

6.5kWh Residential Energy Storage Battery Manual

Version: 1.1

Date: 2019-08-07

This document describes the application scenarios, installation, electrical connection, commission and troubleshooting of 6.5kWh Residential Energy Storage Battery (hereinafter simply put as battery). Before installing and operating battery, please ensure that you are familiar with product features, functions, and safety precautions as provided in this document.

Warning and caution messages are listed in the document to remind users, installers and maintainer of safe operation.



Symbol	Description
 WARNING	Indicates a potentially hazardous situation, if not avoided, could result in serious injury or death.
 CAUTION	Indicates a potentially hazardous situation, if not avoided, may result in minor or moderate injury.

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1 Safety

1.1 Warning Label



Do not dispose battery in household trash.



Recyclable.



Certification in European Union area.



Risk of electric shock.



Explosive gas.



Battery may leak corrosive electrolyte.



Battery is heavy enough to cause severe injury.



Keep battery away from children.



Do not reverse polarities.

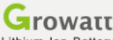






Do not expose battery to flame.





Operate as specified by the manual.

Nameplate

 Lithium Ion Battery IFP16/122/360/2P16SJM-10+40/90	
Model	GBLI 6531
Nominal Power	3.3kW
Nominal Voltage	51.2V
Nominal Capacity	128Ah (6.5kWh)
Rated Capacity	118Ah (6.0kWh)
Ingress Protection	IP55
Operating Ambient Temperature	-10°C - +45°C
   	
Operation voltage range: 48-57.6Vdc Maximum discharge current: 85A d.c. Nominal discharge power: 3.3kW Maximum discharge power: 4.4kW Maximum charge current: 64A d.c. Nominal charge power: 3.3kW Maximum charge power: 3.5kW Protection class: I	

Label



WARNING



- Do not disassemble or alter the PACK to avoid heat, explosion or fire.
- Do not use the PACK beyond specified conditions. It might cause heat generation, damage, or deterioration of its performance.
- Do not throw, drop, hit, drive a nail in, stamp on the PACK. It may cause heat generation, explosion, or fire.
- In case of electrolyte leakage, keep leaked electrolyte away from contact with eyes or skin, immediately clean with water and seek help from a doctor.
- Do not put the PACK into a fire. Do not use it or leave it in a place near fire, heaters, or high temperature sources. It may cause over temperature, explosion or fire.
- Do not submerge the PACK in water, or wet the product. It may cause heat generation, explosion, or fire.
- Do not reversely connect the PACK positive (+) and negative (-) terminal.
- Do not short circuit by letting the PACK terminals (+ and -) contact a wire or any metal.
- The unit is heavy enough to cause severe injury.
- Keep out of reach of children or animals.

S/N Label
Size: 60 x 16 mm

P/N: SD00.0000800



S/N: GPD0219519230001

1.2 Precautions

Risks of electrolyte leakage

- Do not subject battery to strong impact.
- Do not crush or puncture battery.
- Do not open or mutilate batteries. Released electrolyte is harmful to the skin and eyes.

Risks of fire

- Do not expose battery to direct sunlight.
- Avoid contact with conductive objects such as wires.
- Keep battery away from fire source, inflammable, explosive and chemical materials.
- Do not dispose of batteries in a fire. The batteries may explode.

Risks of electric shock

- Do not touch battery with wet hands.
- Keep battery away from children and animals.
- A battery can present a risk of electric shock and burns by high short-circuited current.
- Battery installation and wire connection must be operated by professionals.

Risks of damage

- Keep distance to water source.
- Do not subject battery to high voltage.
- Place battery on a flat surface. Do not place any foreign object on top of battery nor step on battery.
- Battery-connected PCS should have reinforced insulation.

1.3 Responses to Emergencies

Event	Description and recommended actions
Leakage	<p>Inhalation: leave the contaminated area right now.</p> <p>Swallow: induce vomiting.</p> <p>Contact with eyes: flush eyes with flowing water for 15 minutes.</p> <p>Contact with skin: wash thoroughly with soap and water.</p>

	Immediately seek for medical intervention after taking emergency measures.
Fire	Battery may catch fire when heated above 150°C. Please implement the following actions: <ol style="list-style-type: none"> 1. Extinguish fire before the battery catches fire. ABC or carbon dioxide extinguisher is recommended. 2. If the fire is too strong to put out, move battery to a safe place before it catches fire. 3. If battery is on fire, evacuate people first before seeking help from professional fire protection personnel. 4. If battery catches fire during charging, turn off the breaker between battery and PCS when safety can be guaranteed.
Wet battery	If battery became wet or has been submerged in water, do not access it. Immediately contact your distributor for technical assistance.
Damage	Damaged battery is dangerous and must be handled with utmost care. They are not usable for use and could pose a safety threat to people or property. If battery is suspected to be damaged, stop any operation and return it to distributor.

1.4 Storage safety

- Place battery according to signs on packing case. Do not put battery upside down or sidelong.
- Store batteries in a place free from direct sunlight and rain.
- Keep batteries at least two meters away from a heat source (such as a radiator).
- Avoid contacting with corrosive and organic substances (including gas exposure).
- Batteries with deficiencies should be separated from normal batteries by setting wall between or placing in difference fire protection zones.
- Ambient temperature ranges between -30°C to 60°C during the first seven days, and ranges between -20°C to 45°C within six months. Relative humidity ranges between 5%RH-95%RH. Keep the storage area dry, clean and well ventilated.
- In case of storage over six months, batteries should be recharged in the following steps:
 1. Identify batteries that need recharging;
 2. Ensure batteries in power-off mode. Refer to Quick Guidance to complete the installation and wire connection;
 3. Set “CV=55V, CC=64A” and start recharging;
 4. Recharge until LED2 flicks;
 5. Leave circuit open and rest battery for five minutes. Check battery voltage. If voltage is not less than 52 V, the recharging succeeds.

