

Presentation:

PRODUCTION SPECIFICATION

Rechargeable Lithium iron Phosphate Battery

For Rack Mounting Type

(Maximum 15pcs in parallel)

Model: ESS5000M

Customer Approval (Date)

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1. Scope

This Specification is applied to JOYKOO rechargeable lithium ion battery of the following mentioned type for various applications in power solution devices and power systems.

2. Battery Classification and Type

2.1 Battery Classification:

The product of this model is a 51.2V100Ah battery pack, with communication function (RS485+CAN), BMS Continuous working current 100Amp, Each battery module can be parallel directly, Maximum 15pcs in parallels.

2.2 Battery Capacity: 51.2V100Ah

3. Technical Standard

The specification is based on the technical specification of GB/T 36276-2018 or IEC62619.

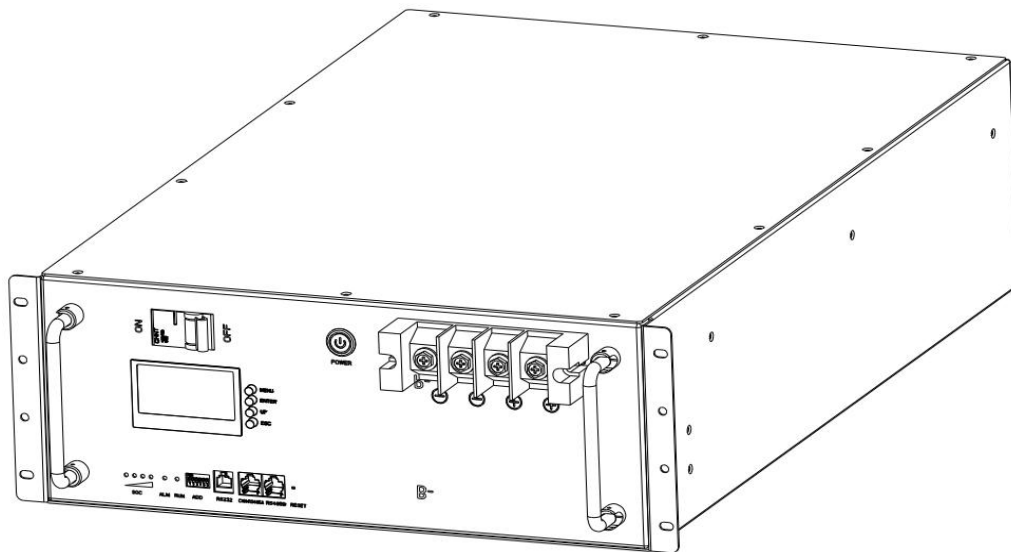
4. Cell Nominal Specification

Cell Description Items		Specification	Remarks
4.1	Typical Capacity	102Ah	0.5C ₅ A discharge
4.2	Minimum Capacity	100Ah	0.5C ₅ A discharge
4.3 Nominal Voltage		3.2V	
4.4 Discharging Voltage (Min)		2.0V	
4.5 Charging Voltage (Max)		3.65±0.05V	
4.6 Charging Current (Std)		50A	0.5C ₅ A (0 ~ +45°C)
4.7 Discharging Current (Std)		50A	0.5C ₅ A (-20 ~ +60°C)
4.8 Max Charging Current		100A	1.0C ₅ A (0 ~ +45°C)
4.9 Discharging Current (Max/Peak 3s)		200A	2.0C ₅ A (-20 ~ +60°C)
4.10 Max continuous Discharging Current		100A	1.0C ₅ A (5 ~ +45°C)
4.11 Cell Internal Impedance		≤0.5mΩ	AC Impedance 1kHz
4.12 Cell Cycle life		≥6000	0.5C ₅ A (0 ~ +45°C)
4.13 Cell Dimension		5.0±0.3 mm	Thickness
		160.0±0.5 mm	Width
		115.0±0.5 mm	Length
4.14 Cell Weight		2.0kg	About

5. Battery Pack Nominal Specification

Battery Pack Description Items		Specification	Remarks
4.1	Typical Capacity	102Ah	0.5C ₅ A discharge
4.2	Minimum Capacity	100Ah	0.5C ₅ A discharge
4.3 Nominal Voltage		51.2V	
4.4 Discharging Voltage (Min)		45.3V	
4.5 Charging Voltage (Max)		58.40±0.05V	
4.6 Charging Current (Std)		50A	0.5C ₅ A (0 ~ +45°C)
4.7 Discharging Current (Std)		50A	0.5C ₅ A (-20 ~ +60°C)
4.8 Max Charging Current		100A	1.0C ₅ A (0 ~ +45°C)
4.9 Discharging Current (Max/Peak 3s)		200A	2.0C ₅ A (-20 ~ +60°C)
4.10 Max continuous Discharging Current		100A	1.0C ₅ A (5 ~ +45°C)
4.11 Battery Internal Impedance		≤30mΩ	AC Impedance 1kHz
4.12 Combination Method		16S1P	
4.13 Battery Dimension		550*440*176mm	Approximate
4.14 Battery Weight		49kg	About
4.15 Battery Cycle life		≥6000	0.5C ₅ A 80% DOD
4.16 Storage temperature range	< 1 Month	-20 ~ +60°C	
	< 3 Month	-20 ~ +45°C	
	< 12 Month	-20 ~ +25°C	
4.17 Charging temperature range		0 ~ +45°C	

