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CNAS L13753



# UN38.3 测试报告

## UN38.3 Test Report

报告编号 Report No.: S03A24010503U00101

样品名称: 磷酸铁锂电池  
Sample Name: LiFePO<sub>4</sub> Battery

样品型号: GSL10000U  
Sample Model:

委托单位: 深圳市格盛力能源有限公司  
Applicant: Shenzhen GSL Energy Co., Ltd.

签发日期: 2024-01-27  
Issue Date:

广东储能检测技术有限公司

Guangdong ESTL Technology Co., Ltd.



|                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                |                      |           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------|
| 样品名称<br>Sample Name                                                                                                                                                                                                                                                                                                                                                                    | 磷酸铁锂电池<br>LiFePO <sub>4</sub> Battery                                                                                                                                                                                          | 样品型号<br>Sample Model | GSL10000U |
| 测试实验室<br>Testing laboratory                                                                                                                                                                                                                                                                                                                                                            | 广东储能检测技术有限公司<br>Guangdong ESTL Technology Co., Ltd.                                                                                                                                                                            |                      |           |
| 实验室地址<br>Testing Address                                                                                                                                                                                                                                                                                                                                                               | 广东省东莞市松山湖园区总部二路9号1栋1单元101、201-208 室、4单元201室和11号1栋2单元101室。<br>Room 101, 201-208, Unit 1, & Room 201, Unit 4, Building 1, No.9/Room 101, Unit 2, Building 1, No.11, Zongbu 2nd Road, Songshanhu Park, Dongguan, Guangdong, China |                      |           |
| 委托单位<br>Applicant                                                                                                                                                                                                                                                                                                                                                                      | 深圳市格盛力能源有限公司<br>Shenzhen GSL Energy Co., Ltd.                                                                                                                                                                                  |                      |           |
| 委托单位地址<br>Applicant Address                                                                                                                                                                                                                                                                                                                                                            | 深圳市龙岗区中心城天安数码新城1栋A601-602<br>A601-602, Building 1, Tianan Cyber Park, Long Gang Central City, Shenzhen, Guangdong, China                                                                                                       |                      |           |
| 生产厂家<br>Manufacturer                                                                                                                                                                                                                                                                                                                                                                   | 格盛力新能源科技（广东）有限公司<br>Guangdong GSL Energy Tech Co., Ltd.                                                                                                                                                                        |                      |           |
| 生产厂家地址<br>Manufacturer Address                                                                                                                                                                                                                                                                                                                                                         | 惠州市惠阳区秋长街道新见路58号的2号厂房8-10层<br>Floor 8-10, Building 2, No.58, Xinjian Road, Qiuchang Subdistrict, Huiyang District, Huizhou, Guangdong, China.                                                                                  |                      |           |
| 电芯生产单位<br>Factory of Cell                                                                                                                                                                                                                                                                                                                                                              | 瑞浦能源有限公司<br>RUIPU ENERGY CO., LTD.                                                                                                                                                                                             |                      |           |
| 测试标准 Standard                                                                                                                                                                                                                                                                                                                                                                          | 联合国《试验和标准手册》第七修订版修正1第38.3节<br>UNITED NATIONS the "Manual of Test and Criteria"<br>(ST/SG/AC.10/11/Rev.7+A1:2021) Section 38.3.                                                                                                 |                      |           |
| 接样日期<br>Date of sample receipt                                                                                                                                                                                                                                                                                                                                                         | 2024-01-02                                                                                                                                                                                                                     |                      |           |
| 测试日期<br>Tested date                                                                                                                                                                                                                                                                                                                                                                    | 2024-01-02 to 2024-01-20                                                                                                                                                                                                       |                      |           |
| 检验结论 Test conclusion:                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                |                      |           |
| 由深圳市格盛力能源有限公司送检的磷酸铁锂电池，依据联合国《试验和标准手册》第七修订版修正1第38.3节进行检测，试验为全项目，测试结果符合标准相关要求。<br>The LiFePO <sub>4</sub> Battery submitted by Shenzhen GSL Energy Co., Ltd. are tested according to UNITED NATIONS the "Manual of Test and Criteria"(ST/SG/AC.10/11/Rev.7+A1:2021) Section 38.3. The test items are full items. The test results comply with the relevant requirements of the standard. |                                                                                                                                                                                                                                |                      |           |

