MOTOMA®

Power into the Future

# USER MANUAL

## Energy Storage Battery

Version: V23A


**48V 100Ah/150Ah/200Ah**

**51.2V 100Ah/150Ah/200Ah**

# Table Of Contents

# 1 Introduction

The energy storage battery is an essential component of the PV power generation system. It can provide electricity power for the connected loads, and it can also store the electricity power from PV modules, diesel generators, or wind energy generators. When the sun goes down, energy demand is high, or there is a power outage, you can use the energy stored in the system to meet your energy needs at no additional cost. In addition, the Energy storage battery can help you achieve energy self-consumption and ultimately achieve the goal of energy independence.

According to different power consumption, the Energy storage battery can output power during peak power consumption, and can also store energy during low power consumption. Therefore, the PV arrays and inverter are required to match the battery to achieve the highest operating efficiency. For a simple diagram of a typical energy storage system, see Figure 1.

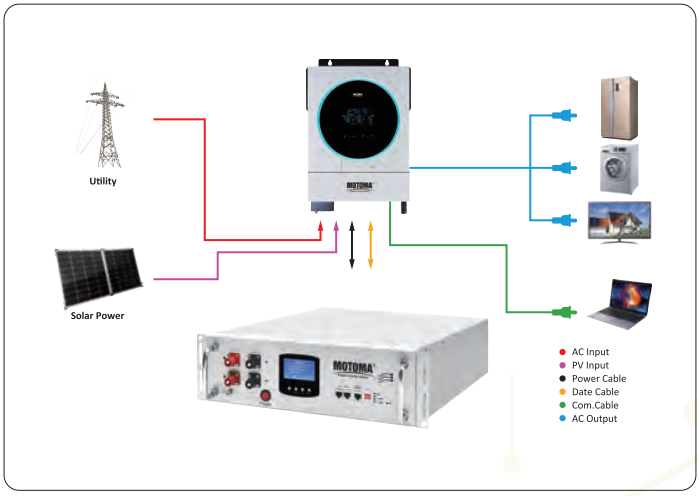



Figure 1 Energy Storage System Overview

- It is very important and necessary to read the user manual carefully before installing or using the battery. Failure to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, death, or may damage the battery and the whole system.
- If the battery is stored for a prolonged time, it is requirement that they are charged every three to six months, and the SOC should be no less than 80%, after fully discharging, The battery needs to be recharged within 12 hours.
- Do not expose cable outside. Do not use cleaning solvents to clean the battery.
- All battery terminals must be disconnected before maintenance.

# 2 Safety Warning

- Do not expose the battery to flammable or harsh chemicals or vapors.
- Do not paint any part of the battery; include any internal or external components.
- Do not connect battery with PV solar wiring directly.
- Any external object is prohibited to be inserted into any part of the battery.
- Any warranty claims are excluded for direct or indirect damage due to items above.
- Parallel connection within 10 batteries, the maximum 15 batteries, Series connection is NOT allowed.

## 2.1 Before Connecting

- After unpacking, please check the battery and packing list first, if the battery is damaged or spare parts are missing, Please contact the dealer.
- Before installation, be sure to cut off the grid power and make sure the battery is in the turned off mode.
- Wiring must be correct, do not mix-connect the positive and negative cables, and ensure no short circuit with the external device.
- It is prohibited to connect the battery with AC power directly.
- The BMS in the battery is designed for 48 VDC, DO NOT connect battery in series.
- It is prohibited to connect the battery with different type of batteries.
- Please ensure the electrical parameters of battery system are compatible to inverter.
- Keep the battery away from fire or water.

## 2.2 During Operation

- If the battery system needs to be moved or repaired, the power must be cut off first and the battery is completely shutdown.
- It is prohibited to connect the battery with different type of battery.
- It is prohibited to put the batteries working with faulty or incompatible inverter.
- In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited.
- Please do not open, repair or disassemble the battery. We do not undertake any consequences or related responsibility due to violation of safety operation or violating of design, production and equipment safety standards.

# 3 Unpacking & Overview

## 3.1 Packing List

You will receive the following parts (Not a full set), sample as follow picture. For customized requirements, please place an order with the manufacturer.

| Battery pack | Power output positive cable | Power output Negative cable |
|---|---|---|
|  |  |  |
| Inverter COM. cable | Parallel COM. cable (RJ45) | Manual |
|  |  |  |
| GND | *RS485 COM. box | |
|  |  | |

***NOTE:** *Types of communication tools need to place an order.

# 4 Product Overview

## 4.1 General Battery Shape

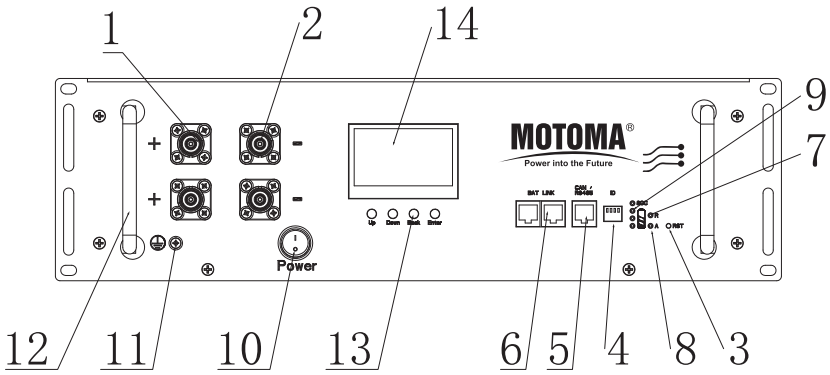



Figure 2 Front View

| No. | Descripton | Silk-screen | Remark |
|---|---|---|---|
| 1 | Battery positive pole | + | Output terminal |
| 2 | Battery negative pole | - | Output terminal |
| 3 | Reset | RST | |
| 4 | Add Coder | ID | Set Battery address code |
| 5 | CAN/RS485 communication port | CAN/RS485 | Connect to inverter |
| 6 | RS485 communication port | BAT LINK | Parallel use |
| 7 | Run LED indication | R | |
| 8 | ALARM LED indication | A | |
| 9 | Capacity LED indication | SOC | |
| 10 | Power switch | POWER | ON/OFF |
| 11 | GND | GND | |
| 12 | Handle | | |
| 13 | LCD KEY | | |
| 14 | LCD | | |

# 5 Installation

## 5.1 Selecting Mounting Location

Consider the following points to install the Energy storage battery:

- The ambient temperature should be between 0°C and 40°C and relative humidity should be between 25% and 85% to ensure optimal operation.
- Install the battery in a dry, protected area with no excessive dust and sufficient air circulation. Do not operate in locations where the temperature and humidity are out of the specified range.

## 5.2 Installation Connection 1

If output current is small around 100A , the batteries could be connected as below diagram.

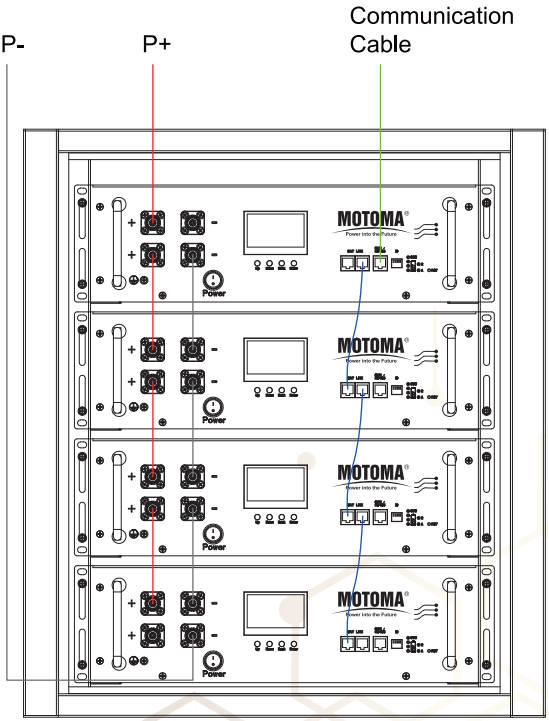



Figure 3 Installation Connection 1

## 5.3 Installation Connection 2

If output current is higher than 100A, it's need to connect with combiner box or combiner bar as below diagram.

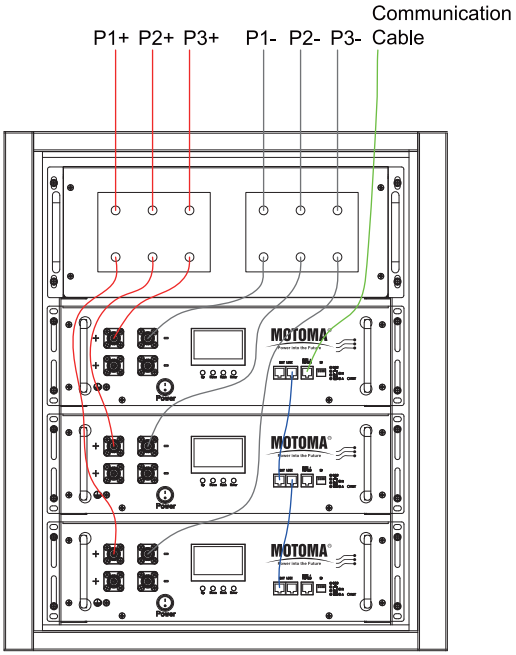



Figure 4 Installation Connection 2

## 5.4 Combiner Box

If current is small around 100A, could use the Breaker (Figure 5.1).
If the current is higher than 150A, could use the breaker (Figure 5.2).
**NOTE:** Breaker value should be 20% more than actual current.


Figure 5.1 Breaker


Figure 5.2 Breaker

For using " Fuse"
Like breaker you can use fuse also ,But the fuse is unrecoverable when was blown and need to change to new one.
**NOTE:** Fuse value should be 10% more than actual current.


Figure 5.3 Breaker

## 5.5 Installation Guideline

**Step 1:**
Connection diagram as below.

If inverter needs CAN BUS port / RS485 port. Please insert communication cable (RJ45) to CAN port, RS485 only be used for battery packs parallel mode.

- 1 Battery, 1 Inverter. Single mode.

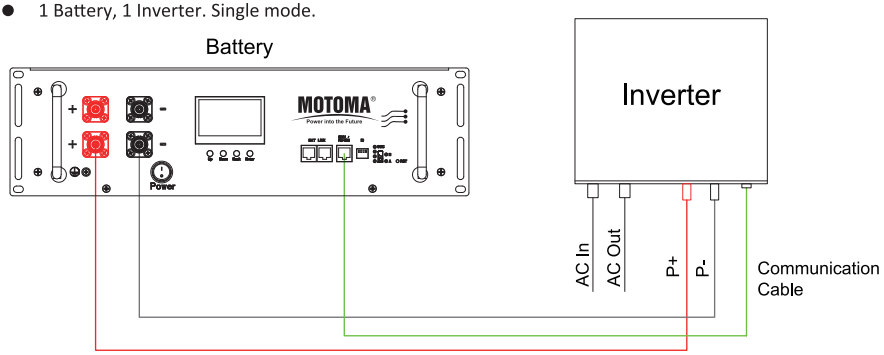



Figure 6 Connection Between 1pc Inverter and 1pc Battery

- 2 Batteries---1 Inverter. Battery 1 is slave. Battery 2 is master.

The Negative and Positive power cable should be in same length.

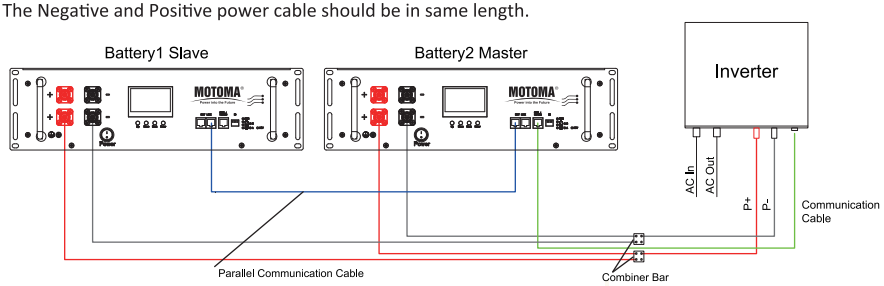



Figure 7 Connection Between 1pc Inverter and 2pcs Batteries

- 3 Batteries---1 Inverter. Battery 1, 2 is slave; Battery 3 is master.

More batteries in parallel connection, one battery is master, others are slave.

The negative and positive power cables should be in same length.

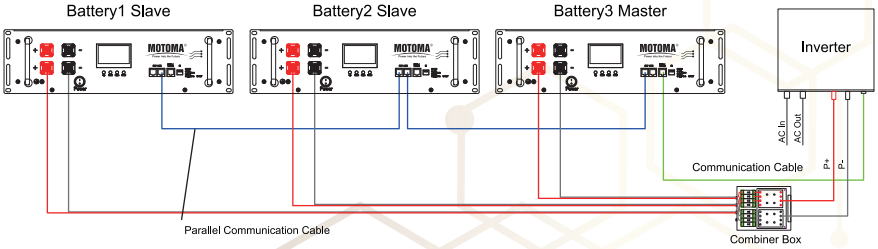



Figure 8 Connection Between 1pc Inverter and 3pcs Batteries Bottom View

- 3 Batteries---3 Inverters.

Mainly cable for 3-phase inverter. battery 1, 2 is slave. Battery 3 is master. More batteries in parallel, one pack is master, other are slave. 3-phase inverter output 380V AC. One inverter is master, others are slave. Please refer to the operation manual of the corresponding inverter for the parallel connection method of the inverter, here is only an example.

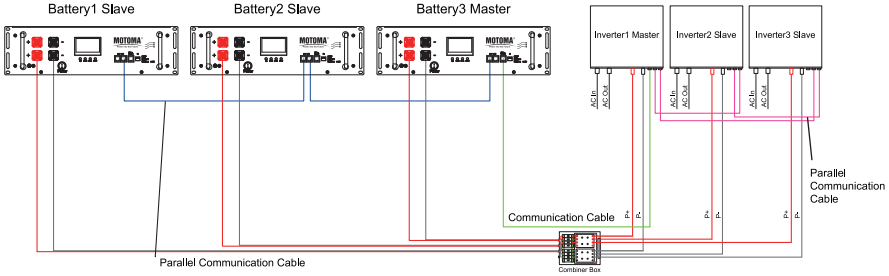



Figure 9 Connection Between 3pcs Inverters and 3pcs Batteries Bottom View

**Step 2:**

- Connection Guideline.

Communication cable

Inverter

Battery

A. Connect communication cable between battery (CAN/RS485) and Inverter(RS485).

B. Select protocol on Battery LCD screen, default is 6-PYL.

C. Single battery use, DIP is Model 2 (1ON,2 ON,3 OFF,4 ON).
2pcs batteries in parallel, Master is Model 2, Slave is Model 3.

D. If select protocol except PYL, DIP is Model 1 for single battery use.
2pcs batteries in parallel, Master is Model 1, Slave is Model 2.

- DIP Regulation

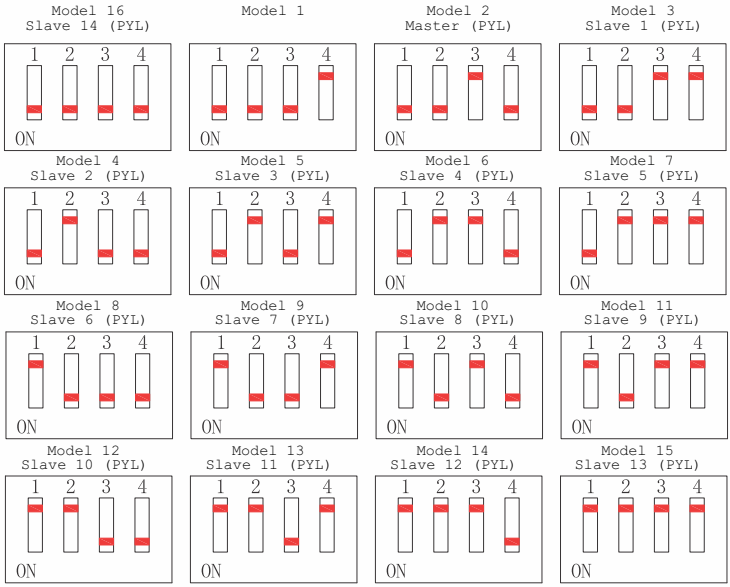



Figure 10 Dial Address

**Step 3:**

Connect the parallel COM. cable (blue network line). Each battery has 2PCS RS485 port for parallel communication, 1PC CAN/RS485 port for inverter or other device. RS485 port only used for host software and update the firmware.

Figure 8. this is 4 bits coder and communication port. CAN port and RS485A port can be selected as the same time .

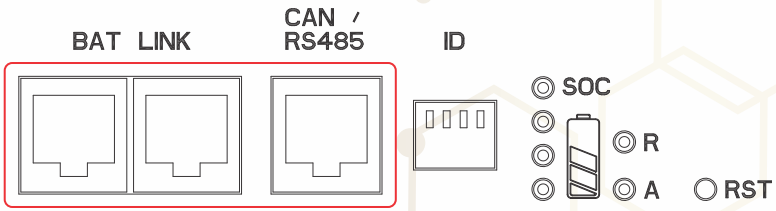
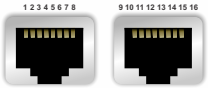