1.5 Transportation Safety

Battery has cleared UN38.3 (Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and

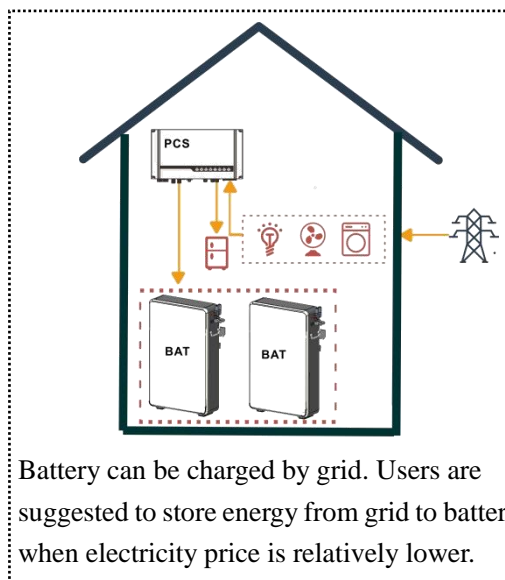
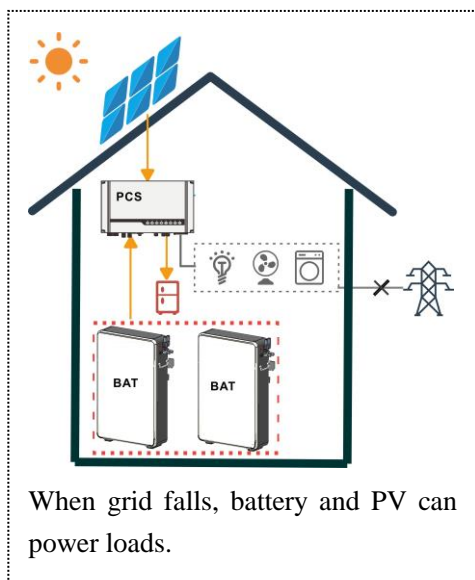
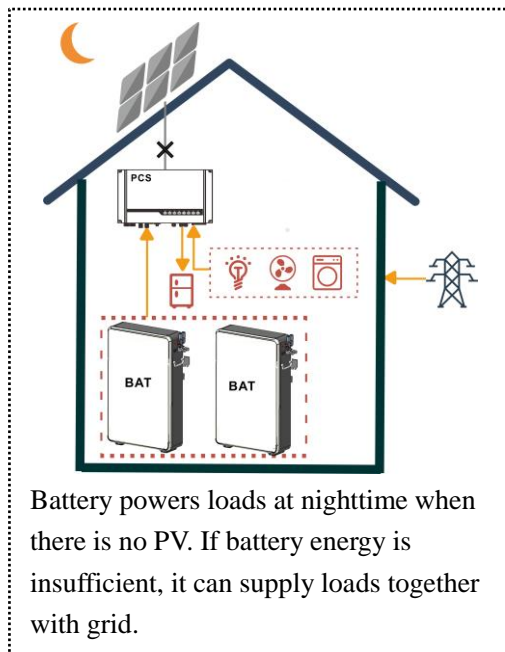
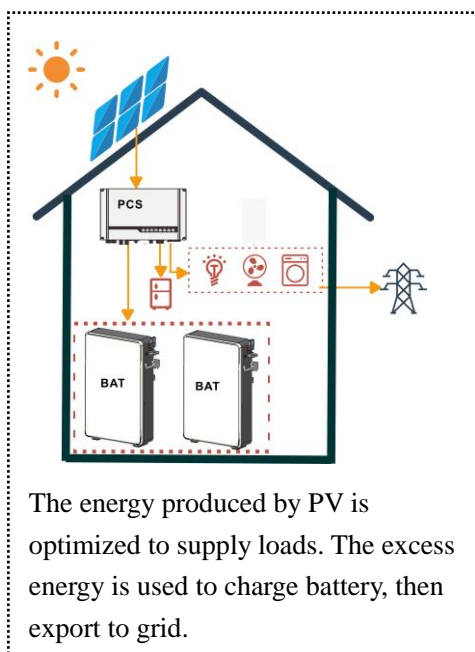
SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of packaging for Exporting Dangerous Goods). The battery is classified as class 9 dangerous goods, and is subject to land and water transportation. It is mandatory to report to the airline company and obtain approval before air transport.

- Before transportation, press POWER button for two seconds and five LED lights flicker for three times to power off battery.
- During transportation, put battery flat, do not have battery stand or lean on the floor to avoid possible crash.
- Maintain temperature between -20°C to 45°C during the transportation.
- Prohibit mixing up with explosive, inflammable or toxic objects.
- Use van-type vehicle including container and metallic van-type vehicle. Platform vehicle and convertible are prohibited.
- Do not pile up foreign objects on the top of battery. Four batteries at most can be piled up.
- Maintain original packaging and keep labels complete and recognizable.
- Prevent from direct sun exposure, rain, condensation and mechanical damages.

2. Introduction to Product

2.1 Intended Purpose

The battery is a 6.5kWh LiFePO4 pack. It has a 48V battery module as the main power supply unit which composed of 32 64Ah cells in two parallel and sixteen serial connect (2P16S). Battery coordinates with PV, PCS, Grid and loads in the residential energy storage system. The four typical application scenarios are as shown below:



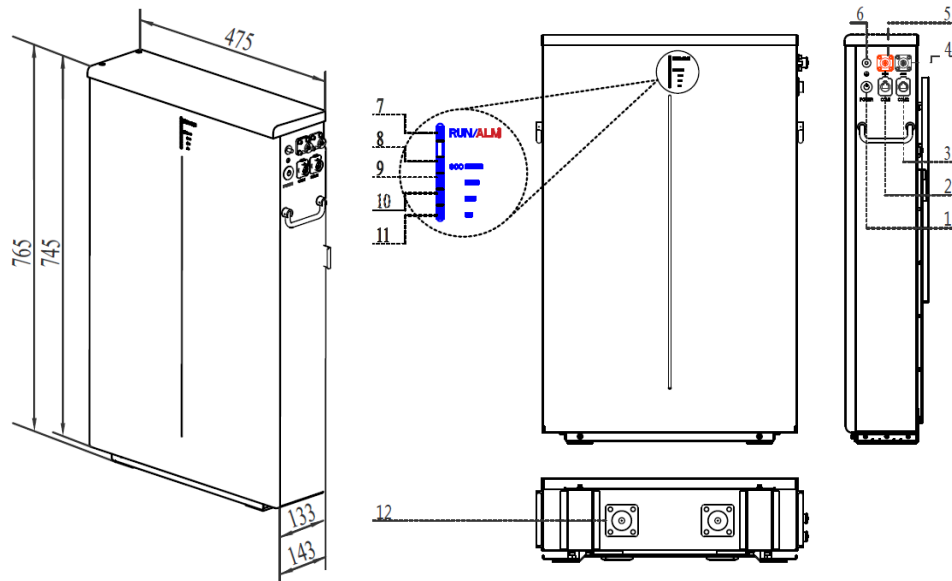
2.2 Function


Compared with normal batteries, the battery is characterized with better charging and discharging performance, longer cycle life and less self-discharging loss. The build-in BMS can monitor battery operation status and alarm timely to avoid operation out of limit. Two batteries can be parallel-connected to expand energy and power of energy storage system. Battery realizes communication with PCS via CAN network port.

