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CNAS L13261

Report No.: KS2205S2109B01

# UN38.3 Test Report

**Samples Name** LiFePO4 Battery

样品名称 磷酸铁锂电池

**Model**

型号

JK48V100PRO

**Applicant**

委托单位

Zhuhai OTE Electronic Technology Co., Ltd.

珠海市欧特电子科技有限公司



广东科正技术服务有限公司

KSIGN(Guangdong) Testing Co., Ltd.

## General Information 基本资料

|   |  |                                    |                                      |
|---|--|------------------------------------|--------------------------------------|
| <b>Sample Name</b><br>样品名称                      | LiFePO4 Battery<br>磷酸铁锂电池  | <b>Model Name</b><br>型号            | JK48V100PRO                          |
| <b>Rating</b><br>标称                             | 51.2Vd.c., 100Ah   | <b>Watt-hour</b><br>瓦时             | 5120Wh                               |
| <b>Dimension</b><br>尺寸(T*W*L)                   | Max.: 177.0*460.0*442.0 (mm)   | <b>Weight</b><br>重量                | Appr.: 48.5kg                        |
| <b>Sample Status</b><br>样品状态                    | Good<br>良好   | <b>Sample Information</b><br>样品信息  | Battery (16S1P)<br>电池 (16串1并)        |
| <b>Applicant</b><br>申请商                         | Zhuhai OTE Electronic Technology Co., Ltd.<br>珠海市欧特电子科技有限公司  |                                    |                                      |
| <b>Applicant Address</b><br>申请商地址               | 5Th FL, #201, Futaihuayuan, #2068 Mingzhunan Rd, Qianshan, Zhuhai,<br>Guangdong, China (Mainland)<br>珠海市前山明珠南路 2068 号福泰花园 5 栋 201 房  |                                    |                                      |
| <b>Manufacturer</b><br>制造商                      | Zhuhai OTE Electronic Technology Co., Ltd.<br>珠海市欧特电子科技有限公司  |                                    |                                      |
| <b>Manufacturer Address</b><br>制造商地址            | 5Th FL, #201, Futaihuayuan, #2068 Mingzhunan Rd, Qianshan, Zhuhai,<br>Guangdong, China (Mainland)<br>珠海市前山明珠南路 2068 号福泰花园 5 栋 201 房  |                                    |                                      |
| <b>Manufacturer Telephone</b><br>制造商电话          | +86-756 8598852  | <b>Manufacturer Email</b><br>制造商邮箱 | info@opsolarbattery.com              |
| <b>Manufacturer Web</b><br>制造商网址                | www.opsolarbattery.com   |                                    |                                      |
| <b>Test Method &amp; Criterion</b><br>检验方法及判定标准 | UNITED NATION "Recommendations on the TRANSPORT OF DANGEROUS<br>GOODS, Manual of Test and Criteria" ST/SG/AC.10/11/Rev.7, Section 38.3<br>联合国《关于危险品货物运输的建议书试验和标准手册》第七修订版, 第 38.3 节   |                                    |                                      |
| <b>Testing Laboratory</b><br>检测单位               | KSIGN(Guangdong) Testing Co., Ltd.<br>广东科正技术服务有限公司<br>West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park,<br>Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China<br>广东省深圳市宝安区沙井街道沙头社区民主九九工业区福源厂新厂房A区C栋一层西<br>侧, 518104   |                                    |                                      |
| <b>Sample Receiving Date</b><br>收样接收日期          | 2022 年 05 月 16 日   | <b>Test Date</b><br>测试日期           | 2022 年 05 月 16 日 to 2022 年 06 月 07 日 |
| <b>Conclusion</b><br>测试结论                       | The samples has passed the test items of UNITED NATION "Recommendations on<br>the TRANSPORT OF DANGEROUS GOODS, Manual of Test and Criteria"<br>ST/SG/AC.10/11/Rev.7, Section 38.3.受检样品通过联合国《关于危险品货物运输的建<br>议书试验和标准手册》第七修订版, 第 38.3 节各项检测, 检测结果合格。<br><br><b>Seal/签章:</b><br><b>Date of issue/签发日期:</b> 2022 年 08 月 23 日 |                                    |                                      |

