



SPECIFICATIONS

FOR LiFePO4 POLYMER LITHIUM-ION BATTERY

MODEL: GMB5581230- 6500mAh

CUSTOMER: _____

CONFIRMATION : _____

DATE : _____

PRERARED	CHECKED	APPROVED
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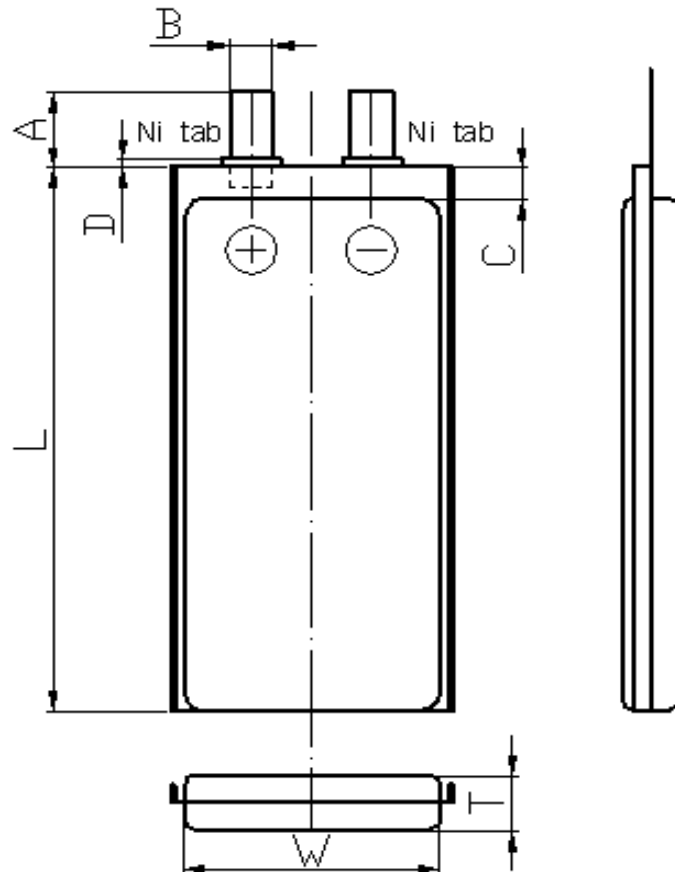
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1. Scope

The document describes the product specification of the LiFePO₄ polymer lithium-ion rechargeable battery cell supplied by Henan Huanyu Power Sources Corporation Limited.

2. Model: GMB5581230**3. Dimensions:**

Item	Description	Dimensions
T	Thickness	5.7mm max
W	Width	82 mm max
L	Length	231.0 mm max
B	Tab width	20.0±0.5 mm

4. Specifications

NO.	Item	Specification
	Typical capacity	6500 mAh@ 0.3C ₅ A (1950mA) discharge
	Nominal voltage	3.2V
	Internal impedance	20m Ω
	Charge cut-off voltage	3.65V
	Charge current	Standard charge: 0.3C ₅ A Rapid charge: 1C ₅ A
	Standard Charging method	0.3C ₅ A constant current (CC) charge to 3.65V, then constant voltage 3.65V (CV) charge till charge current decline to ≤0.02C ₅ A
	Charging time	Standard charge: 5.0h (reference) Rapid charge: 3.0h (reference)
	Max. discharge current	1.0C
	Max instant discharge current	3.0 C ₅ A
	Discharge cut-off voltage	2.0V
	Operating temperature	Charge: 0°C ~ 45°C Discharge: -20°C ~ 60°C
	Storage temperature	-20°C ~ 55°C
	Storage humidity	<85 %
	Cell Weight	Approx: 200g

