

**Lvwo**

Specification

Versions

A0

Date

25/09/2022

DOC No:

PS-P-106

Address: Address: Economic Development Zone of Hangbu town, Shucheng County, Lu'an City, Anhui Province, China.

Tel:+86-0564-8030526

Post Code:231300

Web: www.lvwo-energy.com

Lithium Ion Battery Pack Technical Specification

Pack Type	48200
Battery Pack Nominal Voltage	51.2V
Battery Pack Nominal Capacity	200Ah
Cell Type	Lithium Iron Phosphate
Date	2022.09.25

Counter sign column

Technology	Quality	Market	Purchase

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Specification version description

Version	Change description	Modifier	Date	Notes
A/0	Initial version		2022.09.25	



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1.Product overview

This product is a lithium iron phosphate battery pack (including BMS) designed and manufactured by Anhui Lvwo Recycling Energy Technology Co., Ltd. It consists of 16 series cells,and this product is suitable for the operating current less than 200A load equipment.

2. Product technical specifications

The product type is 48V200Ah battery pack, and the Max. charging and discharging current is 200A, with 20A current limiting function (When current is more than 200A, the limiting-current function starts), with communication function (Double RS485),and with storage (500 pcs , 2P*2 fence terminal, black chassis.)

2.1 General technical parameters of battery pack:

Battery pack	NO.	Item	General parameters		Notes
	1	Series-parallel system	≥P16S		3.2V 100Ah chunlan
	2	Rated capacity	Nominal capacity	200Ah	0.1C,capacity≥100%; 0.33C capacity ≥95%; 1C capacity ≥90%;
			Mini. capacity	According to different discharge current ratio	
	3	Nominal voltage	51.2V		Operating voltage
	4	Discharge cut-off voltage	43.2V		Discharge cut-off voltage
	5	Charging voltage	56.4V		
	6	Internal resistance	≤60mΩ(This value may be adjusted for different cell and PACK schemes)		AC measurement at 50%SOC (1、Cancel the current limiting modes≤60mΩ; 2、 In current limiting modes≤800m Ω)
	7	Consistency	Terminal cell differential pressure ((pressure difference at charge cut-off)) ≤200mV		Record the battery pack pressure difference at constant flow and constant pressure
	8		Discharge end cell pressure difference (total pressure difference at 43.2V) ≤300mV		
	9	Standard charging	Continuous current: 20A Continuous voltage: Cut-off current: 0.05I15A		
10	Standard discharging	Continuous current: 200A Cut-off voltage: 43.2V			
Battery pack	11	Max. charging continuous current	100A		

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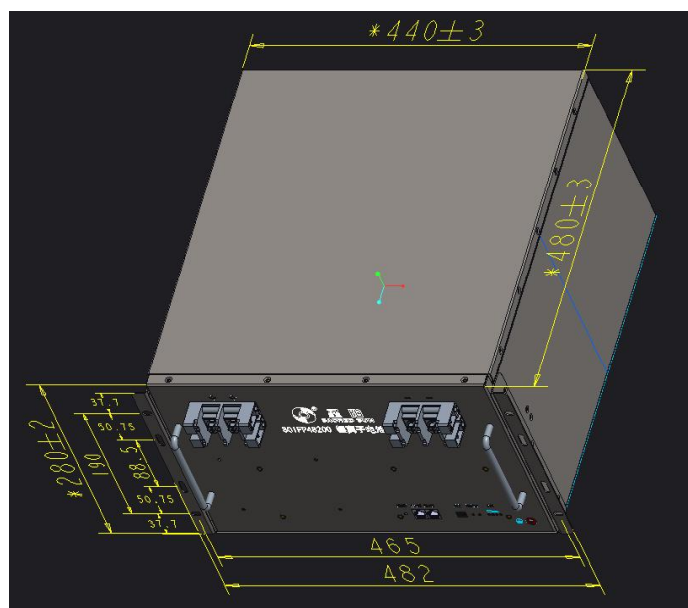
	12	Max. discharge continuous current	200A	
	13	Operating temp. range	Charging: 0~55℃	60±25%R.H. (Cell storage humidity range)
			Discharging: -10~55℃	
	14	Storage temp. range	-40~70℃	Humidity range at the time of shipment
	15	Dimension/ mm	440*480*280	APPROX (External dimensions, without mounting lug and terminals)
	16	Weight	75±3kg	APPROX
	17	Shipped products with electricity	30%-50%30%-50% power delivery	
	18	Packaging material	Carton	
	19	Cell overvoltage protection during shipment	3.75V	
Fire fighting	20	Operating temperature	170℃ or open flame	