- Monitoring: detect the voltage and temperature of cell, the voltage and current of battery.
- SOC estimate: indicate the precise volume of remaining electricity.
- Alarm: alarm when overvoltage, under voltage, overcurrent, over temperature or under temperature occurs.
- Protection: protect against over voltage, under voltage, over current, over temperature, under temperature, cell fault and hardware failure.
- Report: report alarm messages and operation data to PCS via CAN and RS485 network ports.
- Parallel connection: support a maximum of two batteries in parallel connection.
- Power-off triggered by fault: battery powers off if level three under voltage, 0V cell or parallel connection failure happens.
- Forced power-off: when battery does not connect to mains supply, press POWER button for two seconds and battery powers off.
- Activation: input 45V~60V via P+/P- terminals, battery will be activated from off mode to standby status.

2.3 Appearance

The battery is an energy storage unit composed of cells, mechanical parts, battery management system (BMS) as well as power and signal terminals. Product dimension (unit: mm) and appearance are as shown below:



No.	label	Name	No.	Name	Function
1	POWER	POWER button	8	LED4	81%-100%SOC indication
2	COM1	Network port 1	9	LED3	61%-80%SOC indication
3	COM2	Network port 2	10	LED2	41%-60%SOC indication
4	-	Negative terminal	11	LED1	0%-40%SOC indication
5	+	Positive terminal	12	Safety vent	A vent to release pressure inside.
6		Grounding terminal			
7	RUN/A LM	Blue RUN light indicates normal operation.			
		Red ALM light indicates failure or protection status.			

2.4 Technical Parameters

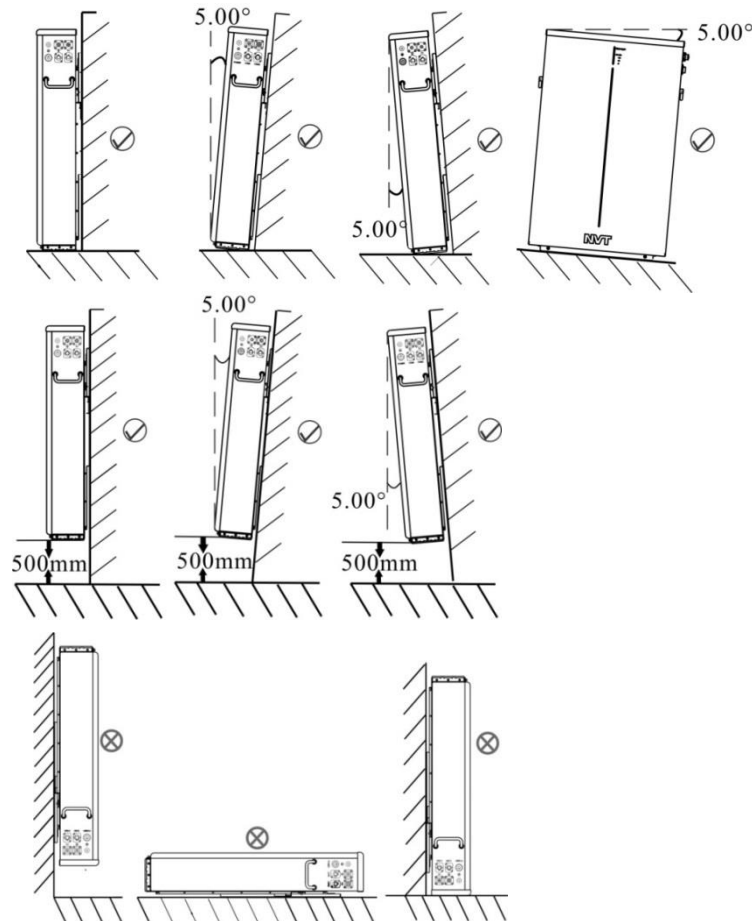
No.	Item	Specification
1	Nominal capacity/energy	128Ah/6.5kWh
	Rated/usable capacity/energy	118Ah/6.0kWh
2	Typical voltage	51.2 V
	Operating voltage	48V ~57.6V
3	Standard charging current (25℃)	64A
	Max. discharging current (25℃, 3s)	96A
	Continual Max. discharging current (25℃)——85A	85A
4	Rated discharging power	3.3kW
	Max. discharging power	4.4kW
	Peak discharging power	5kW/3S
	Rated charging power	3.3 kW
	Max. charging power	3.5 kW
5	Max. Short circuit current peak	2000A
6	Operating temperature range	-10℃~45℃
	Optimal operating temperature	0℃~30℃
7	Storage conditions	Within 6 month after initial charge temperature: -20℃ ~ +45℃ humidity: 5% RH -95%RH
8	Room temperature cycle life(25℃)	≥6000 cycles/60%EOL
9	Cooling	Natural cooling
10	Dimension	W475*D133*H745 mm
11	Weight	58kg±1Kg
12	Installation	Wall-mounted installation/floor standing installation
13	Ingress protection	IP55
14	Cell safety certification	IEC62619/UL1973
15	Battery safety certification	IEC62619/CE/RCM/UL1973/CEC
16	Transportation test standard	UN38.3+PI965(sea)
17	Network port	CAN2.0B*1CH; RS485*1CH
18	Maximum parallel-connected batteries	Two batteries
19	Protective class	I
20	over voltage category	II
21	External bipoles circuit breaker required for battery output	80V, 100A, 2P

3 Installation

3.1 Basic Installation Requirements

Battery can be installed indoors or outdoors. Ensure the following conditions are satisfied:

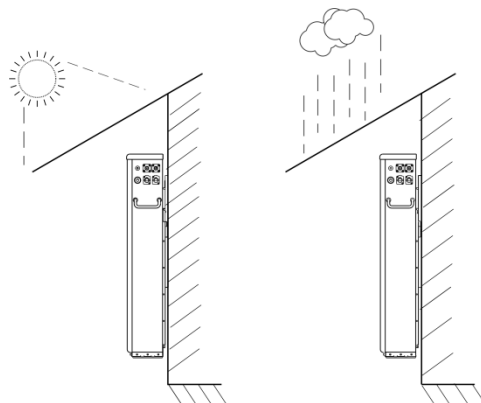
- A deviation of $-5^{\circ} \leq \theta \leq 5^{\circ}$ is allowed for both installation against wall and floor. Additionally, the distance between the bottom part of battery and floor should not exceed 500mm. Please refer to figures below (✓ means acceptable installation and X unacceptable).



