惠州亿纬锂能股份有限公司
产品规格书

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产品名称	磷酸铁锂动力电池
产品型号	LF80
产品规格	3.2V、80Ah
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规格书修订记录

日期	内容	备注
2018-1-22	新发行	A
2018-8-6	修改重量公差为 1630±100g； 公司地址、 电话变更；	B

1 Scope of application

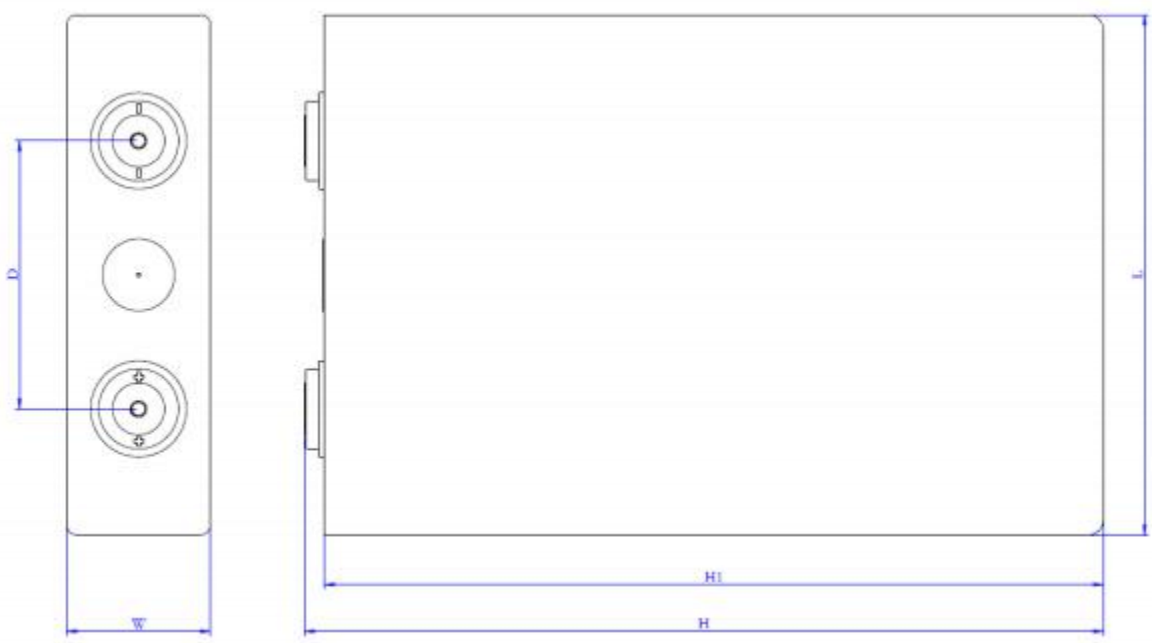
This standard describes the product types, basic performance, test methods and precautions of the square aluminum-shell lithium iron phosphate batteries produced by Huizhou Yiwei Lithium Energy Co., Ltd. This product is suitable for vehicle power systems and energy storage systems.

2 Product type

2.1 Product name: square aluminum shell lithium iron phosphate battery

2.2 Model specification: LF80

3 Nominal technical parameters



Item	Describe	Size
L	Width	130.3±0.3mm
W	Thickness (30%-40%SOC)	36.7±0.5mm
H	Height (total height)	170.5±0.5mm
H1	Height (body height)	165.5±0.5mm
D	Center distance of pole	67.0±1.0mm

The pole is a double aluminum pole structure, M4 internal thread, the pole torsion resistance is 8Nm, and the torque should be less than 8Nm when used. The effective threaded hole depth is 6mm.