2.2 Case dimension structure diagram:

Dimensions: (W*D*H: 440mm x 480mm x 267mm) Positive and negative fence terminal specifications: DT60-02

Battery pack dimensions are as follows:



Name	Value
Width (mm)	440±3
Depth (mm)	480±3
Height (mm)	280±2



3. BMS

3.1 Descriptions of BMS

1) BMS is designed for 16 series lithium iron phosphate battery packs;

2) The BMS system has the following functions:

Communication function (dual RS485 communication), 20A current limiting function, over charge protection function, over discharge protection function, over current protection function, short circuit protection function, balancing function, alarm function;

The reset key (RST) of the BMS has the functions of manually opening, closing and resetting, as follows:

Manual key setting	Turn on/Activation	Press the button for 1s and release it. The BMS is activated, and the LED indicator lights up successively from "RUN" for 0.5 seconds.
	Power off/dormancy	Press the button for 3s and release it, the BMS is in dormancy, and the LED indicator starts to light up from the lowest power for 0.5 seconds.
	Resetting	After pressing the button for 10s, release it, the BMS is reset, and the LED lights are all on for 1.5 seconds at the same time.

Item	Details	Standard
Cell over charge protection	Over charge protection value	3.75±0.05V
	Over charge alarm value	3.6±0.05V
	Over charge protection recovery value	3.6±0.05V
Cell over discharge protection	Over discharge protection value	2.00±0.05V
	Over discharge alarm value	2.5±0.05V
	Over discharge recovery value	2.90±0.05V
Battery pack over charge protection	Over charge protection value	57.60±0.05V
	Over charge alarm value	57.00±0.05V
	Over charge protection recovery value	56.6±0.05V
Battery pack over discharge protection	Over discharge protection value	43.20±0.05V
	Over discharge alarm value	43.2±0.05V
	Over discharge recovery value	51.2±0.05V
Over current protection	Discharging over current protection 1	205A
	Discharging over current 1 delay	5000ms
	Discharging over current protection 2	250A
	Discharging over current 2 delay	500ms
	Charging over current protection	205A
	Charging over current delay	4000ms

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Short circuit protection	Short circuit protection current	330±10A
	Protection condition	Load short circuit
	Detection delay time	≤500us
	Protection release condition	When charging (I > 2A), the short-circuit protection will be lifted automatically after the load is removed.
Temperature protection	Charging over temp. protection	65±2℃
	Charging over temp. recovery	50±2℃
	Discharging over temp. protection	65±2℃
	Discharging over temp. protection recovery	50±2℃
	Charging low temp. protection	0±2℃
	Charging low temp. protection recovery	5±2℃
	Discharging low temp. protection	-10±2℃
	Discharging low temperature protection recovery	0±2℃
Balanced function	Balanced opening threshold	3.45V

3.2. LED indicator description:

State		Charging				Discharging			
Capacity indicator light		L1 ●	L2 ●	L3 ●	L4 ●	L1 ●	L2 ●	L3 ●	L4 ●
	0~25%	Off	Off	Off	Flickering 2	Off	Off	Off	Steady on
	25~50%	Off	Off	Flickering 2	Steady on	Off	Off	Steady on	Steady on
	50~75%	Off	Flickering 2	Steady on	Steady on	Off	Steady on	Steady on	Steady on
	75~100%	Flickering 2	Steady on	Steady on	Steady on	Steady on	Steady on	Steady on	Steady on
Running indicator light ●		Steady on				Flickering 3			

3.3 Status indication

System state	Abnormal event	RUN	ALM	Power LED				Description
		●	●	●	●	●	●	
Power Off	Dormancy	Off	Off	Off				
Standby	Normal	Flickering 1	Off	According to battery indicator				Standby mode
	Alarm	Flickering 1	Flickering 3					
Charging	Normal	Steady on	Off	According to battery indicator (Max. indicator LED flickering 2)				An alarm other than an overcharge alarm ALM flickering 3
	Alarm	Steady on	Flickering 3					
Discharging	Normal	Flickering 3	Off	According to battery indicator				