检测 Tested by

陈保东

审核 Reviewed by

郭倩倩

批准 Approved by

林



| 样品信息 Sample Information                                                                                                                                                                                                                                                                     |            |                                               |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------------------------|-------------------|
| 标称电压<br>Nominal Voltage                                                                                                                                                                                                                                                                     | 51.2V      | 额定容量<br>Rated Capacity                        | 200Ah             |
| 瓦时<br>Watt-hour                                                                                                                                                                                                                                                                             | 10.24kWh   | 商标<br>Trade mark                              | --                |
| 充电限制电压<br>Limited Charge Voltage                                                                                                                                                                                                                                                            | 56V        | 放电终止电压<br>Discharge Cut-Off Voltage           | 46V               |
| 充电电流<br>Charge Current                                                                                                                                                                                                                                                                      | 40A        | 最大持续充电电流<br>Max. Continuous Charge Current    | 100A              |
| 放电电流<br>Discharge Current                                                                                                                                                                                                                                                                   | 40A        | 最大持续放电电流<br>Max. Continuous Discharge Current | 150A              |
| 充电截止电流<br>End Charge Current                                                                                                                                                                                                                                                                | 5000mA     | 电池尺寸<br>Battery dimensions                    | 720mm*550mm*240mm |
| 电芯型号<br>Cell Model                                                                                                                                                                                                                                                                          | CB56-100Ah | 电芯容量<br>Cell Rated Capacity                   | 100Ah             |
| 组合方式<br>Compound mode                                                                                                                                                                                                                                                                       | 16S2P      |                                               |                   |
| Description of the sampling procedure: /<br>取样程序的说明: /                                                                                                                                                                                                                                      |            |                                               |                   |
| Description of the deviation from the standard, if any: /<br>测试结果不符合标准项的说明: /                                                                                                                                                                                                               |            |                                               |                   |
| Remarks/备注:<br>1. 本报告中以点代替小数点。<br>Throughout this report a comma is used as the decimal separator.<br>2. 判定栏中“-”表示“不需要判定”，“P”表示“通过”，“F”表示“不通过”，“N/A”表示“不适用”。<br>As for the Verdict, “-” means “no need for judgement”, “P” means “pass”, “F” means “fail” and “N/A” means “not applicable”. |            |                                               |                   |

| Summary of testing:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|---------------------------------|---------|--------------------------|---------------------|-----------------|------------------------------------|------------------------------|----------|----------------------|---------|------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tests performed (name of test and test clause):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |               | <b>Testing location:</b> |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| <table><tr><th>Test items</th><th>Sample Number</th></tr><tr><td>T.1: Altitude simulation / 高度模拟</td><td rowspan="5">B1 - B4</td></tr><tr><td>T.2: Thermal test / 温度试验</td></tr><tr><td>T.3: Vibration / 振动</td></tr><tr><td>T.4: Shock / 冲击</td></tr><tr><td>T.5: External short circuit / 外接短路</td></tr><tr><td>T.6: Crush / 挤压-or Impact/撞击</td><td>C1 - C10</td></tr><tr><td>T.7 Overcharge / 过充电</td><td>B5 - B8</td></tr><tr><td>T.8: Forced discharge / 强制放电</td><td>C11 - C30</td></tr></table>                                                                                                                                                                                                                                                                                                                                 | Test items    | Sample Number            | T.1: Altitude simulation / 高度模拟 | B1 - B4 | T.2: Thermal test / 温度试验 | T.3: Vibration / 振动 | T.4: Shock / 冲击 | T.5: External short circuit / 外接短路 | T.6: Crush / 挤压-or Impact/撞击 | C1 - C10 | T.7 Overcharge / 过充电 | B5 - B8 | T.8: Forced discharge / 强制放电 | C11 - C30 | <b>测试地点:</b><br>广东储能检测技术有限公司<br>Guangdong ESTL Technology Co., Ltd.<br>广东省东莞市松山湖园区总部二路9号1栋1单元101、201-208 室、4单元201室和11号1栋2单元101室。<br>Room 101, 201-208, Unit 1, & Room 201, Unit 4, Building 1, No.9/Room 101, Unit 2, Building 1, No.11, Zongbu 2nd Road, Songshanhu Park, Dongguan, Guangdong, China |
| Test items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Sample Number |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.1: Altitude simulation / 高度模拟                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | B1 - B4       |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.2: Thermal test / 温度试验                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.3: Vibration / 振动                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.4: Shock / 冲击                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.5: External short circuit / 外接短路                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.6: Crush / 挤压-or Impact/撞击                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | C1 - C10      |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.7 Overcharge / 过充电                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | B5 - B8       |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| T.8: Forced discharge / 强制放电                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | C11 - C30     |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |
| <p>The samples' state is good.</p> <p>样品状况良好。</p> <p>Large Batteries of B1~B2 B5~B6 are full charged state after first cycle;</p> <p>大型电池组B1~B2 B5~B6 为第一个充电周期满电状态；</p> <p>Large Batteries of B3~B4 B7~B8 are full charged state after 25<sup>th</sup> cycles;</p> <p>大型电池组B3~B4 B7~B8为25次循环后满电状态；</p> <p>Rechargeable component cells of C1~C5 are 50% charged state after first cycle;</p> <p>可充电元件电芯C1~C5为第一个充电周期后50%充电状态；</p> <p>Rechargeable component cells of C6~C10 are 50% charged state after 25<sup>th</sup> cycles;</p> <p>可充电元件电芯C6~C10为25次循环后50%充电状态；</p> <p>Rechargeable component cells of C11~C20 are full discharged after first cycle;</p> <p>可充电元件电芯C11~C20为第一个充电周期完全放电状态；</p> <p>Rechargeable component cells of C21~C30 are full discharged after 25<sup>th</sup> cycles;</p> <p>可充电元件电芯C21~C30为25次循环后完全放电状态；</p> |               |                          |                                 |         |                          |                     |                 |                                    |                              |          |                      |         |                              |           |                                                                                                                                                                                                                                                                                                       |