CAUTION

Do not place the battery upside down nor keep it flat as above.

- Build sunshade & rain shelter to avoid direct exposure to sunlight and rain.



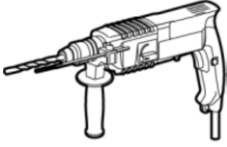
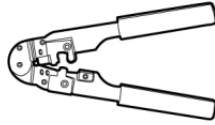
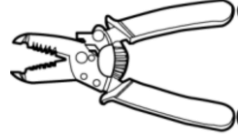



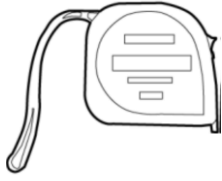

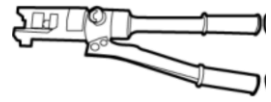





WARNING

Keep the dirt or dust at a minimal level;
Do not install battery in a place where flood frequently occurs;
Do not install battery in highly humid area such as bathroom;
Ensure direct contact between battery shell and ambient air. Do not cover or shield battery to avoid poor cooling.

3.2 Installation Required Tools

The following tools are required to install battery:

		
Drill	Crimper	Wire stripper
		
Screw driver	Cable wrench	Pencil
		
Tape measure	Multi-meter	Hydraulic plier
		
Insulated gloves	Safety goggles	Safety shoes

3.3 installation Procedures

Pre-installation Check

Check exterior package: before opening package, check for damages like holes, cracks or other traces on exterior packing case. If any abnormality is detected, do not open the package and contact your distributor.

Check deliverables: after opening package, check if deliverables are complete. If there is any part missing or damaged, please contact your distributor.

Check and confirm the battery is powered off and breaker is open before any further step.

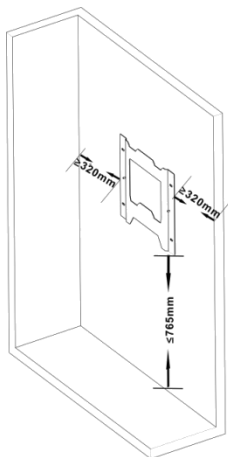
Accessory list:

Note: External bipoles circuit breaker required for battery output. An external bipoles dc isolator is required.

Standard Accessories		
	Single battery	Parallel-connected batteries
Battery	1 PCS	2PCS
Terminal	Positive terminal 1PCS (Min. 3 AWG) Negative terminal 1PCS (Min. 3 AWG) Network terminal 1PCS(Min. 26 AWG) M6-OT 1PCS M6 nut 1PCS	Positive terminal 2PCS (Min. 3 AWG) Negative terminal 2PCS (Min. 3 AWG) Network terminal 3PCS(Min. 26 AWG) M6-OT 2PCS M6 nut 2PCS
Fastening	M8 expansion screw 2PCS M8*H60 anchor bolt 2PCS	M8 expansion screw 4PCS M8*H60 anchor bolt 4PCS
Manual	1 PCS	1 PCS
Warranty card	1 PCS	1 PCS

Optional Accessories		
	Single battery	Parallel-connected batteries
Fastening	M8 expansion screw 2PCS M8*H60 anchor bolt 2PCS Gradienter 1PCS	M8 expansion screw 4PCS M8*H60 anchor bolt 4PCS Gradienter 1PCS
Bus bar box		1PCS
Bracket	1PCS	2PCS

3.3.1 Wall Mounted Installation



Step 1 Confirm installation spot.

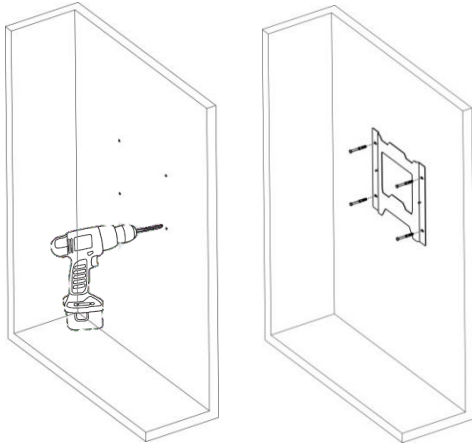
At least two persons participate the installation. One person places the bracket on wall and ensure the gradienter horizontal; the other person marks four spots of screw driving. After confirming the spots to drive screws, put down the bracket.



CAUTION

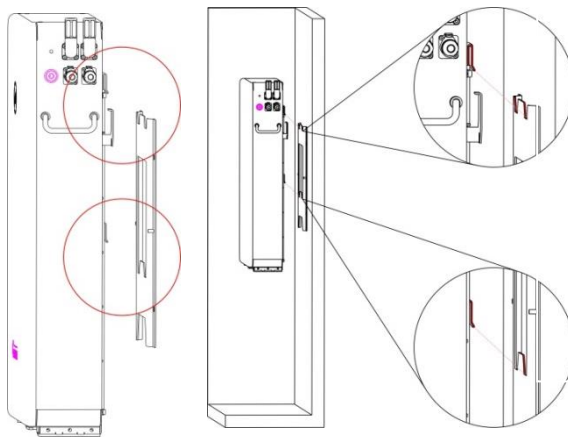
The weight capacity of wall should exceed 4 times weight of battery.

Keep the distance between bracket, wall and floor as is shown (320mm, 320mm, 765mm).



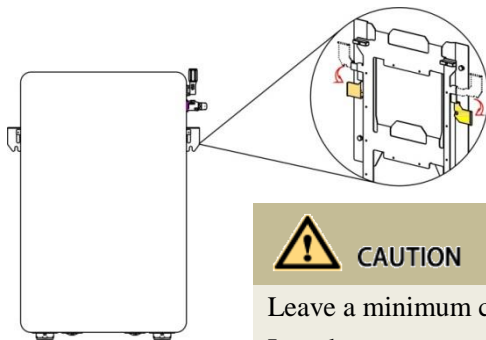
Step 2 Fix bracket to wall.

Choose alloy drill bit with a diameter of 12mm and install it to a drill. Drill in the four spots that have been located in step 1 and have at least 60mm drilling depth. Clean the soil and drive expansion tube into the hole. One person puts the bracket on wall and minds to keep gradienter horizontal. The other person drives M8 screw through the bracket into hole.



Step 3 Fix battery on bracket.

Rotate the left latch leftward and the right latch rightward until they keep perpendicular to the battery. Install battery from the top down and lock the connection part of battery with the support plate of bracket.