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	Alarm	Flicker 3	Flicker 3		
	Under voltage protection	Off	Flicker 3	All off	Stop discharge
	Over current protection	Off	Steady on	All off	Stop discharge
Temperature	Protection	Off	Steady on	All off	Stop charging and discharging
Failure	Cell failure, NTC failure	Off	Steady on	All off	Stop charging and discharging
	Voltage sensor failure				
	Current sensor failure				
	Charge and discharge MOS failure				

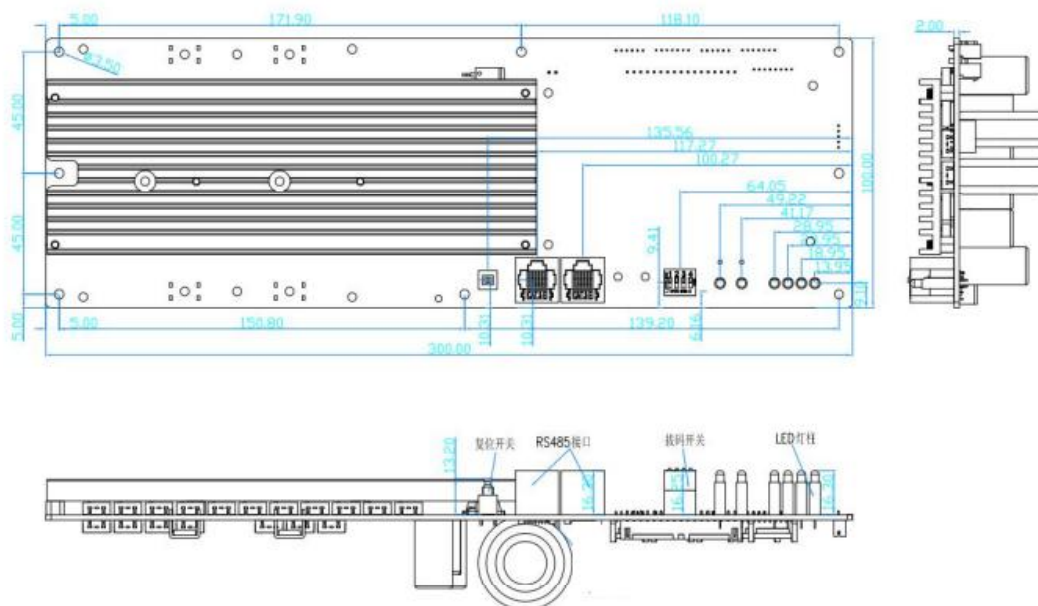
3.4 LED indicator blinking description:

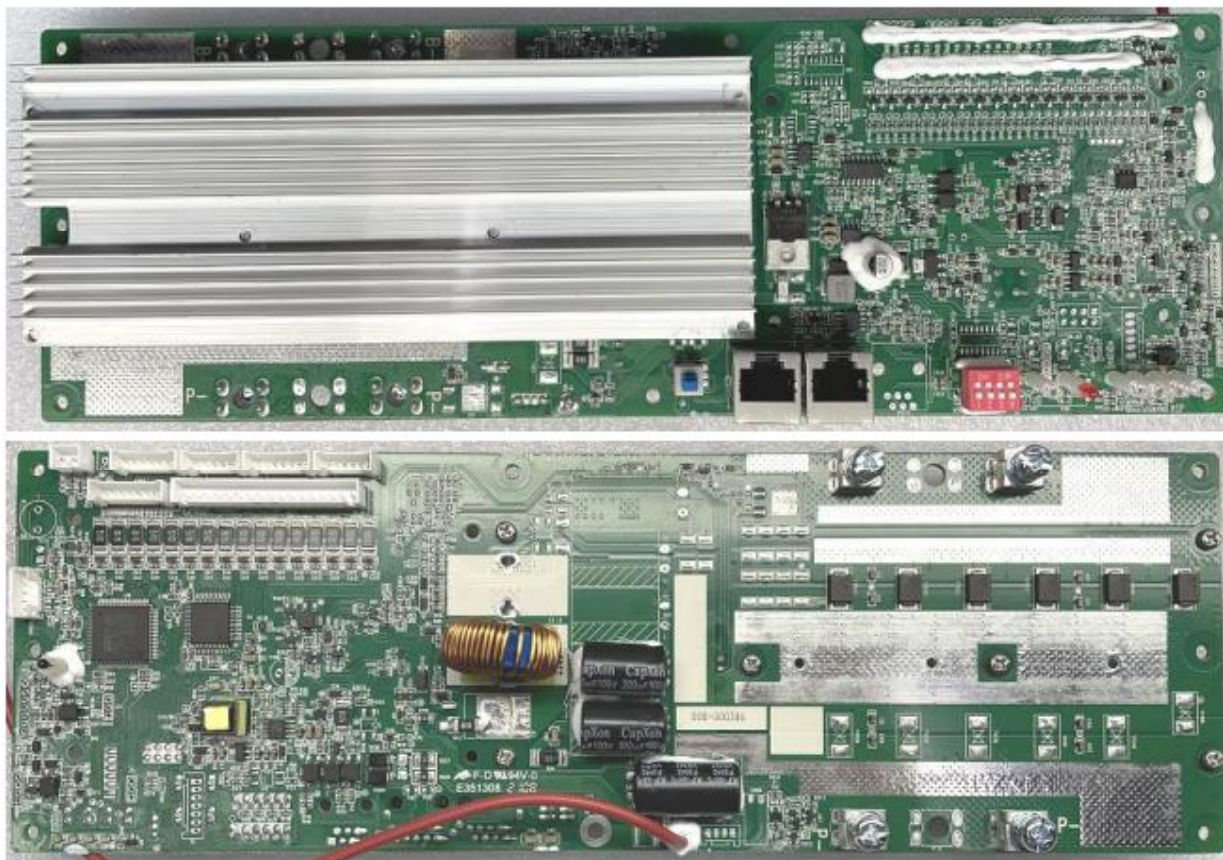
Flickering mode	On	off
Flickering 1	0.25s	3.75s
Flickering 2	0.5s	0.5s
Flickering 3	0.5s	1.5s