**Tested By:**  
主检  
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批准  
Technical Director

杨龙

## Test Summary Lists

### 测试摘要列表

| Test No.<br>测试编号 | Test Item<br>测试项目   | Test Results<br>测试结果   | Conclusion<br>本项结论 |
|------------------|---|------------------------|--------------------|
| T1               | Altitude simulation / 高空模拟  | See Appendix 1<br>见附表1 | Passed<br>合格       |
| T2               | Thermal test / 耐热测试   | See Appendix 2<br>见附表2 | Passed<br>合格       |
| T3               | Vibration / 振动测试  | See Appendix 3<br>见附表3 | Passed<br>合格       |
| T4               | Shock / 冲击测试  | See Appendix 4<br>见附表4 | Passed<br>合格       |
| T5               | External short circuit / 外部短路   | See Appendix 5<br>见附表5 | Passed<br>合格       |
| T6               | Impact / 撞击   | N/A<br>不适用             | N/A<br>不适用         |
|                  | Crush / 挤压  | See Appendix 6<br>见附表6 | Passed<br>合格       |
| T7               | Overcharge / 过度充电   | See Appendix 7<br>见附表7 | Passed<br>合格       |
| T8               | Forced discharge / 强制放电测试   | See Appendix 8<br>见附表8 | Passed<br>合格       |
| Remark<br>备注     | 1) Impact test applicable to cylindrical cells not less than 18.0mm in diameter.<br>撞击试验适用于直径不小于 18.0mm 的圆柱形电芯。<br>2) Crush test applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0mm in diameter.<br>挤压试验适用于棱柱形、袋状、硬币/纽扣电芯和直径不超过 18.0mm 的圆柱形电芯。<br>3) Batteries or single cell batteries not equipped with battery overcharge protection that are redesigned for use only as a component in another battery or in equipment, which affords such protection, are not applicable to overcharge test.<br>未安装过度充电保护装置、按设计要求只能作为部件用在另一个带过度充电保护装置的电池组或设备中的电池组或单一电池组，无需满足过充试验的要求。 |                        |                    |

| Test Item<br>测试项目 | Sample No.<br>样品编号 | Sample State<br>样品状态  |
|-------------------|--------------------|---|
| T1~T5             | B01~B02            | At first cycle, in fully charged states<br>第1个充放电周期，完全充电状态                  |
|                   | B03~B04            | After 25 cycles ending in fully charged states<br>第25个充放电周期，完全充电状态          |
| T6                | C01~C05            | At first cycle at 50% of the design rated capacity<br>第1个充放电周期 50%设计额定容量状态  |
|                   | C06~C10            | After 25 cycle at 50% of the design rated capacity<br>第25个充放电周期 50%设计额定容量状态 |
| T7                | B05~B06            | At first cycle, in fully charged states<br>第1个充放电周期，完全充电状态                  |
|                   | B07~B08            | After 25 cycles ending in fully charged states<br>第25个充放电周期，完全充电状态          |
| T8                | C11~C20            | At first cycle in fully discharged states<br>第1个充放电周期，完全放电状态                |
|                   | C21~C30            | After 25 cycles ending in fully discharged states<br>第25个充放电周期，完全放电状态       |

The above samples have been charged and discharged cycles by the factory as required before the test.

备注：以上样品在测试前已由工厂按要求进行充放电循环处理。

### Appendix 1 附表 1

| Test Items<br>测试项目   | Altitude simulation<br>高空模拟  |                     |                   |                     |                       |                          |                     |
|--|--|---------------------|-------------------|---------------------|-----------------------|--------------------------|---------------------|
| 1.1  | Test procedure<br>测试步骤   |                     |                   |                     |                       |                          |                     |
|  | <p>Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hour at ambient temperature (20±5°C).</p> <p>Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.</p> <p>试验电芯和电池在环境温度(20±5°C)下, 储存在小于等于11.6kPa的压力下至少六小时。</p> <p>试验电芯或电池应无重量损失、无渗漏、无排气、无解体、无破裂和无燃烧, 并且每个试验电芯或电池在试验后的开路电压不少于其在进行这一试验前电压的 90% (完全放电状态的试验电芯或电池除外)。</p> |                     |                   |                     |                       |                          |                     |
| 1.2  | Result<br>测试结果   |                     |                   |                     |                       |                          |                     |
| Sample No.<br>样品编号   | Before 测试前   |                     | After 测试后         |                     | Mass loss<br>质量损失 (%) | Residual OCV<br>剩余电压 (%) | Test result<br>测试结果 |
|  | Mass<br>样品质量 (Kg)  | Voltage<br>开路电压 (V) | Mass<br>样品质量 (Kg) | Voltage<br>开路电压 (V) |                       |                          |                     |
| B01  | 48.50  | 56.37               | 48.50             | 56.36               | 0.00                  | 99.98                    | O                   |
| B02  | 48.43  | 56.35               | 48.43             | 56.34               | 0.00                  | 99.98                    | O                   |
| B03  | 47.98  | 56.37               | 47.98             | 56.35               | 0.00                  | 99.96                    | O                   |
| B04  | 48.35  | 56.36               | 48.35             | 56.36               | 0.00                  | 100.00                   | O                   |
| <p>Note: L- Leakage, V- Venting, D- Disassembly, R- Rupture, F- Fire,<br/>O- No leakage, no venting, no disassembly, no rupture, no fire, no mass loss, change ratio is not less than 90 %.</p> <p>注: L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火;<br/>O- 无泄漏、无排气、无解体、无破裂、无起火、无质量损失、电压比不小于 90 %。</p> |  |                     |                   |                     |                       |                          |                     |

