LR5000

Rechargeable Li-ion Battery

User Manual

Version：DYV1.1

This manual introduces LR5000 by YelonESS. Please read this manual before installing the battery and follow the instruction carefully during the installation process. If there is question, please contact YelonESS immediately for advice and clarification.

Contents

1. Symbol in label, manual and product

	Caution! Warning! Reminding. Safety related information. Risk of battery system failure or life cycle reduces.
	Do not reverse connection the positive and negative.
	Do not place near open flame
	Do not place at the children and pet touchable area.
	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

CE	The certificate label for
	Label for Waste Electrical and Electronic Equipment (WEEE)
TÜV NORD	The certificate label for Safety by TÜV NORD

2. Safety Precautions

Reminder

1) It is important and necessary to read the user manual carefully (in the accessories) before installation 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 outdoor environment, or 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 there is something abnormal;
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 use the positive cable to connect to the negative port on the battery, or vice versa. Make sure 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 48V DC, please DO NOT connect battery in series;
6) Battery must connect to ground and the resistance must be less than 0.1Ω;
7) Please ensured the electrical parameters of battery system are compatible to related equipment;
8) Keep the battery away from water or fire.

2.2 In Use

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 tab 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 by staffs from YelonESS or authorized by YelonESS. We do not undertake any consequences or related responsibility due to violation of safety operation or breach of design, production and equipment safety standards.

3. Introduction

LR5000 lithium iron phosphate battery is the new energy storage products developed and produced by YelonESS. It can be used to support reliable powerfor various types of equipment and systems.
LR5000 has built-in BMS battery management system, which can manage and monitor cells information including voltage, current and temperature.

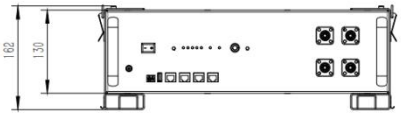
3.1 Features

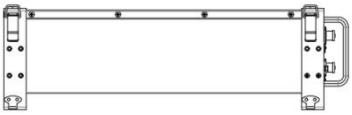
1) Wide temperature range: The product is designed to resist high and low temperature, and the lithium iron phosphate battery with high temperature resistance is used to ensure the normal operation of the system, which can adapt to the environment of -10℃ ~ +50℃.
2) Quick-plug installation: The product is equipped with quick-plug standard interfaces, the interface protection level reaches IP65, and the insulation voltage is 1500V, making the installation fast, safe and efficient.
3) Multiple groups in parallel: Multiple groups of batteries are connected in parallel for higher power loads. It can effectively deal with the adverse effects of the circulation on the overall operation of the system in parallel, and ensure the safe and long-life operation of the lithium battery pack.

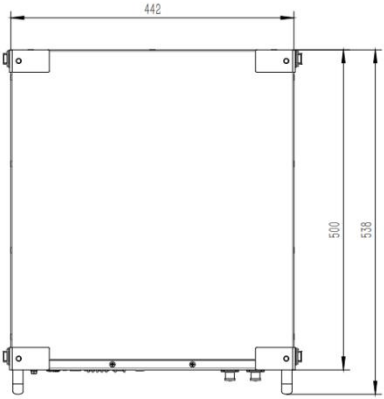
4) Online software upgrade: Remote maintenance or function optimization can be achieved through remote online software upgrade.
5) High stability: high stability of lithium iron phosphate battery system and intelligent BMS to ensure the stability of the battery.
6) Hibernation: When the battery is running under-voltage protection, the BMS automatically shuts down the power supply to minimize the battery power consumption and prevent deep discharge, ensuring battery safety.
7) Pre-charging: It has the pre-charging function and can adapt to the load condition when the input end has a large capacity capacitor. The maximum pre-charge flow is 1A and the maximum pre-charge time is 3s. This mode applies to the scenario where the device has no more than 20mF capacitor.
8) Back connection protection: When the output is back connected, the BMS detects that the output is back connected after it starts up, and immediately starts the back connection protection to prevent the reverse voltage from damaging the device.
9) Temperature thermal management: It has the function of collecting the temperature of the cell and the environment, and it also has the function of high and low temperature alarm and protection of the cell, and high temperature protection.
10) Intelligent balancing: The charging balancing policy can be flexibly configured to effectively improve battery life and cycle life.
11) Multiple protection functions: with battery level overcharge, over discharge, over-current, short circuit, high temperature, low temperature alarm and protection, electric core level overcharge, over discharge alarm and protection functions.
12) Communication function: supports CAN & RS485 communication interfaces to meet different application requirements of customers.
13) LED status indicator: multiple LED indicators can indicate SOC, running status and fault status.
14) Small size and light weight, standard of 19-inch embedded designed

module is comfortable for installation and maintenance.