3.5 Dimension and physical diagram of BMS

The dimension of the whole board: length * width * thickness
 $\leq 300\text{mm} \times 100\text{mm} \times 45\text{mm}$ (the thickness from the communication port to the restricter plate is about 46.8mm);
 (subject to actual objects)

Main board dimension diagram:



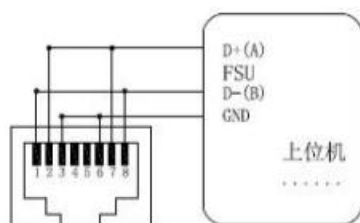


Notes: There may be some differences between the actual product and the above reference physical drawings. The pictures are for reference only.

4. Communication

With the host computer communication with dual RS485 interface, the product can carry out multi-machine parallel communication. Please refer to the communication protocol specification for communication specifications.

4.1 RS485 interface

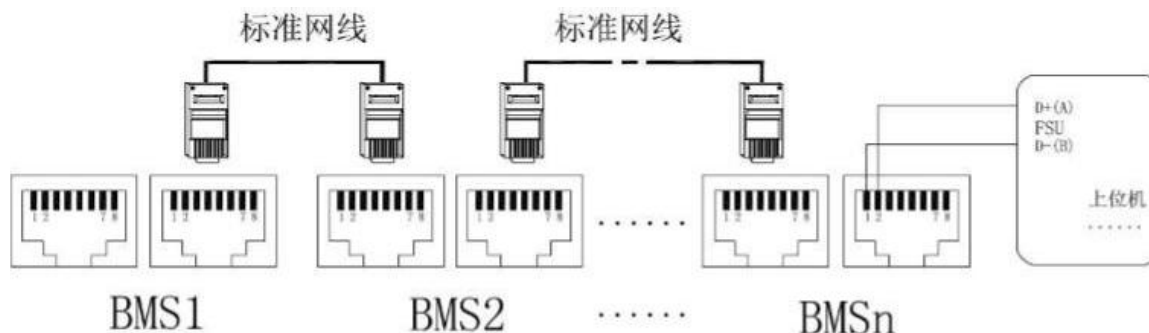


RS485--采用8P8C立式RJ45插座		
RJ45引脚	2、7	1、8
定义说明	RS485-A	RS485-B

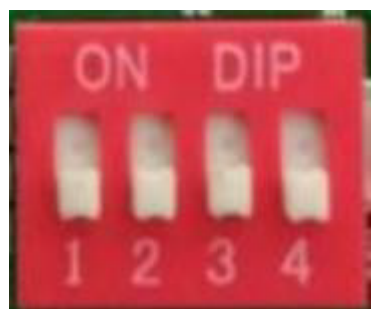


4.2 Parallel interface

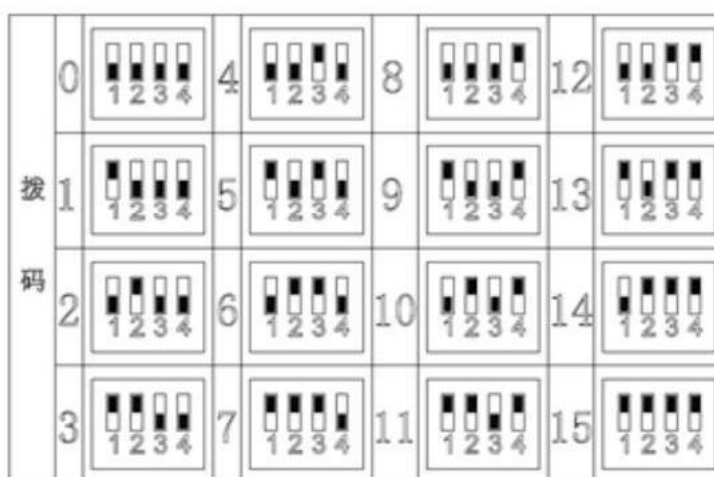
BMS battery packs communicate in parallel through RS485 buses, and can also communicate with devices with RS485 buses. Human-computer interaction of any battery pack in parallel with RS485 buses, multi-machine parallel bus interface is shown in the following figure.



4.3 Address DIP switch



(上图 4 位)



4.3.1 Dial code setting

(1) When carrying out multi-machine parallel communication operation, it is necessary to configure the dial-up address of each PACK first. The dialing code is in BCD code format, and the address 0 is defined as



(The black dot is the OFF state, the blank is the ON state, the same as below Address 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15.)



Address 2



And so on for the other addresses.