## Appendix 2 附表 2

| Test Items<br>测试项目   | Thermal test<br>温度试验   |                     |                   |                     |                       |                          |                     |
|--|--|---------------------|-------------------|---------------------|-----------------------|--------------------------|---------------------|
| 2.1  | Test procedure<br>测试步骤   |                     |                   |                     |                       |                          |                     |
|  | <p>Test cells and batteries are to be stored for at least six hours at a test temperature equal to <math>72 \pm 2^\circ\text{C}</math>, followed by storage for at least six hours at a test temperature equal to <math>-40 \pm 2^\circ\text{C}</math>. The maximum time interval between test temperature extremes in 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (<math>20 \pm 5^\circ\text{C}</math>). For large cells and batteries, the duration of exposure to the test temperature extremes should be at least 12 hours.</p> <p>Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.</p> <p>将电芯和电池在温度为<math>72 \pm 2^\circ\text{C}</math>的条件下贮存不少于6个小时，然后，在温度<math>-40 \pm 2^\circ\text{C}</math>条件下贮存不少于6个小时，两个温度间的间隔最长为30min，重复操作上述步骤直到10次，然后，将其在环境温度温度为<math>20 \pm 5^\circ\text{C}</math>的条件下放置24个小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为12小时。</p> <p>试验电芯或电池应无重量损失、无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电芯或电池在试验后的开路电压不少于其在进行这一试验前电压的90%（完全放电状态的试验电池或电池除外）。</p> |                     |                   |                     |                       |                          |                     |
| 2.2  | Result<br>测试结果   |                     |                   |                     |                       |                          |                     |
| Sample No.<br>样品编号   | Before 测试前   |                     | After 测试后         |                     | Mass loss<br>质量损失 (%) | Residual OCV<br>剩余电压 (%) | Test result<br>测试结果 |
|  | Mass<br>样品质量 (Kg)  | Voltage<br>开路电压 (V) | Mass<br>样品质量 (Kg) | Voltage<br>开路电压 (V) |                       |                          |                     |
| B01  | 48.50  | 56.36               | 48.50             | 56.01               | 0.00                  | 99.38                    | O                   |
| B02  | 48.43  | 56.34               | 48.43             | 56.00               | 0.00                  | 99.40                    | O                   |
| B03  | 47.98  | 56.35               | 47.98             | 55.99               | 0.00                  | 99.36                    | O                   |
| B04  | 48.35  | 56.36               | 48.35             | 55.98               | 0.00                  | 99.33                    | O                   |
| <p>Note: L- Leakage, V- Venting, D- Disassembly, R- Rupture, F- Fire,<br/>O- No leakage, no venting, no disassembly, no rupture, no fire, no mass loss, change ratio is not less than 90 %.</p> <p>注: L- 泄漏; V- 排气; D- 解体; R- 破裂; F- 起火;<br/>O- 无泄漏、无排气、无解体、无破裂、无起火、无质量损失、电压比不小于 90 %。</p> |  |                     |                   |                     |                       |                          |                     |