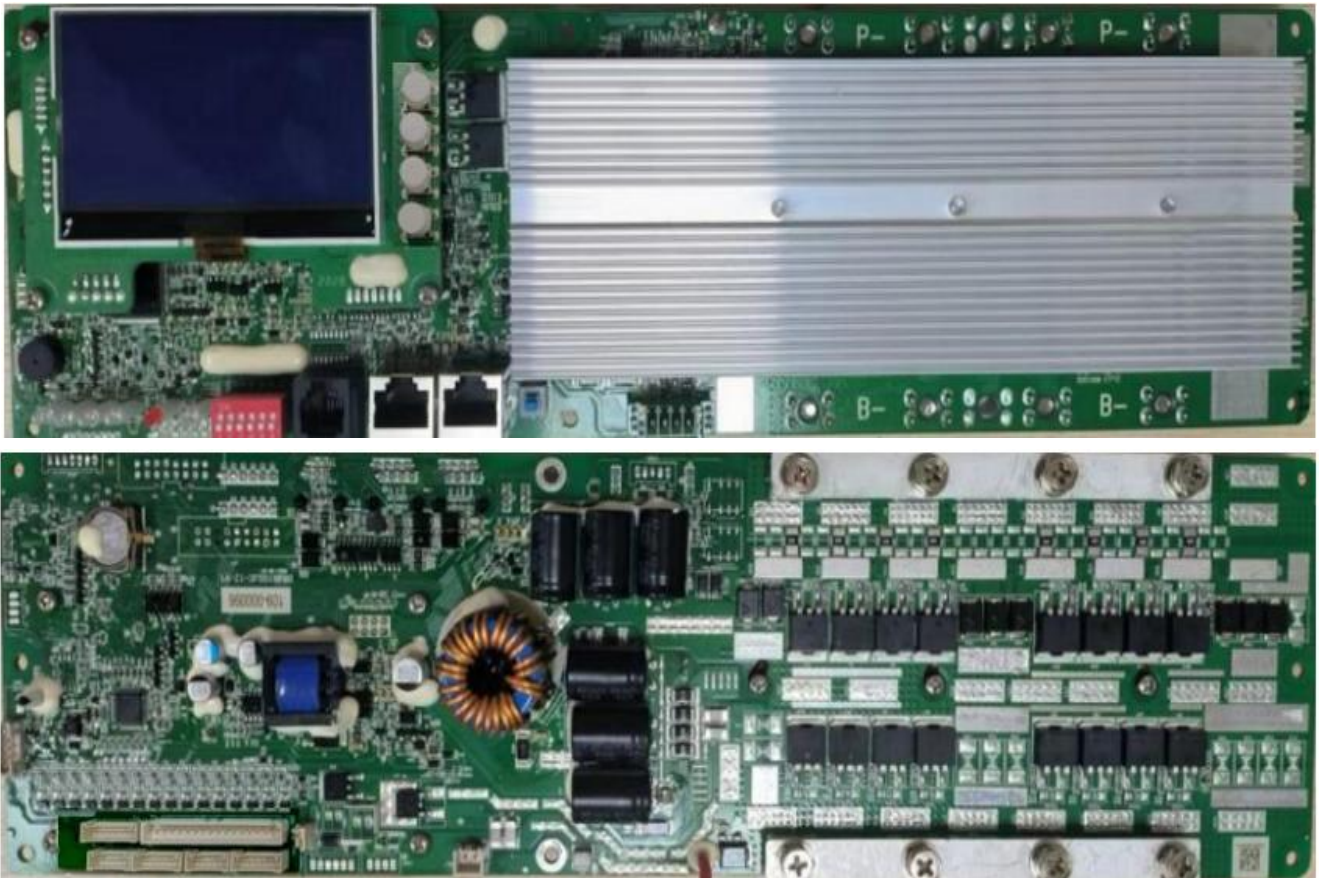
5. Battery Pack Outline Drawing



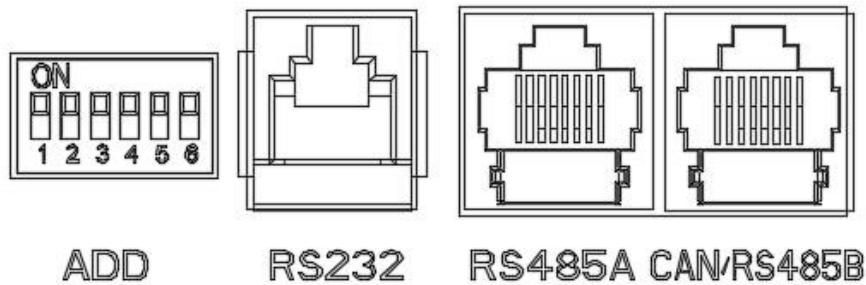
7. Battery BMS Functions

Items	Function Details	Standard
Cell overcharge protection	Overcharge detection voltage	3.80±0.05V
	Overcharge Alarm voltage	3.65±0.05V
Cell over-discharge protection	Over-discharge detection voltage	2.70±0.1V
	Over-discharge Alarm voltage	2.80±0.1V
Cell overcharge protection	Overcharge detection voltage	57.00±0.1V
	Overcharge detection Alarm voltage	54.75±0.1V
Cell over-discharge protection	Over-discharge detection voltage	40.50±0.1V
	Over-discharge detection Alarm voltage	42.00±0.1V
Over-current protection	Over-discharge Alarm current	105A
	Discharge Over-current protection current1	102A <Current<205A
	Discharge Over-current detection delay time1	30s
	Discharge Over-current protection current2	≥110A
	Discharge Over-current detection delay time2	2-3S
	Charge Over-Current protection current1	102A <Current<105A
	Charge Over-current detection delay time1	20S
	Charge Over-Current protection current2	≥110A
	Charge Over-current detection delay time2	2-3S
	Protection condition	Load short
	Detection delay time	≤800us
	Protection release condition	Disconnected load
Cell Temperature	Charge Alarm for High and low temperature	≤-3℃ , ≥65℃
	Charge Protection for high and low temperature	≤-5℃ , ≥70℃
	Discharge Alarm for High and low temperature	≤-20℃ , ≥70℃
	Discharge Protection for high and low temperature	≤-25℃ , ≥75℃
PCB Temperature	PCB Alarm for high Temperature	≥90℃
	PCB Protection for high Temperature	≥95℃
Environment Temperature	High and low ambient temperature alarm	≤-15℃ , ≥65℃
	High and low temperature protection of ambient temperature	≤-20℃ , ≥70℃
SOC	SOC Low volume alarm	≤5%
Communication Protocol	RS485/CAN	RS485 or CAN