5. Battery Performance

5.1 Electrical characteristics

NO.	Item	Requirements	Test Mothed
1	Discharge Characteristics at different discharge rate	Discharge capacity / Nominal capacity*100% A) $0.3C_5A \geq 100\%$ B) $1.5C_5A \geq 90\%$	1.Standard charge at $0.3C_5A$ under the condition of normal atmospheric pressure and the environmental temperature of $25^{\circ}C \pm 5^{\circ}C$ and $45\% \sim 80\%$ RH, discharge at $4.5I_3(A)$ to 2.0V or the cut-off voltage which is specified in the technical document of the company. 2.the capacity(AH)=the discharge time *discharge current,and then is described the percentage of the nominal capacity (Charge/discharge cycle can be conducted for 3 times before meeting the Standards (the same below) .
2	Retain capability at room temperature	Residual Capacity \geq Nominal capacity*80% Recoverable capacity \geq Nominal capacity *90%	Measure initial status and initial capacity. Store for 28 days after standard charge, then measure final status and residual capacity at $0.3C_5A$ to 2.0V; After charge/discharge($0.3C_5A / 0.3C_5A$) cycle can be conducted for 3 times , recoverable capacity will be tested
3	Cycle Life	Discharge Capacity \geq Nominal capacity*80%	conduct $0.3C_5A/0.3C_5A$ cycle for 2000 times .The discharge capacity shall be measured after 2000 cycles.
4	storage performance	recoverable capacity \geq nominal capacity *95%	Standard charge and then rest for 1H,then discharge for 2H at $0.3C_5A$,storage for 90 days at $20^{\circ}C \pm 5^{\circ}C$,then standard charge and test for 1 hour, then discharge at $0.3C_5A$, (Charge/discharge cycle can be conducted for 5 times before meeting the Standards (the same below) .

5.2 Safety Performance

NO.	Item	Requirements	Test Mothed
1	Overcharge	No fire, no explosion ,	After standard charging, then Charge at 3 C ₅ A to 10.0V
2	Overdischarge	No fire, no explosion	After standard charging, Discharge 0.3C ₅ A to 0V at 20 °C ± 5 °C 下
3	Short Circuit at Room Temperature	No fire, no explosion	After standard charging, Keep the battery into a ventilation cabinet and short-circuit the positive and negative terminals directly (general resistance shall be less than or equal to 5mΩ) for 10 minutes
4	Needle puncture performance	No fire, no explosion	After standard charging, keep the battery on the bracket ,and then puncture it through with the iron nail of 3mm diameter on the part of the battery centre very quickly and entirely.
5	Hot Oven	No fire, no explosion	After standard charging. Keep the battery in the box with constant temperature of 85 °C ± 2 °C and remained for 2hours at this temperature.

5.3 Adaptation to Environment Characteristic

NO.	Item	Requirements	Test Mothed
1	Thermal Cycle	No fire, no explosion, no fume, no leakage	Standard charge the battery, then store it at 75±2°C for 48h, then at -20°C for 6h and at room temperature for 24h.,observe the change of the appearance of the battery
2	Static Humidity	No remarkable deformation, no erosion, No smoking \fire\explosion, the discharge time ≥2h	Standard charge. Put the battery into a 40°C ± 5°C and 95% RH chamber for 48h, then get it out and store it for 2h at room temperature. Observe the variation of the battery's appearance and then discharge at 0.3C ₅ A to 2.0V measuring final capacity.
3	Drop	No fire, no explosion.	After standard charging.Then let it self fall off from a height of 1.5m(the lowest height) to a rigid wooden board with the thickness of 20mm. The drop is implemented one time for every face.
4	High-low Temperature Discharge	No remarkable deformation, No fire, no explosion, no fume, no leakage	Standard charge. Then store it at the constant temperature of 60±2°C for 3h, and discharge at 0.3C ₅ A to 2.0V, then standard charge at room

			temperature and store for 20h according to the order of 0±2 °C /-10±2 °C /-20±2 °C and discharge at 0.3C ₅ A measuring corresponding discharge capacity. Then store for 2h at room temperature. Measure final status and Observe the variation of the battery's appearance.
5	Vibration	No remarkable deformation, no explosion, no fume, no leakage	<p>After standard charging. Measure initial status. Equip it to the vibration platform, adjust and prepare the test equipment according to following vibration frequency and relevant swing, doing frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min:</p> <p>A)vibration frequency:10Hz~30Hz Displacement breadth (single swing): 0.38mm</p> <p>B) vibration frequency: 30Hz~55Hz Displacement breadth(single swing): 0.19mm。</p> <p>Measure final status after sweeping and Observe the variation of the battery's appearance.</p>

Comments: The definitions of some nomenclatures of this specification.

- (1) standard charge: Charge with current 0.3C₅A to limit charge voltage 3.65V under the condition of 25°C ±5°C surrounding temperature, then change to charge with constant voltage till the current less than or equal to 0.02 C₅A.
- (2) Residual Capacity: The first discharge capacity after being tested by the specific procedure.
- (3) Standard Cycle: After standard charge at 0.3C, rest for 10min, then discharge at 0.3C₅A to 2.0V.
- (4) Recovery Capacity: The discharge capacity by implementing charge-discharge cycle repeatedly after being tested by the specific procedure.
- (5) Test should be conducted with new batteries within one month after shipment from our factory, Unless otherwise defined.

6. Visual Inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

7. Standard environmental test condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:

Temperature: 20 ±5°C

Humidity: 25-85 % RH

Atmosphere: 86KPa~106 kPa

8. Storage and Others

8.1 Long Time Storage

If the cell is stored for a long time(exceed three months), the cell should be stored in drying and cooling place. The cell should be charged and discharged every six month. The cell's storage voltage should be 3.2~3.35V and the cell is to be stored in a condition as NO.7.

8.2 Others

Any matters that this specification does not cover should be consulted between the customer and HUANYU.

9. Warranty Period& Product Liability

Warranty period of this product is 6 months from manufacturing code.

HUANYU is not responsible for the troubles caused by mishandling of the battery which is clearly against the instructions in this specification. When HUANYU find any new facts which require modification of this document, we

will inform the buyer.

10. Handling of Cells

Since the battery is packed in soft package, to ensure it is not damaged, you should carefully handle the battery.

10.1 Soft aluminum packing foil

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles.

- Don't strike battery with any sharp edge parts
- Clean worktable to make sure no any sharp particle

10.2 Sealed edge

Sealing edge is very easy to be damaged

- Don't bend or fold sealing edge

10.3 Folding edge

The folding edge is formed in battery process and passed all hermetic test

- Don't open and deform folding edge

10.4 Tabs

The battery tabs are not so stubborn especially for aluminum tab

- Don't bend tab

10.5 Mechanical shock

- Don't drop, hit, bend battery body

10.6 Short

- Short terminals of battery is strictly prohibited at any time, it may damage battery very badly.

10.7 Notice Designing Battery Pack

- The outer case of the Battery should have sufficient strength and battery should be protected from mechanical shock
- No Sharp edge components should be inside of the outer case

10.8 Tab connection

- Ultrasonic welding or spot welding is recommended to connect battery with PCM or other parts
- If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance.
 - a. The temperature of the solder iron should be controlled and static-proof
 - b. The Soldering temperature should not exceed 350°C;
 - c. Soldering time should not be longer than 3s
 - d. Soldering times should not exceed 5 times
 - e. Keep battery tab cold down before next time soldering.
 - f. Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

11. Warnings and Cautions in using the battery

To prevent the possibility of the battery from leaking, heating or explosion please observe the following precautions:

WARNINGS!

- Use the battery charger specifically for that purpose when recharging.
- Do not discard the battery in fire or a heater.
- Do not dismantle the battery
- Do not immerse the battery in water or seawater, and keep the battery in a cool dry surrounding if it stands by.
- Do not use or leave the battery near a heat source as fire or heater.
- Do not reverse the position and negative terminals.
- Do not connect the battery to an electrical outlet.
- Do not short-circuit the battery by directly connecting the positive and negative terminals with metal objects.
- Do not transport or store the battery together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample or throw the battery.
- Do not directly solder the battery and pierce the battery with a nail or other sharp objects.

CAUTIONS!

- Do not use or leave the battery at high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not use the battery in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- If the battery leaks, and the electrolyte get into the eyes, do not rub the eyes, instead, rinse the eyes with clean water, and immediately seek medical attention. Otherwise, it may injure eyes.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using it.
- In case the battery terminals are dirty, clean the terminals with a dry cloth before use. Otherwise performance may occur due to the poor connection with the instrument.
- Be aware discarded batteries may cause fire or explosion, tape the battery terminals to insulate them.