



# Rechargeable LiFePO<sub>4</sub> Battery specification

可充磷酸锂铁电池规格

**Model/型号：48V 100Ah**

Manufacturer approved 制造商批准：

| Prepared by编制 | Checked审核 | Approve批准 |
|---------------|-----------|-----------|
|               |           |           |

Customer 客户名称：

| Customer Approval<br>客户认准 | Checked审核 | Approve批准 |
|---------------------------|-----------|-----------|
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## 1. 适用范围 Scope

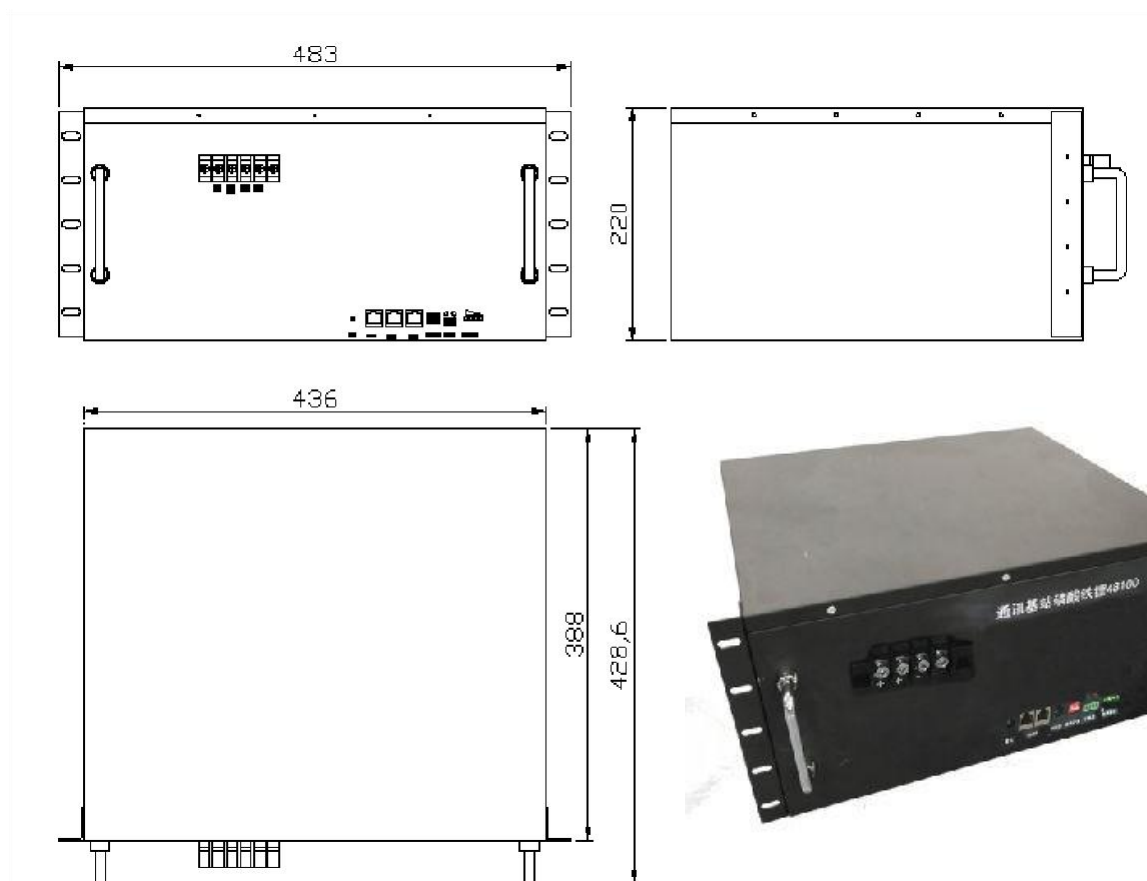
本产品规格书描述了 48V100Ah 磷酸铁锂电池的外形尺寸、产品性能指标、技术要求及使用注意事项。产品主要应用于通信后备电源和储能系统。

This product specification describes the type and size , performance , technical requirements and safety issue of the 48V100Ah phosphate lithium rechargeable battery. The product applies to telecommunication back up power and storage system.

## 2. 产品设计 Product Design

2.1 电池规格 Battery specification: 48V100AH

2.2 电池尺寸 Battery dimension: L\*W\*H=436\*388\*220mm



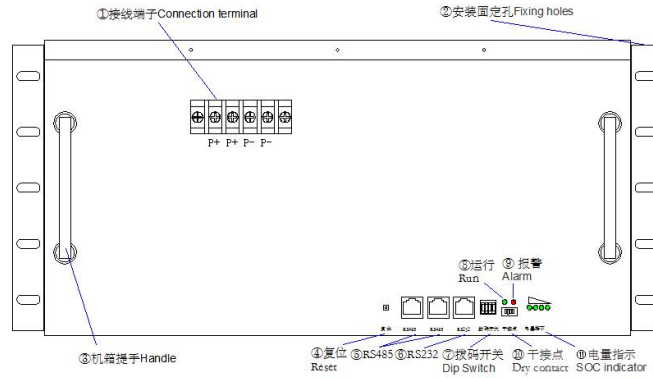


### 3. 电池组规格 Battery Pack Specification

| 序号<br>NO. | 项目<br>Item                    | 规格<br>Specification                         | 备注<br>Remarks   |
|-----------|-------------------------------|---|---|
| 3.1       | 标称容量<br>Nominal Capacity      | 100Ah                                       | 在 25±2℃的环境中以 0.33C 电流放电至 43.2V<br>25±3℃,0.33C constant current<br>discharge,43.2V cut off                                   |
| 3.2       | 标称电压<br>Nominal Voltage       | 51.2V                                       |   |
| 3.3       | 充电<br>Charge                  | 最大充电电压<br>Max. Charge Voltage               | 57.6V   |
|           |                               | 标准充电电流<br>Standard Charge Current           | 20A   |
|           |                               | 最大充电电流<br>Max. Charge Current               | 50A<br>When used in parallel, it is necessary to turn on the<br>current limit function, and the charging<br>current is 20A. |
| 3.4       | 放电<br>Discharge               | 放电最低电压<br>Min. Discharge Voltage            | 43.2V   |
|           |                               | 标准放电电流<br>Standard Discharge Current        | 20A   |
|           |                               | 最大放电电流<br>Max. Discharge Current            | 100A  |
|           |                               | 最大瞬间放电电流<br>Max. Pulse Discharge<br>Current | 120A<br>25°C±3°C,≤1S  |
| 3.5       | 充电温度<br>Charge Temperature    | 0°C~45°C                                    |   |
| 3.6       | 放电温度<br>Discharge Temperature | -20°C~60°C                                  |   |
| 3.7       | 储存温度<br>Storage Temperature   | -20°C~45°C<br>-20°C~35°C<br>-20°C~25°C      | Within 1 month<br>Within 3 months<br>Within 1 year  |
| 3.8       | 储存湿度<br>Storage Humidity      | ≤75% R.H                                    |   |
| 3.9       | 电池内阻<br>Battery Impedance     | ≤200mΩ                                      | AC Impedance  |
| 3.10      | 重量<br>Weight                  | Approx.45 Kg                                |   |
| 3.11      | 出货状态<br>As of shipment        | ≥51.2V                                      | Battery Voltage   |

## 4. 功能说明 Function Introduction

### 4.1 控制面板介绍 Control panel introduction



### 4.2 控制面板说明 Control panel interface description

| 序号<br>NO. | 项目<br>Item                  | 功能描述<br>Function description   | 备注<br>Remark  |
|-----------|-----------------------------|--|---|
| ①         | 接线端子<br>Connection terminal | 用于电池对外输出<br>For battery external output  |   |
| ②         | 安装固定孔<br>Fixing holes       | 系统模块安装时固定电池组<br>Fixed battery pack when the system module is installed                         | 推荐安装在 19 英寸机架上<br>The recommendation is installed on a 19" machine                        |
| ③         | 机箱提手<br>Handle              | 便于搬运、挪动和安装<br>Easy to move, move and install   |   |
| ④         | 复位<br>Reset                 | 应急系统复位，确保系统的可维护性<br>Reposition of emergency system to ensure the maintainability of the system |   |
| ⑤         | RS485                       | 系统 RS485 通信接口<br>System RS485 communication interface  |   |
| ⑥         | RS232                       | 系统 RS232 通信接口<br>System RS4232 communication interface   |   |
| ⑦         | 拨码开关<br>DIP Switch          | 系统扩展时的地址分配<br>Address allocation for system extension  |   |
| ⑧         | 运行<br>Run                   | 正常运行时 LED 指示（绿灯）<br>Normal running LED instructions (green light)                              | 系统运行时常亮<br>When the system runs, it is always bright                                      |
| ⑨         | 报警<br>Alarm                 | 系统异常时报警指示<br>Alarm when the system is abnormal   |   |
| ⑩         | 干接点<br>Dry contact          | 是一种无源开关，具有闭合和断开的两种状态<br>It is a passive switch with two states of closure and disconnection.   |   |
| ⑪         | 电量指示<br>SOC indicator       | 电池容量估算显示<br>Estimation of battery capacity   | 4 只绿灯表示 4 个阶段的电池容量<br>Four green lights represent the battery capacity of the four stages |



## 5. 电池组性能 Battery Pack Performance

### 5.1 电气性能 Electrical performance

| 序号<br>NO. | 项目<br>Item  | 标准<br>Standard   | 测试方法<br>Test Methods   |
|-----------|---|--|--|
| 1         | 标准充电<br>Standard charge                                 | 恒流---恒压<br>CC--CV  | 在25℃±2℃环境中，以0.2C <sub>3A</sub> 恒流充电至57.6V，然后恒压57.6V充电至电流≤0.05C <sub>3A</sub><br>In an ambient temperature of 25℃±2℃, at a constant current of 0.2C <sub>3A</sub> charge to 57.6V, then constant voltage 57.6V, cut off when charging current ≤0.05 C <sub>3A</sub> .   |
| 2         | 单体电池性能一致性<br>Single cell performance consistency        | <p>a) 电池组内各单体电池间最大静态开路电压偏差≤0.05V;<br/>b) 电池组内各单体电池间最大静态内阻差≤2mΩ;<br/>c) 电池组内各电池模块容量最大最小值与平均值的差异≤1%</p> <p>a) The maximum static open circuit voltage deviation between each cell in the battery pack is ≤0.05V;<br/>b) The maximum static internal resistance difference between the individual cells in the battery pack is ≤2mΩ;<br/>c) The difference between the maximum and minimum capacity of each battery module in the battery pack is ≤1%</p> | <p>a) 蓄电池组以标准方式充满电后，搁置0.5~1H，测量电池组内各单体电池的电压；<br/>b) 测量电池组内各单体电池的内阻；<br/>c) 蓄电池组以标准充电方式充满电后，搁置0.5~1H，断开电池串连，单体电池模组按0.1C<sub>3A</sub>放电至2.7V/只，记录各单体电池模组容量，重复充放电3次。</p> <p>a) After the battery pack is fully charged in the standard way, rest 0.5~1H and measure the voltage of each single cell in the battery pack;<br/>b) measuring the internal resistance of each cell in the battery pack;<br/>c) After the battery pack is fully charged in the standard charging mode, rest 0.5~1H, disconnect the battery, and discharge the single battery module to 2.7V/only according to 0.1C<sub>3A</sub>, and record the capacity of each single battery module. Repeat the charge and discharge 3 times.</p> |
| 3         | 0.33C <sub>3A</sub> 放电<br>0.33C <sub>3A</sub> discharge | 放电容量≥100%额定容量<br>≥100% of rated capacity   | <p>电池组以标准充电方式充满电后，静置0.5~1H，以0.33C<sub>3A</sub>电流放电至43.2V。<br/>After the battery pack is fully charged in the standard charging mode, rest for 0.5~1H and discharged to 43.2V with a current of 0.33C<sub>3A</sub>.</p>   |
| 4         | 1.0C <sub>3A</sub> 放电<br>1.0C <sub>3A</sub> discharge   | 放电容量≥95%额定容量<br>≥95% of rated capacity   | <p>电池组以标准充电方式充满电后，静置0.5~1H，以1.0C<sub>3A</sub>电流放电至43.2V。<br/>After the battery pack is fully charged in the standard charging mode, rest for 0.5~1H and discharged to 43.2V with a current of 1.0C<sub>3A</sub>.</p>   |
| 5         | -10℃ 放电<br>-10℃ discharge                               | 放电容量≥60%额定容量<br>≥60% of rated capacity   | <p>电池组以标准充电方式充满电后，放入-10℃±2℃的低温箱中静置6H后，以0.1C<sub>3A</sub>电流放电至43.2V。</p>  |



|   |                                |  |  |
|---|--------------------------------|--|--|
|   |                                |  | <p>实验结束后，将其取出在环境温度 <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的条件下静置 12H，目测其外观，蓄电池组外观无变形、无爆裂。</p> <p>After the battery pack is fully charged in the standard charging mode, it is placed in a low temperature box at <math>-10^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 6H, and then discharged to 43.2V with a current of 0.1C3A. After the end of the experiment, it was taken out and allowed to stand at an ambient temperature of <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 12H, and its appearance was visually observed. The appearance of the battery pack was free from deformation and cracking.</p>   |
| 6 | 40°C放电<br>40°C discharge       | 放电容量 $\geq 95\%$ 额定容量<br>$\geq 95\%$ of rated capacity | <p>电池组以标准充电方式充满电后，放入 <math>40^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的高温箱中静置 4H 后，以 0.33C<sub>3</sub>A 电流放电至 43.2V。实验结束后，将其取出在环境温度 <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的条件下静置 12H，目测其外观，蓄电池组外观无变形、无爆裂。</p> <p>After the battery pack is fully charged in the standard charging mode, it is placed in a high temperature chamber at <math>40^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 4H, and then discharged to 43.2V at a current of 0.33C<sub>3</sub>A. After the end of the experiment, it was taken out and allowed to stand at an ambient temperature of <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 12H, and its appearance was visually observed. The appearance of the battery pack was free from deformation and cracking.</p>    |
| 7 | 55°C放电<br>55°C discharge       | 放电容量 $\geq 90\%$ 额定容量<br>$\geq 90\%$ of rated capacity | <p>电池组以标准充电方式充满电后，放入 <math>55^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的高温箱中静置 4H 后，以 0.33C<sub>3</sub>A 电流放电至 43.2V。实验结束后，将其取出在环境温度 <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的条件下静置 12H，目测其外观，蓄电池组外观无变形、无爆裂。</p> <p>After the battery pack is fully charged in the standard charging mode, it is placed in a high temperature chamber of <math>55^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 4H, and then discharged to 43.2V with a current of 0.33 C<sub>3</sub>A. After the end of the experiment, it was taken out and allowed to stand at an ambient temperature of <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> for 12H, and its appearance was visually observed. The appearance of the battery pack was free from deformation and cracking.</p> |
| 8 | 容量保存率<br>Save Rate<br>Capacity | 剩余容量 $\geq 95\%$ 额定容量<br>$\geq 95\%$ of rated capacity | <p>电池按标准充电方式充满电后，在 <math>25^{\circ}\text{C}\pm 2^{\circ}\text{C}</math> 的环境下条件下开路静置 28 天，以 0.33C<sub>3</sub>A 的电流放电至 43.2V。</p> <p>After the battery is fully charged according to the</p>   |



|   |                    |                    |   |
|---|--------------------|--------------------|---|
|   |                    |                    | standard charging method, it is left open for 28 days under the environmental condition of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , and discharged to 43.2 V with a current of 0.33 C <sub>3</sub> A.   |
| 9 | 循环寿命<br>Cycle Life | $\geq 5000$ cycles | 在 $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 的环境条件下, 蓄电池组以标准充电方式充满电后, 静置 0.5~1H 后, 以 0.33C <sub>3</sub> A 电流放电至 80%DOD, 然后进行下一个循环。<br>After finish the standard charging, ay aside for 0.5~1H,in $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 0.33C <sub>3</sub> A constant current discharge to 80%DOD,then go for next cycle. |

## 5.2 BMS 保护功能 BMS Protection Function

| 序号<br>NO. | 项目<br>Item                        | 描述<br>Description                                   | 参数 (可设置)<br>Parameter(settable) | 单位<br>Unit | 备注<br>Remark |
|-----------|-----------------------------------|---|---------------------------------|------------|--------------|
| 1         | 过充报警<br>Over charge alarm         | 单体过充报警电压<br>Cell over charge alarm voltage          | 3.55±0.02                       | V          |              |
|           |                                   | 总体过充报警电压<br>Battery overcharge alarm voltage        | 58.4±0.5                        | V          |              |
| 2         | 过充保护<br>Over charge protection    | 单体过充电保护电压<br>Cell over charge protection            | 3.65±0.02                       | V          |              |
|           |                                   | 单体过充电检测延迟时间<br>Cell over charge protection delay    | 200                             | ms         |              |
|           |                                   | 单体过充电解除电压<br>Cell over charge recovery voltage      | 3.45±0.02                       | V          |              |
|           |                                   | 总体过充电检测电压<br>Battery over charge recovery voltage   | 58.4±0.5                        | V          |              |
|           |                                   | 总体过充电检测延迟时间<br>Battery over charge protection delay | 5000                            | ms         |              |
| 3         | 过放报警<br>Over charge alarm         | 单体过放电报警电压<br>Cell over discharge alarm voltage      | 2.7±0.02                        | V          |              |
|           |                                   | 总体过放报警电压<br>Battery over discharge alarm voltage    | 43.5±0.5                        | V          |              |
| 4         | 过放保护<br>Over discharge protection | 单体过放电保护电压<br>Cell over discharge protection         | 2.5±0.02                        | V          |              |
|           |                                   | 单体过放电检测延迟时间<br>Cell over discharge protection delay | 5000                            | ms         |              |
|           |                                   | 单体过放解除电压<br>Battery over discharge recovery voltage | 3.1±0.02                        | V          |              |





|   |                                  |   |   |    |   |
|---|----------------------------------|---|---|----|---|
|   |                                  | Cell over discharge recovery voltage                        |   |    |   |
|   |                                  | 总体过放电检测电压<br>Battery over discharge recovery voltage        | 40.0±0.5  | V  |   |
|   |                                  | 总体过放电检测延迟时间<br>Battery over discharge protection delay      | 5000  | ms |   |
|   |                                  | 总体过放解除电压<br>Battery over discharge recovery voltage         | 46.5±0.5  | V  |   |
| 5 | 过流报警<br>Over current alarm       | 充电过流报警电流<br>Charge over current alarm                       | 110±0.5   | A  |   |
|   |                                  | 放电过流报警电流<br>Discharge over current alarm                    | 120±0.5   | A  |   |
| 6 | 过流保护<br>Over-current protection  | 放电过电流保护 1<br>Discharge over current protection 1            | 110±0.5   | A  | 连续出现保护状态 3 次，将自动锁定，需手动复位保护板解除保护<br>Continuous protection state 3 times, will automatically lock, need to manually reset the protective plate to release protection. |
|   |                                  | 放电过电流检测延迟时间 1<br>Discharge over current protection delay 1  | 1   | s  |   |
|   |                                  | 放电过电流保护 2<br>Discharge over current protection 2            | 120±0.5   | A  |   |
|   |                                  | 放电过电流检测延迟时间 2<br>Discharge over current protection delay 2  | 250   | ms |   |
|   |                                  | 放电过流保护解除条件<br>Release conditions for discharge over current | Automatic release after 1 minutes                 |    |   |
|   |                                  | 充电过电流保护<br>Charge over current protection                   | 110±0.5   | A  |   |
|   |                                  | 充电过电流检测延迟时间<br>Charge over current protection delay         | 1   | s  |   |
|   |                                  | 充电过流保护解除条件<br>Release conditions for charge over current    | Automatic release after 1 minutes                 |    |   |
| 7 | 短路保护<br>Short circuit protection | 保护电流<br>Protection current                                  | ≥300  | A  |   |
|   |                                  | 检测延迟时间<br>Detection delay time                              | ≤1  | ms |   |
|   |                                  | 短路保护解除<br>Short circuit protection release                  | 有充电或负载移除后 After the charge or the load is removed |    |   |

|    |                                |   |       |    |  |
|----|--------------------------------|---|-------|----|--|
| 8  | 温度保护<br>Temperature protection | 充电高温保护<br>Charge high temperature protection      | 65    | °C |  |
|    |                                | 充电高温恢复条件<br>Charge high temperature recovery      | 60    | °C |  |
|    |                                | 充电低温保护<br>Charge low temperature protection       | -15   | °C |  |
|    |                                | 充电低温恢复条件<br>Charge low temperature protection     | -5°C  | °C |  |
|    |                                | 放电高温保护条件<br>Discharge high temperature protection | 65    | °C |  |
|    |                                | 放电高温恢复条件<br>Discharge high temperature recovery   | 60    | °C |  |
|    |                                | 放电低温保护条件<br>Discharge low temperature protection  | -25°C | °C |  |
|    |                                | 放电低温恢复条件<br>Discharge low temperature recovery    | -5°C  | °C |  |
| 9  | 均衡<br>Balance                  | 开启电压<br>Open voltage                              | 3.40  | V  |  |
|    |                                | 开启压差<br>Open voltage difference                   | 50    | mV |  |
|    |                                | 电流<br>Current                                     | 80    | mA |  |
| 10 | 通讯<br>Communication            | RS485&RS232                                       | yes   |    |  |
| 11 | 消耗电流<br>Consumption of current | 工作消耗电流<br>Working consumption current             | ≤50   | mA |  |
|    |                                | 休眠模式消耗电流<br>Dormancy mode consumption of current  | ≤200  | μA |  |

### 5.3 安全性能 Safety Performance

| 序号<br>NO. | 项目<br>Item      | 标准<br>Standard                    | 测试方法<br>Test Methods                                   |
|-----------|-----------------|-----------------------------------|--|
| 1         | 抗重物冲击<br>Impact | 应不起火、不爆炸<br>No fire, no explosion | 电池组放在冲击台上并固定在夹具中（电池组最大面应与台面平行），将 10Kg 重锤自 1.0m 高度自由落下， |



|   |                                       |   |   |
|---|---------------------------------------|---|---|
|   |                                       |   | <p>电池组允许发生变形。</p> <p>The battery pack is placed on the shock table and fixed in the fixture (the maximum surface of the battery group should be parallel to the table), and the 10Kg weight is free from the height of 1.0m, and the battery pack is allowed to deform.</p>   |
| 2 | <p>抗热冲击<br/>Thermal abuse</p>         | <p>应不起火、不爆炸<br/>No fire, no explosion</p> | <p>电池组放置于高温箱中，调节高温箱温度以（5℃±2℃）/min 上升至 130℃±2℃，保持 30min。</p> <p>The cell is placed in a gravity or circulating air-convection oven。 The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130°C ± 2°C。 The cell remains at this temperature for 30 min before the test is discontinued。</p>  |
| 3 | <p>抗过充电<br/>Over charge</p>           | <p>应不起火、不爆炸<br/>No fire, no explosion</p> | <p>电池组拆除保护单元线路后，电池模块放置于通风橱中，将恒流恒压源电压设置为 2 倍电池组标称电压，以 2C<sub>3</sub>（A）电流给电池组充电，实验过程中用具有连续记录功能的点温度计检测电池组温度变化，当电池温度达到稳态或降至环境温度时实验结束。</p> <p>After the battery pack dismantling the protection unit line, the cell module is placed in the ventilator, and the constant current voltage source voltage is set to 2 times the nominal voltage of the battery pack, and the battery pack is charged with 2C<sub>3</sub> (A) current. In the experiment, the temperature change of the battery group is detected by a point thermometer with continuous recording function, when the battery temperature reaches steady state or decrease. The experiment ends when the environment is temperature.</p> |
| 4 | <p>抗过放电<br/>Over discharge</p>        | <p>应不起火、不爆炸<br/>No fire, no explosion</p> | <p>电池组拆除保护单元线路后，电池模块放置于通风橱中，将电池组用 0.2C<sub>3</sub>（A）电流放电至某一电池电压达到 0V 时实验结束。</p> <p>After the battery pack dismantling the protection unit line, the battery module is placed in the ventilator, and the battery pack is discharged with the 0.2C<sub>3</sub>(A) current to the end of the test when the voltage of a battery is up to 0V.</p>  |
| 5 | <p>抗短路<br/>External short-circuit</p> | <p>应不起火、不爆炸<br/>No fire, no explosion</p> | <p>电池组拆除保护单元线路后，电池模块放置于通风橱中，将电池组正负极用 0.1Ω电阻器短路，实验过程中用具有连续记录功能的点温度计检测电池组温度变化，当电池温度下降到低于峰值 10℃时实验结束。</p> <p>After the battery pack dismantled the protection unit line, the battery module was placed in the ventilator,</p>  |



|    |                                  |   |  |
|----|----------------------------------|---|--|
|    |                                  |   | and the positive and negative electrode of the battery pack was short circuited by the 0.1Ω resistor. In the experiment, the temperature change of the battery pack was detected by a point thermometer with continuous recording function. The experiment ended when the temperature of the battery dropped below the peak of 10°C.   |
| 6  | 高温储存<br>High temperature storage | 应不漏液、不冒烟、不起火或不爆炸<br>No leakage, no smoke, no fire, no explosion   | 电池按标准充电方式充满电后，将其放入 85°C±2°C 的高温箱中保持 48H。<br>Each fully charged battery is paced in the high-temperature cabinet for 48H.   |
| 7  | 抗加热<br>Heating                   | 爆炸电池没有任何部分穿透网屏，没有部分或全部电池突出网屏<br>No part of the explosion battery penetrated the screen, and no part or all of the batteries highlighted the screen. | 电池组按标准充电方式充满电后，将其放在金属网上，盖住平面桌中间的孔，然后进行加热直至电池组爆炸或被摧毁。<br>After the battery pack is charged by the standard charge mode, the battery is placed on the metal net, covering the hole in the middle of the flat table, and then heating until the battery pack exploded or destroyed.   |
| 8  | 抗穿刺<br>Puncture                  | 应不起火、不爆炸<br>No fire, no explosion   | 电池组拆除保护单元线路后，电池模块按标准充电方式充满电后，将直径 3mm 的钢针沿径向刺穿电池组中的任何电池。<br>After the battery pack dismantles the protection unit line, the battery module is charged by the standard charging mode, and the steel needle of the diameter 3mm is pierced through any battery in the battery pack.   |
| 9  | 抗挤压<br>Crushing                  | 应不起火、不爆炸<br>No fire, no explosion   | 电池组拆除保护单元线路后，电池按标准充电方式充满电后，电池两个最大面积的表面之间进行压缩，压缩力通过一个直径为 32mm 的液压活塞施加，压缩持续进行至压力达到 17.2MPa，施加的压力为 13kN，当达到最大压力泄压。<br>After the battery pack dismantling the protection unit line, the battery is compressed by the standard charging mode. The two maximum surfaces of the battery are compressed. The compression force is exerted through a hydraulic piston with a diameter of 32mm. The compression is continued until the pressure is 17.2MPa, and the pressure is 13kN, when the maximum pressure is discharged. |
| 10 | 抗低压<br>Low pressure              | 应不漏液、不冒烟、不起火或不爆炸<br>No leakage, no smoke, no fire, no explosion   | 电池放置于真空箱室，抽真空至 11.6KPa 或更低，在 25°C±2°C 的环境温度下保持 6H。<br>The battery is placed in the vacuum chamber, vacuumed to 11.6KPa or lower, maintaining 6H at   |



|    |                             |  |  |
|----|-----------------------------|--|--|
|    |                             |  | ambient temperature of 25°C±2°C.   |
| 11 | 恒定湿热<br>Steady damp-heat    | 其外观应无明显变形、锈蚀、冒烟或爆炸，其容量应不低于额定值的 90%<br>Its appearance should not be obviously deformed, corroded, smoked or exploded, its capacity should be no less than 90% of the rated value. | 电池组按标准方式充满电后，将其放入 60°C±2°C、相对湿度为 90%~95% 的恒温恒湿箱中静置 12H 后，再将其取出在环境温度 25°C±2°C 的条件下静置 2H，目测其外观，再以 0.1C <sub>3</sub> (A) 电流放电至终止电压。<br>After the battery pack is full of electricity in the standard way, the battery is placed in the constant temperature and constant humidity box of 90%~95% at 60°C±2°C and relative humidity for 12H. Then it is removed at the ambient temperature of 25 and 2 C, and then statically is set to 2H, visual appearance, and then discharge to the termination voltage with 0.1C <sub>3</sub> (A) current. |
| 12 | 抗振动<br>Vibration            | 其外观应无明显损伤、不漏液、不冒烟或不爆炸，并能正常工作<br>The appearance of the battery should have no obvious damage, no leakage, no smoke or no explosion, and can work normally.                        | 电池组按标准方式充满电后，进行 X、Y、Z 三个方向的振动试验。从 10Hz~55Hz 循环扫频振动 90min~100min,扫频速率为 1oct/min, 位移幅值（单振幅）为 0.8mm。<br>The battery pack will be tested in three directions of X, Y and Z after the battery pack is filled with electricity in standard way. From the 10Hz~55Hz cycle, the frequency sweep is 90min~100min, the sweep frequency is 1oct/min,and the displacement amplitude (single amplitude) is 0.8mm.   |
| 13 | 抗碰撞<br>Mechanical shock     | 其外观应无明显损伤、不漏液、不冒烟或不爆炸，并能正常工作<br>The appearance of the battery should have no obvious damage, no leakage, no smoke or no explosion, and can work normally.                        | 电池组按标准方式充满电后，承受 X、Y、Z 三个方向的碰撞实验。初始 3ms 内平均加速度应不小于 75g，峰值加速度在 125g~175g 之间，碰撞次数为 1000±10 次。<br>The battery pack is filled with electricity in standard way, and it bears three directions of X, Y and Z collision test. The average acceleration in the initial 3MS should not be less than 75g, the peak acceleration is between 125g~175g, and the number of collisions is 1000 + 10 times.   |
| 14 | 温度循环<br>Temperature cycling | 其外观应无破裂，无质量损失，容量不低于初始容量状态的 70%<br>The appearance of the battery should be free from breakage, loss of mass, and capacity of no less than 70% of the initial capacity.            | 电池组按标准方式充满电后，将其放入 70°C±2°C 的高温箱中保持 12H，然后放入 -40°C±2°C 的低温箱中保持 12H，重复 9 次，最后在 25°C±2°C 的环境中静置 24H。<br>After the battery pack is fully charged in the standard way, put it in a high temperature chamber at 70 °C ± 2 °C for 12H, then put it in a low temperature chamber at -40 °C ± 2 °C for 12H, repeat 9 times, and finally maintains 24H in the environment of 25°C±2°C.   |
| 15 | 绝缘电阻                        | 电池组正负极接口分别对电池组金  | 用绝缘电阻测试仪直流 500V 的测试电压，对被测电   |



|    |                             |   |   |
|----|-----------------------------|---|---|
|    | Insulation resistance       | 属外壳的绝缘电阻不小于 2MΩ<br>The positive and negative interface of the battery pack has no more than 2M ohm resistance to the metal shell of the battery pack. | 池组正负极端子对电池金属外壳进行测试。<br>The positive and negative terminals of the tested battery pack are tested with the test voltage of DC 500V of the insulation resistance tester.  |
| 16 | 抗电强度<br>Dielectric strength | 应无击穿, 无飞弧现象<br>No breakdown , no arc phenomenon   | 用耐压测试仪50Hz、有效值500V 的交流电压或710V 的直流电压, 对电池组正负极端子对金属外壳进行测试。<br>Using the voltage tester 50Hz, the AC voltage of the effective value 500V or the DC voltage of 710V, the positive and negative terminals of the battery pack are tested on the metal shell. |

## 6. 包装 Package

标志的图形、尺寸、颜色应符合GB/T 191—2000 的要求  
The sketch, sizes, color of marking should match GB/T191-2000 requests.

- 6.1 产品的名称和型号及规格 Model and specification of product.
- 6.2 数量 Quantity.
- 6.3 合格品标识 Measure up marking.
- 6.4 制造日期 Manufacturing date.
- 6.5 其他标识, 如颜色 Other markings (color.etc).

## 7. 外观检查 Visual inspection

不允许有任何影响电池性能的外观缺陷, 诸如裂纹、裂缝、泄漏等。  
scratch, flaw, crack, and leakage are not allowed

## 8. 标准测试环境 Standard test conditions

标准测试环境,除非特别说明, 本标准书中所有测试均在以下环境条件下进行: 温度: 25±2℃  
湿度: 60±15%RH

大气压: 86kpa-106kpa

Unless otherwise specified, all tests should be conducted within one month of delivery under the following conditions:

Temperature: 25±2℃

Humidity: 60±15%RH Barometric:86kpa-106kpa

## 9. 使用警告 CAUTIONS IN USE

为了使电池安全的使用及处理请在使用前认真的阅读操作说明。

Please read the manual carefully before using it to ensure properly use.

9.1 不能把电池曝晒或丢在火中。

Do not make the battery exposure or thrown into fire.

9.2 电池充电时不能把正负极性装反。

Never reverse charge the battery.



9.3 避免短路电池。

Never short circuit the battery.

9.4 避免过分的物理震动和冲击电池。

Avoid excessive physical shock or vibration.

9.5 不能拆解或使电池变形。

Do not disassemble or deform the battery.

9.6 不能将电池浸入水中。

Never allow the battery to get wet or be immersed in water.

9.7 不能将其它不同厂家、类型、型号的电池混合使用。

Do not use different types together.

9.8 禁止小孩接触电池。

Keep away from children

9.9 电池必须在合适的条件下充电。

Charge at the appropriate conditions.

9.10 决不能用故障的充电器给电池充电。

Never use the faulty charger to charging.

9.11 电池持续充电不能超过24hours。

Never keep charging more than 24 hours.

## 10. 贮存 Storage

10.1 电池贮藏在通风干燥的环境中。

Store the battery in cool, dry and well-ventilated conditions.

10.2 电池应单独放置于专门的空间，与其他货物隔离开了。

Store the battery in a individual room, separate from the other carriage.

10.3 不同国家法规的不同，处理时根据当地的法规。

Regulations vary for different countries. Dispose of in accordance with local regulations.

10.4 电池贮存在规格书规定的温度范围内，如果电池贮存超过六个月，建议你给电池充电。

Please store the battery in the adequate temperature as mentioned in specifications and recharge if keep in storage more than 6 months.

## 11. 电池操作说明 Battery operating instruction

### 11.1 充电 Charge

充电电流：不能超过规格书规定的最大的充电电流。

Charge current: Never out of the max charge current as mentioned in specification.

充电电压：不能超过规格书规定的最高的限制电压。

Charge voltage: Never out of the max charge voltage as mentioned in specification.

充电温度：电池充电温度必须按照规格书的温度范围执行。

Charge temperature: Please refer to the temperature range as specification.

先恒流后恒压方式充电，禁止颠倒的方式充电。如果电池正负极颠倒充电会带来危险。



Charge as constant current before constant voltage, Never reverse charge the battery.

#### 11.2 放电电流 Discharge current

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。

The discharge current is not allowed to out of max current as specification. Otherwise, the battery will be over heat and capacity fading.

#### 11.3 放电温度 Discharge temperature

电池放电温度必须按照规格书的温度范围执行。

Please refer to the temperature range as specification.

#### 11.4 过放电 Over-discharge

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，电池可能过放还有一个原因是自动能量的消失。预防电池过放的出现方法是电池应保持一定的电量。

It's workable if over charge and discharge for a short while but not allow to do it for a long time . over discharge may result in self-energy disappear . Please keep a certain electric quantity to prevent over discharge.

### 12. 保质期 Warranty period

电池的保质期从出货之日算起为 12 个月。如果证明电池的缺陷是在制造过程中形成的而不是由于 用户滥用及错误使用造成，本公司负责退换电池。

Quality assurance for one year against manufacturing defects, but. we are not responsible for the damage caused by inadequate and improper use. The information ( subject to change without prior notice ) contained in this document is for reference only and should not be used as a basis for product guarantee or warranty. For applications other than those described here, please contact our office. Manufacturer reserves the right to alter, amend the design, model and specification without prior notice.

### 13. 其它化学反应 Other Chemical Reaction

由于电池是利用化学反应的原理，所以即使是存放很长一段时间而不使用也会随时间的增加而降低性能。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，也会缩短电池的使用寿命，或者产生漏液，导致电池损坏。如果电池使用指定的方法也不能充电，则需要更换电池。

The battery performance will reduce if over time using or unused for a long time due to it's a reaction of chemical. In addition, the battery life will be shorten or injury or damage itself from electrolyte leakage, heating ignition or explosion for improper handling. It's necessary to replace battery if unable to charge even with proper way.

### 14. 备注 Note:

本说明书未包括事项应由双方协议确定。

Any other items which are not covered in this specification shall be agreed by both parties.