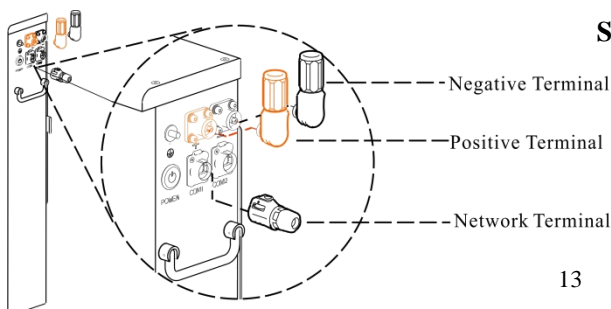


Rotate the left latch rightward until the notch locks limiting pin, rotate the right latch leftward until the notch locks limiting pin too.



CAUTION

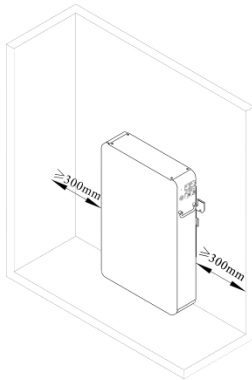
Leave a minimum clearance of 133mm before the front surface of battery. In order to guarantee a stable connection between battery and bracket, please visually check if the two upper joints are fixed. Try to move the lower part of battery away from wall. The connection is proved qualified if the battery cannot be moved at all. Otherwise, please connect the battery and bracket again until confirming a fixed connection.



Step 4 Insert power cable and network cable into battery terminals.

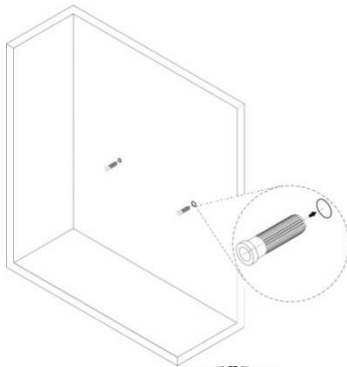
Having confirmed fixed installation, plug power cables into battery terminals (orange positive terminal and black negative terminal). Plug CAN network cable into the network ports of PCS and battery. Please refer to Section 4.2 for network making details.

3.3.2 Floor Standing Installation



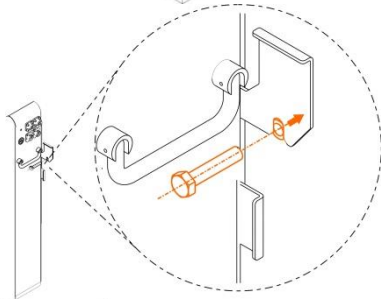
Step 1 Confirm installation spot.

Place battery in the to-be installed area. Rotate the left latch leftward and the right latch rightward until they are perpendicular to the battery. Keep the distance between wall and battery as shown (300mm, 300mm). Leave a minimum clearance of 133mm before the front surface of battery. Use pencil to mark where the notches of two latches are and confirm the two drilling spots. Move battery away.

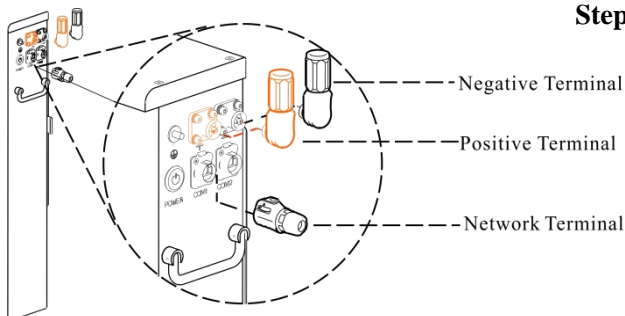


Step 2 Install battery.

Choose an alloy drill bit with a diameter of 12mm and install it in the drill. Drill two holes in the spots that have been confirmed in step 1. Keep the drilling depth as least 60mm. Clean the soil and drive expansion tube into hole.



Move battery back to the place confirmed in step 1. Drive M8 screw through notch of latch into wall.

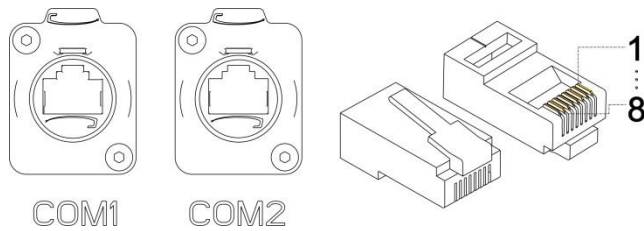


Step 3 Insert power cables and network cable into battery terminals.

Check and confirm battery is well fixed to wall. Plug the power cables into battery terminals. Plug the CAN network cable into network ports of battery and PCS. Please refer to Section 4.2 for cable making details.

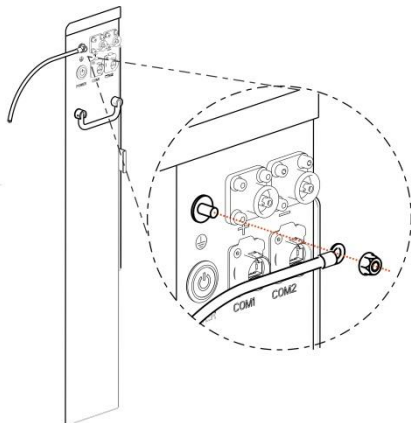
4 Electrical Connection

4.1 Preparation



Item	No.	Definition
COM1/ COM2	1	RS485B
	2	RS485A
	3	GND2
	4	CANH
	5	CAHL
	6	GND2
	7	WAKE-
	8	WAKE+

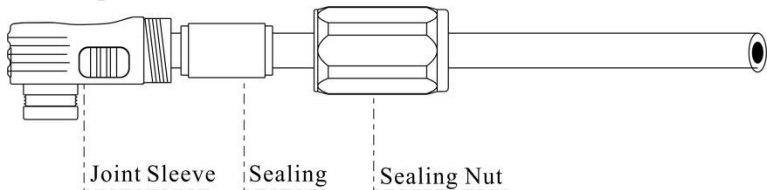
4.2 Electrical Connection Procedures



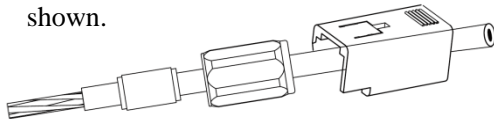
Step 1 Connect grounding cable.

It is recommended to fasten grounding terminal and grounding cable with M6 screw.