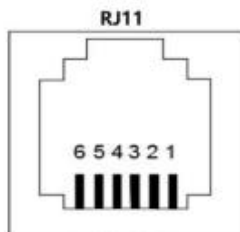
8.BMS Layout Drawing



9. BMS Communication Port

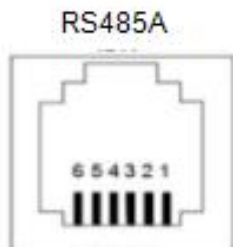


9.1 Communicate Port RS232 Port



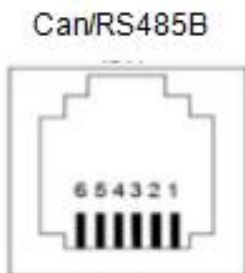
RJ11	
Pin	Signal definition
3	BMS TX
4	BMS RX
5	GND

9.2 Communicate Port RS485A Port (Default Baud rate 9600bps)



RJ45		
Pin	Signal definition	Notes
1	RS485_B	PC/INV
2	RS485_A	
3	GND	
4	NC	
5	NC	
6	RS485_A	parallel
7	RS485_B	

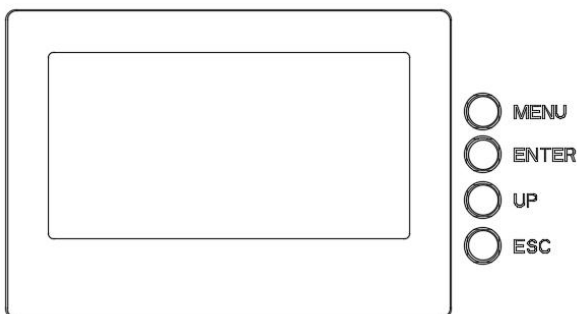
9.3 Communicate Port CAN/RS485B Port (Default Baud rate 500kbps)



RJ45		
Pin	Signal definition	Notes
1	RS485_B	PC/INV
2	RS485_A	
3	GND	
4	CANH1	INV
5	CANL1	
6	RS485_A	parallel
7	RS485_B	

9.4 LCD Display

The LCD is used to output the BMS status, and it does not support any data input. Press any key, the LCD works, and it is turned off automatically after 3 minutes.

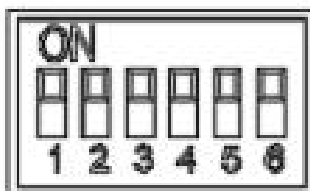


LCD Essential Parameter		Key definition	
Lattice	128X64	S1	Menu-The list line
Pigment	White characters on a blue background	S2	Enter-Affirm
Size of outer frame	72.2x49.2mm	S3	UP-The last line
Window size	65X38mm	S4	Esc- Exit

9.5 Dial address

The dial switch on the interface board is used to set the address information of the battery pack. When multiple battery packs use a monitoring software or a battery pack in parallel, it is used to distinguish between different battery packs.

The address setting follows the 8421 code rule, and in the parentheses are the screen on the dial switch. The ON indicates the position of the switch to the "ON" on the switch, and the OFF is the opposite:



Address message	Dial-up				Reserve	Host	Description
	1#	2#	3#	4#			
0	OFF	OFF	OFF	OFF	OFF	OFF	Host 0
1	ON	OFF	OFF	OFF	OFF	OFF	Pack 1
2	OFF	ON	OFF	OFF	OFF	OFF	Pack 2
3	ON	ON	OFF	OFF	OFF	OFF	Pack 3
4	OFF	OFF	ON	OFF	OFF	OFF	Pack 4
5	ON	OFF	ON	OFF	OFF	OFF	Pack 5
6	OFF	ON	ON	ON	OFF	OFF	Pack 6
7	ON	ON	ON	OFF	OFF	OFF	Pack 7
8	OFF	OFF	OFF	ON	OFF	OFF	Pack 8
9	ON	OFF	OFF	ON	OFF	OFF	Pack 9
10	OFF	ON	OFF	ON	OFF	OFF	Pack 10
11	ON	ON	OFF	ON	OFF	OFF	Pack 11
12	OFF	OFF	ON	ON	OFF	OFF	Pack 12
13	ON	OFF	ON	ON	OFF	OFF	Pack 13
14	OFF	ON	ON	ON	OFF	OFF	Pack 14
15	ON	ON	ON	ON	OFF	OFF	Pack 15
The inverter communication protocol selects CAN communication (selected in host mode by dialing 5 and 6)							
0	OFF	OFF	OFF	OFF	OFF	OFF	LUXPOWER
32	OFF	OFF	OFF	OFF	OFF	ON	PYLONTECH DEYE GOODWE
16	OFF	OFF	OFF	OFF	ON	OFF	VICTRON SMA SOFAR
48	OFF	OFF	OFF	OFF	ON	ON	GROWATT
The inverter communication protocol selects RS485 communication (selected in host mode by dialing 5 and 6)							
0	OFF	OFF	OFF	OFF	OFF	OFF	SRNE
32	OFF	OFF	OFF	OFF	OFF	ON	Voltronic Power
48	OFF	OFF	OFF	OFF	ON	ON	GROWATT

10. Function Description

10.1.1 Shutdown / boot:

The BMS switch is dial to "1" for boot, dial to "0" for shutdown, transport or long-term not in use, the BMS switch must be "0".

