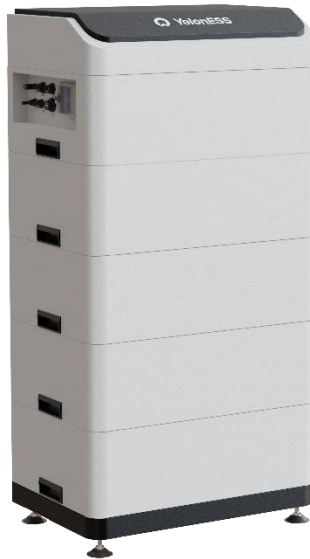




# HS5000

Rechargeable Li-ion Battery






## User Manual





This manual introduces HS5000 by YelonESS. Please read this manual before you install the battery and follow the instruction carefully during the installation process. If you have any questions, please contact YelonESS for advice and clarification.

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## 1. Meaning of symbol in label, manual and product

	Caution! Warning! Reminder Safety related information. Risk of battery system failure or life cycle reduces.
	Do not reversely connect the positive and negative.
	Do not place the device near flame.
	Keep out of the reach of children and pet
	Warning electric shock
	Warning: Fire Do not place near flammable material.
	Read the product and operation manual before operating the battery system.
	Grounding.
	Recycle label

	<p>The certificate label for EMC</p>
	<p>Label for Waste Electrical and Electronic Equipment (WEEE). Directive (2012/19/EU).</p>

## 2. Safety Precautions



### Reminder

- 1) It is important and necessary to read the user manual (in the accessories) carefully before installing or using battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage battery, potentially rendering it inoperable.
- 2) If the battery is stored for long time, it is required to charge them every six months, and the SOC should be no less than 90%.
- 3) Battery needs to be recharged within 12 hours, after fully discharged.
- 4) Do not install the product in an environment out of the operation temperature or humidity range listed in manual.
- 5) Do not expose cable outside.
- 6) Do not connect power terminal reversely.
- 7) All the battery terminals must be disconnected for maintenance.
- 8) Please contact the supplier within 24 hours if the product is not working normally.
- 9) Do not use cleaning solvents to clean battery.
- 10) Do not expose battery to flammable or harsh chemicals or vapors.
- 11) Do not paint any part of battery, include any internal or external components.

- 12) Do not connect battery with PV solar wiring directly.
- 13) The warranty claims are excluded for direct or indirect damage due to items above.
- 14) Any foreign object is prohibited to insert into any part of battery.



## **Warning**

### **2.1 Before Connecting**

- 1) After unpacking, please check product and packing list first, if product is damaged or lack of parts, please contact with the local retailer.
- 2) Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode.
- 3) Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device.
- 4) It is prohibited to connect the battery and AC power directly.
- 5) The embedded BMS in the battery is designed for 96VDC, please DO NOT connect battery in parallel.
- 6) Battery must connect to ground and the resistance must be less than  $0.1\Omega$ .
- 7) Please ensured the electrical parameters of battery system are compatible to related equipment.
- 8) Keep the battery away from water and fire.

### **2.2 In Operation**

- 1) If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shut down.
- 2) It is prohibited to connect the battery with different type of battery.
- 3) It is prohibited to connect batteries with faulty or incompatible inverter.
- 4) It is prohibited to disassemble the battery (QC sticker removed or damaged).
- 5) In case of fire, only dry powder fire extinguisher can be used, liquid fire

extinguishers are prohibited.

6) Please do not open, repair or disassemble the battery except staffs from YelonESS or authorized by YelonESS. We do not undertake any consequences or related responsibility which because of violation of safety operation or violating of design, production and equipment safety standards.

### **3. Introduction**

HS5000 lithium iron phosphate battery is the new energy storage products developed and produced by YelonESS, it can be used to support reliable power for various types of equipment and systems.

HS5000 has built-in BMS (battery management system), which can manage and monitor cells information including voltage, current and temperature.

