply emits odor, heat, deformation, discoloration or any other abnormal phenomenon shall not use;

8.If the power supply leaks or smells off, it should be immediately removed from close to the open flame;

9.If the equipment is not used for a long time, place the power supply in a cool and dry place and charge and discharge it every 3~6 months, otherwise, it will affect the performance of the power supply and shorten the service life of the power supply;

System power-off

Matters needing attention

CAUTION

- After the system is powered off, the internal chassis still has surplus electricity and heat, which may cause electric shock or burns. Therefore, after the system is powered off for 10 minutes, wear protective gloves before operating the energy storage. You can maintain the energy storage system only after all indicators are off.
- When the energy storage system is running, only turn off the DC switch of the energy storage PV, and the system cannot be completely powered off. In this case, the energy storage cannot be maintained.

Power off the system

- First turn off the AC output and the power grid switch.
- Set "DC SWITCH" on the side of PCS to "OFF".
- Press and hold to shut down the PACK host, and the normal communication will also close. No separate operation is required. When the communication is abnormal, you need to operate each slave switch separately to shut down the PACK slave.

Routine maintenance

To ensure the long-term proper running of the energy storage system, you are advised to perform routine maintenance according to this section.

ATTENTION

Before maintaining the system, such as system cleaning, electrical connection, and grounding reliability, you must power off the system.

Maintenance list

Check content	Inspection method	Maintenance cycle
System cleaning	Check whether the heat sink at the bottom of PCS is shielded and dirty with dust.	Every six months to once a year.
System operating status	● Check whether the energy storage is damaged or deformed. ● Listen for abnormal sounds during the operation of the energy storage. ● When the energy storage is running, check whether the parameters of the energy storage are correctly set.	Once every six months.
Electrical connection	● Check whether the cable connection is loose or loose. ● Check whether the cable is damaged, especially the skin on which the cable is in contact with the metal surface. ● Check whether the unused DC input terminal and COM port are locked.	Half a year after the first commissioning, and once every six months to a year thereafter.
Ground reliability	Check whether the ground cable is properly grounded.	Half a year after the first commissioning, and once every six months to a year thereafter.

Battery module storage and recharge

Battery module storage requirements

- When storing battery modules, do not place them upside down or on the side according to the packaging box.
- When stacking the battery module packing cases, comply with the stacking requirements on the outer packaging.
- Handle the battery module with care. Do not damage the battery module.
- Storage environment requirements:

  Ambient temperature: -10 ° C to 55 ° C Recommended storage temperature: 20 ° C to 30 ° C

  Relative humidity: 5%-80%RH.

  Dry, ventilated and 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 external connection when it is stored, and the switch on the panel must be turned off.
- Ac mains input voltage: single-phase power grid 220V/230V/240V, ±10%, three-phase voltage: 380V/400V, ±10%.
- The storage status of the battery module should be collected monthly. For the battery module whose storage time is close to 12 months (-10 ° C ~ 25 ° C), 9 months (25 ° C ~ 35 ° C) or 6 months (35 ° C ~ 55 ° C), timely recharge should be arranged.
- When using the stored battery module, the principle of first in first out should be followed.
- Battery modules need to be replenished to at least 50% SOC before long-term storage.

Expired storage criteria

In principle, it is not recommended to store battery modules for a long time. Use them in a timely manner. The storage battery modules should be processed according to the following requirements.

Storage temperature requirement	Actual storage temperature	Supplementary cycle	Remark
-10℃＜T＜55℃	T≤-10℃	Not allow	Within the recharge cycle: None
	-10℃＜T≤25℃	12 months	Need treatment, use as soon as possible to reach the replenishment time: The total storage time of supplementary power processing cannot exceed the warranty time
	25℃＜T≤35℃	9 months	
	35℃＜T≤55℃	6 months	
	55℃＜T	Not allow	

- Battery module deformation, damage, leakage, directly scrapped, regardless of storage time.
- The storage time is calculated based on the latest charge time marked on the supplementary charge label on the battery module package. After the battery module passes the supplementary charge, the latest charge time and next charge time are updated on the supplementary label (next charge time = latest charge time + supplementary charge period).

- The maximum allowable period and number of storage recharge is 3 years or 3 times, such as: recharge once every 8 months, the maximum allowable 3 times; Recharge once every 12 months, maximum allowed 3 times; It is recommended that the battery module be scrapped if the maximum allowed period and times are exceeded.

- Lithium battery long-term storage will have capacity loss, lithium battery storage at the recommended storage temperature for 12 months, the general irreversible capacity loss is 3% to 10%. If the customer performs a discharge test according to the specifications, the battery module whose storage capacity is less than 100% of the rated capacity may fail the test.

Check the battery module before recharge

- Before the battery module is replenished, the appearance of the battery module needs to be inspected. Only the qualified battery module can be replenished for the next step. The unqualified battery module can be scrapped.

- If the battery module does not appear as listed below, it is judged to be qualified for appearance inspection.

  The battery module is deformed

  The battery module cover is damaged

  The battery module is leaking

A	
APP	application
AC	alternating current
B	
BCU	battery control unit
BAT	battery
C	
COM	communication
D	
DC	direct current
F	
FIT	feed-in tariff
E	
EMI	Electromagnetic Interference
P	
PV	photovoltaic
PACK	Battery pack
PCS	Photovoltaic energy storage grid-connected inverter
S	
SOC	State of Charge

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