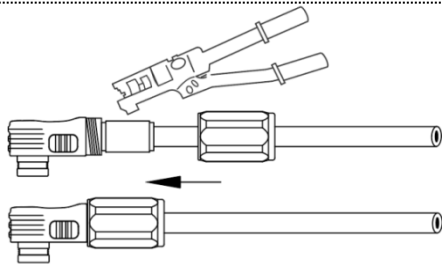
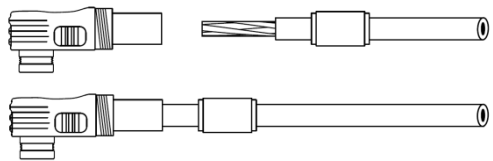
Step 2 Make power cables.



1. Strip cable sheaths for 20 ± 0.5 mm, with orange positive cable and black negative cable. Insert sealing, sealing nut and protection cover along the cable as shown.

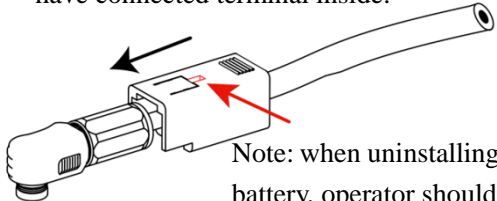


2. Insert the copper wires all into the joint sleeve.

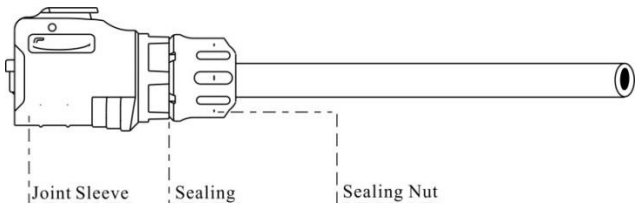


3. Press connecting part with a hydraulic clamp; tighten up sealing, sealing nut and joint sleeve.

4. Pull protection cover and have connected terminal inside.



Note: when uninstalling battery, operator should use a screwdriver to pull up the marked spot as shown.

Step 3 Make network cables.


1. Strip cable sheaths for 15 ± 0.5 mm first. Insert sealing and sealing nut along the cable.

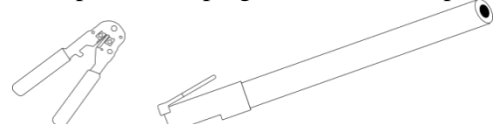
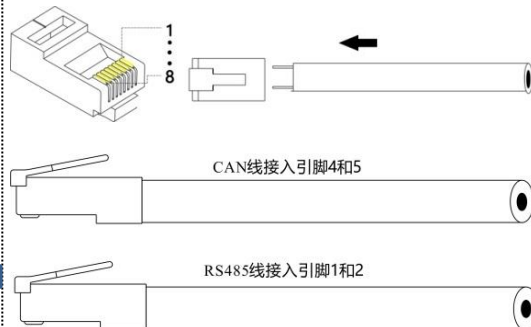
2. Network cable adopts standard 8-core cable. Reserve two wires, cut the other six wires.

Make CAN network cable: insert the two remaining wires into pin 4 and pin 5 of RJ45 plug. Ensure the two wires stay aligned and keep consistent between wire color and pin.

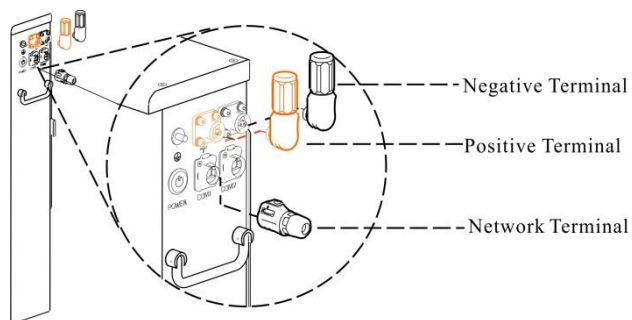
Make RS485 network cable: insert the two remaining wires into pin 1 and pin 2 of RJ45 plug. Ensure the two wires stay aligned and keep consistent between wire color and pin.

4. Connect RJ45 plug with joint sleeve, and tighten up sealing, sealing nut and joint sleeve.

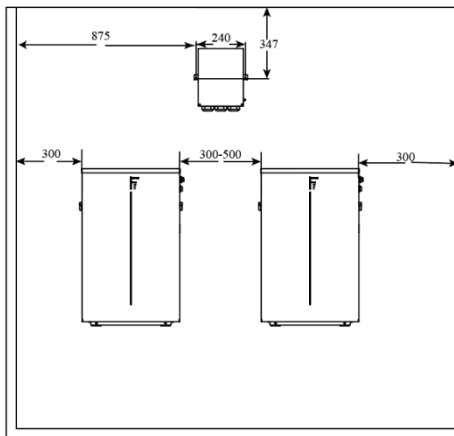
3. Crimp the RJ45 plug with a wire crimper.



Step 4 Insert power cables and network cable into battery terminals.

1. Measure battery voltage with a multi-meter and ensure the voltage output is 0V under power-off mode.
2. Plug one end of the power cables that have been made in Section 4.2 step 2 into DC breaker, and plug the other end into the battery terminals.
3. Plug the CAN network cable that has been made in Section 4.2 step 3 into a network terminal of battery (CMO1 or COM2), and plug the other end of CAN network cable into network port of PCS.



5 Installation Steps under Parallel Connection



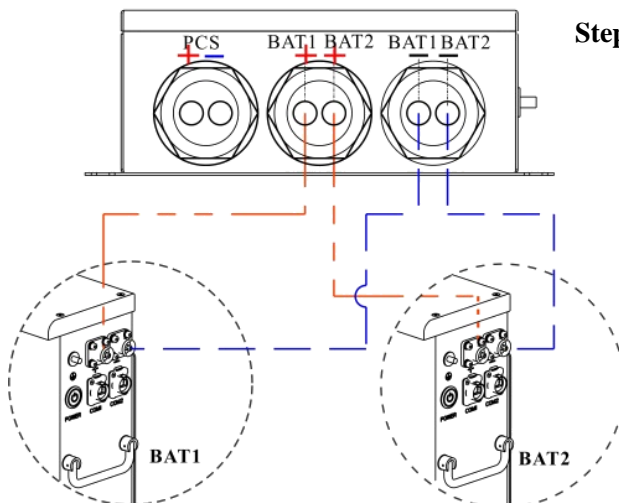
Step 1 Install battery.