4 Nominal technical parameters

No.	Item		Parameters	Remark
1	Nominal capacity		81.5Ah@ 1.0C discharge	(25±2)℃,1.0C Constant current discharge， 2.5Vcut off
2	Minimum capacity		80.0Ah@ 1.0C discharge	
3	Standard		3.2V	
4	Internal resistance		≤0.5mΩ	
5	Charging (constant voltage CC-CV)	Maximum charging current	1C	Under the condition of 0℃～45℃, the maximum charging current of the battery does not exceed 1C.
		Charging cut-off voltage	3.65V	
6	Discharge	maximum discharge current	3C	
		Discharge cut-off voltage	2.5V	
7	Charging time	Standard charging	2.0h	0.5C
		fast charging	1.0h	1.0C
8	Recommended SOC use window		SOC:10%～90%	
9	Operating temperature under charging conditions		0℃～55℃	See the appendix for details
10	Operating temperature under discharge conditions		-20℃～55℃	The battery can work normally within the specified temperature range, and the capacity loss is within the error range.
11	Storage temperature	Short-term (within 1 month)	-20℃～45℃	
		Long-term (within 1 year)	0℃～35℃	
12	Storage humidity		＜70％	
13	Battery weight		1630±100g	

5 Test Conditions

5.1 Test environment conditions

The tests in this specification should be carried out under standard atmospheric conditions.

Temperature: (25±2)°C

Relative humidity: 45%~85%

Atmospheric pressure: 86KPa~106KPa

5.2 Measuring instrument and equipment requirements

All instruments and equipment for inspection and testing (including testing equipment and instruments for monitoring and monitoring test parameters) shall be verified or qualified in accordance with the relevant national metrological verification regulations or relevant standards, and shall be within the validity period. All test instruments and equipment should have sufficient accuracy and stability, and their accuracy should be one order of magnitude higher than the accuracy of the measured index or the error should be less than one-third of the allowable error of the measured parameter.

5.3 Standard charging

Under the condition of ambient temperature (25±2) ℃, charge the battery at a constant current of 0.5C to the charge limit voltage and then charge at a constant voltage until the current is less than 0.05C.

5.4 Standard discharge

Under the condition of ambient temperature (25±2)℃, discharge the battery at a constant current of 0.5CA to a final voltage of 2.5V. If there are special requirements, the battery can be discharged at a constant current of 1.0CA to a final voltage of 2.5V.

6 Battery performance

6.1 Electrical properties

No.	Item	skills requirement	Test Methods
1	Appearance	The battery should be free from defects such as damage, leakage, or oil stains, and clearly marked.	
2	Discharge performance at room temperature	Discharge capacity/nominal capacity×100％ A） 0.33CA ≥100％ B） 0.5CA ≥98％ C） 1CA ≥97％	After the battery is standard charged, put it aside for 1h, and discharge to the lower limit voltage of 2.5V at 0.33C(A), 0.5C(A), and 1C(A) respectively. If the discharge capacity does not reach the rated capacity, this test is allowed to be repeated 3 times .
3	At different temperatures Discharge performance	Discharge capacity/nominal capacity×100％ A) 55℃≥95%（Discharge termination voltage： 2.5V） B) -20℃≥70%（Discharge termination voltage： 2.0V）	Measure the initial capacity and initial state of the battery. After standard charging, the battery is stored at a constant temperature of 55±2℃ for 3 hours, discharged at 1.0C(A) to the final voltage, and then charged at room temperature. Then put it aside for 20 hours at a constant temperature of -20±2℃, and measure the corresponding termination capacity of the battery at 0.2C(A).
4	Maintained at room temperature ability	Remaining capacity ≥ nominal capacity×95％ Recovery capacity ≥ nominal capacity ×97％	Measure the initial state and initial capacity of the battery. After the standard charge of the battery, leave it in an open circuit for 30 days and measure the final state of the battery; Discharge to 1.0C (A) to the final voltage to calculate the remaining capacity of the battery; The charge retention capacity can be expressed as the rated capacity Percentage. After this battery is standard charged, put it aside for 30 minutes, and discharge the battery to the termination voltage at a temperature of 1.0C (A) at a temperature of (25±2) ℃. Calculate the discharge capacity (in Ah). The capacity recovery capacity can be expressed as a percentage of the rated capacity.
5	Cycle life	≥2500 times	After the standard charge is finished, put it a side for 30 minutes, discharge at a constant current of 1.0C to the final voltage at (25±2) ℃, and then proceed to the next cycle until the capacity decays to 80% of the initial capacity. The number of cycles is defined as the cycle life of the battery.
6	Initial internal resistance	Under 30% SOC, measure its AC AC impedance at 1 KHz	≤0.5mΩ

6.2 Safety performance

No.	Item	skills requirement	Test Methods
1	Overcharge test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h. Then at the same temperature, charge to 5V with a current of 1C (A).
2	Over discharge test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h. Then at the same temperature, discharge to 0V at 1C (A).
3	Short circuit test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h. Then short-circuit the battery externally for 10 minutes, and the external circuit resistance should be less than 10mΩ.
4	Acupuncture test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h. Then use steel nails of φ3mm～φ8mm to penetrate quickly from the direction perpendicular to the battery plate (the steel needle stays in the battery).
5	Squeeze test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h. Then carry out the test under the following conditions: a) Squeeze direction: apply pressure perpendicular to the direction of the battery plate. b) Degree of squeezing: Until the battery case ruptures or the internal short circuit (battery voltage becomes 0V).
6	Drop test	No explosion, no fire	After the battery is standard charged, put it aside at 25±5℃ for 1h, and then fall to the wooden floor from a height of 1.5 meters. Requires two drops on each side.

7.Transportation

Batteries should be packed in boxes for transportation in a half-charged state. During transportation, they should be protected from severe vibration, impact or squeezing, and protected from sunlight and rain. They are suitable for transportation by vehicles, trains, ships, airplanes and other vehicles.

8. Storage and other matters

8.1 Long-term storage

The battery should be stored (more than 1 month) in a clean, dry and ventilated room with an ambient temperature of 0°C to 35°C. Contact with corrosive substances should be avoided, and fire and heat sources should be kept away. The battery is charged and discharged every 6 months, and the storage voltage is 3.0~3.3V (30~50% SOC).

8.2 Other Matters

Any matters not mentioned in this specification must be negotiated and determined by both parties。

9. Operating instructions and precautions when using the battery

9.1 Charging

9.1.1 recharging current

The charging current shall not exceed the maximum charging current specified in this standard. Charging with a current higher than the recommended value may cause problems with the battery's charge and discharge performance, mechanical performance and safety performance, and may cause heat generation or liquid leakage.

9.1.2 Charging voltage

The charging voltage shall not exceed the maximum upper limit voltage specified in this standard. When the battery voltage is higher than the maximum upper limit voltage value, it may cause problems in the charge and discharge performance, mechanical performance and safety performance of the battery, and may cause heat generation or liquid leakage.

9.1.3 Charging temperature

The battery must be charged at the specified current within the ambient temperature range of 0°C to 55°C.

9.1.4 Prohibit reverse charging

Correctly connect the positive and negative poles of the battery, and reverse charging is strictly prohibited. If the positive and negative poles of the battery are connected reversely, the battery will be scrapped and cause safety hazards.

9.2 Discharge

9.2.1 Discharge current

The discharge current must not exceed the maximum discharge current specified in this standard. Large current discharge will cause the battery's capacity to drop sharply and cause overheating.

9.2.2 Discharge temperature

The battery must be discharged within the ambient temperature range of -20°C~55°C.

9.2.3 Prohibit over-discharge

During the normal use of the battery, a battery management system should be installed to prevent the occurrence of battery over-discharge. If the battery is over-discharged, it will cause the battery to be scrapped and cause safety hazards.

It should be noted that during the long-term unused period of the battery, it may be in a certain over-discharged state due to its self-discharge characteristics. In order to prevent the occurrence of over-discharge, the battery should be charged regularly to maintain the voltage above 2.9V.

9.3 Notes on battery operation

9.3.1 Before using the battery, please read the instruction manual carefully and pay attention to the markings on the surface of the battery.

9.3.2 Please use the battery in a normal indoor environment, temperature: -20℃～55℃, relative humidity: 15~90%, atmospheric pressure: 86~106Kpa.

9.3.3 During use, keep away from heat and fire sources, prevent children from playing with the battery, do not hit the battery, and do not drop or shock the battery.

9.3.4 The battery can only be charged with the matching charger.

9.3.5 It is forbidden to short-circuit the battery at any time, it will cause serious damage to the battery to avoid danger.

9.3.6 When not in use for a long time, please store the battery well and keep the battery in a half-charged state, neither fully charged nor discharged.

9.3.7 Please dispose of discarded batteries safely and properly, and do not throw them into fire or water.

9.3.8 Precautions for battery box design

- The battery box should have sufficient mechanical strength to ensure that the internal battery is protected from mechanical impact
- There should be no sharp corners at the place where the battery is installed in the box
- Need to increase air convection, waterproof and dustproof measures

9.3.9 Battery connection

- Apply fine sandpaper before use, otherwise it may cause poor contact and function failure
- Use special wrenches and other tools for connection operations

10.Warnings and precautions when using the battery

In order to prevent the battery from leaking, heating, and exploding, please pay attention to the following precautions:

Warning ！

- It is strictly forbidden to immerse the battery in water. When it is not in use, it should be placed in a cool and dry environment.
- It is forbidden to use and leave the battery next to heat and high temperature sources, such as fires, heaters, etc.
- When charging, please use a special charger for lithium-ion batteries
- During use, it is strictly forbidden to reverse the positive and negative poles of the battery
- Do not throw the battery in the fire or heater
- It is forbidden to use metal to directly connect the positive and negative poles of the battery to short-circuit
- It is forbidden to transport or store the battery with metal, such as hairpins, necklaces, etc.
- It is forbidden to knock or throw, step on, or bend the battery.
- It is forbidden to weld the battery directly and pierce the battery with nails or other sharp objects

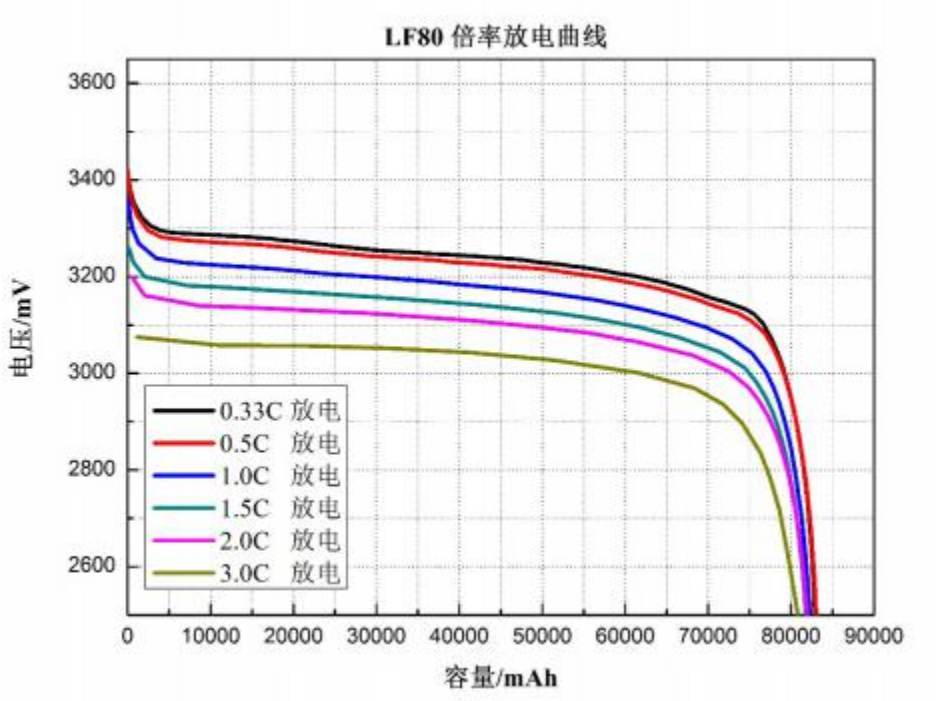
Careful!

- It is forbidden to use or place the battery under high temperature (under hot sunlight), otherwise it may cause the battery to overheat or fail to function and shorten its life.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields, otherwise it will easily damage the battery safety protection device and bring unsafe hidden dangers.
- If the battery leaks and the electrolyte enters the eyes, please do not rub it, rinse your eyes with clean water, and immediately send to a doctor for treatment, otherwise it will hurt your eyes
- If the battery emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or charging, immediately remove the battery from the device or charger and stop using it

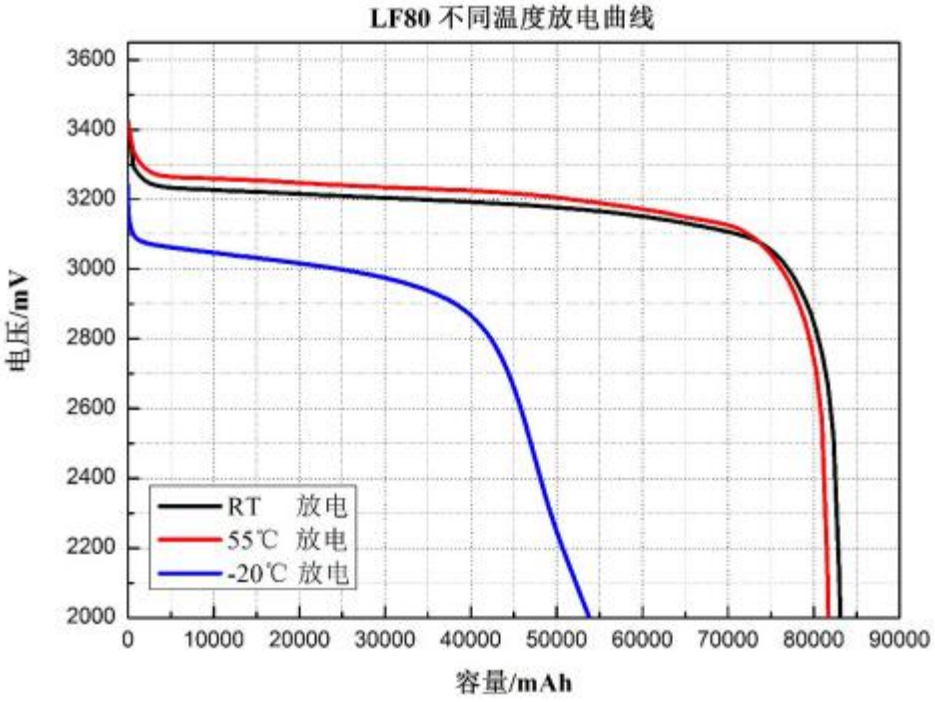
Note: The battery safety test refers to the safety requirements and test methods of GB/T 31485 power batteries for electric vehicles.

Appendix: Electrical performance curve diagram of battery products

1. Discharge curves of different rates

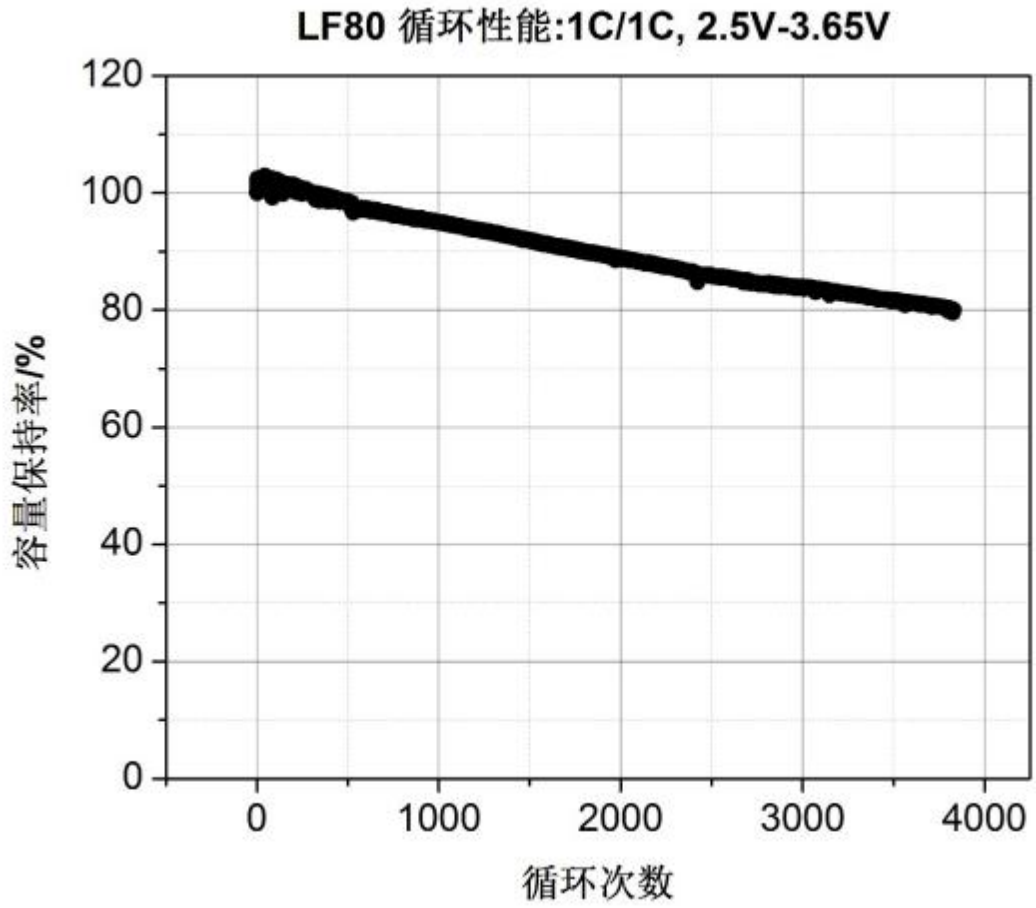


2. Discharge curves at different temperatures



Appendix: Electrical performance curve diagram of battery products

3. Cycle performance (1.0C/1.0C charge and discharge) curve



Appendix:

Table 1 Permissible continuous charging current of different temperature batteries

Tem	Standard charge	Fast charge	Pulse charge
<0℃	Charging is not allowed	Charging is not allowed	Charging is not allowed
0~10℃	0.2C constant current charging to 3.60V	Charging is not allowed	Charging is not allowed
10~45℃	0.5C constant current charging to 3.65V	Charging current 1.0C	Refer to Table 3
45~50℃	When the voltage is less than 3.60V, charge below 0.2C		
50~55℃	When voltage <3.60V, charge below 0.1C		
>55℃	Charging is not allowed		

Note: During the charging and discharging process of the above current, the temperature of the main body of the battery is not allowed to exceed 55℃.

Table 2 Continuous discharge current MAP table under different temperatures and different SOCs of the battery

SOC/%	55℃	50℃	45℃	25℃	10℃	0℃	-10℃	-20℃
100	160	160	240	240	240	80	40	40
90	160	160	240	240	240	80	40	40
80	160	160	240	240	160	80	40	40
70	240	240	240	240	160	40	40	24
60	240	240	240	240	80	40	24	24
50	160	160	240	240	80	40	24	16
40	160	160	160	160	40	24	24	16
30	80	80	80	80	40	24	16	16
20	80	80	80	80	40	24	16	0
10	40	40	40	40	24	16	0	0
0	0	0	0	0	0	0	0	0

Table 3 The transient (30S) maximum charging current Ic allowed by the battery cell under different temperature and SOC conditions

TEM SOC(%)	100	90	80	70	60	50	40	30	20	10	0
55℃	0	8	8	8	8	16	16	16	16	16	16
50℃	0	16	16	16	16	40	40	40	40	40	40
45℃	0	40	40	40	40	80	80	80	80	80	80
25℃	0	40	80	240	240	240	240	240	240	240	240
10℃	0	8	16	40	80	80	80	80	80	80	80
0℃	0	0	16	16	16	16	48	48	48	48	48

Table 4 Transient (30S) maximum discharge current Id allowed by the cell under different temperature and SOC conditions

TEM SOC（%）	100	90	80	70	60	50	40	30	20	10	0
55℃	400	400	400	320	320	240	240	160	160	80	0
25℃	400	400	400	400	320	320	240	240	160	120	0
10℃	400	400	240	240	160	160	80	80	40	40	0
0℃	160	160	160	80	80	80	40	40	40	16	0
-10℃	80	80	80	80	40	40	16	16	16	0	0
-20℃	48	48	48	48	24	24	24	8	8	0	0