4.3.2 Host computer communication address code setting

In the system parameters of the host computer, input the code system of the master or slave computer to be communicated, and the communication can be detected and communicated. BMS is configured as a single operating mode, and the dial address can be any address. The BMS is configured to work in cascade mode, and different dialing addresses are selected from 1 to 15.

5. Fire-fighting

5.1 Fire fighting requirements

The independent S type thermal sensing aerosol is installed inside the fire protection lithium battery pack, which can realize the automatic fire suppression function and meet the all-weather fire protection of the battery pack.

5.2 S-type thermal sensing aerosol technical performance requirements

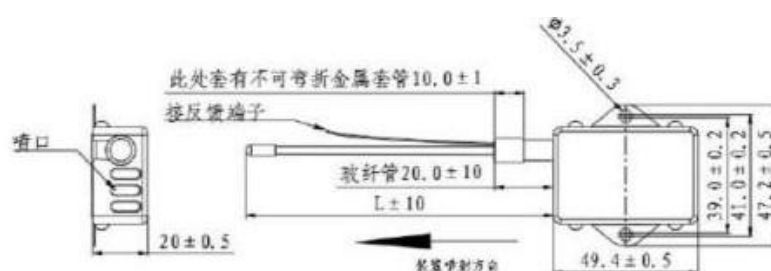
In addition to meeting the performance requirements of GA 499.1-2010 (aerosol fire extinguishing systems, Part 1: Thermal aerosol fire extinguishing devices), the S type thermal sensing aerosol also meets the following conditions:



- a) Applicable temperature range: -50°C to $+90^{\circ}\text{C}$;
- b) Dimensions: $49.2 \times 47.7 \times 20\text{mm}$;
- c) Weight of extinguishing agent $\geq 0.01\text{kg}$;
- d) Fire extinguishing effectiveness $\geq 33\text{g/m}^3$;
- e) Protective volume $\geq 0.2\text{m}^3$;
- f) Spray delay time $\leq 1\text{s}$;
- g) Spray duration $\leq 1\text{min}$;
- h) Effective use period ≥ 6 years;
- i) S-type thermal sensing aerosol uses a low-temperature agent, with no cooling required;
- j) S-type thermal sensing aerosol features a heat-triggered self-activation mechanism, meeting GA 499.1 industry standards, activating the extinguishing device at temperatures of 170°C or upon contact with open flames.