10.1.2 Boot self-inspection:

After startup, BMS self-inspection and the self-test status output of the self-test shall be listed below.

Table 1 The LED indication of the startup and self-test process

State	RUN	ALM	The SOC indicates the LED				Explanation
			1	2	3	4	
	●	●	●	●	●	●	
Self-checking Unusual	go out	After 20 flashes go out System shutdown	bright	go out	go out	go out	Single section voltage is higher than 4.1V or less than 0.5V, Or the Voltage difference is bigger than 2.5V
	go out	After 20 flashes go out System shutdown	go out	bright	go out	go out	Temperature $\geq 100^{\circ}\text{C}$, or $\leq -30^{\circ}\text{C}$, or temperature difference $\geq 30^{\circ}\text{C}$
	go out	After 20 flashes go out System shutdown	go out	go out	bright	go out	A 12V detection circuit error

10.1.3 The process of parallel machine

When two (or more) battery systems are required to be used in parallel, two (or more) near the total battery voltage should be selected as close as possible.

When installing in parallel, ensure that the battery circuit breaker is in the disconnected state, connect the output port of the battery system to the master row, and then start it respectively. Only when the first set is started into the working state, the second set can be started.

10.1.4 Pre-charging status:

1) When the battery voltage is below 45V, the BMS enters the pre-charge mode with the charging current

limited to 20A.

2) When the battery voltage is above 45V, the BMS determines whether enter pre-charging by checking the charging current.

If the charging current is between 105 A and 120A, the pre-charging mode is delayed for 20s, and the current charging is limited for 3min, and then the charge limit is lifted; if the charging current is > 120 A, the pre-charging mode is delayed for 2-3s, and the current charging is limited for 3min, and then the charge limit is lifted.

3) When the battery voltage is higher than 45V, if the battery occurs for five consecutive times, BMS will limit the current until the battery is fully charged.

10.1.5 Resting state:

BMS automatically enters dormancy in the following 2 conditions:

- 1) The battery has a single section or a whole group of over discharge. After the over discharge protection, if the protection is not removed, the charging can be restored.
- 2) Start-on self-inspection unqualified, need artificial processing.

10.1.6 BMS failure status:

The BMS fails in the following 3 cases:

1) During work (standby / charge / discharge), a single segment voltage is detected with $\geq 4.1V$ or $\leq 0.5V$, or 2.5V of differential voltage, The SOC1, ALM flash immediately.

2) During the operation (standby / charge / discharge), a temperature of $\geq 100^{\circ}C$, or $\leq -30^{\circ}C$, or a temperature difference of $\geq 30^{\circ}C$ is detected. The SOC2, ALM flash immediately.

After the BMS fails, if the signal volume returns to normal, the BMS returns to normal. If not recovered from the failure state for 15 minutes, go dormant automatically.

10.1.7 short-circuit protection

Short circuit protection only for discharge, load resistance greater than 0.1R

10.1.8 Balanced function

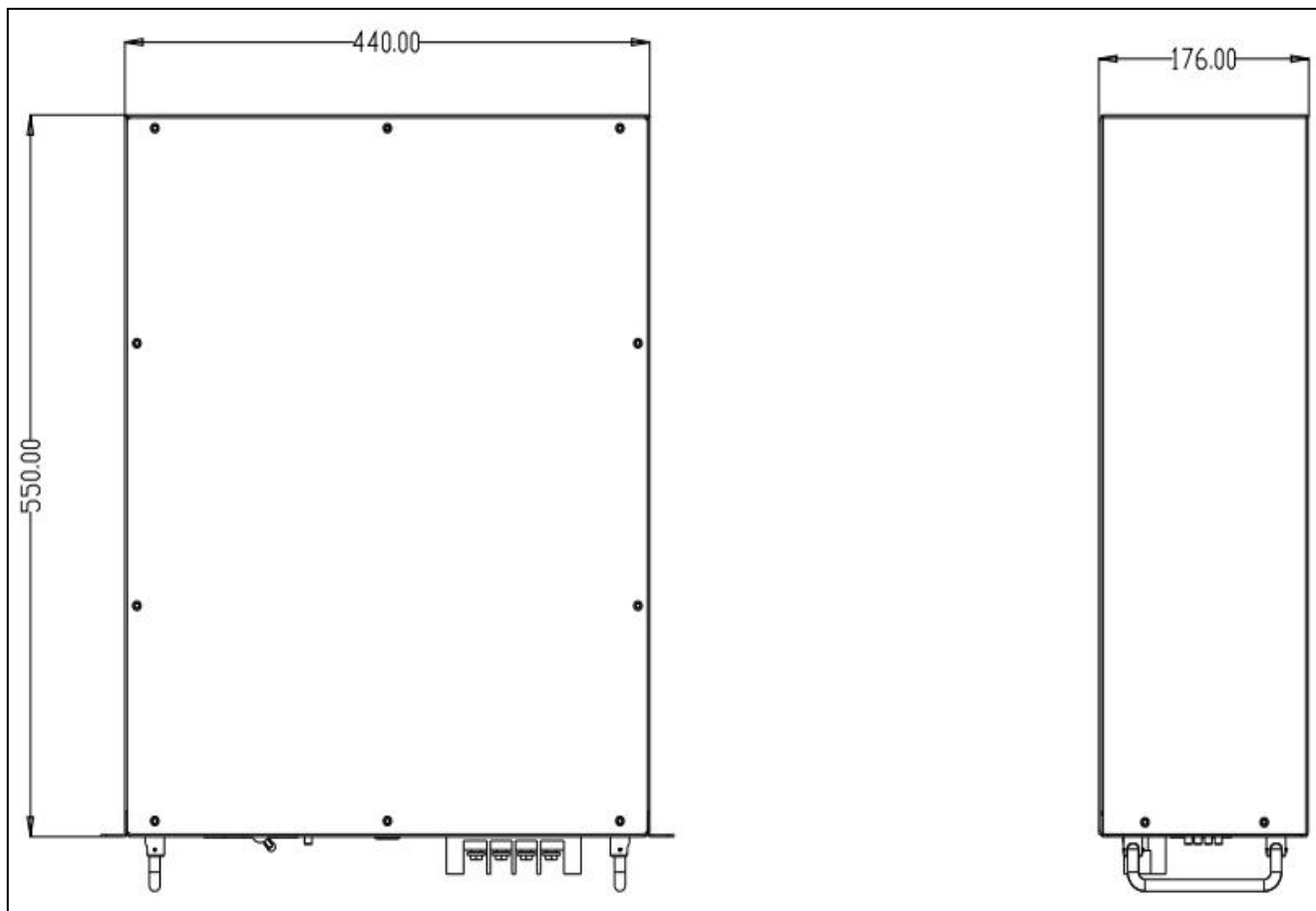
The BMS adopts the resistance bypass for cell balance function of the battery panel. When the single section balance voltage of the protective panel reaches 3.4V and the section voltage is above the lowest single section voltage is 40mV.

