

磷酸铁锂电池产品规格书

LiFePO4 battery Specification

客户名称 Customer _____

产品名称 Product 磷酸铁锂电池 (LiFePO4 Battery)

产品型号 Model 18650-1500mAh-3.2V

执行标准 Standards: GB/T18287-2013、GB31241-2014

客户确认 (Customer Confirmation)

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A0	首次发行 First Issue;	2016. 6. 10
A1	1、中英文版更改为中文版，优化页面排版; 1. Change Chinese&English version to Chinese version, optimize page layout; 2、不同放电倍率: 0.5C: 95%→96%, 1C: 90%→93% , 3C: 85%→90%; 2. Different discharging rate: 0.5C: 95%→96%, 1C: 90%→93% , 3C: 85%→90%; 3、不同温度放电性能 60℃ 95%→98%; 3. Different temperature discharging performance: 4、循环性能 0.2C 充放→0.5C 充放; 4. Cycle life 0.2C charge&discharge→0.5C charge&discharge	2020. 3. 23
A2	中文版改为中英文版;	2021. 4. 22
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目录 Catalogue

1. 适用范围 Scope	4
2. 产品型号 Model	4
3. 引用标准 Standards	4
4. 电池尺寸 Cell Dimension	4
5. 产品规格 Product Specifications	4
6. 电性能测试指标 Electrical Performance Test Index	5
7. 安全能测试指标 Safety Performance Test Index	6
8. 环境适应性能 Environmental Adaptability	8
9. 外观 Appearance	9
10. 标准测试条件 Standard Testing Conditions	9
11. 包装与运输 Packaging & Shipment	9
12. 储存 Storage	9
13. 保质期限储存 Warranty	9
14. 安全警告及操作注意事项 Safety Warnings and Operating Precautions	9

1. 适用范围 Scope

本产品规格书描述了深圳市朗泰沣电子有限公司生产的磷酸铁锂电池主要性能指标,用户请务必按照本规格书中的测试或使用方法进行使用,如果有不明的事项,请与供方协商解决。

This product specification describes Shenzhen FBTech Electronics Ltd production of LiFePO₄ rechargeable battery main performance index, please according to the methods in the specification to test and use, if unknown, please consult with the supplier .

2. 产品型号 Model

型号 Model: 18650-1500mAh-3.2V

3. 引用标准 Standards

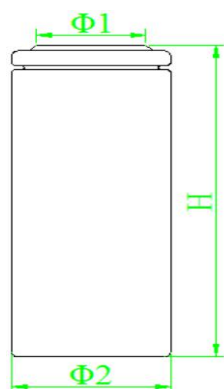
本标准参考国标 GB/T18287-2013、GB31241-2014、UL1642 、IEC62133 UN38.3 以及 CE61960 等技术标准规范编制而成。

This standard is compiled with reference to the technical standards and specifications of the national standard GB/T18287-2013, GB31241-2014, UL1642, IEC62133 UN38.3 and CE61960.

4. 电池尺寸 Cell Dimension

电芯尺寸（包含热缩膜）如下图所示（单位：mm）。

Cell Dimension (including PVC) as shown in the figure below (unit: mm)



项目 Item	尺寸 imension(mm)	公差 Tolerance(mm)
盖帽直径 Φ1 Cap Diameter φ1	10.0	+0.2 -0.2
电池直径 Φ2 Cell Diameter φ2	18.30	+0.2 -0.2
电池高度 H Cell Height H	65.2	+0.5 -0.5

5. 产品规格 Product Specification

项目 Items		规格标准 Specification	备注 Remarks
5.1	标称容量 Nominal Capacity	1500mAh	0.2C 放电
5.2	最小容量 Min. Capacity	1460mAh	
5.3	标称电压 Nominal Voltage	3.2V	
5.4	内阻 (Max, at 1000Hz.) Impedance (Max, at 1000Hz.)	≤30mΩ	
5.5	电池重量 Weight	40.5±2g	
5.6	出货电压 Shipping Voltage	3.15-3.25V	
5.7 充电 Charge	充电上限限制电压 Upper Limit Voltage	3.65±0.03V	
	充电上限限制电流 Upper Limit Current	0.01C	
	标准充电电流 Standard Current	0.2C	0℃~45℃
	快速充电电流 Rapid Current	0.5C	10℃~45℃
	最大充电电流 Max Current	1C	10℃~45℃
5.8	放 电 放电截止电压 Cut-off Voltage	2.0V	

Discharge	标准放电电流 Standard Current	0.2C	-20℃~60℃
	快速放电电流 Rapid Current	0.5C	-20℃~60℃
	最大持续放电电流 Max Continuous Current	3C	
	最大脉冲放电电流 Max. Pulse Current	5C	瞬时 ms
5.9 工作温度 Working Temperature	充电温度 Charging Temperature	0℃ ~ 45℃	电池表面温度不超过 80℃ C The battery surface temperature < 80℃
	放电温度 Discharging Temperature	-20℃ ~ 60℃	
5.10 电池贮存 温度 Storage Temperature	≤1 个月 ≤one month	-20℃ ~ 45℃	
	≤3 个月 ≤three months	-20℃ ~ 35℃	
	≤12 个月 ≤one year	-20℃ ~ 25℃	
	>12 个月 >one year	25℃	

6. 电性能测试指标 Electrical Performance Test Index

序号 No.	项目 tems	测试方法 Test Methods	标准 Standards
1	标准充电 Standard Charge	以 0.2C 恒流充电，当电池电压达到 3.65V 后，改为恒压充电，充电电流逐渐减少，直到充电电流小于或等于 0.01C，停止充电，最长充电时间设置 8 小时。Charge at 0.2C constant current. When the battery voltage reaches 3.65V, change to constant voltage charging. The charging current will gradually decrease until the charging current is less than or equal to 0.01C. Stop charging. The maximum charging time is set to 8 hours.	
2	不同倍率 放电性能 Different Rate Discharge	电池标准充电后，搁置 10min，然后以 0.2C、0.5C、1C、3C 放电至 2.0V。计算各倍率下的放电容量与 0.2C 的放电容量的比值。After standard charging of the battery, put it aside for 10 minutes, and then discharge it to 2.0V at 0.5C, 1C, 3C, and 5C. Calculate the ratio of the discharge capacity at each rate to the discharge capacity at 0.2C.	0.2C/0.2C ≥ 100% 0.5C/0.2C ≥ 96% 1C/0.2C ≥ 93% 3C/0.2C ≥ 90%
3	不同温度 放电性能 Different Temperature Discharge	电池按标准充电后，先在需要测试的对应的的试验温度中（-10℃、0℃、25℃、60℃）放置 4 个小时后按 0.2C 的电流放电至 2.0V。计算各温度下的放电容量与 25℃的放电容量的比值。After standard charging of the battery, first place it at the corresponding test temperature (-10℃, 0℃, 25℃, 60℃) to be tested for 4 hours, and then discharge it to 2.0V at a current of 0.2C. Calculate the ratio of the discharge capacity at each temperature to the discharge capacity at 25℃	不泄漏、无外观不良 No leakage, no bad appearance -10℃/25℃ ≥ 50% 0℃/25℃ ≥ 75% 25℃/25℃ ≥ 100% 60℃/25℃ ≥ 98%

序号 No.	项目 Items	测试方法 Test Methods	标准 Standards
4	循环性能 Cycle Life	在 $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的环境温度下, 将电池按照 0.5C 充放电制度循环 2000 次, 计算电池残余容量与初始容量的比值。 Cycle the battery 2000 times in accordance with the 0.5C charge and discharge system, and calculate the ratio of the battery's residual capacity to the initial capacity	2000 周循环残留容量 / 初始容量 $\geq 80\%$ 2000 cycles remaining capacity/initial capacity $\geq 80\%$
5	常温荷电保持能力 Room Temperature Capacity Retention	测量电池的初始状态和初始容量, 电池标准充电后, 开路放置 30 天, 测量电池最终状态; 以 0.2 C 放电至 2.0V, 测量电池的剩余容量; 电池再经标准充电后, 以 0.2C 放电至 2.0V, 测量电池的恢复容量; 可循环三次, 当有一次达到标准, 即达到标准要求。Measure the initial state and initial capacity of the battery. After the battery is standard charged, leave it in an open circuit for 30 days, and measure the final state of the battery; discharge to 2.0V at 0.2 C, and measure the remaining capacity of the battery; after the battery is standard charged, discharge to 2.0V at 0.2C, to measure the recovery capacity of the battery; it can be cycled three times, and once it reaches the standard, it meets the standard requirements.	1、剩余容量/初始容量 $\geq 90\%$ 2、恢复容量/初始容量 $\geq 95\%$ 1、 Remaining capacity/initial capacity $\geq 90\%$ 2、 Recovery capacity/initial capacity $\geq 95\%$

7. 安全性能 Safety Performance Test Index

序号 No.	项目 Items	测试方法 Test Methods	标准 Standards
1	过充电 Over-Charge	用 3C 恒流充电, 直到电池的电压达到 4.8V, 然后恒压充电至电流接近 0A。监测测试过程中的电池表面温度, 当电池温度降到比最高温度低 10°C 时结束测试。Charging with 3C constant current until the battery voltage reaches 4.8V, and then charging with constant voltage until the current is close to 0A. Monitor the battery surface temperature during the test, and end the test when the battery temperature drops to 10°C lower than the maximum temperature.	电池不起火、不爆炸 Don't fire and explode
2	强制放电 Forced Discharge	电池标准充电后, 以 0.2C 进行放电至 2.0V, 然后以 1C 的电流对电池进行反向充电, 要求充电时间不低于 90min。结束测试, 观察电池外观变化。After the battery is standard charged, discharge it to 2.0V at 0.2C, and then reverse charge the battery with a current of 1C. The charging time is not less than 90min. End the test and observe the change in battery appearance.	电池不爆炸、不起火 Don't fire and explode
3	热滥用 Hot Abuse	电池标准充电后, 将电池置于热箱中, 温度以 $(5^{\circ}\text{C} \pm 2^{\circ}\text{C})/\text{min}$ 的速率升至 $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 后恒温 30min; 结束测试, 观察电池外观变化。After the battery is standard charged, put the battery in a hot box, and the temperature rises to $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$ at a rate of $(5^{\circ}\text{C} \pm 2^{\circ}\text{C})/\text{min}$, and then the temperature is kept constant for 30 minutes; end the test and observe the appearance change.	不起火、不爆炸 Don't fire and explode

序号	项目 Items	测试方法 Test Methods	标准 Standards
4	外部短路 External Short Circuit	电池标准充电后，将电池接上热电偶后置于通风橱中，短路其正负极（导线电阻 $80\text{m}\Omega \pm 20\text{m}\Omega$）；试验中监视电池温度变化，当电池温度下降到比峰值低 20%，或短路时间达到 24h，即可终止测试；观察电池的温度及外观变化。After the battery is standard charged, connect the battery to the thermocouple and place it in a fume hood, short-circuit its positive and negative poles (wire resistance $80\text{m}\Omega \pm 20\text{m}\Omega$); monitor the battery temperature change during the test, when the battery temperature drops to 20% lower than the peak value, or the test can be terminated when the short-circuit time reaches 24h; observe the temperature and appearance changes of the battery.	电池不爆炸、不起火；短路过程中电池表面温度 $\leq 150^\circ\text{C}$。Don't fire and explode; The surface emperature of the battery during the short circuit $\leq 150^\circ\text{C}$.
5	跌落 Fall	电池标准充电后，搁置 1h~4h 后进行测试，将电池按 1m 的跌落高度自由跌落于混凝土板上，圆柱型电池两个端面各跌落一次，圆柱面跌落两次，共计进行四次跌落试验，方型电池每个面各跌落一次，共进行 6 次，结束测试。测试完成后电池芯放置 1h，然后目视检查。After standard charging of the battery, test it after putting it aside for 1h~4h. The battery is dropped freely on the concrete slab at a drop height of 1m. The two ends of the cylindrical battery are dropped once and the cylindrical surface is dropped twice. A total of four drop tests are carried out. The prismatic battery was dropped once on each side for a total of 6 times to end the test. After the test is completed, the battery cell is placed for 1 hour, and then visually inspected.	开路电压应不低于 90% 的初始电压，应不泄露，不起火，不爆炸。The open circuit voltage should not be lower than 90% of the initial voltage, should not leak, fire, or explode.
6	重物冲击 Heavy Impact	电池标准充电后，将电池放置于冲击台上，将直径为 $15.8\text{mm} \pm 0.2\text{mm}$ 的金属棒横置在电池几何中心上表面，采用重量为 $9.1\text{kg} \pm 0.1\text{kg}$ 的重锤自 $610\text{mm} \pm 25\text{mm}$ 的高度自由落下，冲击已固定在夹具中的电池（电池面积最大的面应与台面垂直），测试完毕观察 6h。After the battery is standard charged, place the battery on the impact table, place a metal rod with a diameter of $15.8\text{mm} \pm 0.2\text{mm}$ on the upper surface of the geometric center of the battery, and use a weight of $9.1\text{kg} \pm 0.1\text{kg}$ from $610\text{mm} \pm 25\text{mm}$. Fall freely from height, impact the battery fixed in the fixture (the surface with the largest battery area should be perpendicular to the table), and observe for 6 hours after the test.	不起火、不爆炸 Don't fire and explode
7	挤压测试 Crush Test	电池标准充电后，将电池放置在挤压设备的两个挤压平面之间，从最初接触点开始，以约 1.5cm/s 的速度持续进行挤压，逐渐增加压力至 13KN (17Mpa)，一旦获得最大压力就停止测试。圆柱形或方形电池在接受挤压时，其纵轴要平行于挤压平面，垂直于挤压方向。方形电池最大面垂直于挤压方向。After standard charging of the battery, place the battery between the two extrusion planes of the extrusion device. From the initial contact point, continue extrusion at a speed of about 1.5cm/s, and gradually increase the pressure to 13KN (17Mpa). Stop the test when the maximum pressure is obtained. When a cylindrical or square battery is squeezed, its longitudinal axis should be parallel to the extrusion plane and perpendicular to the extrusion direction. The largest surface of the square battery is perpendicular to the extrusion direction.	不起火、不爆炸 Don't fire and explode

8. 环境适应性能 Environmental Adaptability

序号	项目 Items	测试方法 Test Methods	标准 Standards
1	振动环境 Vibration Environment	电芯按标准充电结束后，将电芯用夹具安装在振动台的台面上，按下面的振动频率和对应的振幅调整好实验设备。X、Y、Z 三个方向每个方向上从 10~55Hz 循环扫频振动 30min，扫频速率为 1oct/min；振动频率：10Hz~30Hz 位移幅值(单振幅)：0.38mm；振动频率：30Hz~55Hz 位移幅值(单振幅)：0.19mm。 After the battery cell is charged according to the standard, install the battery clamp on the surface of the vibration table, and adjust the experimental equipment according to the following vibration frequency and corresponding amplitude. X, Y, Z three directions in each direction from 10 ~ 55Hz cyclic frequency sweeping vibration for 30min, the frequency sweep rate is 1oct/min: Vibration frequency: 10Hz~30Hz displacement amplitude (single amplitude): 0.38mm; Vibration frequency: 30Hz~55Hz displacement amplitude (single amplitude): 0.19mm.	开路电压应不低于 90% 的初始电压，应不泄露，不泄气、不破裂、不起火，不爆炸。The open circuit voltage should not be less than 90% of the initial voltage, and the battery should not leak, deflate, rupture, fire, or explode.
2	温度循环 Temperature cycle	电池芯在标准充电后，在环境温度 $75\pm 2^{\circ}\text{C}$ 条件下开路放置 6 小时，然后 -40°C 条件下开路放置 6 小时，温度转换时间小于 30 分钟，温度循环 10 次，最后室温条件下放置 24h，观察电池芯外观变化。After standard charging, the battery is placed in an open circuit at an ambient temperature of $75\pm 2^{\circ}\text{C}$ for 6 hours, and then placed in an open circuit at -40°C for 6 hours, the temperature conversion time is less than 30 minutes, the temperature is cycled 10 times, and finally placed at room temperature for 24 hours, Observe the appearance change of the battery cell。	不起火、不爆炸、不漏液 No fire, no explosion, no leakage
3	恒定湿热 Constant Heat and Humidity	电池标准充电后，置于温度为 $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$，相对湿度为 90~95% 的恒温恒湿箱中，搁置 48h 后，取出电池搁置 2h。观察电池外观变化。然后以 0.2C 放电至 2.0V，测量电池最终容量。After standard charging, the battery should be placed in a constant temperature and humidity box with a temperature of $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and a relative humidity of 90-95%. After being left for 48 hours, the battery should be taken out and left for 2 hours. Observe the change in battery appearance. Then discharge to 2.0V at 0.2C and measure the final battery capacity.	电池外观无明显变形、无锈蚀、不泄露、不泄气、不破裂、不起火、不爆炸；放电时间 ≥ 3 小时；The appearance of the battery has no obvious deformation, no corrosion, no leakage, no deflation, no rupture, no fire and no explosion; discharge time ≥ 3 hours;
4	低气压 Low Pressure	电池标准充电后，将电池搁置在真空箱中，真空箱密闭后，逐渐减少起内部压力至不高于 11.6kpa，并保持 6h，结束测试。After the battery is standard charged, put the battery in a vacuum box. After the vacuum box is sealed, gradually reduce the internal pressure to no higher than 11.6kpa, and keep it for 6 hours to end the test.	电池应不泄露、不泄气、不破裂、不起火，不爆炸。The battery should not leak, deflate, rupture, fire, or explode.

9. 外观 Appearance

电池外观不允许有影响电池商业价值的缺陷，如漏液、生锈、严重划伤变形、开裂等。

The appearance of the battery is not allowed to have defects that affect the commercial value of the battery, such as leakage, rust, severe scratches, deformation, cracking, etc.

10. 标准测试条件 Standard Testing Conditions

10.1 测试的电池是出厂时间不超过 3 个月的新电池且电池未进行过五次以上充放电循环。

10.2 除非其它特殊要求，本产品规格书规定的测试条件为：温度 15~35℃，相对湿度≤75%。

10.1 The battery tested is a new battery with a delivery time of no more than 3 months, and the battery has not undergone more than five charge-discharge cycles.

10.2 Unless other special requirements, the test conditions specified in this product specification are: temperature 15~35℃, relative humidity ≤75%.

11. 包装与运输 Packaging & Shipment

11.1 电池的包装应干燥防潮、防尘、防震；朗泰沣公司建议在运输时，使用朗泰沣公司运输时同样的包装，即使打开了包装，当再运输时，仍使用本公司同样的部件和材料进行再包装。

11.2 电池应在半荷电状态包装成箱进行运输，在运输过程中，防止剧烈振动、冲击、挤压，防止暴晒、雨淋，应使用汽车、火车、轮船、飞机等交通工具运输。

11.1 The packaging of the battery should be dry, moisture-proof, dust-proof and shock-proof; FBTech recommends that using the same packaging during transportation. Even if the package is opened, still repackaging it use the same components and materials when re-transporting.

11.2 Batteries should be packed in cartons for transportation in a half-charged state. During transportation, avoid severe vibration, impact, squeezing, and prevent exposure to sunlight and rain. Vehicles, trains, ships, airplanes, etc. should be used for transportation.

12. 储存 Storage

电池应贮存在环境温度范围为-20℃~+35℃，相对湿度在 25~75%的清洁、干燥、通风的室内，应避免与腐蚀性物质接触，应远离火源及热源。

如果长时间存放，超过三个月时，应对电池进行一次完全充放电循环，再将电池充电约 3.3V 电池的条件下贮存。最长时间储存 6 个月必须充电，否则会影响电池性能。

12.1 The battery should be stored in a clean, dry and ventilated room with an ambient temperature range of -20℃ ~ +35℃ and a relative humidity of 25 ~ 75%. Avoid contact with corrosive substances, and keep away from fire and heat sources.

12.2 If stored for a long time, more than three months, the battery should be fully charged and discharged once, and then the battery should be stored under the condition of about 3.3V. It must be charged when stored for up to 6 months, otherwise it will affect the battery performance.

13. 保质期限 Warranty

电池的保质期从出货之日算起为 1 年，若电池在此期间内出现异常情况，但必须是由于明显的制造工艺方面的问题，且在电池没有被异常使用的情况下，本公司负责退换电池。

The warranty of the battery is 1 year from the date of shipment. If the battery is abnormal during this period, it must be due to obvious manufacturing process problems and the battery is not used abnormally We will replace the battery.

13. 14. 安全警告及操作注意事项 Safety Warnings and Operating Precautions

为了防止电池出现泄漏、发热、着火、性能降低或寿命下降、爆炸等事故，请按如下操作规定正常使用电池，并遵守防范事项。

In order to prevent the battery from leaking, heating, catching fire, performance degradation or lifespan, explosion and other accidents, please use the battery normally according to the following operating regulations and observe the precautions.

- 严禁将电池浸入海水或水中，保存不用时应放置于阴凉干燥的环境中。
- 严禁将电池在高温下使用或放置，如火、加热器等，否则可能会引起电池过热、起火或功能失效、寿命减短。
- 严禁颠倒正负极使用电池。
- 严禁将电池正负端直接插入电源插座。
- 严禁短路电池，它会导致电池严重损坏。
- 严禁将电池与金属，如发夹、项链等一起运输或贮存。
- 严禁敲击、抛掷、踩踏、坠落、冲击电池等。
- 严禁直接焊接电池和用钉子或其它利器刺穿电池。
- 严禁在强静电和强磁场的地方使用，否则易破坏电池安全保护装置，带来不安全的隐患。
- 严禁拆解或使用变形电池，拆解电池会使内部短路，进而引起内部物质分解，起火爆炸等；拆解电池会使电池内部电解液外露，如电解液进入眼睛，请不要揉擦用清水冲洗眼睛，并立即送医治疗，否则会伤害眼睛。
- 电池必须在规格书规定的电压电流温度下充放电，电池放电电流不能超过规格书规定的最大放电电流，过大的电流放电会造成电池发热和容量衰减。电池不能过放电短时间的过充过放不影响电池的使用，但是长时间的过放电会影响到电池的功能失效，电池永久性不能适用。
- 充电时请选用锂离子电池专用充电装置。
- 如果电池发出异味、发热、变色、变形或使用、贮存、充电过程中出现任何异常，立即停止充电或停止使用，并将其从装置中移出或隔离。
- 如果电极弄脏，使用前应用干布抹净，否则可能会导致接触不良功能失效。
- 废弃的电池应用绝缘纸包住电极，送至专业的废品回收站回收。

- It is strictly forbidden to immerse the battery in sea water or water, and place it in a cool and dry environment when it is not in use.
- It is strictly forbidden to use or place the battery under high temperature, such as fire, heater, etc. Otherwise, it may cause the battery to overheat, catch fire or function failure, and shorten the life.
- It is strictly prohibited to use the battery upside down.
- It is strictly forbidden to directly plug the positive and negative ends of the battery into a power outlet.
- It is strictly prohibited to short-circuit the battery, it will cause serious damage to the battery.
- It is strictly forbidden to transport or store the battery together with metal, such as hairpins and necklaces.
- It is strictly prohibited to knock, throw, step on, drop, or impact the battery.
- It is strictly forbidden to weld the battery directly and pierce the battery with nails or other sharp objects.
- It is strictly 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 hidden dangers of insecurity.
- It is strictly forbidden to disassemble or use deformed batteries. Disassembling the battery will cause internal short-circuit, which will cause internal decomposition, fire and explosion, etc.; disassembling the battery will expose the internal electrolyte of the battery. If the electrolyte enters your eyes, please do not rub it with water, and send to a doctor for treatment immediately, otherwise it will hurt your eyes.
- The battery must be charged and discharged under the voltage, current and temperature specified in the specification. The discharge current of the battery cannot exceed the maximum discharge current specified in the specification. Excessive current discharge will cause the battery to heat up and capacity decline. Short-term over-charge and over-discharge will not affect the use of the battery, but long-term over-discharge will affect the function of the battery, and the battery cannot be used permanently.

- Please use a special charging device for lithium-ion batteries when charging.
- If the battery emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or charging, immediately stop charging or stop using it, and remove it from the device or isolate it.
- If the electrode is dirty, wipe it with a dry cloth before use, otherwise it may cause poor contact and function failure.
- Use insulating paper to wrap the electrodes of the discarded batteries and send them to a professional recycling station for recycling.