5.3 S-Type Thermal induction aerosol installation requirements

S-type thermal sensitivity aerosol should be installed and fixed in the battery pack, and the schematic diagram of routine installation is shown in Figure 3:



6. Testing conditions

In addition to the special points out, all tests (standard test conditions) in the following conditions:

Ambient temperature: $25 \pm 5^{\circ}\text{C}$ (if the ambient temperature is lower than 20°C , the battery pack needs to stand at $\geq 20^{\circ}\text{C}$ for more than 5 hours before testing) Ambient humidity: 30% ~ 80%

Atmospheric pressure: 86kpa ~ 106kpa

Pack standard charge and discharge

Standard charging: Charge the battery pack at 10A current constant current constant voltage to cut-off voltage 56.4V, cut-off current 0.05I10 (2A);

Standard discharge: the battery pack at 100A current constant discharge to 40V cut-off voltage;

7. Electrical performance, safety performance, mechanical performance test

The project is not mentioned in the table in accordance with: YD/T2344.1-2011 "Communication

Lithium Iron Phosphate Battery Pack Part 1: Integrated Battery Pack" and Q/ZTT2235.1-2019 China Tower enterprise standard.



7.1 Electrical performance test

Testing items	Testing methods	Technical requirement
Discharge capacity	Under standard test conditions, the battery pack is charged by standard, discharged at 0.1C current, and the discharge capacity is recorded.	≥100% nominal capacity
-10℃ Low temperature discharge capacity	After standard charging, the battery pack is stored in a low temperature environment of -10±2℃ for 8H, and discharged at 0.1C current to the termination voltage to record the discharge capacity.	≥70%nominal capacity
55℃ high temperature discharge capacity	After standard charging, the battery pack is stored in a high temperature environment of 55±2℃ for 4H, and discharged at 0.1C current to the termination voltage to record the discharge capacity.	≥99%nominal capacity
Charge retention capacity (residual capacity) and capacity recovery capacity	After the battery pack standard charge and discharge, record the initial capacity; After the standard battery charge, it is left for 28d at 15~35℃, and then the discharge records the residual capacity; After the battery is charged and discharged to standard, record the restored capacity.	Residual capacity (charge retention rate) ≥95% Recovery capacity ≥97%
Cycle life	After charging the battery pack standard, discharge at 0.5C, and terminate the cycle life test when the discharge capacity is less than 80% of the initial capacity.	≥800 times
Stored at 55℃ for 7 days	After the battery pack standard charge and discharge, record the initial capacity; After standard charging, the battery is stored in a high temperature environment of 55±2℃ for 7 days, and then discharged to record the residual capacity; After the battery is charged and discharged to standard, record the restored capacity.	Residual capacity ≥92% Recovery capacity ≥95%



7.2 Safety performance

Testing items	Testing methods	Technical requirement
Short-circuit	After standard charging, the battery pack is placed in an explosion-proof box, and a wire with internal resistance less than 100mΩ is short-circuited to the positive and negative electrodes outside the battery pack. The battery surface temperature is recorded during the test, and the short-circuit duration is 10min, that is, the test is completed. Or use a single cell for short-circuit safety assessment test.	No fire, no explosion (without protection line and shell test)
Over charge	After standard charging of the battery pack, a cell of the battery pack is charged at 0.2C with a constant current and constant voltage source. After constant current charging to 5V, the battery pack is charged at constant voltage. The test ends when the cut-off current reaches 0A or the surface temperature is lower than the ambient temperature +10℃.	No fire, no explosion (without protection line and shell test)
Over discharge	After the battery pack is charged, the load meter is used to discharge the battery pack at 0.5C continuously until the voltage of a single battery reaches 0~0.5V, and the test is finished.	No fire, no explosion (without protection line and shell test)

7.3 Mechanical property

Vibration	- Place the whole set of packaged test products to be shipped on the vibration table, scan the vibration back and forth for 5H at 10~90HZ, and the scanning speed is 1HZ/S. The vibration is scanned on the front and back, up and down, and left and right six surfaces respectively. Vibration finish checks the internal and external packaging and performs an inspection of the battery pack and standard charge and discharge tests. - Place the battery pack on the vibration table, and scan the vibration back and forth at 10~90HZ for 5H, the scanning speed is 1HZ/S, respectively, the front and back, up and down, and the left and right six sides of the scanning vibration; After the vibration is completed, the battery is checked and charged and discharged according to the standard.	- The internal packaging parts are not damaged and the battery pack is not deformed, damaged or any security risks; Discharge capacity ≥99% nominal capacity - There is no deformation and damage outside the battery pack; Discharge capacity ≥99% nominal capacity
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8. Product packaging requirements

8.1 The chassis is in good appearance and should not be scratched, painted off, deformed, or damaged.

8.2 Product description label,

The following picture shows the product description label, which is firmly adhered and the information content is correct.