10.1.9 The LED display of the BMS working status

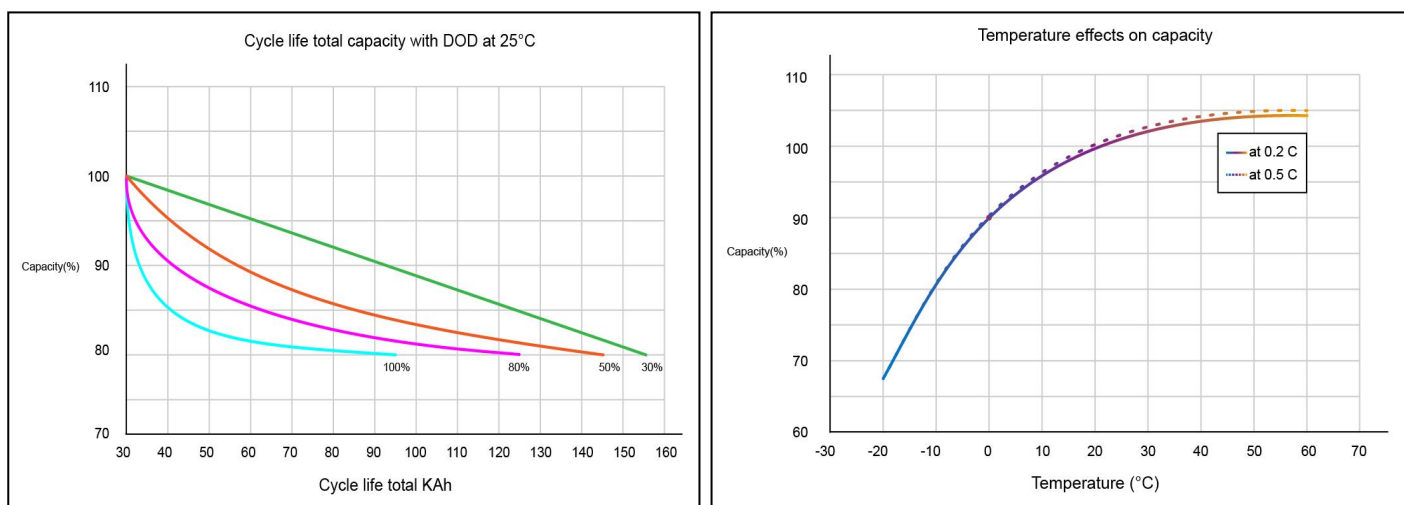
State	Normal / Alarm/ Protection	RUN	ALM	SOC indicate LED	DO output		Explanation
		●	●	SOC1~S OC4●	DO2 Alarm / Protection	DO1 Low Capacity	
Shut off / Sleep		go out	go out	go out	Break	Break	
Standby	Normal	Bright	go out	According to the electricity instruction(Each LED represents a 25%SOC)	Break	SOC ≤ 15% Through	
Charge	Normal	Short flash	go out		Break		
	Alarm	Short flash	go out		Break		
	Over voltage protection	Bright	go out		Through		
	Temperature protection	go out	Bright		Through		
	Pass circulation limit flow	Short flash	go out	Through	Limit flow go out		
Discharge	Normal	Long flash	go out	According to the electricity instruction	Break	Through	
	Alarm	Long flash	go out		Through		
	Low voltage protection	go out	Bright		Through		60S enter into the dormant
	Temperature ,over current protection	go out	Bright		Through		
	Discharge overflow	Long flash	go out		Through		

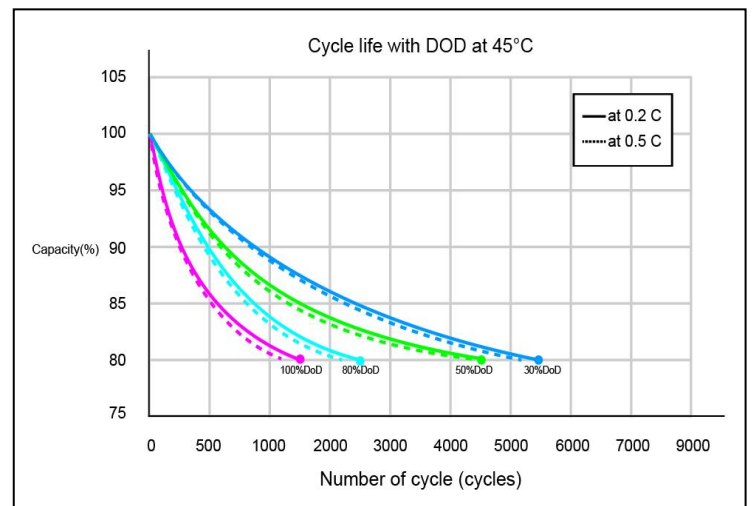
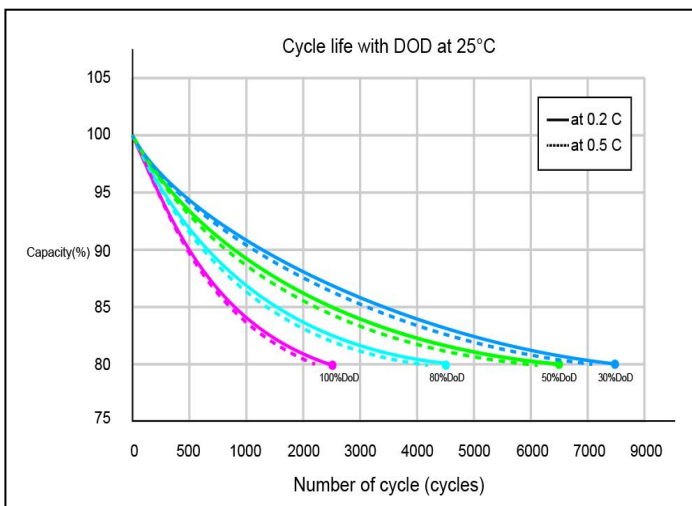
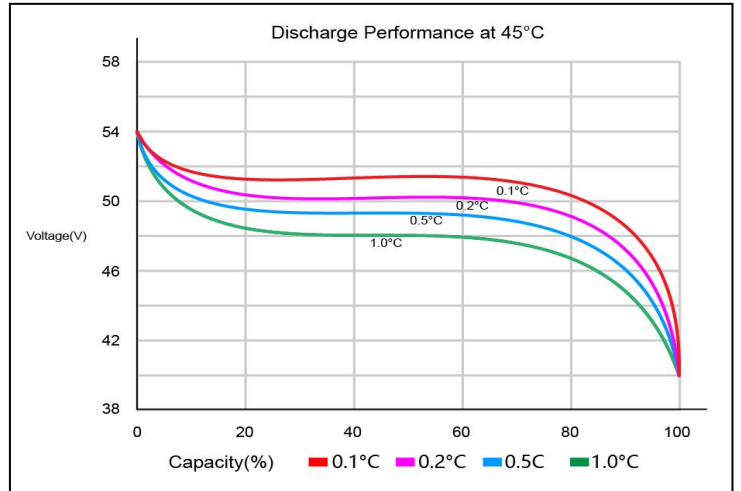
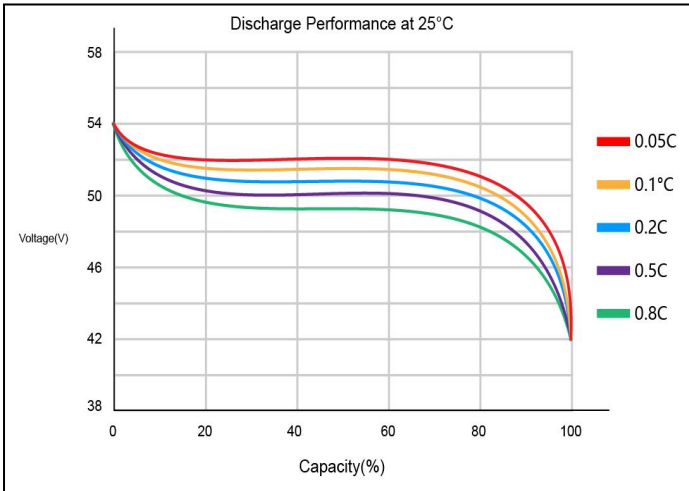
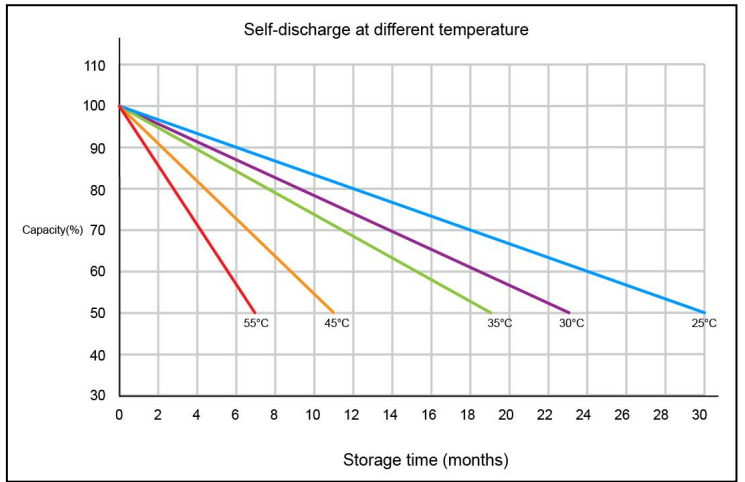
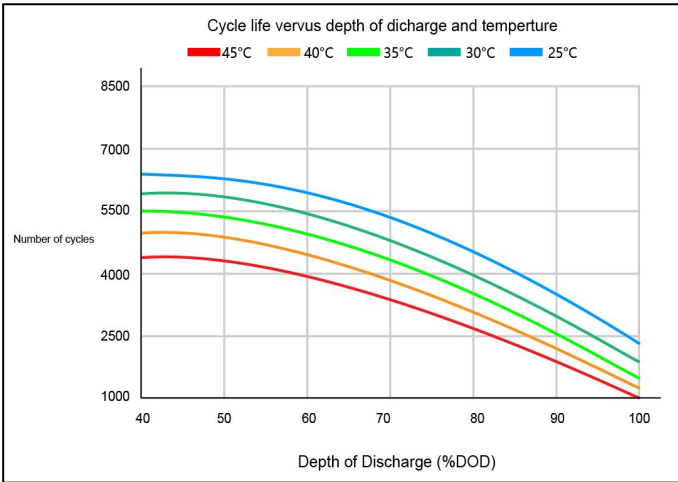
Note: LED long flash: period about 2.4 seconds flash once; LED short flash: period about 1.2 seconds flash once.

11. The Dimension of the Battery Module(550*440*176mm)

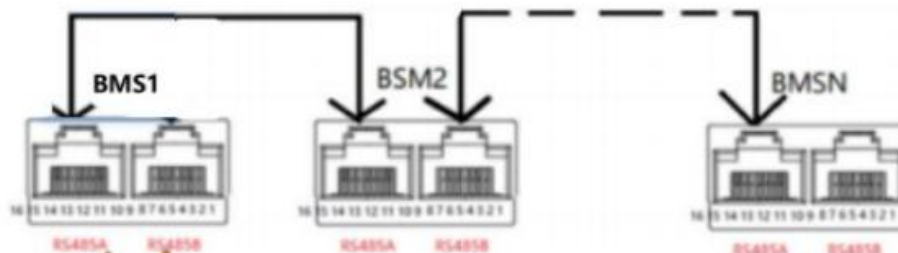


12. Battery Cycle life testing curve





13. Communication Interface Parallel



13.1 Pull-up code setting:

During the multi-machine parallel communication operation, the dialing address configuration of each PACK is required first. Dial code is adopted BCD code format, address (black dot is OFF state, blank is ON state, the same as below), ground Address 2 Other addresses, and so on.

13.2 Setting of the upper computer communication address code

Communication in the system parameters of the current host or host computer to communicate into the code system of the slave system, communication can be detected and communicated.

The BMS is configured as a stand-alone working mode, and the dialing address can be any address (you need to match with the host machine or FSU address)

The BMS is configured in a cascading working mode, and dialing deselect different addresses from 1 to 15 (Need match with the upper computer or FSU address)

13.3 The RESET key

RESET: It means reset. When the system is abnormal, you can use this key to reset the system and restore the system normal operation.

The RESET key manual operation instructions:

Start the BMS in the shutdown state, key 3S boot

Shut off BMS, non-standby state, key 3S boot and close

Reset the BMS non-standby state, press 10s until all LED light is lighting and reset

14. Precautions For Installation and Maintenance

14.1 Installation Precautions

- (1) Unpack the boxes, test the number of accessories and the battery appearance before installation
- (2) Install the hanging ear and handle, use the multi-meter to measure the battery voltage, generally, the battery voltage should between 48.0-51.2V when shipping out.
- (3) Check the positive and negative electrodes of the battery before wiring, and it is strictly prohibited to connect the positive and negative electrode terminals when installing the battery.
- (4) During the battery connection process, please wear the protective gloves, and when using the metal tools such as the torque wrench, please use the metal tools Insulation packaging, absolutely avoid torque wrench and other metal tools at both ends of the battery to contact with positive and negative terminals, made short circuit into battery.
- (5) Before connecting to the external equipment, Be sure the equipment to be disconnected, and check the connection polarity and total voltage of the battery again. If is correct, then connect the positive electrode of the

battery to the positive electrode of the device, the negative electrode of the battery to the negative extreme of the device, and tighten the connecting line;

(6) The battery must be carried and placed in the process must be light, slowly fall, avoid impact, do not throw, knock the battery, never damage the battery or cause potential safety risks;

(7) It is forbidden to use the sharp parts of the tools to contact the surface of the battery box, scratch or damage the battery box;

(8) It is forbidden to dismantle the battery box without permission;

(9) It is forbidden to place any metal or conductive material together or assemble it into the battery box;

(10) Install according to the selected installation method:

A) Standard cabinet (rack) installation: install the battery pack with a supporting hanging ear and fix it in the standard cabinet, and add the tray to the battery box

B) Installation of wall hanging box: ensure the wall meets the wall hanging requirements before installation; install special wall hanging for lithium battery according to the designed position; the battery pack is fixed in the wall hanging box properly;

Integrated indoor and outdoor cabinet (box) installation: according to the customized integrated cabinet (box) installation specifications installation.

14.2 Maintenance precautions

Our company lithium iron phosphate battery pack because of its low self-discharge rate, floating charge resistance, super long service life and other performance, has maintenance-free Features, fully intelligent BMS battery management system, instead of the manual detection link, can automatically monitor the single in the battery pack. The voltage of the body battery and the total voltage and total current of the battery pack shall balance and prevent the single battery in the process of charging and discharge.