3.2 Specification







Basic Parameters	LR5000
Battery Type	lithium iron phosphate
Nominal Voltage (V)	51.2
Nominal Capacity (Wh)	5120
Battery Capacity (Ah)	100
Dimension (mm)	448*500*132
Weight (Kg)	40±1
Recommend Charge Voltage (V)	57.6
Recommend Charge Current (A)	50
Recommend Discharge Current (A)	50
Max. Charge Current (A)	100
Max. Discharge Current (A)	100

Peak Charge/Discharge Current (A)	120A（15sec ）
Communication	RS485, CAN
Configuration (max. in 1 battery group)	8pcs in parallel maximum
Charge Temperature	0℃~50℃
Discharge Temperature	-10℃~50℃
IP rating of enclosure	IP21
Type of cooling	Air cooling
Humidity	5 ~ 95%(RH)
Altitude(m)	<4000
Cycle Life	>6,000 25℃ Test conditions:0.1Cdischarge，25 ℃, DoD 80%
Certification	IEC62619 / CE / UN38.3

3.3 Equipment interface instruction

3.3.1. SOC

5 green LEDs show the battery's current capacity.

3.3.2 POWER BUTTON

Turn on: press ON to start the battery module.

Turn off: press OFF to turn off the battery module.

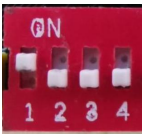
3.3.3 ADD switch

ADD DIP switch requirements when a single battery set is used.

ADD（1234, from left to the right）				location number	
OFF	OFF	OFF	OFF	1	When you only have a single battery

In this picture, all buttons are at OFF position.

When multiple batteries are used in parallel,please click below :

ADD（1234）				location number	
ON	OFF	OFF	OFF	1 	The first battery connected to the inverter
OFF	ON	OFF	OFF	2 	Remaining batteries

3.3.4 WIFI stick (Optional Spare Part)

Please connect the phone app(YelonESS) through wifi to check the battery data.

3.3.5 I/O

Port	PIN	Definition
	PIN1	Reserved
	PIN2	Reserved
	PIN3	Normal condition
	PIN4	Common pin
	PIN5	Protected mode
	PIN6	Reserved
	PIN7	Reserved
	PIN8	Reserved

3.3.6 CAN

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

3.3.7. LINK A and LINK B

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

3.3.8 Alarm

Red LED flashes to show the battery is alarming; solid on means the battery is under protection.

3.3.9 SW button (Red In the middle)

Turn on: press to turn on the indicator light

Turn off: press to turn off the indicator light

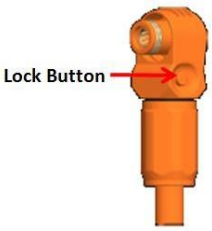
3.3.10. Running

Green LED light flashing to show the battery running status.

3.3.11 Power Terminals

Power cable terminals: there are two pair of terminals with same function, one connects to equipment, the other one paralleling to other battery module for capacity expanding. Uses water-proofed connectors for power cables. Keep pressing this Lock Button while pulling out the power plug.

There is a “click” sound when connected tightly.

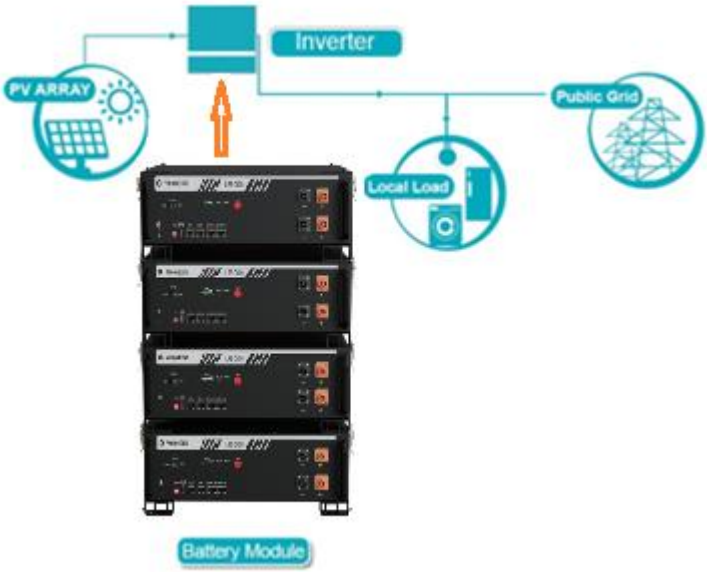


3.3.12 BMS basic function

Protection and alarm	Management and monitor
Charge/Discharge End	Cells Balance
Charge Over Voltage	Intelligent Charge Model
Discharge Under Voltage	Charge/Discharge Current Limit
Charge/Discharge Over Current	Capacity Retention Calculate
High/Low Temperature(cell/BMS)	Administrator Monitor
Short Circuit	Operation Record
	Power Cable Reverse
	Soft start of inverter