Label material: PET sub-silver sticker and dimension is shown in the figure:



8.3 Before packaging, the host computer set the forced dormancy state;

8.4 After the appearance inspection is qualified, the batteries are packed into boxes.

8.5 Outer carton material, hardness and other aspects to ensure turnover, transportation safety, carton information logo is the same as the following figure;

8.6 The interior must include buffer packaging materials; consider the packaging: space for terminal posts, placement for bagged screws, and locations for hang tabs; 8.7 bagging of screws: chassis slot screws and hang tab screws; quantities and configurations:

NO.	Name	Quantity	Notes
1	Shipment Test Report	1	
2	Hang Tab	2	Locked in the chassis
3	External hex screws	8	External hex cross-combination bolt M6*16, cold galvanized
4	Hanger bolt nut	8	M6/blue and white zinc plating/strength grade 8
5	Network cable	1	RJ45-1m
6			
7			

8.8 Included in the box: shipping testing report, and all documents are placed in a plastic bag inside the box;

8.9 Sealing, packing straps, bulk matching pallets + corner protectors; height meets the weight requirements of the outer box;



9. Marking (Customer standards comply)

Marking date follows the actual shipping date.

10. Product storage and transportation

10.1 Product storage

When storing products for long periods and not in use, place them in a dry, ventilated area, away from flammable and explosive items; regularly charge the battery pack every three months to maintain optimal performance.

10.2 Product transportation

The battery pack must undergo external packaging before transportation and should be protected from severe shocks, impacts, or pressure during transit, as well as from sunlight and rain.

11. Product usage precautions

11.1 Never immerse the battery in water or wet it.

11.2 Charging and using battery outside our specified temperature range is prohibited; do not store, charge, or use the product near fire or heat sources.

11.3 If the battery pack emits odor or leaks, stop using or charging it immediately and move it to a well-ventilated area, away from fire sources, and contact us promptly.

11.4 Do not reverse the positive and negative terminals when connecting to a load.

11.5 Avoid short-circuiting the battery pack's positive and negative terminals with metal conductors. 11.6 Do not throw the battery pack into fire or apply heat to it.

11.7 Strictly prohibit disassembling the battery pack; do not penetrate the pack with nails or sharp objects; avoid striking the pack with hammers or other forceful means; do not step on or drop the battery pack.

11.8 Never place the battery pack in a microwave or pressure vessel.

11.9 If any abnormalities occur during charging or usage, please stop charging and usage immediately. 11.10 The optimal operating temperature of the product is $25\pm 5^{\circ}\text{C}$. If the product is not in the temperature range during use, the discharge capacity will be reduced.

11.11 If there is any fault or abnormality in the process of use, please contact us. Do not remove the battery pack without permission.

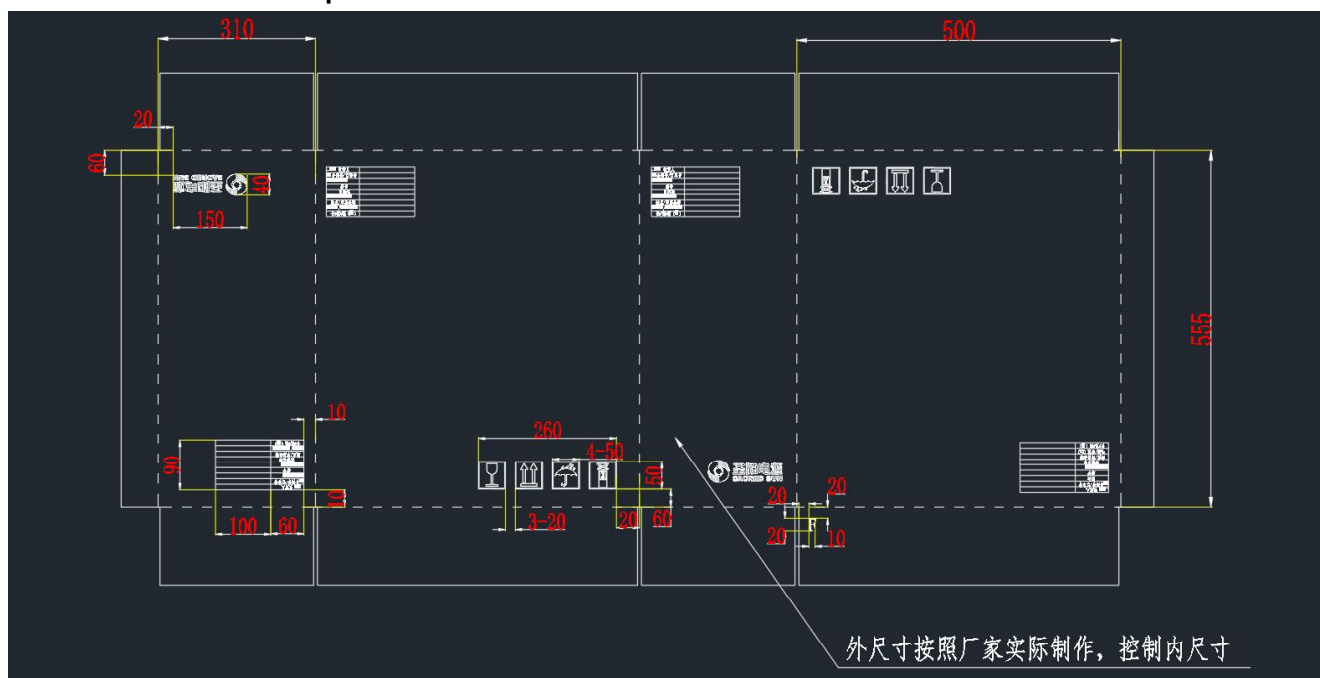
11.12 The test above refers to the new battery whose arrival time is no more than one month.