#### **3.1 Features**

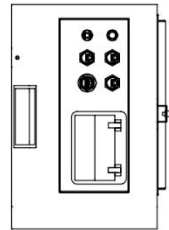
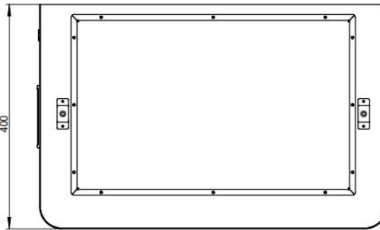
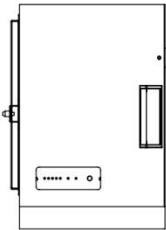
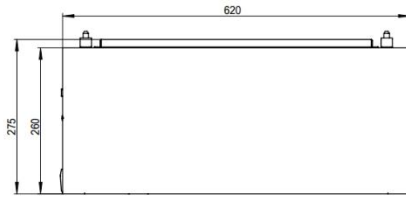
- 1) Wide temperature range: The product is designed to resist high and low temperature, and the lithium iron phosphate battery with high temperature resistance is used to ensure the normal operation of the system, which can adapt to the environment of  $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$ .
- 2) Multiple groups in series: Multiple groups of batteries are connected in series for higher power loads. It can effectively deal with the adverse effects of the circulation on the overall operation of the system in series, and ensure the safe and long-life operation of the lithium battery pack.
- 3) Online software upgrade: Remote maintenance or function optimization can be achieved through remote online software upgrade.
- 4) High stability: high stability of lithium iron phosphate battery system and intelligent BMS to ensure the stability of the battery.
- 5) Sleep mode: When the battery is under overvoltage protection, the BMS automatically shuts down the power supply to minimize the battery power consumption and prevent deep discharge, ensuring battery safety.
- 6) Pre-charging: It has the pre-charging function and can adapt to the load condition when a large capacity capacitor is connected. The maximum pre-

charge flow is 1A and the maximum precharge time is 3s. This mode applies to the scenario where the device has no more than 20mF capacitor.

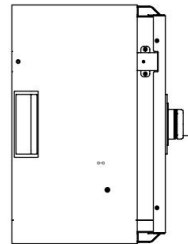
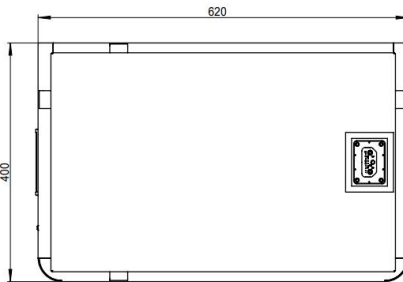
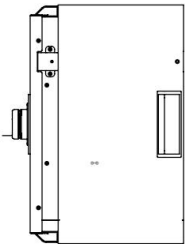
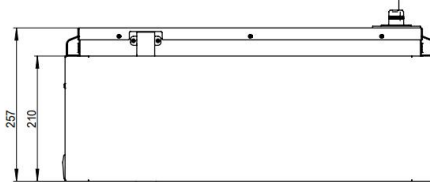
- 7) Anti reversed-connection protection: When the output is reversely connected, the BMS detects the problem after it starts up, and immediately prevent the reverse voltage from damaging the battery.
- 8) Thermal management: It has the function of monitoring the temperature of the cell and the environment, and it also has the function of high and low temperature alarm and cell protection, and high temperature protection.
- 9) Intelligent balancing: The charging balancing function flexibly configured to effectively improve battery life and cycle life.
- 10) Multiple protection functions: with battery level overcharge, over discharge, overcurrent, short circuit, high temperature, low temperature alarm and protection, electric core level overcharge, over discharge alarm and protection functions.
- 11) Communication function: Supports CAN&RS485 communication interfaces to meet different application requirements of customers.
- 12) LED status indicator: Multiple LED indicators can indicate SOC, running status and fault status.
- 13) Small size and light weight, standard designed module is comfortable for installation and maintenance