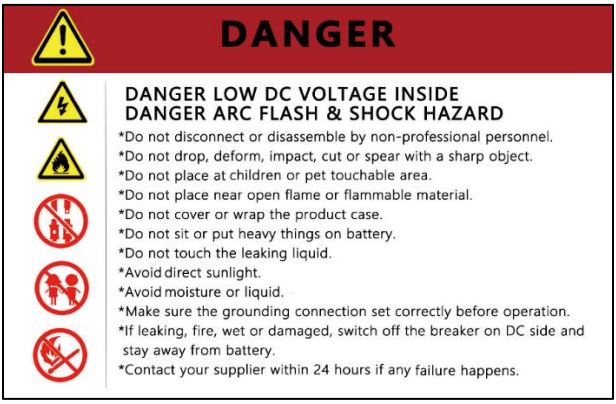
4. Safe handling of lithium batteries guide

4.1 Schematic diagram of solution



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

4.2 Danger Label



4.3 Safety gear

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

Insulated gloves

Safety goggles

Safety shoes

4.4 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.

5. Installation and operation

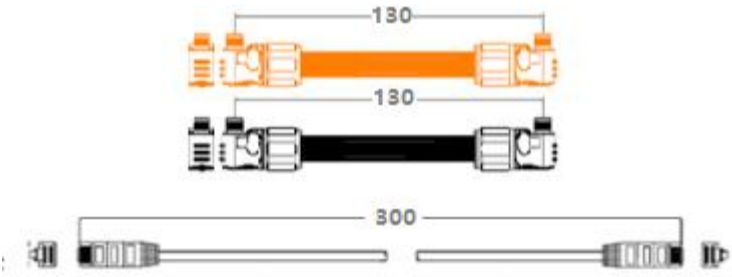
5.1 Package items

Unpacking and check the Packing List

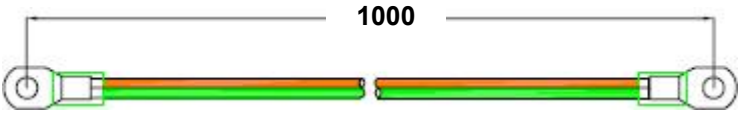
1) For battery module package:

- Battery module

- Two 25mm^2 power cables and one RJ45 communication cable(mm)



- 6mm^2 grounding cable

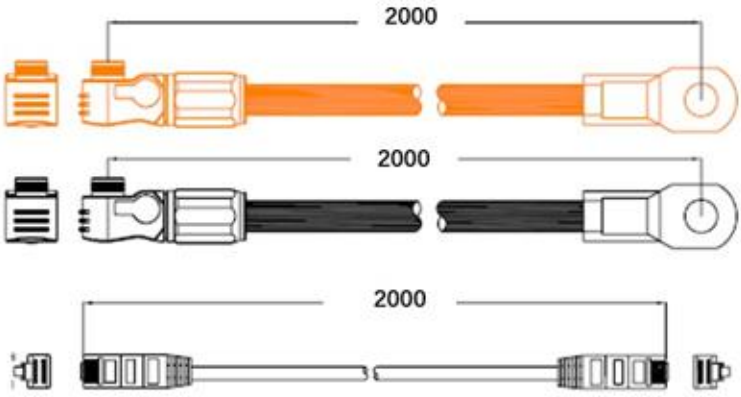


2) For external cable kits:

NOTE

Power and communication cables to connect to inverter belongs to an **External Cable Kit**, **included in battery carton box**. If any cable is missing, please contact the seller.

Two 25mm^2 power cables (peak current capacity **120A,** constant **100A**) and RJ45 communication cable for each energy storage system(mm)



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 is 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 are no mandatory ventilation requirements for battery module, but please avoid installation in confined area. The aeration shall 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 packto operate is 10°C to 40°C. Frequent exposure to harsh temperatures may impact the performance and reduce life of the battery.

5.3 Grounding

Grounding cables shall be 6mm^2 or higher yellow-green cables. After connection, the resistance from battery grounding point to ground connection point of room or installed place shall be smaller than 0.1Ω.