Power on two batteries in condition of no load, measure their voltages with a multi-meter and confirm the voltage difference not more than 1V. After that, power off two batteries and install them according to the procedures specified in Section 3.3. Keep the minimal distance between two batteries, wall and battery, bus bar box and wall as shown (unit: mm)



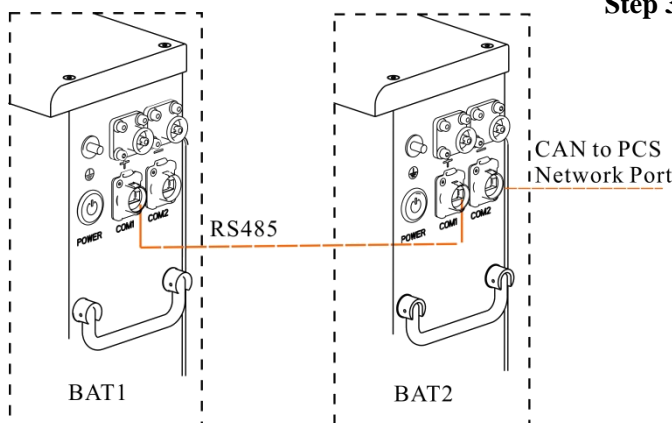
WARNING

If voltage difference is measured more than 1V, the difference shall be adjusted to be less than 1V either by charging the battery with lower voltage or discharging the battery with higher voltage before conducting the parallel-connected installation.



Step 2 Insert power cables into battery terminals.

Make the power cables of both batteries based on Section 4.2 Step 2. Plug one end of positive and negative terminals into DC breaker. Respectively measure the positive and negative terminal blocks of two batteries with a multi-meter, and ensure the voltage outputs under off mode are both 0V. After that, plug the other end of power cables into terminals on two batteries.



Step 3 Insert network cables into battery terminals.

Make RS485 and CAN network cables based on Section 4.2 step 3. Connect two batteries with the RS485 network cable, and connect battery and PCS with the CAN network cable. Specifically, Plug RS485 network cable into one network port of each battery, plug one end of CAN network cable into the CAN network port of any battery, and plug the other end into PCS network port.



WARNING

RS485 network cable only applies to the communication between two batteries, and CAN network cable only applies to the communication between battery and PCS.

Ensure two batteries in parallel connection are from the same batch, same model and same manufacturer. Do not mix an old battery with a new battery. Batteries undergone less than 300 cycles are defined as new batteries.

6 Power on/off Battery



WARNING

There are many technical contents involved in the electrification process, and technicians must go through technical training and obtain certificates in compliance with local laws and regulations. Please stand on dry insulating objects and do not wear metal objects such as watches, rings and necklaces during operation. Insulating tools should be used.

Do not contact with two charged positions with a potential difference.

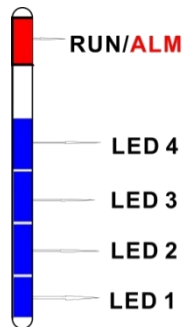
If other people are not allowed to operate, the prohibition sign should be hung on the distribution equipment: "No closing, someone operating."

Make sure to turn off breaker before checking battery.

Measure battery voltage with a multi-meter and ensure voltage output under off mode is 0V.

If any abnormality is detected when powering on, immediately power off the battery. Proceed again only after causes are confirmed.

6.1 LED Indication



LED light definition							Remark
Status	SOC	SOC indication				RUN/ALM (green and red lights)	
		LED1	LED2	LED3	LED4	LED5	
charging	0%-25%	■(T=1s)				●	RUN light on and SOC lights flicker
	26%-50%	■(T=2s)	■(T=1s)			●	
	51%-75%	■(T=3s)	■(T=2s)	■(T=1s)		●	
	76%-99%	■(T=4s)	■(T=3s)	■(T=2s)	■(T=1s)	●	
	100%	●	●	●	●	●	
Discharging	100%-81%	●	●	●	●	●	
	80%-61%	●	●	●		●	
	60%-41%	●	●			●	
	40%-14%	●				●	
	13%-0%	●				★	LED1 flickers
Idle	0%-13%	●				★	LED1 flickers
	14%-40%	●				●	
	41%-60%	●	●			●	
	61%-80%	●	●	●		●	
	81%-100%	●	●	●	●	●	
Parallel connection	Parallel connection succeeds	SOC indicates current remaining capacity				★	RUN light flickers for five times when parallel connection succeeds.

Note: ★ (ALM light flickers) ● (ALM light remains on)
 ● (RUN light remains on) ★ (RUN light flickers)

6.2 Power on Battery

Power on single battery by pressing POWER button		
No,	Procedures	Acceptation criteria
1	Close the breaker that is connected with positive and negative power cables.	Breaker in ON position.
2	Press POWER button for two seconds and observe the LED indication on panel.	1. If both RUN and SOC lights turn on normal, battery powers on successfully; 2. If ALM light turns red, there is a failure and should be fixed before powering on again.
Power on single battery by PCS activation		
1	Close the breaker that is connected with positive and negative power cables.	Breaker in ON position.
2	PV or mains supply powers PCS.	1.PCS in ON position; 2, PCS HMI screen indicates normal PV or mains supply input.
3	PCS voltage signal activates battery.	1. If RUN light and SOC lights on battery indicate normal, battery powers on successfully; 2. If the ALM light turns red, the indication shows a failure. The failure shall be fixed before powering on again.

Power on parallel-connected batteries by pressing POWER button		
No.	Procedures	Acceptation criteria
1	Close the breaker that is connected with positive and negative power cables.	Breaker in ON position.
2	Press POWER button for two seconds within 30 seconds and observe the LED indication on two panels.	1. If RUN and SOC lights on both batteries turn on normal, and the RUN lights on both batteries flicker for five times, two batteries power on successfully and communication between batteries works; 2. If ALM light of one or both batteries turn red, there is a parallel failure and should be fixed before powering on again.
Power on parallel-connected batteries by PCS activation		
1	Close the breaker that is connected with positive and negative power cables.	Breaker in ON position.
2	PV or mains supply powers PCS.	1. PCS in ON position; 2. PCS HMI screen indicates normal PV or

		mains supply input.
3	PCS voltage signal activates battery.	<p>1. If RUN lights and SOC lights on both batteries indicate normal, and RUN lights on both batteries flicker for five times, two batteries power on successfully and communication between batteries works;</p> <p>2. If the ALM light of one battery or both batteries turn red, there is a parallel connection failure and should be fixed before powering on again.</p>

6.3 Power off Battery

- Press the POWER button for two seconds. Five LED lights will flicker for three times, and battery turns off.
- Turn off the inverter. Communication will drop for 60 minutes before five LED lights flicker for three times and battery turns off.

7 Maintenance

7.1 Preparation

- Battery replacement should be conducted by professionals.
- Prepare tools like safety gloves, cross head driver and socket wrench.
- Ensure undamaged appearance and complete accessories of new battery.
- Do not change battery in rainy or stormy days.
- Open breaker and power off old battery;
- Confirm wire connection of new battery, close breaker and power on new battery.
- Dispose old battery in compliance with local regulations and laws.

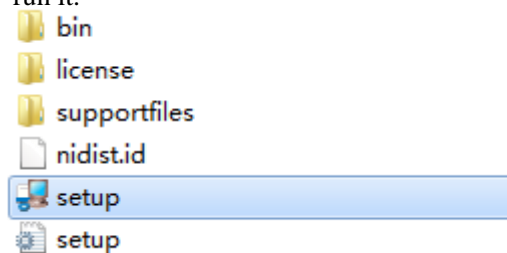
7.2 Battery Replacement

- Wear safety gloves.
- Open breaker, press POWER button for two seconds to power off battery.
- Unplug power cables and CAN network cable from battery terminals.
- **For wall-mounted battery:** rotate both latches upward. Two persons lift up battery off bracket.
For floor-standing battery: unscrew expansion screws with a cross screwdriver, rotate latches upward and move battery.
- Two persons move battery via handlers into packing case and transport battery to a designated repair site.
- Install new battery based on procedures specified in Section 3.

7.3 Firmware Upgrade

Step 1: Install software

1. Choose file “BMS Installation package.zip” and decompress it.
2. Enter “BMS Installation package \Volume”, double click “setup.exe” and run it.



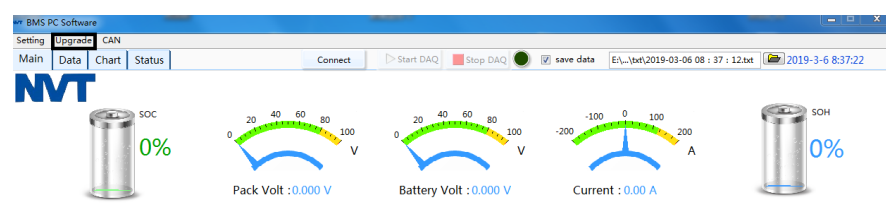
- 3 Execute the default configuration until completing the installation.

Step 2: Make sure the battery stay in IDLE mode or battery relays cut off.

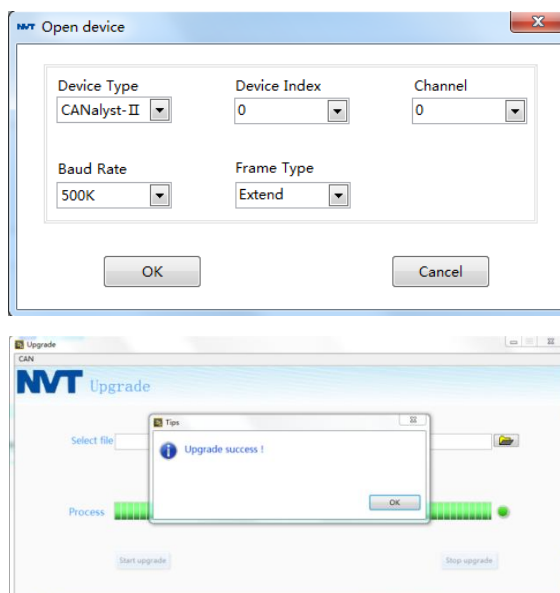
Step 3: Connect computer and the COM1 or COM2 of battery with “CANalyst-II”.

Step 4: Upgrade

1. Choose “Upgrade” as shown in the below figure.



2. Choose “CANalyst-II” for device type and “Extend” for Frame Type, set “500Kbps” baud rate. Keep other default parameters. Click “OK”.



3. Choose target upgrade file.
4. Click “Start to Upgrade”.
5. Upgrade succeeds when progress bar reaches 100%.

7.4 Troubleshooting

Error Indication	Error description	Error cause	Suggested actions
ALM			
★ (ALM Light Flickers)	0%-15%.	Low SOC.	1. There is no safety threat and can continue discharge battery.
● (ALM Light on)	Protection against level two/three discharge under voltage.	Single cell voltage below the threshold for under-voltage protection.	There is over discharge risk. User should stop discharging and arrange recharge.
	Protection against level three charge over voltage.	Single cell voltage exceeding threshold for protection.	1. There is no safety threat; 2. User should stop charging. Idle battery and it will turn to normal. 3. After step two, battery discharge will work normal.
	Protection against level three charge over current.	Charging current exceeding protection threshold.	1. There is safety risk and user should stop using battery. 2. User should contact installer to repair PCS.
	Protection against level three discharge over current.	Discharging current exceeding protection threshold.	

	Protection against level three low temperature charge..	Cell surface temperature below battery temperature low limit.	There is no safety threat and user should stop using battery.
	Protection against level three low temperature discharge.		
	Protection against level three high temperature charge.	Cell surface temperature exceeding battery temperature up limit.	There is safety risk and user should stop using battery. User should contact installer to repair battery.
	Protection against level three high temperature discharge.		
	Protection against level three over voltage difference among cells.	Cell voltage difference exceeding protection threshold.	1. There is no safety risk. 2. User should contact installer to repair battery.
	Protection against short circuit charge.	External short circuit of battery.	There is safety risk and user should stop using battery. User should contact installer to repair PCS and battery.
	Protection against short circuit discharge.		
	Protection against parallel connection failure.	Communication failure between two parallel connected battery.	Check if RS485 wire between PCCs and CAN wire with PCS are well connected. Detect and ensure the voltage difference between two batteries does not exceed 1V. Turn on two batteries within 30 seconds.
	Relay1 failure.	Relay drive failure or relay failure.	There is safety risk and user should stop using battery. User should contact installer to repair battery.
	Relay2 failure.		
	Pre-charge relay failure.		
	Voltage sampling front-end failure.	BMS internal communication failure.	
	Temperature sampling failure.	BMS temperature sampling circuit failure.	
	Current sampling failure.	BMS current sampling failure.	
	failure of over voltage difference among cells ($\Delta > 1V$).	Over voltage difference among cells.	
	Communication failure.	Communication loss between PCS and battery.	1. There is no safety threat and user should stop using battery. 2. Check if PCS and battery communication terminal is well connected. 3. If PCS and battery cannot communicate when the communication wire is

			confirmed well connected, user should contact installer to repair battery.
	Current limit failure.	Current limitation failure, ALM light maintains on.	There is safety risk and user should stop using battery. User should contact installer to repair battery.

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