## 3.2 Specification

### CS0500 control box



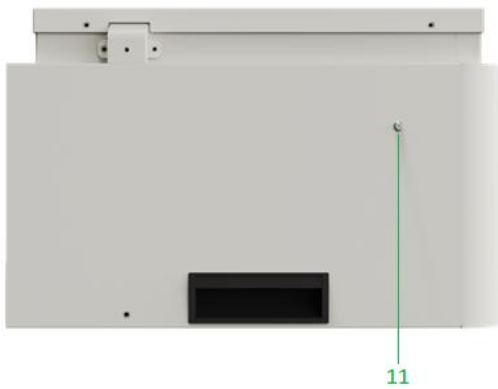
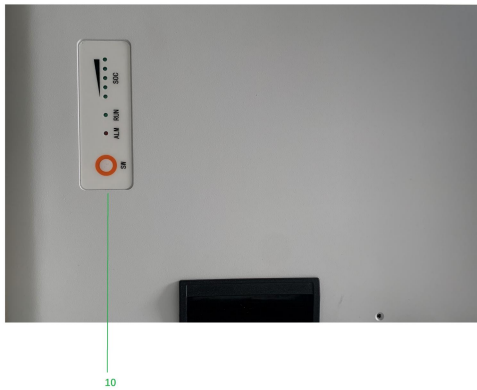
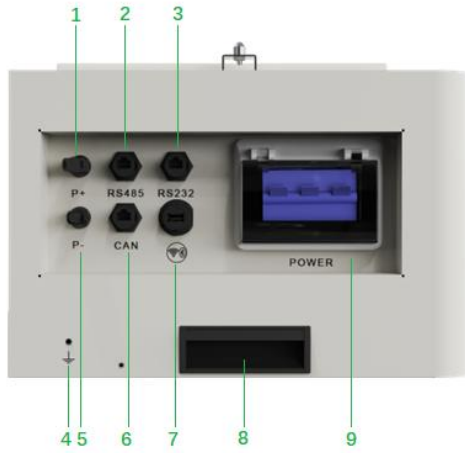
### HS5000 battery module





Basic Parameters	HS5000
Battery Type	lithium iron phosphate
Nominal Voltage (V)	96
Nominal Capacity (Wh)	4800
Battery Capacity (Ah)	50
Dimension (mm)(HS5000x1)	620*400*257
Dimension (mm)(CS0500x1)	620*400*275
Weight (Kg) HS5000x1	55.5±1
Weight (Kg) CS0500x1	15
Recommend Charge Voltage (V)	108
Recommend Charge Current (A)	25
Recommend Discharge Current (A)	25
Max. Charge Current (A)	50
Max. Discharge Current (A)	50
Communication	RS485, CAN
Configuration (max. in 1 battery group)	6pcs in series
Charge Temperature	0°C~50°C
Discharge Temperature	-10°C~50°C
IP rating of enclosure	IP65
Type of cooling	Air cooling
Humidity	5 ~ 95%(RH)
Altitude(m)	2000
Cycle Life	>6,000 25°C Test conditions: 0.2C Charging/Discharging, @25°C, 80% DOD
Certification	IEC62619 / CE / UN38.3

### 3.3 Equipment interface

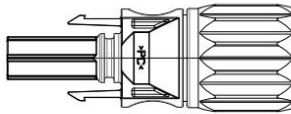


## 1/ Power cable

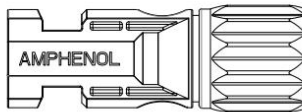
Power cable: one end connects to the positive and negative output interface on the battery, and the other one connects to the inverter.

Power cables uses water-proofed connectors.


## 2 / RS485




H4PFC8TM Female terminals



H4PMC8TM Male terminals

Port	PIN	Definition
	PIN1	/
	PIN2	/
	PIN3	/
	PIN4	/
	PIN5	/
	PIN6	/
	PIN7	RS485-A
	PIN8	RS485-B

### 3 / RS232


Port	PIN	Definition
	PIN1	232-RX
	PIN2	232-TX
	PIN3	232-COM
	PIN4	/
	PIN5	/
	PIN6	/
	PIN7	/
	PIN8	/

### 4 / Grounding

Grounding cables shall be 6mm<sup>2</sup> or higher yellow-green cables. After connection, the resistance from battery and control box grounding point to grounding connection point of room or installed place shall be smaller than 0.1Ω.