1. The grounding connector should be free of any dirt or paint to ensure a direct connection with the cable.

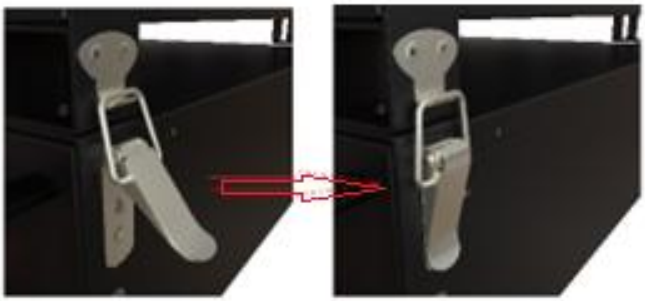
2. Install a grounding cable to the grounding point of the modules.

5.4 Put into bracket

1) Put the battery into 4 pcs of brackets.

2) Use 4 location holes. Stack the batteries together. Connect the 4 lockers together.

3) There can be a maximum of 4 batteries in stack.



Caution

1) Follow local electric safety and installation policy, a suitable breaker between battery system and inverter could be required.
2) All the installation and operation must follow local electric 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.

5.5 Use the suitable breaker

1) The rated voltage shall be ≥60V DC. Do NOT use AC breaker.
2) The type of breaker shall be Type C (recommended) or type D.
3) The rated current shall match the requirement of system design. Consider the DC current on the inverter side when deciding the rated current.
   When deciding the size of power cable: for instance, if only one pair of 25mm^2 cables are provided, the rated current of breaker shall be 125A or smaller.

6. Trouble shooting

- Communication related problem

Unable to communicate with inverter on compatible list.

Possible causes:

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

- Functional related problem

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

Possible causes:

1.Battery cannot be turned on. When the switch is ON, not all the lights are on or flashing.

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

Solution: use a charger or inverter to provide 53-58.4V voltage. If the battery can be turned on, keep charging the module and use monitoring tools to check the battery log.

If the battery terminal voltage is ≤45V DC, please use ≤0.05C to slowly charge the module to avoid affecting SOH.

If battery terminal voltage is ＞45V DC, use ≤0.5C to charge.

If the battery still cannot be turned on, turn it off and repair it.

2.The battery can be turned on, but red light is on and the battery cannot be charged or discharged. If the red light is on, it means the system is abnormal, please check the following values:

a) Temperature: if the temperature is above 55 ℃ or under -20 ℃, the battery cannot work. Solution: take the battery to the normal operating temperature range

b) Current: If current exceeds the allowed working current, the battery protection will be triggered.

Solution: check whether the current is too large or not. if it is, change the settings on the power supply side.

c) High Voltage: If charging voltage is above 58.4V, battery protection will be triggered. Solution: check whether voltage is too high or not. if it is, change the settings on the power supply side and discharge the battery.

d) Low Voltage: when the battery is discharged to 41.6V or less, battery protection will be triggered.

Solution: Charge the battery until the red light is off.

e) Cell voltage is high. The module voltage is lower than 53V and not all the SOC LEDs are on. When discharging the module, protection is off.

Solution: keep charging the module at 53-58.4V or keep the system cycle. The BMS can balance the cells during cycling.

3.Unable to charge or discharge with red LED on. The temperature is 0~55℃. The battery cannot be charged by a charger and cannot be discharged with a load. And it is under permanent protection. The single cell voltage is higher than 3.65 or lower than 2.6 or the temperature higher than 80℃.

Solution: Switch off the module and contact your local distributor for repair.

4.Buzzer rings and all LEDs flash

a) High voltage protection. Cell voltage is higher than 3.65V or module voltage is higher than 58.4V.

Solution: b**attery system requires properly established communicationwith inverter and correctly settings on inverter to run safely.** Check thesetting of the inverter or charger, the charge voltage must be 53-58.4V DC.Check the communication between battery system and inverter. Check whether the ADD switch on battery module is set correctly.

Under this condition, the BMS is not damaged. Leave the module switched OFF and wait for the battery voltage drops down naturally(15mins) and then restart. If there is no alarm, it means the module is ready for work.

5. Buzzer rings and ALM is solid red

a) connection of cables is reversed

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. Then try to turn on the single module, without any cable connected. If no alarm, then it is reverse connection of cables. Switch off the module and contact your local distributor.

b) MOS failed

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

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

6.After switch is On, the module does not turn on directly

a) BMS failure

Solution: switch off the module and contact your local seller.

If the problem still cannot be located after trying the solutions above, turn off the battery and contact your local distributor.

7. Emergency Situations

1) Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid orgas. If one 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.
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. Disconnect all power switches 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.

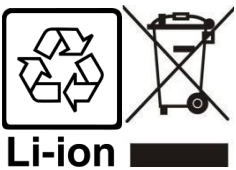
Caution

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 to process, and using the best available techniques to achieve a relevant recycling efficiency.



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 IP21 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 parallel connection system performance.

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