Avoid overcharge and over discharge occurs, The automatic detection and protection function of battery management system greatly reduces the failure rate of battery pack, super long service life, greatly reduces the use cost of the communication industry.

Late installation and use of lithium iron battery can be a simple maintenance inspection, because of its maintenance-free characteristics, maintenance can be extended Cycle, such as being done once in 3 months. Check whether the pole column and connecting line of lithium iron phosphate battery are loose, damage, deformation or corrosion, and the battery shall no damage, deformation; Observe the state of the battery pack operation indicator light. Under the normal state, the green light is on, and only the last battery pack CAPACITY light is left, when flashing, it indicates that the battery power is low, and the battery is about to drain off the power and turn off the output;

If a fault occurs, the battery pack ALM red light flashes, send an alarm, please check whether the battery connection is correct or whether there is overflow; press RESET to reset and see if the fault is eliminated. If not, please contact manufacturers processing, do not open the battery pack box without authorization;

For multiple batteries in parallel, if one of the batteries fails and needs to be replaced, ensure a new replacement The voltage difference between the battery pack voltage and the other battery packs to be connected in parallel is within 2V. If the pressure difference is large, the high-voltage battery pack will charges the battery pack with low voltage with high current, and the battery pack with low voltage charges will over current protection, resulting in unable to charge problem;

Record the time and number of power failure, and make detailed statistics of the power supply time of the battery;

14.3 Analysis and solution of common problems

14.3.1 Under pressure alarm

Phenomenon: ALM alarm indicator flashes, RUN operation indicator goes out.

analysis of causes:

- (1) The load current is too large to exceed the battery discharge protection value.
- (2) Battery protection plate failure.

Solution: the protection board locks into the over current state until the charger can be activated at the charging input.

14.3.2 Discharge and over current protection

Phenomenon: ALM alarm indicator flashes, RUN operation indicator goes out.

analysis of causes:

- (1) The load current is too large to exceed the battery discharge protection value.
- (2) Battery protection plate failure.

Solution: the protection board locks into the over current state until the charger can be activated at the charging input.

14.3.3 Temperature protection

Phenomenon: ALM alarm indicator flashes, RUN operation indicator goes out.

Cause analysis: The ambient temperature may be too high or too low

Solution: When the temperature of the NTC end returns to the normal value, the protection board recovers from the temperature protection state, and the red ALM lights go out

14.3.4 Battery has no voltage output

Phenomenon: the power indicator light is off, and the voltage at both ends of the battery is 0V.

Cause analysis: The battery is not activated or the battery management system is abnormal.

Solution: activate the battery or reset the battery through the reset key "RESET" on the battery panel under activation, but still have no voltage output, and contact the manufacturer professionals for processing.

15. Packaging, Transportation and Storage

15.1 Packaging

15.1.1 The lithium iron phosphate battery pack is fully packaged overall to ensure that the product is free from any harmful gas in handling, transportation and storage, Chemical contamination, electrostatic conditions, moisture, and mechanical damage.

15.1.2 The chassis has a good appearance, without scratches, paint loss, deformation, damage and other defects;

15.1.3 The Product label is uniformly posted on the upper right corner of the outer box, and the bar code is posted on the upper right corner opposite of the outer box product label and the electricity

Negative side of pool connector, firmly adhesion and correct information content.

Product label material: white label tape, size: 30mm * 80mm

Label Content: Product Model: JOYKOO-BMS-51.2V200Ah

Product quantity: 1 group

Bar code label material: white label tape, size: 15mm * 60mm

La content: 51.2V200Ah-A0001 (five-bit serial number)

15.1.4 Before packaging, the upper computer sets the forced dormancy state;

15.1.5 After passing the battery appearance inspection, package PE bag, schematic shown in the figure:



15.1.6 External wooden material, hardness and other aspects, to ensure the turnover and transportation safety;

15.1.7 There shall be set-up buffer packaging material inside; consider: terminal post placement space, bagged screws and hanging ears;



15.2 Transportation

Pay attention to the following aspects during the battery handling process:

- (1) Should be gently put gently, to avoid severe vibration of the equipment;
- (2) Never reverse, roll, fall, or bump into the battery to avoid damaging the appearance of the battery;
- (3) The battery should avoid exposure to the sun, rain, and it is prohibited to directly flood the battery into the water;
- (4) No positive and negative electrode short circuit.

15.3 Storage

- (1) The external terminal of the battery pack is in the insulation protective state;
- (2) The battery with a storage period of more than 3 months shall be replenished and charged at 0.2C-0.3C for 2-3 hours;
- (3) The battery should be stored in a dry, clean, ventilated, no corrosive gas environment, to stay away from the fire source, to avoid exposure to the sun;
- (4) Do not store or place it in a long temperature of more than 60 degrees, otherwise it will cause functional decline and life reduction.

15.4 Accessories

No. Parts Name Quantity Note

- 1 Combination screws and 4 sets
- 2 One certificate of qualification
- 3 Instructions: 1 user manual

15.5 Battery configuration recommendations

- (1) When the battery is 3 hours of discharge rate, the battery discharge coefficient is recommended to take 0.9;
- (2) When the battery discharge rate is 1 hour, the battery discharge coefficient is recommended to be taken as 0.8; but it is recommended that the battery should not be performed as 1.0

Hour discharge configuration, which is equivalent to the battery working at a full load state, will affect the life of the battery. Redundancy should be considered appropriately remain.

15.6 Battery connection recommendations

Battery connection is recommended using 25 square cable, more than 2 sets of connections are recommended to connect each set of batteries to the sink row, and then connect from the junction row to the switch power supply.