1. If there is any paint on the grounding point on the module's surface and the rack, paint should be removed.
2. Connect a grounding cable to the grounding point of the modules.

### 6 / CAN

Port	PIN	Definition
	PIN1	/
	PIN2	/
	PIN3	/
	PIN4	CAN-H
	PIN5	CAN-L
	PIN6	/
	PIN7	/
	PIN8	/

## 7 / WIFI stick

Users can connect the phone app through WiFi to check the battery data



## 8 Handle

Product handle for easy handling

## 9 / ON/OFF

Turn on: turn on the circuit-breaker, after 2 seconds, push the red button(NO.10 in the Figure above) for 2 seconds to start the battery

Turn off: Turn off the circuit-breaker to turn off the battery

## 10 / Indicator panel



State	Charge					Discharge				
Capacity light	LED5	LED4	LED3	LED2	LED1	LED5	LED4	LED3	LED2	LED1
SOC 0~20	burn out	burn out	burn out	burn out	Twice flash	burn out	burn out	burn out	burn out	Ever bright
SOC 20~40	burn out	burn out	burn out	Twice flash	Ever bright	burn out	burn out	burn out	Ever bright	Ever bright
SOC 40~60	burn out	burn out	Twice flash	Ever bright	Ever bright	burn out	burn out	Ever bright	Ever bright	Ever bright
SOC 60~80	burn out	Twice flash	Ever bright	Ever bright	Ever bright	burn out	Ever bright	Ever bright	Ever bright	Ever bright
SOC 80~100	Twice flash	Ever bright	Ever bright	Ever bright	Ever bright	Ever bright	Ever bright	Ever bright	Ever bright	Ever bright

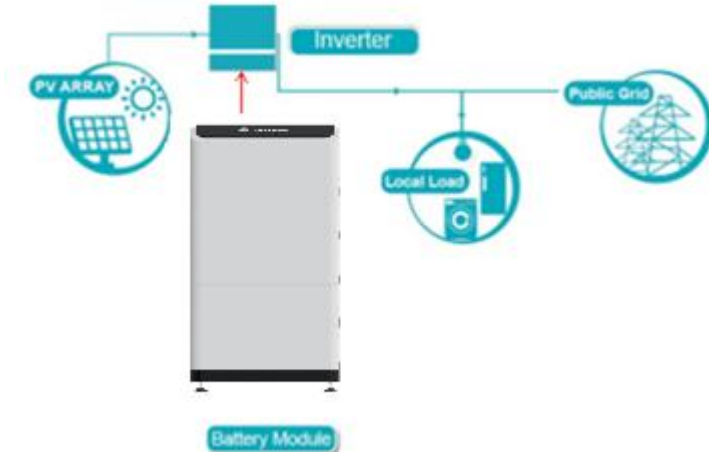
led	LED5	LED4	LED3	LED2	LED1	LED5	ALM	RUN
Normal	Refer to the battery level chart above						off	Twice flash
Protection /Normal	Refer to the battery level chart above						Ever bright	Twice flash
Master and Slave connection error	Twice flash						off	Twice flash
PCS/master equipment communication error	Refer to the battery level chart above						Ever bright	Twice flash

## 11 / Status Indicator

The status indicator of the battery module indicates that if it is flashing after startup, it is normal state; if it is not on, it is abnormal state









## 4. Safe handling of lithium batteries guide

### 4.1 Schematic diagram of solution



Batteries can be used in a single set or multiple sets in series.

### 4.2 Danger label

 <b>DANGER</b>	
	<b>DANGER LOW DC VOLTAGE INSIDE</b>
	<b>DANGER ARC FLASH &amp; SHOCK HAZARD</b>
	*Do not disconnect or disassemble by non-professional personnel.
	*Do not drop, deform, impact, cut or spear with a sharp object.
	*Do not place at children or pet touchable area.
	*Do not place near open flame or flammable material.
	*Do not cover or wrap the product case.
	*Do not sit or put heavy things on battery.
	*Do not touch the leaking liquid.
	*Avoid direct sunlight.
	*Avoid moisture or liquid.
	*Make sure the grounding connection set correctly before operation.
	*If leaking, fire, wet or damaged, switch off the breaker on DC side and stay away from battery.
	*Contact your supplier within 24 hours if any failure happens.

## 4.3 Tools



Wire cutter



Crimping modular plier



Screwdriver

### NOTE

Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover the entire exposed metal surfaces of the available tools, except their tips, with electrical tape.

## 4.4 Safety gear

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



Insulated gloves



Safety goggles



Safety shoes



## 5. Installation and operation

### 5.1 Package items

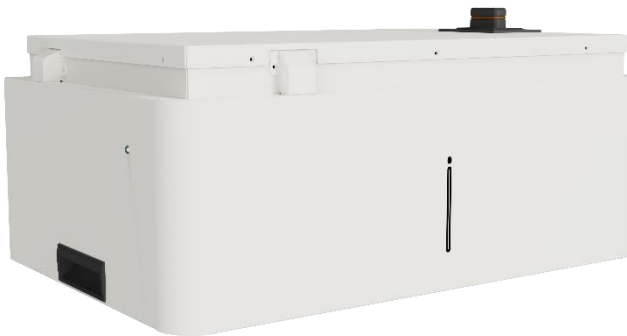
Unpacking and check the Packing List

#### 1) For battery module and control box package:

Control box



Battery module

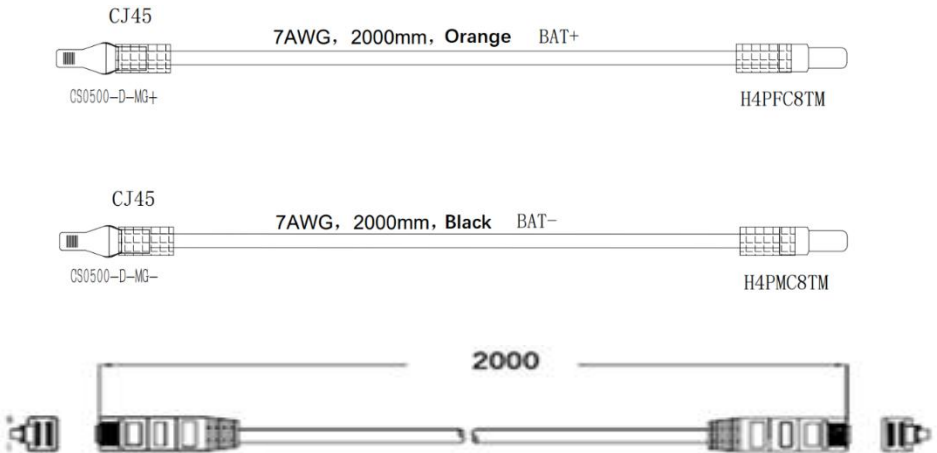


## 2) For External cable kits:

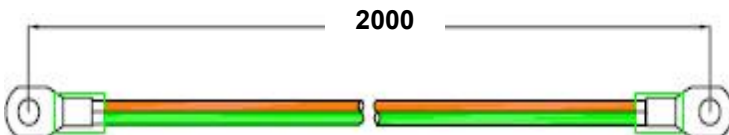
### NOTE

Power and communication cables to connect to inverter belongs to an **External Cable Kit, included in battery carton box**. If there is anything missing please contact your dealer.