## Appendix 3

## 附表 3

| Test Items<br>测试项目 | Vibration<br>振动  |                        |                      |                        |                          |                                |                     |
|--------------------|--|------------------------|----------------------|------------------------|--------------------------|--------------------------------|---------------------|
| 3.1                | Test procedure<br>测试步骤   |                        |                      |                        |                          |                                |                     |
|                    | <p>Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal wave form with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15minutes, this cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. One of the directions of vibration must be perpendicular to the terminal face.</p> <p>The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12kg (cells and small batteries), and for batteries with a gross mass of more than 12kg (large batteries).</p> <p>For cells and small batteries: from 7Hz a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 8gn occurs (approximately 50Hz). A peak acceleration of 8gn is then maintained until the frequency is increased to 200Hz.</p> <p>For large batteries: from 7Hz to a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 2gn occurs (approximately 25Hz). A peak acceleration of 2gn is then maintained until the frequency is increased to 200Hz.</p> <p>Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.</p> <p>将电芯和电池牢固地安装在振动台的台面上，然后开始振动。振动以正弦波形式，以 7Hz 增加至 200Hz，然后再减少回到 7Hz 为一个循环，一个循环持续 15 分钟的对数扫频。每个电芯和电池从三个互相垂直的方向上循环 12 次，每个方向共计 3 个小时。其中一个振动方向必须是垂直样品的极性平面。</p> <p>对于质量不大于 12kg 的样品(电芯和小电池)和质量超过 12kg 的电池(大电池)，对数扫频不同。</p> <p>对于电芯和小电池，对数扫频为：从 7Hz 开始保持 1gn 的最大加速度直到频率为 18Hz，然后将振幅保持在 0.8mm (总偏移 1.6mm) 并增加频率直到最大加速度达到 8gn (频率约为 50Hz)，将最大加速度保持在 8gn 直到频率增加到 200Hz。</p> <p>对于大电池，对数扫频为：从 7Hz 开始保持 1gn 的最大加速度直到频率为 18Hz，然后将振幅保持在 0.8mm (总偏移 1.6mm) 并增加频率直到最大加速度达到 2gn (频率约为 25Hz)，将最大加速度保持在 2gn 直到频率增加到 200Hz。</p> <p>试验电芯或电池应无重量损失、无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电芯或电池在试验后的开路电压不少于其在进行这一试验前电压的 90% (完全放电状态的试验电芯或电池除外)。</p> |                        |                      |                        |                          |                                |                     |
| 3.2                | Result<br>测试结果   |                        |                      |                        |                          |                                |                     |
| Sample No.<br>样品编号 | Before 测试前   |                        | After 测试后            |                        | Mass loss<br>质量损失<br>(%) | Residual<br>OCV<br>剩余电压<br>(%) | Test result<br>测试结果 |
|                    | Mass<br>样品质量<br>(Kg)   | Voltage<br>开路电压<br>(V) | Mass<br>样品质量<br>(Kg) | Voltage<br>开路电压<br>(V) |                          |                                |                     |

|     |       |       |       |       |      |        |   |
|-----|-------|-------|-------|-------|------|--------|---|
| B01 | 48.50 | 56.01 | 48.50 | 56.00 | 0.00 | 99.98  | O |
| B02 | 48.43 | 56.00 | 48.43 | 55.98 | 0.00 | 99.96  | O |
| B03 | 47.98 | 55.99 | 47.98 | 55.99 | 0.00 | 100.00 | O |
| B04 | 48.35 | 55.98 | 48.35 | 55.97 | 0.00 | 99.98  | O |

Note: **L-** Leakage, **V-** Venting, **D-** Disassembly, **R-** Rupture, **F-** Fire,  
**O-** No leakage, no venting, no disassembly, no rupture, no fire, no mass loss, change ratio is not less than 90 %.

注: **L-** 泄漏; **V-** 排气; **D-** 解体; **R-** 破裂; **F-** 起火;

**O-** 无泄漏、无排气、无解体、无破裂、无起火、无质量损失、电压比不小于 90 %。

#### Appendix 4 附表 4

| Test Items<br>测试项目 | Shock<br>冲击  |                |                           |                |                 |   |      |                 |   |       |
|--------------------|--|----------------|---------------------------|----------------|-----------------|---|------|-----------------|---|-------|
| 4.1                | Test procedure<br>测试步骤   |                |                           |                |                 |   |      |                 |   |       |
|                    | <p>Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150gn and pulse duration of 6milliseconds. Alternatively, large cells may besubjected to a half-sine shock of peak acceleration of 50gn and pulse duration of 11 milliseconds. Each battery shall be subjected to a half-sine shock of peak acceleration depending on themass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.</p> <p>将试验电芯和电池用坚硬的支架固定在试验装置上，支架支撑着每个试验电池的所有安装面;电芯经受峰值加速度 150gn 和脉冲持续时间 6ms 的半正弦波冲击;大电芯需经受峰值加速度 50gn 和脉冲持续时间 11ms 的半正弦波冲击;每个电池需经受半正弦波冲击的峰值加速度取决于电池的质量。小型电池的脉冲持续时间为 6ms，大型电池为 11ms。以下提供的公式用来计算适合的最小峰值加速度。</p> <table border="1" data-bbox="512 1389 1337 1800"> <thead> <tr> <th>Battery</th> <th>Minimum peak acceleration</th> <th>Pulse duration</th> </tr> </thead> <tbody> <tr> <td>Small batteries</td> <td>150 gn or result of formula<br/> <math display="block">\text{Acceleration(gn)} = \sqrt{\frac{100850}{\text{mass}^*}}</math>                     whichever is smaller                 </td> <td>6 ms</td> </tr> <tr> <td>Large batteries</td> <td>50 gn or result of formula<br/> <math display="block">\text{Acceleration(gn)} = \sqrt{\frac{30000}{\text{mass}^*}}</math>                     whichever is smaller                 </td> <td>11 ms</td> </tr> </tbody> </table> <p>Note: <b>**</b> Mass is expressed in kilograms</p> <p>Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.</p> | Battery        | Minimum peak acceleration | Pulse duration | Small batteries | 150 gn or result of formula<br>$\text{Acceleration(gn)} = \sqrt{\frac{100850}{\text{mass}^*}}$ whichever is smaller | 6 ms | Large batteries | 50 gn or result of formula<br>$\text{Acceleration(gn)} = \sqrt{\frac{30000}{\text{mass}^*}}$ whichever is smaller | 11 ms |
| Battery            | Minimum peak acceleration  | Pulse duration |                           |                |                 |   |      |                 |   |       |
| Small batteries    | 150 gn or result of formula<br>$\text{Acceleration(gn)} = \sqrt{\frac{100850}{\text{mass}^*}}$ whichever is smaller  | 6 ms           |                           |                |                 |   |      |                 |   |       |
| Large batteries    | 50 gn or result of formula<br>$\text{Acceleration(gn)} = \sqrt{\frac{30000}{\text{mass}^*}}$ whichever is smaller  | 11 ms          |                           |                |                 |   |      |                 |   |       |

|  | <p>Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states. (NOTE: Mass is express in kilograms)</p> <p>每个电芯或电池须在三个互相垂直的电芯安装方位的正方向经受三次冲击，接着反方向经受三次冲击，总共经受 18 次冲击。</p> <p>各试验电芯或电池应无重量损失、无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电芯或电池在试验后的开路电压不少于其在进行这一试验前电压的 90%（完全放电状态的试验电芯或电池除外）。</p> |                        |                      |                        |                          |                                |                     |
|--|--|------------------------|----------------------|------------------------|--------------------------|--------------------------------|---------------------|
| 4.2  | Result<br>测试结果   |                        |                      |                        |                          |                                |                     |
| Sample No.<br>样品编号   | Before 测试前   |                        | After 测试后            |                        | Mass loss<br>质量损失<br>(%) | Residual<br>OCV<br>剩余电压<br>(%) | Test result<br>测试结果 |
|  | Mass<br>样品质量<br>(Kg)   | Voltage<br>开路电压<br>(V) | Mass<br>样品质量<br>(Kg) | Voltage<br>开路电压<br>(V) |                          |                                |                     |
| B01  | 48.50  | 56.00                  | 48.50                | 55.98                  | 0.00                     | 99.96                          | O                   |
| B02  | 48.43  | 55.98                  | 48.43                | 55.98                  | 0.00                     | 100.00                         | O                   |
| B03  | 47.98  | 55.99                  | 47.98                | 55.97                  | 0.00                     | 99.96                          | O                   |
| B04  | 48.35  | 55.97                  | 48.35                | 55.97                  | 0.00                     | 100.00                         | O                   |
| <p>Note: <b>L</b>- Leakage, <b>V</b>- Venting, <b>D</b>- Disassembly, <b>R</b>- Rupture, <b>F</b>- Fire,<br/> <b>O</b>- No leakage, no venting, no disassembly, no rupture, no fire, no mass loss, change ratio is not less than 90 %.</p> <p>注: <b>L</b>- 泄漏; <b>V</b>- 排气; <b>D</b>- 解体; <b>R</b>- 破裂; <b>F</b>- 起火;<br/> <b>O</b>- 无泄漏、无排气、无解体、无破裂、无起火、无质量损失、电压比不小于 90 %。</p> |  |                        |                      |                        |                          |                                |                     |



### Appendix 5 附表 5

| Test Items<br>测试项目   | External short circuit<br>外部短路  |                     |
|--|---|---------------------|
| 5.1  | Test procedure<br>测试步骤  |                     |
|  | <p>The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of <math>57 \pm 4</math> °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at <math>57 \pm 4</math> °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.</p> <p>This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to <math>57 \pm 4</math> °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.</p> <p>The short circuit and cooling down phases shall be conducted at least at ambient temperature. Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.</p> <p>用于测试的电芯或电池外壳温度达到恒温<math>57 \pm 4</math> °C后, 再进行外部短路。短路的时间取决于电芯或电池的尺寸和设计, 并需被评估和记录。如果这个评估无法进行, 那么小电芯和小电池短路时间至少6小时, 大电芯和大电池短路时间至少12小时。然后电芯或电池在<math>57 \pm 4</math> °C环境下经受一个阻值小于<math>0.1\Omega</math>的外部电路短路。</p> <p>电芯或电池温度到<math>57 \pm 4</math> °C之后, 短路时间需持续1小时, 大型电池短路温度下降到最大温升的一半并保持。短路和降温阶段至少应在环境温度下进行。电芯或电池的外壳温度应不超过 170 °C, 并且试验后6h 内应无解体、无破裂和无燃烧。</p> |                     |
| 5.2  | Result<br>测试结果  |                     |
| Sample No.<br>样品编号   | Max. External Temperature<br>样品表面最高温度(°C)   | Test result<br>测试结果 |
| B01  | 58.4  | O                   |
| B02  | 58.6  | O                   |
| B03  | 58.1  | O                   |
| B04  | 58.2  | O                   |
| <p>Note: <b>D</b>- Disassembly, <b>R</b>- Rupture, <b>F</b>- Fire, <b>O</b>- No disassembly, no rupture, no fire, test sample external temperature does not exceed 170 °C.<br/>注: <b>D</b>- 解体; <b>R</b>- 破裂; <b>F</b>- 起火; <b>O</b>- 无解体、无破裂、无起火, 测试样品表面温度不超过 170 °C。</p> |   |                     |

### Appendix 6 附表 6

| Test Items<br>测试项目  | <input type="checkbox"/> Impact 撞击<br><input checked="" type="checkbox"/> Crush 挤压   |                     |
|---|--|---------------------|
| 6.1   | <b>Test procedure</b><br>测试步骤  |                     |
|   | <p>A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.</p> <p>(a) The applied force reaches 13kN ± 0.78kN;<br/>           (b) The voltage of the cell drops by at least 100mV; or<br/>           (c) The cell is deformed by 50% or more of its original thickness.</p> <p>Once the maximum pressure has been obtained, the voltage drops by 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.</p> <p>Cells and component cells meet this requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire during the test and within six hours after this test.</p> <p>将试验电芯或元件电芯放在两个平面之间挤压。挤压在第一个接触点以约 1.5cm/s 的速度慢慢进行，直到下面三个选项之一达到为止：</p> <p>(a) 挤压力达到 13kN±0.78kN；<br/>           (b) 电芯电压降至少达到 100mV；<br/>           (c) 电池厚度和最初比较变形至少 50%。</p> <p>一旦达到最大压力，电压降超过 100mV 或者电芯变形超过 50%，压力应该解除。</p> <p>试验电芯或电池的组成电芯外部温度不超过 170°C，并且在试验过程中和试验后 6 小时内应无解体、无破裂、无起火。</p> |                     |
| 6.2   | <b>Result</b><br>测试结果  |                     |
| Sample No.<br>样品编号  | Max. External Temperature<br>样品表面最高温度(°C)  | Test result<br>测试结果 |
| C01   | 24.8   | O                   |
| C02   | 24.5   | O                   |
| C03   | 24.2   | O                   |
| C04   | 24.1   | O                   |
| C05   | 23.9   | O                   |
| C06   | 24.3   | O                   |
| C07   | 24.7   | O                   |
| C08   | 24.5   | O                   |
| C09   | 24.2   | O                   |
| C10   | 24.4   | O                   |
| Note: <b>D</b> - Disassembly, <b>F</b> - Fire, <b>O</b> - No disassembly, no fire, test sample external temperature does not exceed 170 °C.<br>注: <b>D</b> - 解体; <b>F</b> - 起火; <b>O</b> - 无解体、无起火, 测试样品表面温度不超过 170 °C。 |  |                     |

### Appendix 7 附表 7

|  |  |  |
|--|--|--|
| Test Items<br>测试项目   | Overcharge<br>过度充电   |  |
| 7.1  | Test procedure<br>测试步骤   |  |
|  | <p>The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The duration of the test shall be 24 hours. The minimum voltage of the test shall be as follows:<br/>充电电流必须是制造商建议的最大持续充电电流的两倍，测试时间为 24 小时。试验的最小电压如下：</p>  |  |
|  | <p>When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the or 22V.<br/>Rechargeable batteries meet this requirement if there is no disassembly and no fire within seven days of the test.<br/>如果厂家推荐的充电电压不超过 18V，则测试电压是两倍的厂家推荐的最大充电电压或者 22V 之间的较小值。<br/>试验样品在试验后 7 天内应无解体和无燃烧。</p> | N/A<br>不适用   |
|  | <p>When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times maximum charge voltage.<br/>Rechargeable batteries meet this requirement if there is no disassembly and no fire within seven days of the test.<br/>如果厂家推荐的充电电压超过 18V，本测试的最小充电电压应该为 1.2 倍的厂家推荐的最大充电电压。<br/>试验样品在试验后 7 天内应无解体和无燃烧。</p>  | <p>The specified maximum charge voltage is 58.4V;<br/>The specified maximum charge current is 100A;<br/>The test voltage is 70.08V;<br/>The test current is 200A.<br/>厂家规定的最大充电电压为 58.4V;<br/>厂家规定的最大充电电流为 100A;<br/>测试电压为 70.08V;<br/>测试电流为 200A。</p> |
| 7.2  | Result<br>测试结果   |  |
| Sample No.<br>样品编号   | Voltage Before test(V)<br>测试前开路电压(V)   | Test result<br>测试结果  |
| B05  | 56.35  | O  |
| B06  | 56.37  | O  |
| B07  | 56.37  | O  |
| B08  | 56.36  | O  |
| <p>Note: <b>D</b>- Disassembly, <b>F</b>- Fire, <b>O</b>- No disassembly, no fire.<br/>注: <b>D</b>- 解体; <b>F</b>- 起火; <b>O</b>- 无解体、无起火。</p> |  |  |

### Appendix 8 附表 8

| Test Items<br>测试项目  | Forced discharge<br>强制放电  |                     |                    |                                   |                     |
|---|---|---------------------|--------------------|-----------------------------------|---------------------|
| 8.1   | Test procedure<br>测试步骤  |                     |                    |                                   |                     |
|   | <p>Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C, power supply at an initial current equal to the maximum discharge current specified the manufacturer. The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell, each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere). Primary or rechargeable cells meet this requirement if there is no disassembly and no fire within seven days of the test.</p> <p>每个电芯应在环境温度下与 12V 直流电源串联在起始电流等于制造商给定的最大放电电流的条件强制放电。指定的放电电流通过串联在测试电芯上的合适大小和功率的负载来获得，每个电芯的强制放电时间(小时)为额定容量除以初始电流(安培)。原电池或可再充电电池在试验后 7 天内应无解体和无燃烧。</p> |                     |                    |                                   |                     |
| 8.2   | Result<br>测试结果  |                     |                    |                                   |                     |
| Sample No.<br>样品编号  | Voltage Before test<br>测试前开路电压(V)   | Test result<br>测试结果 | Sample No.<br>样品编号 | Voltage Before test<br>测试前开路电压(V) | Test result<br>测试结果 |
| C11   | 2.689   | O                   | C21                | 2.677                             | O                   |
| C12   | 2.685   | O                   | C22                | 2.678                             | O                   |
| C13   | 2.686   | O                   | C23                | 2.677                             | O                   |
| C14   | 2.687   | O                   | C24                | 2.675                             | O                   |
| C15   | 2.685   | O                   | C25                | 2.673                             | O                   |
| C16   | 2.684   | O                   | C26                | 2.674                             | O                   |
| C17   | 2.680   | O                   | C27                | 2.671                             | O                   |
| C18   | 2.683   | O                   | C28                | 2.672                             | O                   |
| C19   | 2.681   | O                   | C29                | 2.672                             | O                   |
| C20   | 2.682   | O                   | C30                | 2.670                             | O                   |
| <p>Note: <b>D</b>- Disassembly, <b>F</b>- Fire, <b>O</b>- No disassembly, no fire.<br/>注: <b>D</b>- 解体; <b>F</b>- 起火; <b>O</b>- 无解体、无起火</p> |   |                     |                    |                                   |                     |