Figure 11 RS485 and CAN Port

| | | | | | |
|---|---|---|---|---|---|
| Parallel communication |  | RS485B-8P8C | | RS485B-8P8C | |
| | | RJ45 | | RJ45 | |
| | | 1,8 | RS485-B | 9,16 | RS485-B |
| | | 2,7 | RS485-A | 10,15 | RS485-A |
| | | 3,6 | GND | 11,14 | GND |
| | | 4,5 | NC | 12,13 | NC |
| External communication |  | RS485A/CAN port | | | |
| | | RJ45 | | RJ45 | |
| | | 1 | NC | 5 | CAN-L |
| | | 2 | GND | 6 | GND |
| | | 3 | NC | 7 | RS485-A |
| | | 4 | CAN-H | 8 | RS485- B |

**NOTE:** The output connected to the communication cable with a waterproof plug is listed according to the order requirements, which are customized products, and are not listed here.

**Step 4:**

Process of battery turn-on & turn-off. Confirm that the operation is correct, and the battery function can be turned on after the cable connection is correct, and You can press power switch (ON/OFF) 3 seconds, then the battery start working, it enter standby mode (if there is no power switch, please press the RESET button 3-6 seconds, like as follow picture, LED indicate all running status and check it's self).

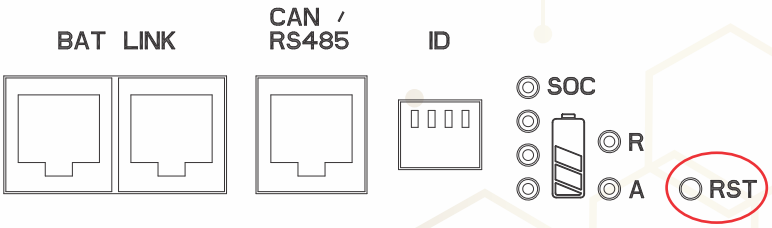



Figure 12 Reset Battery

**Step 5:**

Run the device, set the external charger or inverter, please set according to the corresponding operation manual. Can not exceed the rated parameter requirements.

**Battery Pack Parameters:**

| No. | Item | General Parameter | |
|---|---|---|---|
| 1 | Combination Method | 48V | 51.2V |
| 2 | Rated Capacity (Ah) | 100/150/200 | 100/150/200 |
| 3 | Factory Voltage (V) | 48-50 | 51-53 |
| 4 | Rate power (Wh) | 4800 | 5120 |
| 5 | Charging Voltage (max V) | 54.75 | 58.4 |
| 6 | Charging Current (max A) | 0.5C | 0.5C |
| 7 | Float charge Voltage (V) | 53.5 | 56.5 |
| 8 | Discharge Cut-off Voltage (V) | ≤42V | ≤44V |
| 9 | Max Discharging current (A) | 100 | 100 |
| 10 | Charging Current limits (A) | 20 | 20 |
| 11 | Charge over Current protect (A) | 110 | 110 |
| 12 | Discharge over Current protect (A) | 110 | 110 |
| 13 | Internal resistance | ≤60mΩ | ≤60mΩ |
| 14 | Communication protocol | CAN/RS485 | CAN/RS485 |
| 15 | Host soft ware and communication protocol | RS485 | RS485 |
| 16 | Operation Temperature Range | Charge: 0~45°C | |
| | | Discharge: -20~60°C | |
| 17 | Storage Temperature Range (recommend) | 0~25°C | |

**Battery Pack Parallel Parameters:**

| No. | Item | General Parameter | |
|---|---|---|---|
| 1 | Combination method | 48V | 51 2V |
| 2 | Rated Capacity( Ah) *Parallel | PACK | PACK |
| 3 | Factory Voltage (V) | 48-50 | 51-53 |
| 4 | Charging Voltage (max V) | 54.75 | 58 4 |
| 5 | Charging Current (max A) | 0.2C | 0.2C |
| 6 | Float charge Voltage (V) | 53.5 | 56.5 |
| 7 | Discharge Cut- off Voltage (V) | ≤42V | ≤44V |
| 8 | Max Discharging current (A) | 0.5C(total) | 0.5C(total) |
| 9 | Charging Current limits (A) *Parallel | 20 | 20 |
| 10 | Charge over Current protect( A) *Parallel | 110 | 110 |
| 11 | Discharge over Current protect( A) | 110 | 110 |
| 12 | Internal resistance | ≤60mΩ | ≤60mΩ |
| 13 | Communication protocol | CAN or 485 | CAN or 485 |
| 14 | Host soft ware and communication protocol | RS485 | RS485 |
| 15 | Operation Temperature Range | Charge: 0~45°C | |
| | | Discharge: -20~60°C | |
| 16 | Storage Temperature Range(recommend) | 0~25°C | |

**Step 6:**

Monitors are in running status, and record all parameters, if any mistake, please record it. After start the system, every battery is on, and LED indicate these status.

A : LED indicates

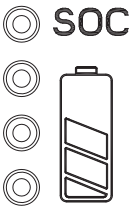



Figure 13 LED

**Chart 1: Battery Status**

| | | | | | |
|---|---|---|---|---|---|
| RUN | ALM | SOC | | | |

**Chart 2: Battery Capacity**

| Status | Charge | | | | Discharge | | | |
|---|---|---|---|---|---|---|---|---|
| soc (%) | L4 | L3 | L2 | L1 | L4 | L3 | L2 | L1 |
| 0-25% | OFF | OFF | OFF | Flash1 | OFF | OFF | OFF | Light |
| 26-50 % | OFF | OFF | Flash1 | Light | OFF | OFF | Light | Light |
| 51-75 % | OFF | Flash1 | Light | Light | OFF | Light | Light | Light |
| 76-100 % | Flash2 | Light | Light | Light | Light | Light | Light | Light |
| RUN LED | Light | | | | Flash2 | | | |

**Chart 3: LED Flash and Buzzer Mode (Off by Default)**

| Mode | ON | OFF |
|---|---|---|
| Led Flash1 | 0.5S | 1.2S |
| Led Flash2 | 0.5S | 2.45 |

**Chart 4: LED Flash Mode**

| System status | Run status | RUN | ALM | SOC | | | | REMARK |
|---|---|---|---|---|---|---|---|---|
| | | 🟢 | 🔴 | 🟢 | 🟢 | 🟢 | 🟢 | |
| Power off / Sleep | | OFF | OFF | OFF | OFF | OFF | OFF | All led off |
| Stand by | Normal | Light | OFF | Lighting for SOC | | | | Stand by mode |
| | Alarm | Light | OFF | | | | | Low volt alarm |
| Charge | Normal | Flash1 | OFF | Lighting for SOC (The LED flash2, while it is the high SOC) Alarm LED do not flash, when the BMS into OVP mode. | | | | |
| | Alarm | Flash1 | OFF | | | | | |
| | OVP | Light | OFF | Light | Light | Light | Light | No charge in, into standby |
| | OTP | OFF | Light | Lighting for SOC | | | | Stop charge |
| | OCP | Flash1 | OFF | Lighting for SOC | | | | |
| DisCharge | Normal | Flash2 | OFF | Lighting for SOC | | | | |
| | Alarm | Flash2 | OFF | | | | | |
| | UVP | OFF | Light | OFF | OFF | OFF | OFF | Discharge off |
| | OTP, OCP | OFF | Light | Lighting for SOC | | | | Discharge off |
| Fail | | OFF | Light | OFF | OFF | OFF | OFF | NO charge or discharge |

**Step 7:**

Stop running battery pack.

When it is necessary to stop the charging and discharging of the battery or trouble shooting, please stop the external equipment first, cut off the input and output circuits, and then press the power-off switch for each battery.

# 6 Error Code Information

| | DESCRIPTION | ERROR CODE | SOLUTION |
|---|---|---|---|
| | **ALARM** | | |
| 1 | Pack Over Voltage | Pack OV | Will not affect the normal use, discharge to clear alarm |
| 2 | Cell Over Voltage | Cell OV | Will not affect the normal use, discharge to clear alarm |
| 3 | Pack Under Voltage | Pack UV | Will not affect the normal use, charge to clear alarm |
| 4 | Cell Under Voltage | Cell UV | Will not affect the normal use, charge to clear alarm |
| 5 | Charge Over Current | Charge OC | Will not affect the normal use, discharge to clear alarm |
| 6 | Discharge Over Current | Discharge OC | Will not affect the normal use, charge to clear alarm |
| 7 | Ambient Temperature Error | AMBIENT TEMP ERROR | Will not affect the normal use, lower temperature to clear alarm |
| 8 | MOS Over Temperature | MOS OT | Will not affect the normal use, lower temperature to clear alarm |
| 9 | Charge Over Temperature | Charge OT | Will not affect the normal use, lower temperature to clear alarm |
| 10 | Discharge Over Temperature | Discharge OT | Will not affect the normal use, lower temperature to clear alarm |
| 11 | Charge Under Temperature | Charge UT | Will not affect the normal use, rise temperature to clear alarm |
| 12 | Discharge Under Temperature | Discharge UT | Will not affect the normal use, rise temperature to clear alarm |
| 13 | Low capacity | Low capacity | Charge |
| | **PROTECTION** | | |
| 14 | Pack Over Voltage | Pack OV | Wait till release to OV or discharge |
| 15 | Cell Over Voltage | Cell OV | Wait till release to OV or discharge |
| 16 | Pack Under Voltage | Pack UV | Wait till release to UV or charge |
| 17 | Cell Under Voltage | Cell UV | Wait till release to UV or charge |
| 18 | Charge Over Current | Charge OC | Automatic disarming after 1min or discharge |
| 19 | Discharge Over Current | Discharge OC | Automatic disarming after 1min or charge |
| 20 | Ambient Temperature Error | AMBIENT TEMP ERROR 0027 | Stop charge or discharge, wait till recover to normal temperature |
| 21 | MOS Over Temperature | MOS OT | Stop Charge and discharge till recover under MOS OTP or check if the MOS is damaged |
| 22 | Charge Over Temperature | Charge OT | Stop Charge till recover under OT |
| 23 | Discharge Over Temperature | Discharge OT | Stop discharge till recover under OT |
| 24 | Charge Under Temperature | Charge UT | Stop Charge till recover under UT |
| 25 | Discharge Under Temperature | Discharge UT | Stop discharge till recover under UT |
| 26 | Float Stopped | Float Stopped | Fully Charge |
| 27 | Discharge Short Circuit | Discharge SC | Remove loads or charge |
| 28 | Reverse | Reverse | Stop Charge, remove loads, connect the wire correctly |
| | **FAULT** | | |
| 29 | Voltage error | Voltage error | Hardware fault or poor connection, contact seller to find solution |
| 30 | Temperature error | Temperature error | Hardware fault or poor connection, contact seller to find solution |
| 31 | Current Check Error | Current Check Error | Hardware fault or poor connection, contact seller to find solution |
| 32 | Cell unbalance | Cell unbalancet | Hardware fault, contact seller to find solution |

# 7 Host Soft Operatiom

When the equipment manufacturer confirms that it is necessary, it can authorize to provide the customer with the host software and operating instructions.

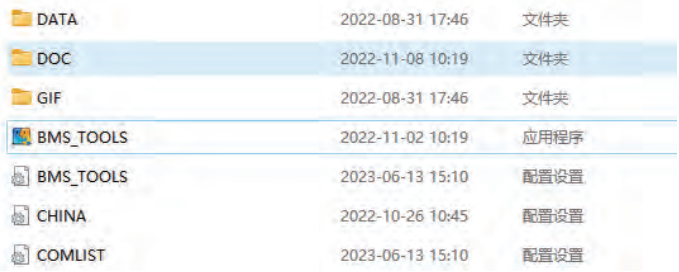



Figure 14 File Location

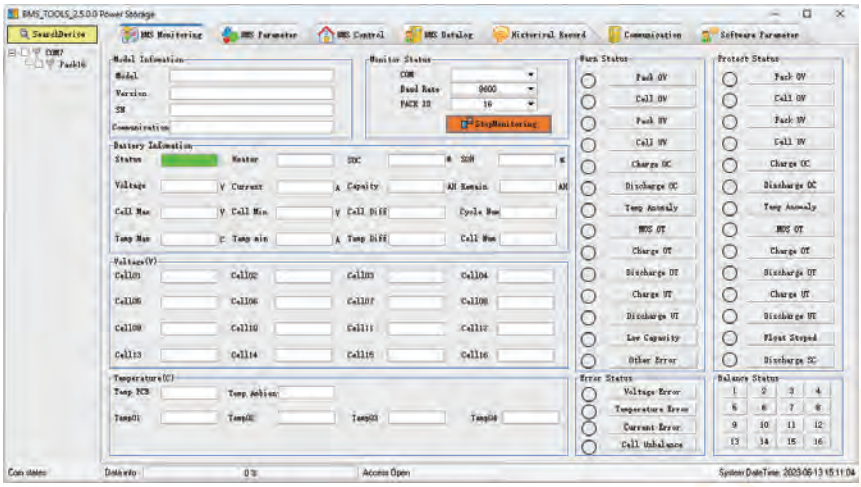


Figure 15 Main Window

# 8 Trouble Shooting

- Battery pack stops work.

A. Turn on switch; be sure it is ON; if battery is low SOC; it needs to charging in.

B. Battery pack low volt or enter sleep mode, there you will press down RST button 3-6 seconds, or charging in.

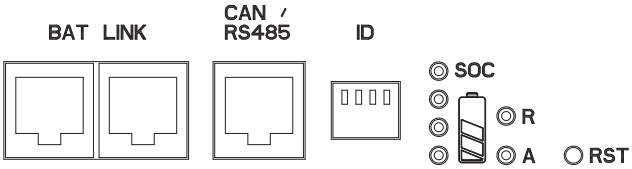



Figure 16 Reset for Trouble Shooting

- No communication, inverter can not received any DATA from BMS.

A. Check whether if communication cable is OK, check RJ45 PIN,
CAN: PIN4=CAN H, PIN5=CAN L,
RS485A: PIN7=485-A, PIN8=485-B.

B. Replace the communication cable. Please give feedback to the dealer and replace.

C. Check inverter or other device which connect to BMS, update the firmware.

D. If the communication function needs to be upgraded, please consult the agent or manufacturer.

E. Confirm your inverter and battery protocol are correct, Different protocol or different connection will make a mistake.

- Battery pack report SOC is mistake.

A. Inverter received Data from Master BMS, but it's SOC < total SOC, as: 9PCS packs has 1800Ah, but inverter read DATA is 1600Ah. So you may check any one is disconnected. Check RS485B COM. Cable (blue), RS485 communication cable, replace the cable which is broken.
RJ45 PIN:
CAN: PIN4=CAN H, PIN5=CAN L,
RS485A: PIN7=485-A, PIN8=485-B.

B. SOC DATA has large tolerance.
Discharge the battery completely first, then charge it fully with a small current, and learn to discharge. Any battery is mistake, we advice you read the BMS Data (When we authorize the terminal to use)with host software. Then we reset the BMS and calibration.

- How to turn on the Battery to discharge.

We recommend method is:

A: reset the single battery's BMS, LED will flash and start work.

B: turn on the power switch on the bottom/front panel.

C: turn on power switch in the combiner box.

**WARNING:** The operating parameters of the equipment cannot exceed the rated working voltage and current of the battery, exceed the rated volt and current, Can cause damage to the battery or other failures.

Inverter or other external device can not connect the battery. We recommend method is.

A. Check whether the working parameters of the device and battery are appropriate, and improper parameters cannot be matched.

B. When the device is turned on, the current is too large, resulting in battery protection. At this time, you should be able to see the LED flashing from the battery panel. In this case, you can adjust your equipment parameters or contact the dealer to solve.

C. It is necessary to update BMS parameters and match the device, then Reset BMS and restart your device.

D. Replace bad battery.

E. There is a bad battery, need to replace, please contact your supplier, need professional installers to operate it. We recommend replacing whole or choose battery has same voltage and same specification.

**NOTE:** When replacing the cells, the same module needs to be replaced at the same time, and the voltage should be the same.

Need to replace spare parts or emergency maintenance.

Some parts can be obtained from the sales or agency, and the excess parts need to be purchased separately. Be careful, turn off the power switch before replacing.

Need to place some safety device for keep a safety environment.

You'd keep a safe case for battery and external device, Please place safety device, as: fire-fighting sand, fire-fighting blankets, fire-fighting water pipes, Install Monitor sound, light, electricity, smoke and other equipments.

## 8.1 Emergency process

### 8.1.1 The External Device Catches Fire and Explodes

A. Under the condition of ensuring safety, non-operating personnel immediately move to a safe location.

B. Under the condition of ensuring safety, the operator immediately cut off the external power supply of the equipment and the internal power supply.

C. Use fire-fighting equipment (the fire-fighting sand, fire-fighting blankets, fire-fighting water pipes).

D. If you cannot completely extinguish the fire, please call the local fire department for help.

E. Keep the accident site data so that the source of the accident can be traced.

### 8.1.2 The Battery Catches Fire and Explodes

A. Under the condition of ensuring safety, non-operating personnel immediately move to a safe location.

B. Under the condition of ensuring safety, the operator immediately cut off the external power supply of the equipment and the internal power supply.

C. Use fire-fighting equipment (the fire-fighting sand, fire-fighting blankets, fire-fighting water pipes).

D. If you cannot completely extinguish the fire, please call the local fire department for help.

E. Keep the accident site data so that the source of the accident can be traced.

**NOTE:** When replacing the cells, the same module needs to be replaced at the same time, and the voltage should be the same.

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# QUALITY CREATES BRAND
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