Two 7AWG power cables (peak current capacity **50A**, constant **50A**) and RJ45 communication cable for each energy storage system (mm)



- 6mm<sup>2</sup> grounding cable



## 5.2 Installation location

Make sure that the installation location meets the following conditions:

- 1) The area is completely waterproof.
- 2) The floor is flat and level.
- 3) There are no flammable or explosive materials.
- 4) The ambient temperature is within the range from 10°C to 40°C.
- 5) The temperature and humidity are maintained at a constant level.
- 6) There is minimal dust and dirt in the area.
- 7) The distance from heat source is more than 2 meters.
- 8) The distance from air outlet of inverter is more than 0.5 meters.
- 9) The installation areas shall avoid of direct sunlight.
- 10) There is no mandatory ventilation requirement for battery module, but please avoid installation in confined area. Avoid high salinity, humidity or temperature.

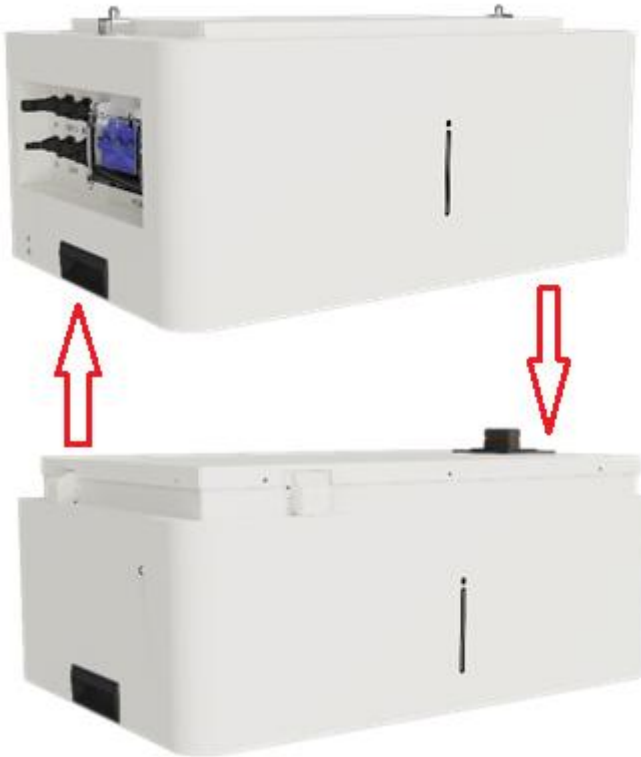


### **Caution**

If the ambient temperature is out of the operating range, the battery stops operating to protect itself. The optimal temperature range for the battery pack to operate is 10°C to 40°C. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery.

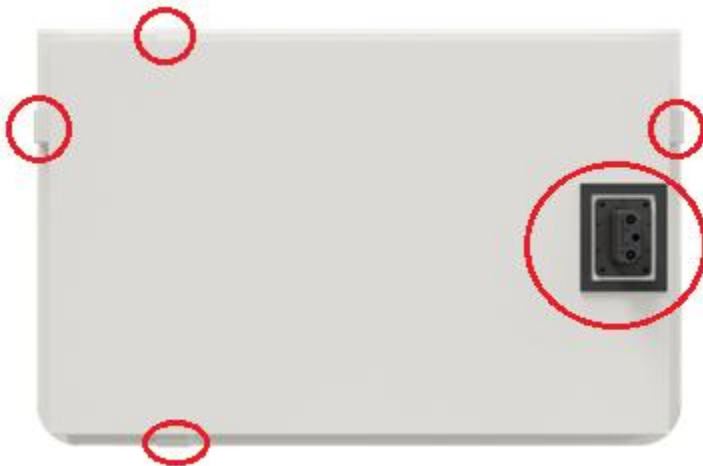
## 5.3 Stacked installation

- 1) Stacked installation of the battery and control box



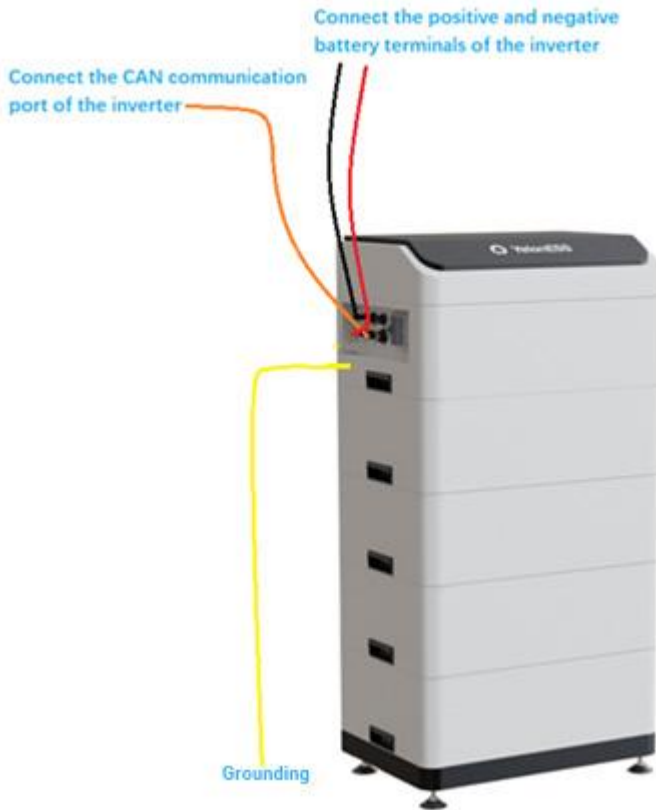
- 2) Use Corresponding plug and slot to stack and connect the batteries together.

Pairing plug on the top



Slot on the bottom





### Caution

- 1) Follow local electrical safety and installation policy, a suitable breaker between battery system and inverter could be installed.
- 2) All the installation and operation must follow local electrical standard.
- 3) When the power cables and the communication cables of battery and the inverter are connected, please turn on the inverter and then the battery. Otherwise the battery protection function will be triggered.

## 6. Trouble shooting.

### - **Communication problem**

Unable to communicate with inverter on compatible list.

Possible conditions:

- 1) CAN: pin. Try connecting the CAN-H,L only and do not connect other pins to inverter.
- 2) RS485: pin. Try connecting the 485-A, B only and do not connect other pins to inverter.
- 3) Check the baud rate is set correctly

### - **Functional problem**

- 1) Check whether the battery can be turned on or not
- 2) If battery is turned on, check whether the ALM light is off, flashing or on
- 3) If the ALM light is off, check whether the battery can be charged/ discharged or not.

### **Possible conditions:**

1. Battery cannot be turned on; lights of the switch SOC are all off or flashing.

- a) Capacity is too low, or module is over discharged.

Solution: use a charger or inverter to provide 105-108V voltage. If the battery can be turned on, keep charging the battery and use monitor tools to check the battery log.

If the battery terminal voltage is  $\leq 85\text{Vdc}$ , please use  $\leq 0.05\text{C}$  to slowly charge the battery to avoid affecting SOH.

If the battery terminal voltage is  $> 85\text{Vdc}$ , the user can use  $\leq 0.5\text{C}$  to charge. If battery cannot be turned on, turn off battery and repair it.

2. The battery can be turned on, but ALM light is on, and the battery cannot be charged or discharged. If the ALM light is lighting, it means the system

is abnormal, please check values as following.

- b) Temperature: Above 55 °C or under -20 °C, the battery could not work.  
Solution: to move battery to the environment with the required operating temperature
- c) Current: If current exceeds 50A, battery protection will turn on.  
Solution: Check whether current is too large or not. If it is, change the settings on power supply side.
- d) High Voltage: If charging voltage is above 109.5V, battery protection will be turned on.  
Solution: Check whether voltage is too high or not. If it is, change the settings on power supply side and discharge the module.
- e) Low Voltage: When the battery discharges to 78V or less, battery protection will be turned on.  
Solution: Charge the battery till the ALM light turns off.
- f) Cell voltage is high. The module voltage is lower than 105V and not all the SOC LED are on. When the user discharges the module, protection will be turned off.  
Solution: keep charging the module at 105-108V or keep the system cycle. The BMS can balance the cell during cycling.

3.Unable to charge and discharge with ALM LED on. The temperature is 0°C~55°C degree. It is impossible to use a charger to charge or use a load to discharge.

- g) Under permanent protection. The single cell voltage has been higher than 3.65V or lower than 2.6V or temperature higher than 80 degrees.  
Solution: Switch off the module and contact your local dealer for repair.

4.Buzzer rings and all LED flash

- i) High voltage protection  
Cell voltage is higher than 3.65V or module voltage is higher than 109.5V.  
Solution: Battery system requires properly established communication with the inverter and correctly settings on inverter to run safely. Check the



setting of the inverter or charger. The charge voltage shall be 105-108V Vdc. Check the communication between battery system and inverter.

Under this condition, the BMS is still functional and not damaged. Just leave the module switched OFF and wait for the battery voltage drop down naturally(15mins) then restart. If the alarm is off, the module is ready for work.

#### 5. Buzzer rings and ALM solid red

##### j) Reverse connection of cables.

Solution: Power off all battery and inverters. Disconnect breaker. Check the cable connection and disconnect all power cables. Check whether the power port is damaged or not. Try to turn on the single battery with no cable connected. If there is no alarm, the reason for the problem is reversed connection of cables. Switch off the module and contact your local distributor.

##### k) MOS failure

Solution: Power off all battery and inverters. Disconnect breaker. Check the cable connection and disconnect all power cables. Check whether the power port is damaged or not. Check the setting of inverter or charger. Check the communication between inverter and battery system.

Try to turn on the single module, with no cable connected. If the buzzer still rings, switch off the module and contact your local dealer.

#### 6. After switch is turned on, the module turns on directly

##### l) BMS failure

Solution : Switch off the module and contact your local dealer.

**Except for the points above, if the faulty still cannot be located, turn off battery and contact your local dealer.**

**Note: Take a single battery set as an example. If there are N battery modules, the voltage parameter in the description needs to be multiplied by N.**

## 7. Emergency Situations

### 1) Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If anyone is exposed to the leaked substance, immediately perform the actions described below.

- a) Inhalation: Evacuate the contaminated area and seek medical attention.
- b) Contact with eyes: Rinse eyes with flowing water for 15 minutes and seek medical attention.
- c) Contact with skin: Wash the affected area thoroughly with soap and water and seek medical attention.
- d) Ingestion: Induce vomiting and seek medical attention.

### 2) Fire

**NO WATER!** Only dry powder fire or carbon dioxide extinguisher can be used; if possible, move the battery pack to a safe area before it catches fire.

### 3) Wet Batteries

If the battery pack is wet or submerged in water, do not let people access it, and then contact YelonESS or an authorized dealer for technical support. Cut off all power switch on inverter side.

### 4) Damaged Batteries

Damaged batteries are dangerous and must be handled with the utmost care. They are not fit for use and may pose a danger to people or property. If the battery pack seems to be damaged, pack it in its original container, and then return it to YelonESS or an authorized dealer.



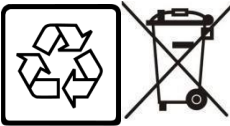
#### **Caution**

Damaged batteries may leak electrolyte or produce flammable gas.

## 8. Remarks

### Recycle and disposal

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) N° 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.



**Li-ion** ████████

### Storage, Maintenance and Expansion

- 1) It is required to charge the battery at least once every 6 months, for this charge maintenance make sure the SOC is charged to higher than 90%.
- 2) Every year after installation. The connection of power connector, grounding point, power cable and screw are suggested to be checked. Make sure there is no loose, no broken, no corrosion at connection point. Check the installation environment such as dust, water, insect etc. make sure it is suitable for IP65 battery system.
- 3) If the battery is stored for long time, it is required to charge them every six months, and the SOC should be higher than 90%.
- 4) A new battery module can be added onto an existing system at any time. Please make sure the new battery is acting as the master. The new module, due to a higher SOH may have a difference on SOC with existing system, but it will not affect the series connection system performan



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