**Photos of samples**  
样品图片



Figure 1 Front view of battery



Figure 2 Back view of battery

**Photos of samples**  
样品图片

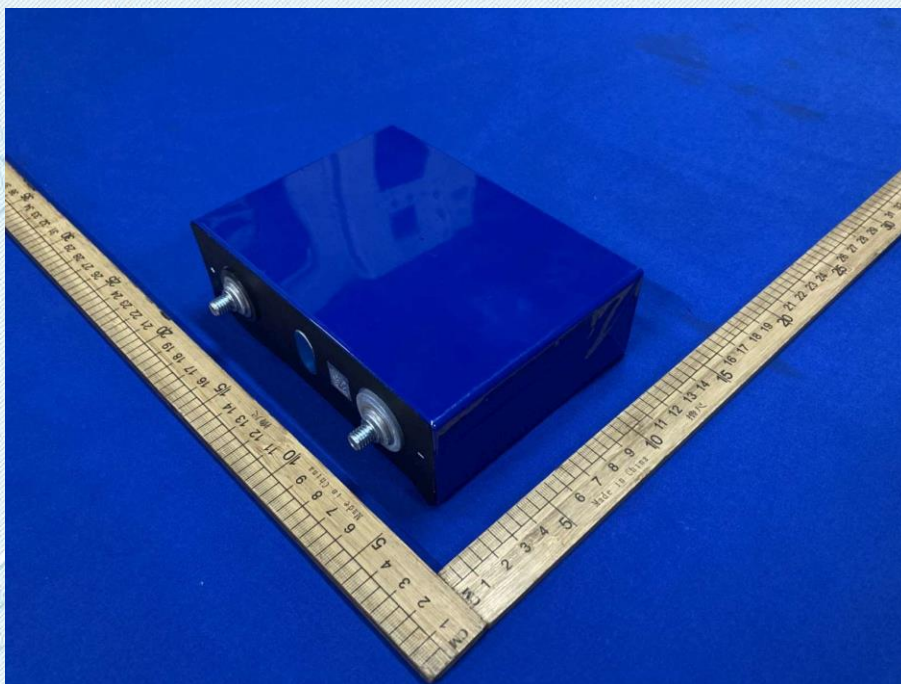


Figure 3 Front view of cell

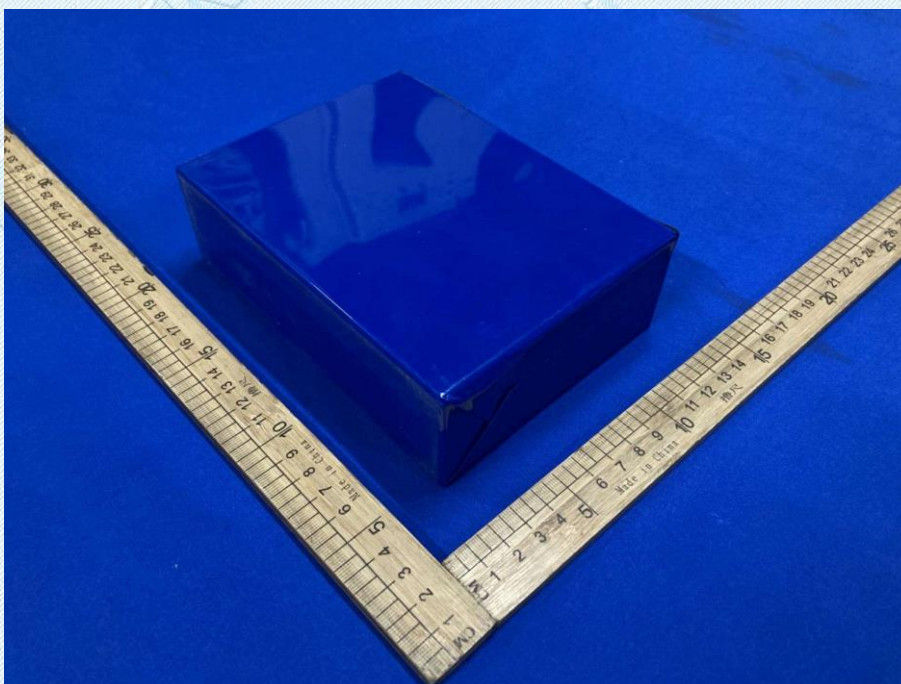


Figure 4 Back view of cell

**Photos of samples**

样品图片

**TYPE: LiFePO4 Battery**  
**MODEL: JK48V100PRO**  
**RATED VOLTAGE: 51.2V**  
**RATED CAPACITY: 100Ah**  
**ENERGY: 5120Wh**  
**DISCHARGE CURRENT: Max. 100A**

[www.opsolarbattery.com](http://www.opsolarbattery.com) [info@opsolarbattery.com](mailto:info@opsolarbattery.com)

Figure 5 Label view

## Important Notice

### 注意事项

1. The report is invalid if it is not stamped with the "Testing Special Stamp" and the "Riding Seam Stamp".

报告未加盖“检测专用章”和“骑缝章”无效。

2. The test report is invalid without the signatures of Approver, Reviewer and Testing engineer.

本报告书无批准人、审核人、及主检人签名无效。

3. The test report can not be partially copied unless prior written approval is issued from our lab.

检测报告未经本实验室书面批准，不得部分复制。

4. The report is invalid when anything of following happens – illegal transfer, reproduce, embezzlement, imposture, modification or tampering in any media form.

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5. Product information and customer information provided by the applicant, we are not responsible for its authenticity.

产品信息和客户信息由申请人提供，我们不对其真实性负责。

6. The test report is valid for the tested samples only.

本报告仅对本次测试样品有效。

7. If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

如对本报告有异议，可在收到报告后15天内向本单位申诉，逾期不予受理。

检测单位： 广东科正技术服务有限公司

Laboratory KSIGN(Guangdong) Testing Co., Ltd.

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--- End of Report ---

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