Attachment 1: Carton dimension of battery outer packaging (according to customer's specified requirements, for reference only)

一、Material name or code

Material name	Material code	Specification
Carton		High quality KLB breaking resistance 16KG inner dimension 555*500*310

二、Material technical requirements



Notes

1. Carton material is high quality KLB breaking 16KG;
2. The dimension indicated is the overall dimension;
3. The front and side of the carton should be printed in black.

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Attachment 2: Shipment inspection report (customer specified standard requirements, for reference only)**Anhui Lvwo Recycling Energy Technology Co., Ltd.****Lithium battery FG inspection report**

NO: QR-CJ-8. 2. 4-03

Product type		Inspection personnel			
Product number		Inspection date			
NO.	Inspection item	Technical requirement	Inspection results	Result determination	Notes
1	Appearance	1.The battery surface should be clean, undeformed undamaged, and free from corrosion at the contact points. 2.The battery pack must display necessary product markings that are clear and legible. 3. The positive and negative terminals of the battery pack should be clearly marked for easy connection.; 4.The power interface and communication (or alarm) interface of the battery pack should have clear labels.			
2	Dimension specification	Compliance with shipping inspection requirements:			
3	Voltage	52-53.5V			
4	Internal resistance	1. Current limiting mode must be $\leq 60\text{m}\Omega$; 2. In current limiting mode $\leq 800\text{m}\Omega$.			
5	Consistency	Charging total voltage cutoff differential (cutoff at 56.4V), constant current time voltage differential $\leq 300\text{mV}$; discharging total voltage cutoff difference (cut off at 43.2V), battery pack difference $\leq 400\text{mV}$.			
6	Insulation detection	Testing voltage of 500V; insulation resistance from positive and negative terminals to the metal shell must be $>2\text{M}\Omega$.			
7	1I ₁₀ C discharging	After fully charging the battery pack as per standards, let it stand for 0.5h–1h. Under environmental conditions of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$, discharge at 1I ₁₀ C current to termination voltage, with capacity not lower than 90% of rated capacity.			
8	3.3I ₁₀ C discharging	Following the same standards, after standing for 0.5h–1h, discharge at 3.3I ₁₀ C current to termination voltage, ensuring that the discharging capacity is no less than 95% of rated capacity.			
9	BMS Protection function	The BMS must effectively activate protective functions against over voltage, under voltage, over current, over temperature, and short circuit; the alarm function should operate normally.			
10	Monitoring function	Communication interface	It must feature RS485 (or dual RS485) with securely installed ports, undamaged and normal communication; capacity and operation indicator lights must display correctly without alarms or damage.		
		Four control function	Telemetry, signaling, telemetry adjustment, and remote control functions should work properly.		
		Sampling accuracy	Compliance with BMS technical parameter requirements		
		Communication	Communication functions should operate normally, and parameter settings and display data must meet requirements.		

Test conclusion:

1. Qualified ☐ Unqualified ☐
2. If there are unqualified items, the handling situation is as follows:

Inspection personnel:

Audit:

Date: