

# GROWATT HOPE 5.5L-A1 USER MANUAL



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## **Residential Energy Storage Hope 5.5L - A1 Battery System**



- **About this Document**

This document describes the installation, electrical connection, operation, commission, maintenance and troubleshooting of Hope 5.5L-A1 Battery System (hereafter simply put Hope 5.5L). Before installing and operating Hope 5.5L-A1, ensure that you are familiar with product features, functions, and safety precautions provided in this document.

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# 1 Product Overview

## 1.1 Product Description

Each Hope 5.5L consists of 106Ah cells which form 51.2V voltage battery module and 16 serial connection (1P16S). A single cluster can connect up to 12 batteries in parallel, and expand the capacity to 60KWH. For meeting the needs of home storage power supply, batteries and inverters combined to be home storage solar system. It has protection functions such as overcharge, overdischarge, overcurrent, overtemperature, and short circuit. For serve customers properly, the company has a big data background to facilitate after-sales maintenance, and equipped with APP display function, remote upgrade function and U-disk upgrade function.

## 1.2 Appearance

Hope 5.5L consists of battery module (including cell and mechanical parts), battery management system (BMS) as well as power and communication terminals. Product appearance is shown as below.

### 1.2.1 Dimension (unit:mm)

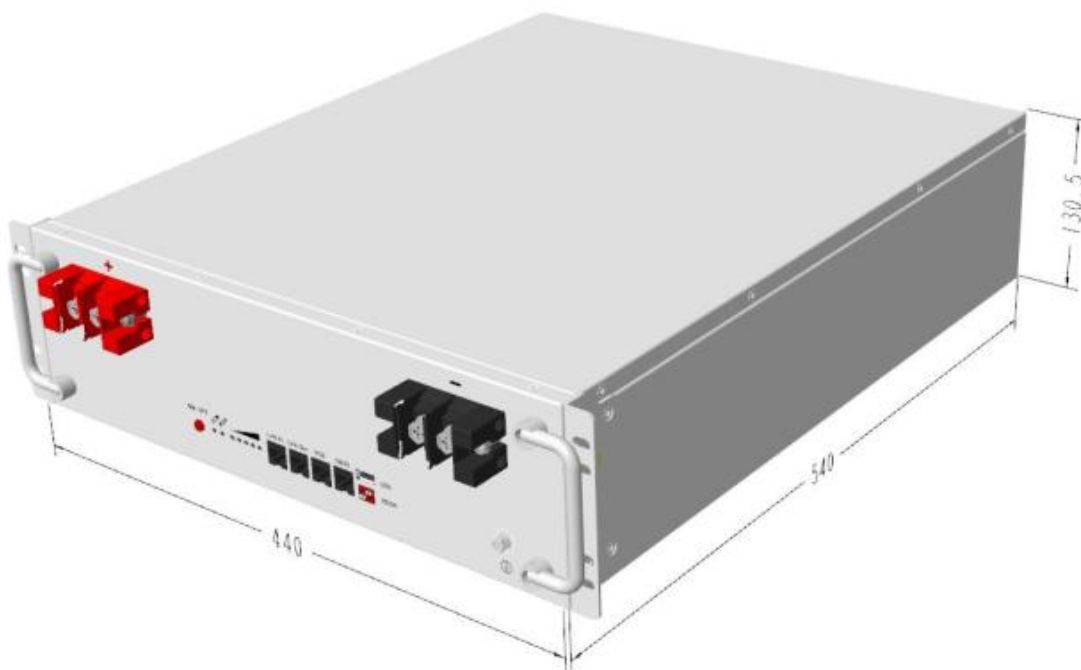


Figure 1: Battery size diagram

### 1.2.2 Introduction to the battery operation panel

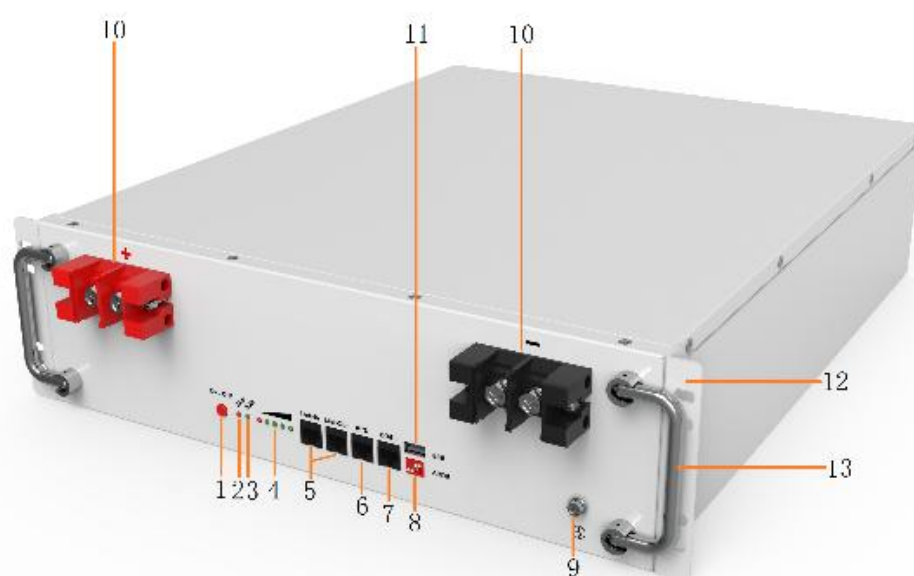


Figure 2: Introduction to the battery operation panel

| Location | Port             | Function                                                                                                      |
|----------|------------------|---------------------------------------------------------------------------------------------------------------|
| 1        | ON/OFF           | Turn the battery on and off                                                                                   |
| 2        | ALM              | Display battery alarm status                                                                                  |
| 3        | RUN              | Display running status                                                                                        |
| 4        | SOC              | Display battery SOC status                                                                                    |
| 5        | LINK-In/LINK-Out | Link-out for multi-cluster in parallel communication;<br>Link-in for multi-cluster in parallel communication  |
| 6        | PCS              | inverter CAN communication                                                                                    |
| 7        | DO/DI            | Relay output/input<br>(Output is for emergency alarm information, Input is for clustering and distinguishing) |
| 8        | ADDR             | Assign addresses for each model<br>(Refer to Table 1-2.1- Table 1-2.6)                                        |
| 9        | GND              | Terminal connect to ground                                                                                    |
| 10       | +/-              | Positive and negative power terminals                                                                         |
| 11       | USB              | USB interface for system upgrade                                                                              |
| 12       | Hanger           | For rack mounting                                                                                             |
| 13       | Handle           | For moving                                                                                                    |

Table 1 Battery address setting method, as described in the table:

| <div> <div>Address</div> <div> Dip switch position  </div> <div>Dfinition</div> </div> |     |     |     |     |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----------|
| address                                                                                                                                                                 | #1  | #2  | #3  | #4  |           |
| 1                                                                                                                                                                       | ON  | OFF | OFF | OFF | Battery1  |
| 2                                                                                                                                                                       | OFF | ON  | OFF | OFF | Battery2  |
| 3                                                                                                                                                                       | ON  | ON  | OFF | OFF | Battery3  |
| 4                                                                                                                                                                       | OFF | OFF | ON  | OFF | Battery4  |
| 5                                                                                                                                                                       | ON  | OFF | ON  | OFF | Battery5  |
| 6                                                                                                                                                                       | OFF | ON  | ON  | OFF | Battery6  |
| 7                                                                                                                                                                       | ON  | ON  | ON  | OFF | Battery7  |
| 8                                                                                                                                                                       | OFF | OFF | OFF | ON  | Battery8  |
| 9                                                                                                                                                                       | ON  | OFF | OFF | ON  | Battery9  |
| 10                                                                                                                                                                      | OFF | ON  | OFF | ON  | Battery10 |
| 11                                                                                                                                                                      | ON  | ON  | OFF | ON  | Battery11 |
| 12                                                                                                                                                                      | OFF | OFF | ON  | ON  | Battery12 |

☆Note:

When the battery module is used independently, refer Table 1.

When the battery modules are connected in parallel, please refer to Table 1. For other battery modules connected in parallel, see Table 1.

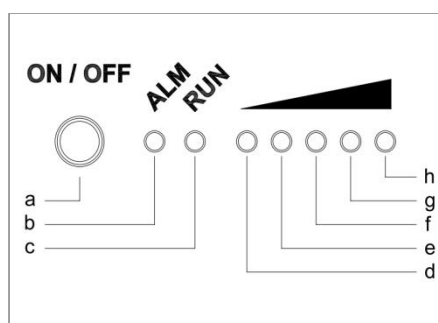


Figure 3: LED lights

| No. | Name   | Color | Description                  |
|-----|--------|-------|------------------------------|
| a   | ON/OFF |       | Power on/off Button          |
| b   | ALM    | Red   | Failure or protection status |
| c   | RUN    | Green | Normal operation             |
| d   | LED 1  | Red   | 0%-19%                       |
| e   | LED 2  | Green | 20%-39%                      |
| f   | LED 3  | Green | 40%-59%                      |
| g   | LED 4  | Green | 60%-79%                      |
| h   | LED 5  | Green | 80%-100%                     |

### 1.3 Function and Introduction

| Function                     | Description                                                                                                                                                                                                                                                                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| APP Display and Upgrade      | Display BMS information and upgrade                                                                                                                                                                                                                                                                                                                    |
| CAN Communication            | 2 Circuits, with isolation, One for battery parallel communication, one for communication with inverter                                                                                                                                                                                                                                                |
| Battery in Parallel          | Up to 12 Cells Connected in Parallel                                                                                                                                                                                                                                                                                                                   |
| SOC Algorithm                | Dynamic SOC estimation for battery packs                                                                                                                                                                                                                                                                                                               |
| SOP Algorithm                | Based on different temperature, The evaluation capacity of voltage and SOC to the maximum output or maximum input at the next moment                                                                                                                                                                                                                   |
| Running Alarm Status Display | 2 LED lights to display. Green: System running status, Red: Faulty status;                                                                                                                                                                                                                                                                             |
| Power off                    | 1. 1、Button Shutdown, 2、No Communication Shutdown, 3、Battery Low Voltage Shutdown 4、When Used in Parallel, it Can Be "One Key Shutdown"                                                                                                                                                                                                                |
| Power on                     | 1、Key On, 2、Charge On, 3、Activate Signal on, 4、When Used in Parallel Can "One Key On"                                                                                                                                                                                                                                                                  |
| Balanced Management          | Improve the consistency of the voltage of each single battery to protect the battery                                                                                                                                                                                                                                                                   |
| Voltage Detection            | Detect single cell voltage (14-16 strings) or total voltage (2 circuits)                                                                                                                                                                                                                                                                               |
| Current Detection            | Battery charging current, discharging current detection                                                                                                                                                                                                                                                                                                |
| Temperature Detection        | 8 circuits. 6 circuits for battery temperature detection, 2 circuits for MOS tube temperature detection                                                                                                                                                                                                                                                |
| Protection                   | It has battery overcharge protection, overdischarge protection, battery overvoltage protection, high temperature and high protection, low temperature protection, short circuit protection and hardware fault protection, etc. And there is record function for the fault alarm, which is convenient for after-sales viewing and analysis of problems. |
| Precharge Control            | Charging low-voltage batteries with low current                                                                                                                                                                                                                                                                                                        |
| Predischarge Control         | Precharge the inverter capacitors                                                                                                                                                                                                                                                                                                                      |
| Interface                    | Same Port                                                                                                                                                                                                                                                                                                                                              |

## **1.4 Battery software upgrade**

### **1.4.1 Upgrade via USB**

- Copy the upgrade file into the U disk;
- Battery off, access U disk;
- Start the battery and successfully enter the upgrade state, the ALM and RUM two leds will blink for 3 seconds at the same time;
- The battery LED light flashes in the mode of running horse light, indicating that the upgrade is completed.

**Note:** Choose the USB upgrade mode, there must be no other files in the U disk, otherwise the upgrade will not be possible or the upgrade error.

### **1.4.2 Through inverter remote upgrade**

- Through our inverter, connect to WiFi for remote upgrade;
- The LED light that displays the SOC continuously flashes at 500ms during the upgrade process;
- The host will upgrade the slave machine in turn after the upgrade is completed;
- The device in the slave upgrade displays the SOC LED light flashing continuously at 500ms;
- The LED displays normally after the upgrade.

**Note:** Inverter remote upgrade mode can only upgrade the battery host.

## 2 Safety

Safety information contains in this section must be observed at all times when working on or with batteries. For safety, installers are responsibility to familiarize themselves with this manual and all warnings before installation.

### 2.1 Application

Please read the product manual and the warning signs on the surface of the battery box carefully before using the battery. Improper use of the battery may cause overheating and damage to the battery. The company does not assume any responsibility for any accidents caused by improper operation. In order to use and dispose of the battery safely, please read the operating instructions carefully before use:

- Keep the batteries away from heat sources, high voltage places and long periods of sunlight exposure;
- Batteries must not be thrown into water or fire;
- Do not reverse the positive and negative terminals of the battery;
- Do not use metal to short the positive and negative terminals of the battery
- Avoid excessive physical shocks and impacts to the battery, do not hit, drop or step on the battery;
- It is strictly forbidden to disassemble or assemble the battery privately without the permission and guidance of the manufacturer;
- Cannot mix other batteries of different manufacturers, types and models;
- Do not use or store in high temperature environments, as this may cause the battery to heat up, catch fire or have a reduced service life;
- Charge the battery promptly (within 15 days) after it runs out of charge;
- Please use the matching or recommended professional lithium battery charger;
- Stop using the battery if it has abnormal conditions such as odor, discoloration, noise, liquid leakage, or serious deformation;
- If electrolyte leaks into the skin or eyes, flush with water and seek immediate medical attention;
- Please place the battery out of the reach of pets and children, and prohibit children from touching the battery;
- Below 0°C, due to the low temperature performance of the battery, please reduce the power to use, a battery pack with a load of 2.5KW or less.

### 2.2 Safety Precautions

#### 2.2.1 Environment requirements

- Do not expose the battery to temperature above 55°C or heat sources.
- Do not install or use the battery in wet locations, moisture, corrosive gases or liquids, such as bathroom.
- Do not expose the battery to direct sunlight for extended periods of time. °
- Place battery in safe place away from children and animals. °
- Battery power terminals shall not touch conductive objects such as wires.
- Do not dispose the batteries in fire, which may cause an explosion.
- The PACK shall not come in contact with liquids.
- The PACK can only be installed indoors. Regarding indoor installation, please do not install it in the bedroom, living room, kitchen, etc.

### 2.2.2 Operation and Precautions

- Do not touch the PACK with wet hands
- Do not disassemble the PACK without permission
- Do not crush, drop or puncture the PACK and battery.
- Dispose the batteries according to local safety regulations
- Store and recharge battery in accordance with this manual.
- Ensure the connection of ground wire reliable.
- Remove all metal objects such as watches and rings that could cause a short-circuit before installation, replacement and maintenance.
- The Pack shall be repaired, replaced or maintained by skilled personal that has been recognized.
- When storing or handling batteries ,do not stack batteries without package.
- Do not broke the battery, the released electrolyte may be toxic and is harmful to skin and eyes.
- Packaged batteries should not be stacked more than specified number stipulated on the packing case.
- Do not use damaged, failed or deformed batteries, which may lead to high temperature or even dangerous accidents. Continued operation of damaged battery may result in electrical shock, fire or even worse.

### 2.3 Warning Labels

| Symbols                                                                             | Description                          |
|-------------------------------------------------------------------------------------|--------------------------------------|
|  | Do not dispose in trash              |
|  | Lithium ion battery can be recycled  |
|  | Certification in European union area |
|  | Electric shock hazard                |
|  | Explosive gas                        |

|                                                                                     |                                               |
|-------------------------------------------------------------------------------------|-----------------------------------------------|
|    | May leak corrosive electrolyte                |
|    | Heavy enough to cause severe injury           |
|    | Keep the Pack away from children              |
|    | Make sure the battery polarity well connected |
|  | Do not expose to fire                         |
|  | Operate as the Manual                         |

|                                                                                                                                                                                            |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
|  <br>Lithium Ion Battery |              |
| Model                                                                                                                                                                                      | Hope 5.5L-A1 |
| Nominal Voltage                                                                                                                                                                            | 51.2V        |
| Rated Capacity                                                                                                                                                                             | 106Ah        |
| Rated Energy                                                                                                                                                                               | 5500Wh       |
| Max Charge Current                                                                                                                                                                         | 100A         |
| Max Discharge Current                                                                                                                                                                      | 100A         |
| Ingress Protection                                                                                                                                                                         | IP20         |
| Charge Temperature                                                                                                                                                                         | 0°C ~ 55°C   |
| Discharge Temperature                                                                                                                                                                      | -20°C ~ 55°C |
| <br>X Made In China                                                                                       |              |

Figure 4: Nameplate

## 2.4 Emergency Responses

Manufacturer takes foreseeable risk scenarios into consideration and is designed to reduce hazards and dangers. However, if the following situation occurs, do as below:

| Situation Occurs | Description and Action                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Leakage          | <ol style="list-style-type: none"> <li>1. Avoid touch of leaking liquid or gas. If you touch the leaking electrolyte, do as below immediately</li> <li>2. Inhalation: Evacuate the contaminated area, and seek medical help.</li> <li>3. Eye contact: Rinse eyes with flowing water for 15 minutes, and seek medical help</li> <li>4. Skin contact: Rinse contacted area thoroughly with soap and water, and seek medical help.</li> <li>5. Ingestion: Vomiting, and seek medical help.</li> </ol> |
| Fire             | If the BATTERY is on fire, try to extinguish the fire with fire fighting sand and evacuate people due to the situation                                                                                                                                                                                                                                                                                                                                                                             |
| Wet Packs        | If PACK is flooded or submerged, do not access it. Contact Growatt or distributor for technical assistance immediately.                                                                                                                                                                                                                                                                                                                                                                            |
| Damaged PACKS    | Damaged PACKS are dangerous and must be handled with special attention. They are no longer suitable for use and may cause danger to people. If the PACK damaged, stop use it and contact the Growatt or distributor.                                                                                                                                                                                                                                                                               |

## 3 Storage and Transportation

### 3.1 Storage Requirements

- Place the BATTERY follow the identification on the packing case during storage.
- Do not put the BATTERY upside down or sidelong.
- The defective PACK needs to be separated from other Batteries.
- The storage environment requirements are as follows:
  - 1) Install the BATTERY in a dry and clean place with proper ventilation
  - 2) The storage temperature for a short week is between -20°C to 55°C
  - 3) If you store the PACK over a long period of six months, the storage temperature is between -10°C to 40°C, relative humidity: 10%~90%RH.
  - 4) Place the BATTERY away from corrosive and organic substances (including gas exposure).
  - 5) Free from direct exposure to sunlight and rain
  - 6) At least two meters away from heat sources (such as a radiator) , free from exposure to intensive infrared radiation.
- If the BATTERY has not been used for more than six months, it needs to be charged, The charging procedure is as follows:
  - 1) Identify the PACK that needs charging;
  - 2) Refer to quick installation guidance, complete the installation and wire connection. Ensure BATTERY in off status during all the steps.
  - 3) Activating the inverter, activating the battery and starting charging;
  - 4) When the RUN\_LED is always on and the SOC LED is flashing to indicate that it is in normal charging;
  - 5) When the 5 SOC LED lights are always on, it indicates a full charge.

### 3.2 Transportation Requirement

PACK has been certified in 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). PACK is classified as category 9 dangerous goods.

- The PACK shall not be transported with other inflammable, explosive or toxic substances; Ensure the original Package and label complete and recognizable.
- Prohibit direct exposure to sunlight, rain, condensing water caused by temperature difference and mechanical damages.
- There will be a drop in capacity during transportation and storage.
- Transportation temperature is between -10°C to 40°C, relative humidity: 10%~90%RH

## 4 Installation

- Ensure to read the Guidance before installation in order to understand product information and safety cautions;
- Operators should be well trained technicians and fully understand the whole photovoltaic system, grid network, working principle and national regional standards;
- Installers must use insulating tools and wear safety equipment;
- Device damages caused by failure to comply with storage, transportation, installation and use requirements specified in Guidance are not covered by Warranty
- The PACK can only be installed indoors. Regarding indoor installation, please do not install it in the bedroom, living room, kitchen, etc
- Different types of batteries are not recommended to be mixed and used in parallel.
- The battery system cannot be installed, dismantled, and maintained when it has been powered on

### 4.1 Installation environment

The ambient temperature for the installation of the battery system shall be above 0°C, below 40°C, and the humidity shall between 10% -95%

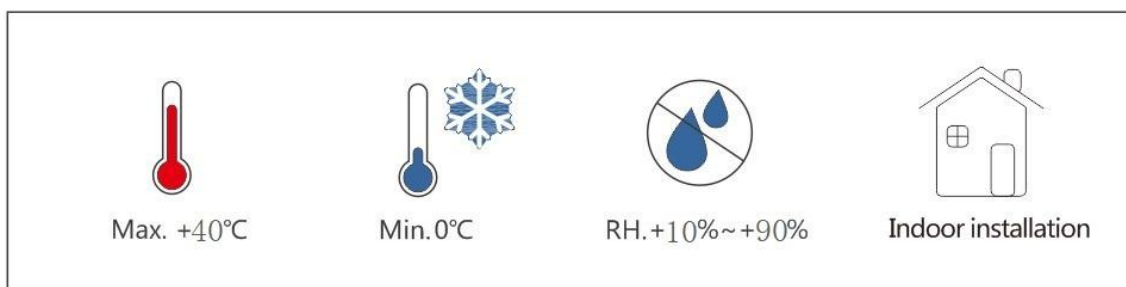
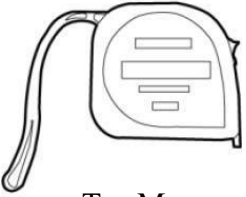


Figure 5: Installation environment requirements

## 4.2 Installation Required Tools

The following tools are required to install the PACK:

|                                                                                                    |                                                                                                   |                                                                                               |
|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| <br>5mm Allen key | <br>Screw Driver | <br>Wrench |
| <br>Tap Measure   | <br>Multi-meter  |                                                                                               |

It is recommended to wear the following safety gear when dealing with the PACK

|                                                                                                       |                                                                                                     |                                                                                                      |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <br>Insulated Glove | <br>Safety Goggle | <br>Safety Shoes |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|

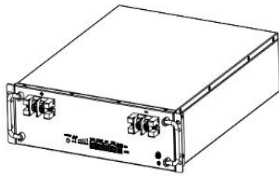
## 4.3 Check

### 4.3.1 Pre-installation Check

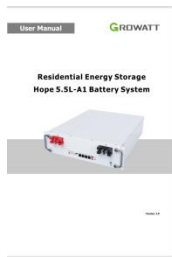
|                   |                                                                                                                                                  |
|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Check the package | Check the PACK package before open it. If any abnormality is detected, do not open the Package and contact your distributor.                     |
| Check the power   | Check and confirm the PACK is powered off before installation.                                                                                   |
| Check deliverable | e Check the quantity of all parts inside according to the package list. If there is any part missing or damaged, please contact your distributor |

### 4.3.2 Check Packing List

| Hope 5.5L-A1 Battery Pack (Standard) |                            |          | Hope 5.5L-A1 Kit package (Optional) |                 |          |
|--------------------------------------|----------------------------|----------|-------------------------------------|-----------------|----------|
| Item No.                             | Part Name                  | Quantity | Item No.                            | Part Name       | Quantity |
| 1                                    | Hope 5.5L-A1 Battery Pack  | 1 pcs    | 5                                   | Battery Bracket | 4 pcs    |
| 2                                    | User Manual                | 1 pcs    | 6                                   | Screw bolt      | 4 pcs    |
| 3                                    | Cable Shorting-circuit cap | 1 pcs    | 7                                   | SC35-8 lug      | 4 pcs    |
| 4                                    | Warranty Card              | 1 pcs    | 8                                   | Screw           | 4 pcs    |
|                                      |                            |          | 9                                   | Power+ Cable    | 1 pcs    |
|                                      |                            |          | 10                                  | Power- Cable    | 1 pcs    |
|                                      |                            |          | 11                                  | Network Cable A | 1 pcs    |
|                                      |                            |          | 12                                  | Network Cable B | 1 pcs    |



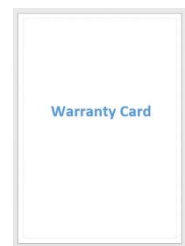
1



2



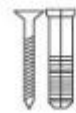
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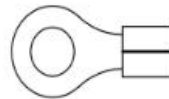
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8



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11

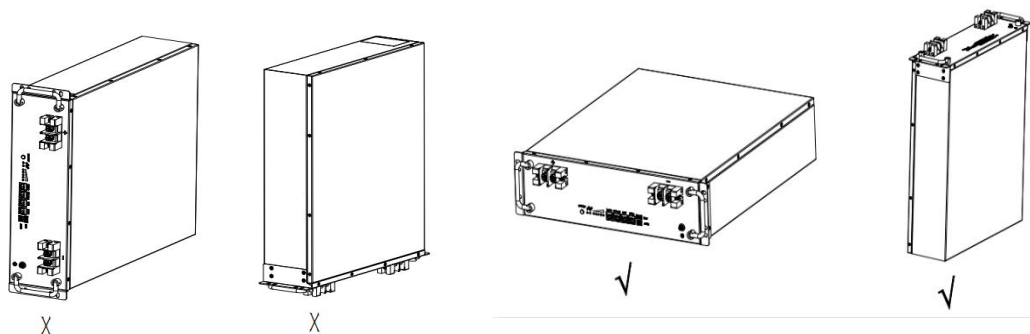


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## 4.4 Installation

### 4.4.1 Battery Placement

- 1) Please install indoors and ensure the level of the ground.
- 2) The maximum quantity of stacking battery pack is 6, only support to horizontally mounted. Make sure the batteries are mounted in the correct orientation. Please refer to the picture below (✓ means acceptable, X means unacceptable).



### 4.4.2 Communication line connection

- Please wear an anti-static wrist strap, anti-static gloves, and goggles
  - It is recommended that the power line and communication line between the battery and the inverter should not exceed 2 meters
- inverter Communication interface definition:

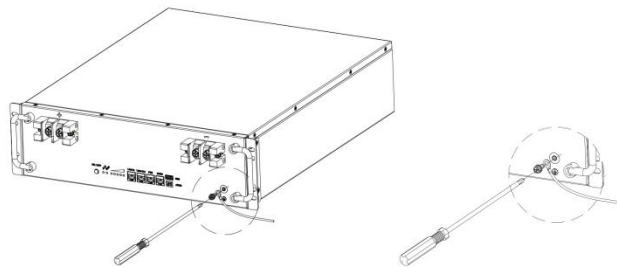
| Item | Crystal head picture                                                                | Serial no. | Definition |
|------|-------------------------------------------------------------------------------------|------------|------------|
| PCS  |  | 1          | RS485_B    |
|      |                                                                                     | 2          | RS 485_A   |
|      |                                                                                     | 3          | GND_COM    |
|      |                                                                                     | 4          | CAN_H      |
|      |                                                                                     | 5          | CAN_L      |
|      |                                                                                     | 6          | GND_COM    |
|      |                                                                                     | 7          |            |
|      |                                                                                     | 8          |            |

#### 4.4.3 Single battery installation

- Make sure the battery is in off mode and the battery breaker is off. Ensure there are no tangled cables after battery wiring.

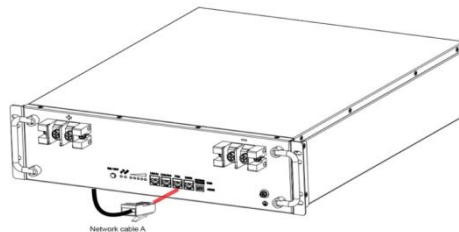
**Operation Step 1:** Fix the ground wire to the ground terminal with an M4 screw, and fix the other end to the inverter. Note that the cross-sectional area of the ground wire is 16mm<sup>2</sup>

1. Insert the network cable A into the inverter port of battery 1, and the other end insert into the BMS network port of the inverter



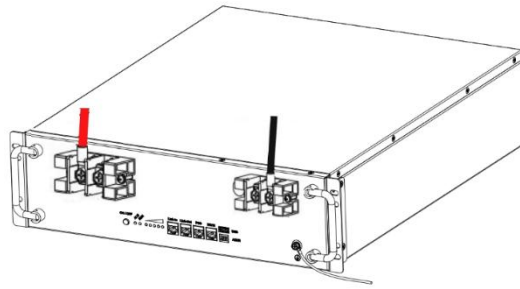
**Operation Step 2:** Insert the network cable into the battery port

1. Insert network cable A into the inverter port of the battery, and the other end of the network cable into the network port of the inverter



**Operation Step 3:** Connect power cable.

1. Fix the OT terminal of the power cable to the pair of "+/-" terminals of the battery
2. Put the plastic cover back
3. Fix the other end to the breaker and then connect to the inverter



- \* When connecting the power cable, make sure the direction of OT terminal is correct. Don't stack two OT terminals on one power port

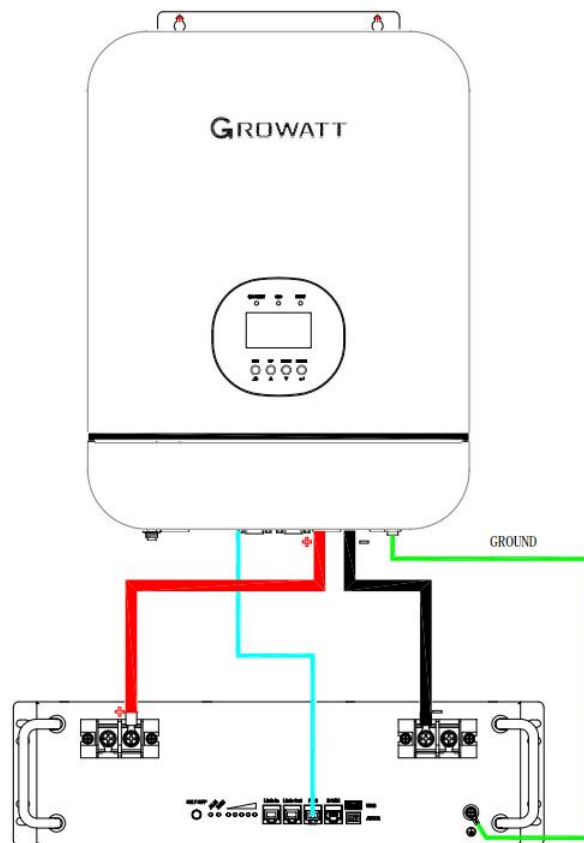


Figure 6: Single Battery Installation Diagram

- 1) The battery is not allowed to be wired in the running state, and the battery should all be off before installation
- 2) Please install the communication line first, then protect the unused ports and USB ports against dust, and finally install the power cable
- 3) To ensure the safety, don't forget to connect ground wire
- 4) We recommend installing a circuit breaker between the inverter and the battery. For the specifications of the circuit breaker, we recommend using a molded case circuit breaker with a rated operating voltage greater than 80Vdc and a rated operating current greater than 200A.

#### **4.4.4 Battery pack capacity expansion installation**

- \* Ensure all batteries are in off mode and battery breakers are off
- \* Ensure there are no tangled cables after battery wiring
- \* Support up to 12 battery packs connected in parallel to form a 5.5KW expanded energy storage system

##### **Operation Step 1: Connect network cable**

1. Insert the network cable A into the inverter port of battery 1, and the other end insert into the BMS network port of the inverter
2. Use network cable B to connect the LINK-OUT port of battery 1 to the LINK-IN port of battery 2. Connect the rest of the batteries in the same way until the last battery is connected.

##### **Operation Step 2: Connect ground**

Connect the ground terminal of each battery to the ground strip

##### **Operation Step 3: Connect power cable**

Connect the +/- terminals of each battery to the +/- terminals of the next battery, and then connect the wires to the inverter

Note: Do not insert the shorting cap for battery pack expansion



4) We recommend installing a circuit breaker between the inverter and the battery. For the specifications of the circuit breaker, we recommend using a molded case circuit breaker with a rated operating voltage greater than 80Vdc and a rated operating current greater than 200A.

#### **4.4.5 Battery pack power expansion installation**

- \* Make sure all batteries are in off mode and the battery circuit breaker is off
- \* Make sure there are no tangled cables after the battery wiring
- \* Supports parallel connection of up to 12 battery packs to form a 66kW expansion storage system

##### **Operation Step 1: Connect the network cable**

1. Insert one end of the network cable A into the inverter interface of battery 1 and the other end into the BMS network port of the inverter
2. Connect the LINK-OUT connector of battery 1 and the LINK-IN connector of battery 2 using network cable B. Connect the rest of the batteries in the same way until the last battery is connected.

##### **Operation Step 2: Connect the ground wire**

Connect the ground terminal of each battery to the grounding strip.

##### **Operation Step 3: Connect the power cord.**

Connect the +/- terminal of each battery into the +/- terminal of the latter battery separately, and then connect the wires to the inverter.

##### **Operation Step 4: Insert the shorting cap.**

Insert the DODI port of the battery pack other than pack 1 into the shorting cap

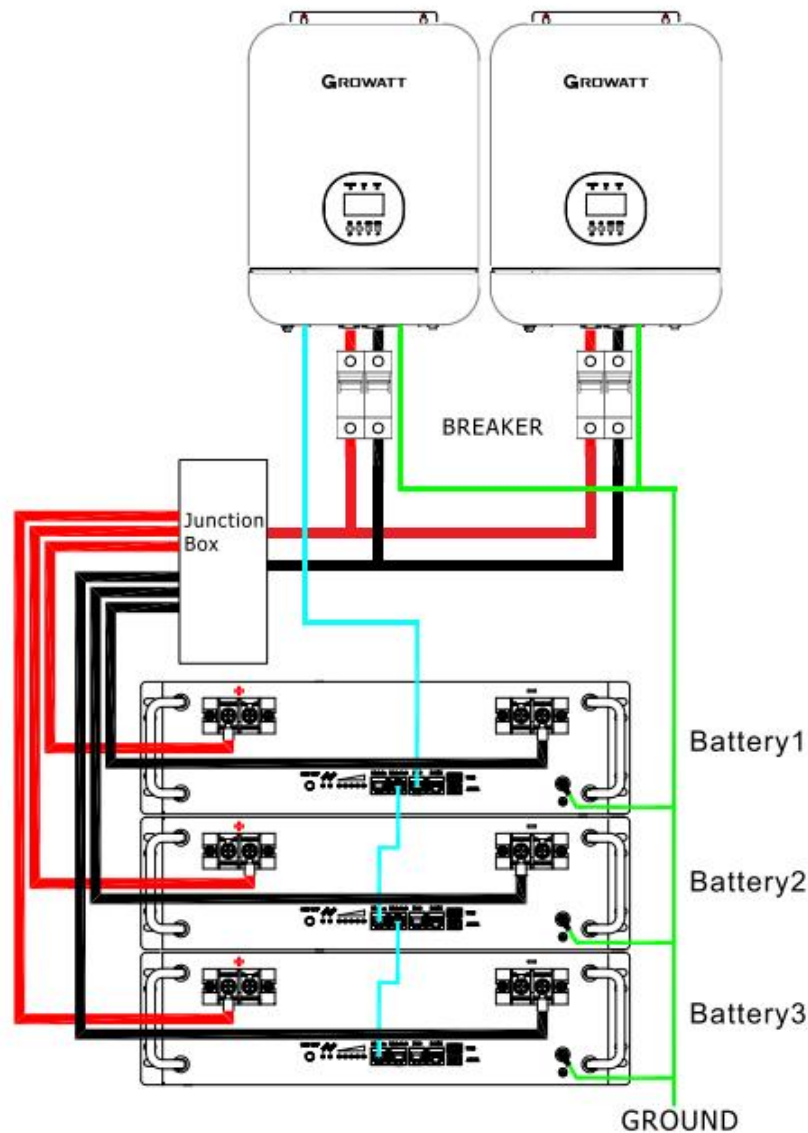


Figure 8: Installation diagram for power expansion

- 1) The battery is not allowed to be wired in the running state, and make sure all batteries are in off mode before installation
- 2) Refer to Figure 8 for power cable wiring
- 3) Please install the communication line first, then protect the unused ports and USB ports against dust, and finally install the power cable
- 4) We recommend installing a circuit breaker between the inverter and the battery. For the specifications of the circuit breaker, we recommend using a molded case circuit breaker with a rated operating voltage higher than 80Vdc, The rated working current is determined by the power. It is recommended to connect a battery pack to a 125A circuit breaker, and connect multiple battery packs to 125A\*n circuit breaker.

#### 4.4.6 Battery pack capacity expansion and power expansion installation

- \* Ensure all batteries are in off mode and battery breakers are off
- \* Ensure there are no tangled cables after battery wiring
- \* Support up to 12 battery packs connected in parallel to form a 33KW expanded energy storage system

##### Operation Step 1: Connect the network cable

1. Insert one end of the network cable A into the inverter interface of battery 1 and the other end into the BMS network port of the inverter.
2. Connect the LINK-OUT connector of battery 1 and the LINK-IN connector of battery 2 using network cable B. Connect the rest of the batteries in the same way until the last battery is connected.

##### Operation Step 2: Connect the ground wire

Connect the ground terminal of each battery to the grounding strip.

##### Operation Step 3: Connect the power cord.

Connect the +/- terminal of each battery into the +/- terminal of the latter battery separately, and then connect the wires to the inverter.

##### Operation Step 4 Insert the shorting cap.

Insert the first battery pack DODI port of the second cluster into the shorting cap (as shown in Figure 10 Battery4 inserting the shorting cap)

Note:

- In order to expand the power, each access to a short cap represents the current doubled, a cluster of battery pack output current is 100A, two clusters of battery pack output current is 200A, and so on, the maximum can be connected to 12 clusters of battery pack;
- When there is only one battery pack, no need to insert the shorting cap;
- When multi-cluster battery is assembled, DIDO network port of the first batteries of each cluster needs to connect the short-cap (except the first cluster battery pack). If the short-cap is inserted incorrectly, the battery will be overcurrent protected due to uneven current distribution.

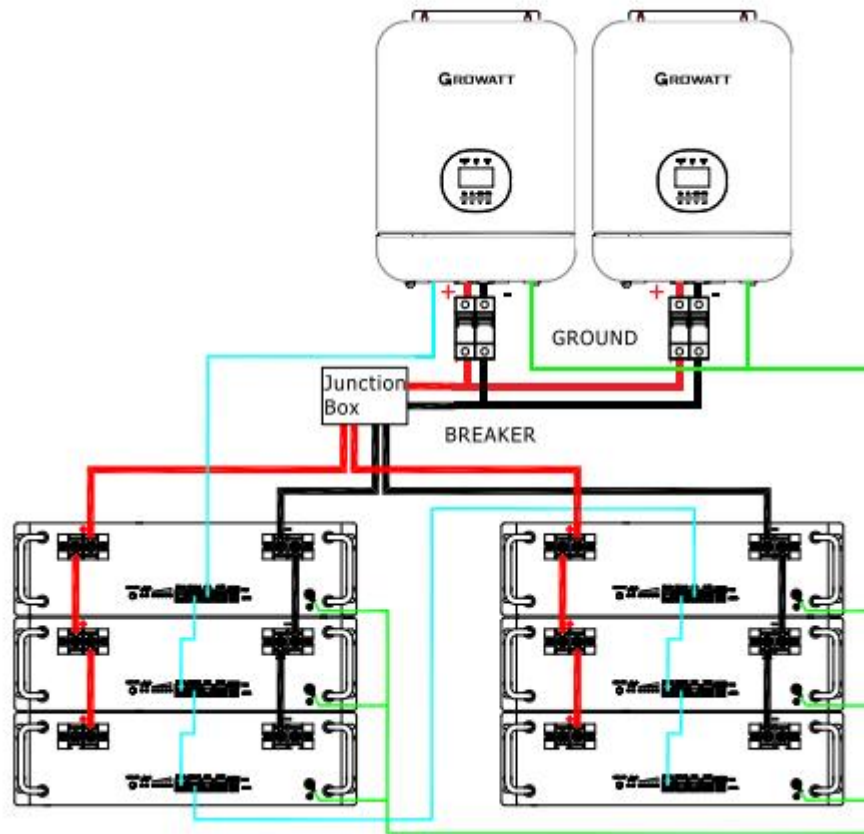


Figure 9: Installation diagram for capacity expansion and power expansion

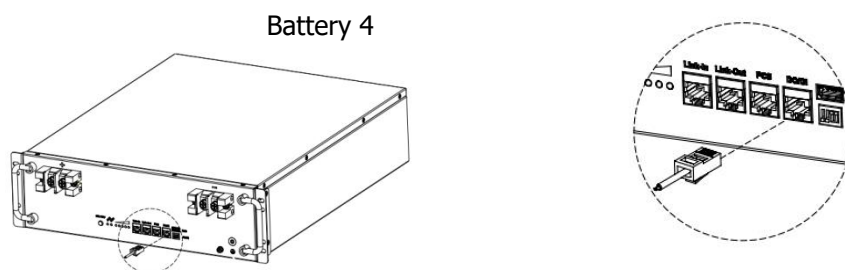


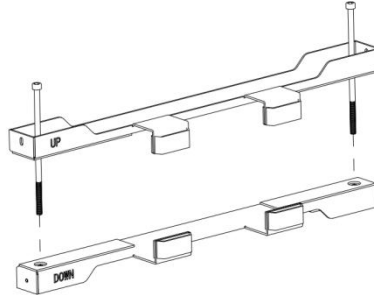
Figure 10: Inserting the shorting cap

- 1) The battery is not allowed to be wired in the running state, and the battery should all be off before installation
- 2) Refer to Figure 9 for power cable wiring
- 3) Please install the communication line first, then protect the unused ports and USB ports against dust, and finally install the power cable
- 4) We recommend installing a circuit breaker between the inverter and the battery. For the specifications of the circuit breaker, we recommend using a molded case circuit breaker with a rated operating voltage higher than 80Vdc, The rated working current is determined by the power. It is recommended to connect a battery pack to a 125A circuit breaker, and connect multiple battery packs to 125A\*n circuit breaker.

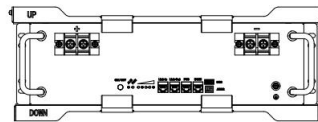
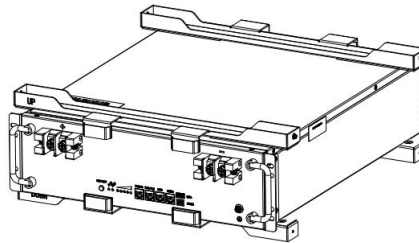
#### 4.4.7 Stackable Installation with Bracket Support

Check and confirm the battery is powered off and battery breakers are turned off before any process.

Step 1 Prepare support brackets.



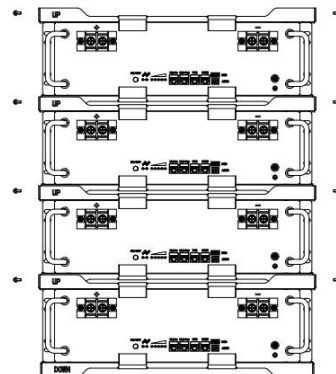
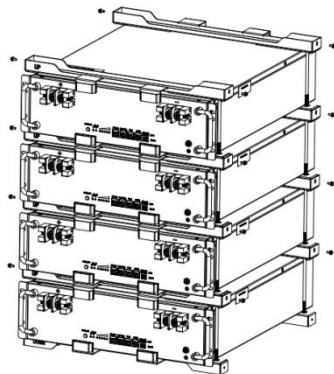
Step 2 Set the battery into 2 pcs of brackets from the rear.



Step 3 Stack battery packs with brackets and fasten screws.

AT most 6 battery packs can be stacked in this way.

MAX.6 PACKs



## 5 Power on and off the Battery

- The installation and use of batteries involve much specialized knowledge. Therefore, technicians should be given appropriate technical training and obtain operational certificates in compliance with local laws and regulations. Please ensure technicians have obtained training certificate before operation.
- Please stand on dry insulating objects and do not wear conductive material such as watches and necklace during operation. Insulated tools should be used
- Do not contact any positions with potential difference
- Prohibition sign should be hung on the battery: " Non - professionals, do not touch"
- If any abnormalities occur during the startup phase, power off the PACK immediately. After problem confirmed, proceed again.  
Make sure the inverter is turned off before checking the PACK.

### 5.1 Power On

When multiple batteries are connected in parallel or multiple clusters of batteries are connected in parallel, press one of the battery power buttons and all the batteries connected in parallel can be turned on.

| Power on the PACK by pressing power button( $t > 1S$ ) |                                                                         |                                                                                                                                                                               |
|--------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Serial                                                 | Procedures                                                              | Acceptation criteria                                                                                                                                                          |
| 1                                                      | Connect the battery and inverter                                        | Make sure the wiring harnesses are well connected                                                                                                                             |
| 2                                                      | Close the breaker of the BATTERY                                        | Make sure the breaker is ON                                                                                                                                                   |
| 3                                                      | Press POWER button for one second. Observe the LED indication on panel. | 1. If both RUN/ALM and SOC lights turn on normally, PACK is powered on successfully.<br>If ALM light turns red, there is a failure and should solve it before power on again. |
| Power on the PACK by Inverter                          |                                                                         |                                                                                                                                                                               |
| 1                                                      | Connect the battery and inverter                                        | Make sure the wiring harnesses are well connected                                                                                                                             |
| 2                                                      | Close the breaker of the BATTERY                                        | Make sure the breaker is ON                                                                                                                                                   |
| 3                                                      | Power on the inverter to charge the battery                             | 1. If both RUN/ALM and SOC lights turn on normal, BATTERY powers on successfully.<br>2. If ALM light turns red, there is a failure and should solve it before power on again. |

### 5.2 Power off

Press the power switch for 3 seconds and release it, battery off, all LED lights off. If multiple batteries are connected in parallel, only press the power switch of any one of the batteries for 3 seconds and then release it, the other batteries can be turned off

## 6 Maintenance Guide

### 6.1 Preparation

- ✧ Tools like safety gloves, cross head driver and socket wrench should be prepared.
- ✧ Turn off and turn on new PACK
  1. If the PACK is power-off. Press power button for 1 second to turn on
  2. If the PACK is power-on. Press power button 3-5 seconds to turn off

Before maintaining the battery, turn off the breaker and press power button 3-5 seconds to make sure the battery is power-off. Follow the installation and wire connection procedures specified above. Ensure wires are properly connected before turn the breaker on. After that, turn on the breaker and press power button of any battery for 1 second to check if the system normal works

### 6.2 Battery Replacement

- Wear safety gloves
- Open the breaker and power off the battery
- Remove your safety screw under the power supply, and disconnect the power cord and CAN communication line of the battery.
- Remove the safety part at the left end of the battery and lift the battery upward
- Put the battery into the packing box according to the repair procedure and transport the battery to the designated repair site
- Install new battery based on procedure specified in Section 4.

### 6.3 System Failure Information List and Troubleshooting Suggestions

| Error Indication         | Error description                  | Error cause                                                           | Suggested actions                                                                                              |
|--------------------------|------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| ★ ( ALM Light Flickers ) | Discharge under voltage protection | Single cell voltage below the threshold for under-voltage protection. | There is over discharge risk. User should stop discharging and arrange recharge                                |
|                          | Charge over voltage protection     | Single cell voltage exceeding threshold for protection threshold      | 1. There is no safety threat;<br>2. User should stop charging. Idle battery and it will turn to normal status. |

|                  |                                        |                                                              |                                                                                                                                                                                                                                                                                                                                                                      |
|------------------|----------------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | External CAN Communication failure     | Communication loss between inverter and battery              | <ol style="list-style-type: none"> <li>1. There is no safety threat and user should stop using battery.</li> <li>2. Check if inverter and battery communication terminal is well connected.</li> <li>3. If inverter and PACK cannot communicate when the communication wire is confirmed well connected, user should contact installer to repair battery.</li> </ol> |
|                  | Interior CAN Communication failure     | Communication loss between two parallel                      | 1. Check CAN connection between two batteries, CAN connection between Link-in and Link-out;                                                                                                                                                                                                                                                                          |
|                  | Parallel connection failure protection | Communication failure between two parallel connected battery | 1. Check CAN connection between two batteries, CAN connection between Battery and Inverter;                                                                                                                                                                                                                                                                          |
| ● (ALM Light on) | Discharge short circuit                | External short circuit of battery                            | There is safety risk and user should stop using battery, User should contact installer to repair inverter and battery                                                                                                                                                                                                                                                |
|                  | Pre-charger short circuit              |                                                              |                                                                                                                                                                                                                                                                                                                                                                      |
|                  | Pre-charger overtime circuit           |                                                              |                                                                                                                                                                                                                                                                                                                                                                      |
|                  | Parallel failure                       | The pack type is different                                   | There is safety risk and user should stop using battery, User should contact installer to use the same battery in Parallel.                                                                                                                                                                                                                                          |
|                  | Main circuit fault                     | BMS main power circuit failure                               | There is safety risk and user should stop using battery. User should contact installer to repair battery                                                                                                                                                                                                                                                             |
|                  | MOS control failure                    | Turn off MOS tube,there is still current                     | There is safety risk and user should stop using battery. User should contact installer to repair battery                                                                                                                                                                                                                                                             |

## 7 Technical Specifications

Functional parameters of Hope 5.5L - A1 battery are as shown below:

| No. | Items                                 | Specification                                                                                              |
|-----|---------------------------------------|------------------------------------------------------------------------------------------------------------|
| 1   | Battery Module                        | Hope-5.5L-A1                                                                                               |
| 2   | Nominal Voltage                       | 51.2V                                                                                                      |
| 3   | Rated Capacity/Energy                 | 106Ah/5.5kWh                                                                                               |
| 4   | Operating Voltage                     | 40 – 58.4V                                                                                                 |
| 5   | Max. charging current(25°C)           | 100A                                                                                                       |
| 6   | Max. discharging current(25°C)        | 100A                                                                                                       |
| 7   | Maximum output pulse current          | 300A 10ms                                                                                                  |
| 8   | Battery Type                          | Cobalt Free Lithium Iron Phosphate (LFP)                                                                   |
| 9   | Operative charge temperature range    | 0°C~55°C                                                                                                   |
| 10  | Operative discharge temperature range | -20°C ~55°C                                                                                                |
| 11  | Storage conditions                    | -20°C ~ +50°C 、 10%~90%RH<br>Recommended temperature: -10°C~40°C<br>Within six months after initial charge |
| 12  | Cooling                               | Natural cooling                                                                                            |
| 13  | Dimension(W / D / H)                  | 440*540*130.5 (mm)                                                                                         |
| 14  | Weight                                | 45±1kg                                                                                                     |
| 15  | Installation                          | Rack mount                                                                                                 |
| 16  | Ingress protection                    | IP 20                                                                                                      |
| 17  | Safety certification                  | CE(EMC)/UN38.3/MSDS/ROHS                                                                                   |
| 18  | Communication port                    | CAN/RS485                                                                                                  |
| 19  | Battery parallel                      | Max.12 batteries                                                                                           |
| 20  | Warranty                              | 5 years                                                                                                    |
| 21  | Cycle                                 | 25°C 0.2C 6000 cycle                                                                                       |

## Appendix 1

| Status                   | Items               | SOC indicator  |                |                |                |                |
|--------------------------|---------------------|----------------|----------------|----------------|----------------|----------------|
|                          |                     | LED1           | LED2           | LED3           | LED4           | LED5           |
| Charge SOC               | 0%                  | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) |
|                          | 1%-19%              | ●              | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) |
|                          | 20%-39%             |                | ●              | ●<br>(t=500ms) | ●<br>(t=500ms) | ●<br>(t=500ms) |
|                          | 40%-59%             |                | ●              | ●              | ●<br>(t=500ms) | ●<br>(t=500ms) |
|                          | 60%-79%             |                | ●              | ●              | ●              | ●<br>(t=500ms) |
|                          | 80%-100%            |                | ●              | ●              | ●              | ●              |
| Discharge SOC            | 100%-80%            |                | ●              | ●              | ●              | ●              |
|                          | 79%-60%             |                | ●              | ●              | ●              |                |
|                          | 59%-40%             |                | ●              | ●              |                |                |
|                          | 39%-20%             |                | ●              |                |                |                |
|                          | 19%-1%              | ●              |                |                |                |                |
|                          | 0%                  | ●<br>(t=500ms) |                |                |                |                |
| Idle                     | 100%-80%            |                | ●              | ●              | ●              | ●              |
|                          | 79%-60%             |                | ●              | ●              | ●              | ●              |
|                          | 59%-40%             |                | ●              | ●              |                |                |
|                          | 39%-20%             |                | ●              |                |                |                |
|                          | 19%-1%              | ●              |                |                |                |                |
|                          | 0%                  | ●<br>(t=500ms) |                |                |                |                |
| LED indicator            |                     |                |                |                |                |                |
| Status                   | Items               |                |                | RUN            | ALM            |                |
| Charge and discharge MOS | Open circuit        |                |                | ●<br>(t=1s)    |                |                |
|                          | Closed circuit      |                |                | ●              |                |                |
| Alarm                    | Total voltage under |                |                |                | ● (t=1s)       |                |

|            |                                                |  |          |
|------------|------------------------------------------------|--|----------|
|            | voltage                                        |  |          |
|            | Total voltage over voltage                     |  | ● (t=1s) |
|            | Cell under voltage alarm                       |  | ● (t=1s) |
|            | Cell over voltage alarm                        |  | ● (t=1s) |
|            | Alarm before power off                         |  | ● (t=1s) |
|            | Charge over current                            |  | ● (t=1s) |
|            | Discharge over current 1 grade                 |  | ● (t=1s) |
|            | Interior CAN communication failure             |  | ● (t=1s) |
|            | Large internal and external voltage difference |  | ● (t=1s) |
|            | Low charging temperature                       |  | ● (t=1s) |
|            | Low discharge temperature                      |  | ● (t=1s) |
|            | High charging temperature                      |  | ● (t=1s) |
|            | High discharging temperature                   |  | ● (t=1s) |
|            | Charge over power                              |  | ● (t=1s) |
|            | Discharge over power                           |  | ● (t=1s) |
|            | Large charging circulation                     |  | ● (t=1s) |
|            | Large discharging circulation                  |  | ● (t=1s) |
|            | Mos high temperature                           |  | ● (t=1s) |
|            | Large Cell voltage difference                  |  | ● (t=1s) |
|            | Large Cell temperature difference              |  | ● (t=1s) |
| Protection | Total voltage under voltage                    |  | ●        |
|            | Total voltage over voltage                     |  | ●        |
|            | Cell under voltage alarm                       |  | ●        |
|            | Cell over voltage alarm                        |  | ●        |
|            | Short circuit                                  |  | ●        |
|            | Charge Over current                            |  | ●        |
|            | Discharge Over current 1 grade                 |  | ●        |

|  |                                                              |  |   |
|--|--------------------------------------------------------------|--|---|
|  | Parallel versions are inconsistent                           |  | ● |
|  | Parallel failure                                             |  | ● |
|  | Large voltage difference for internal and external           |  | ● |
|  | MOS control failure                                          |  | ● |
|  | low charging temperature                                     |  | ● |
|  | low discharging temperature                                  |  | ● |
|  | High charging temperature                                    |  | ● |
|  | High discharging temperature                                 |  | ● |
|  | Charging over power                                          |  | ● |
|  | Discharging over power                                       |  | ● |
|  | Same address failure                                         |  | ● |
|  | Precharge timeout                                            |  | ● |
|  | Precharge short circuit                                      |  | ● |
|  | AFE disconnected                                             |  | ● |
|  | Cell dropout                                                 |  | ● |
|  | Temperature dropout                                          |  | ● |
|  | Abnormal battery voltage sampling                            |  | ● |
|  | Temperature short circuit                                    |  | ● |
|  | Abnormal load voltage sampling                               |  | ● |
|  | Failed to load parameters                                    |  | ● |
|  | AFE over voltage                                             |  | ● |
|  | AFE under voltage                                            |  | ● |
|  | AFE charging overcurrent                                     |  | ● |
|  | AFE discharging overcurrent                                  |  | ● |
|  | Excessive differential voltage between primary and secondary |  | ● |
|  | Charging current limit failure                               |  | ● |
|  | Discharge current limit failure                              |  | ● |
|  | Main circuit                                                 |  | ● |

|  |                                    |  |   |
|--|------------------------------------|--|---|
|  | disconnection                      |  |   |
|  | Discharge overcurrent grade 2      |  | ● |
|  | MOS high temperature alarm         |  | ● |
|  | Excessive differential voltage     |  | ● |
|  | Excessive differential temperature |  | ● |

**note :** ● Indicates always on

● t=500ms indicates the flashing interval 500ms      ● t=1s indicates the flashing interval 1s

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