**Test Procedure:**

1. Each battery type is subjected to tests T.1 to T.8. Tests T.1 to T.5 are conducted in sequence on the same battery. Tests 6 and 8 are conducted using not otherwise tested batteries. Test T.7 may be conducted using undamaged batteries previously used in Tests T.1 to T.5 for purposes of testing on cycled batteries.

每一种类型的电池均应进行T.1至T.8项试验。电池必须按顺序在相同的一组电池上进行试验T.1至T.5。试验T.6和T.8应使用未另外试验过的电池。试验T.7可以使用先前在试验T.1至T.5中使用过的未损坏电池进行,以便测试经过充放电的电池。

2. In order to quantify the mass loss, the following procedure is provided:

$$\text{Mass loss(\%)} = (M_1 - M_2) / M_1 \times 100$$

为了量化质量损失,可用以下公式计算: 质量损失(\%) =  $(M_1 - M_2) / M_1 \times 100$

Where M<sub>1</sub> is the mass before the test and M<sub>2</sub> is the mass after the test. When mass loss does not exceed the values in Table below, it is considered as "no mass loss".

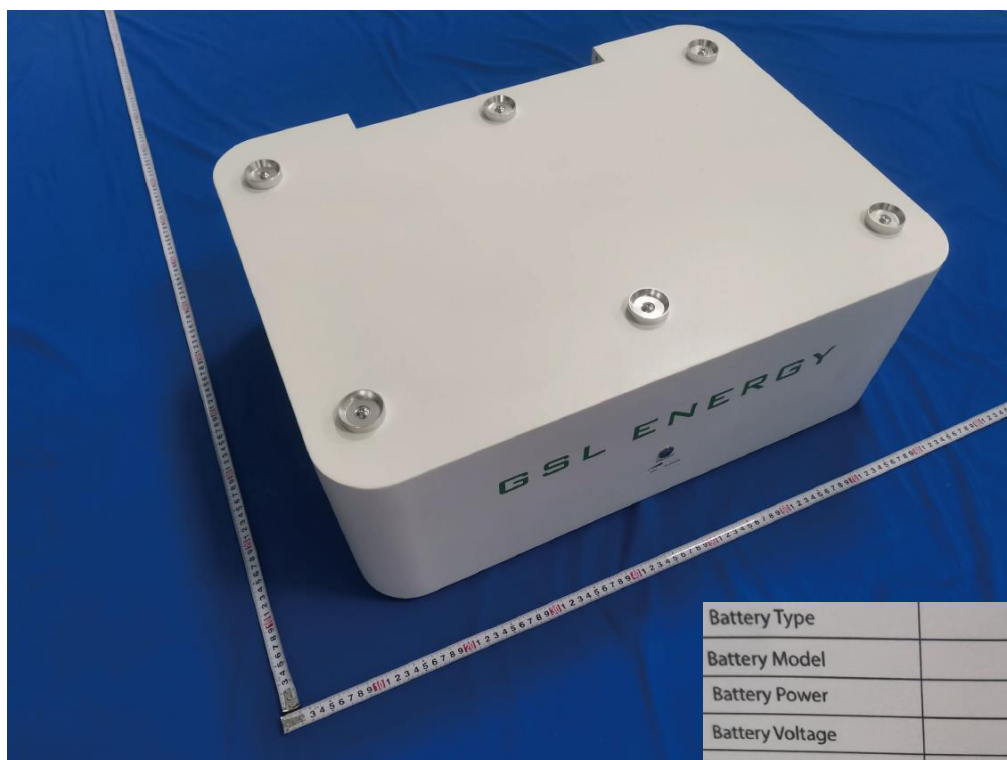
式中: M<sub>1</sub>是试验前的质量, M<sub>2</sub>是试验后的质量。如果质量损失不超过下表所列的数值,应视为“无质量损失”。

| Mass M of cell or battery<br>电芯或电池的质量 | Mass loss limit<br>质量损失限值 |
|---------------------------------------|---------------------------|
| M < 1g                                | 0.5%                      |
| 1g ≤ M ≤ 75g                          | 0.2%                      |
| M > 75g                               | 0.1%                      |

3. In test T.1 to T.4, batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

在测试T.1至T.4中, 电池须满足无渗漏、无泄气、无解体、无破裂和无起火, 并且每个试验电池在试验后的开路电压不小于其在进行这一试验前电压的90%。

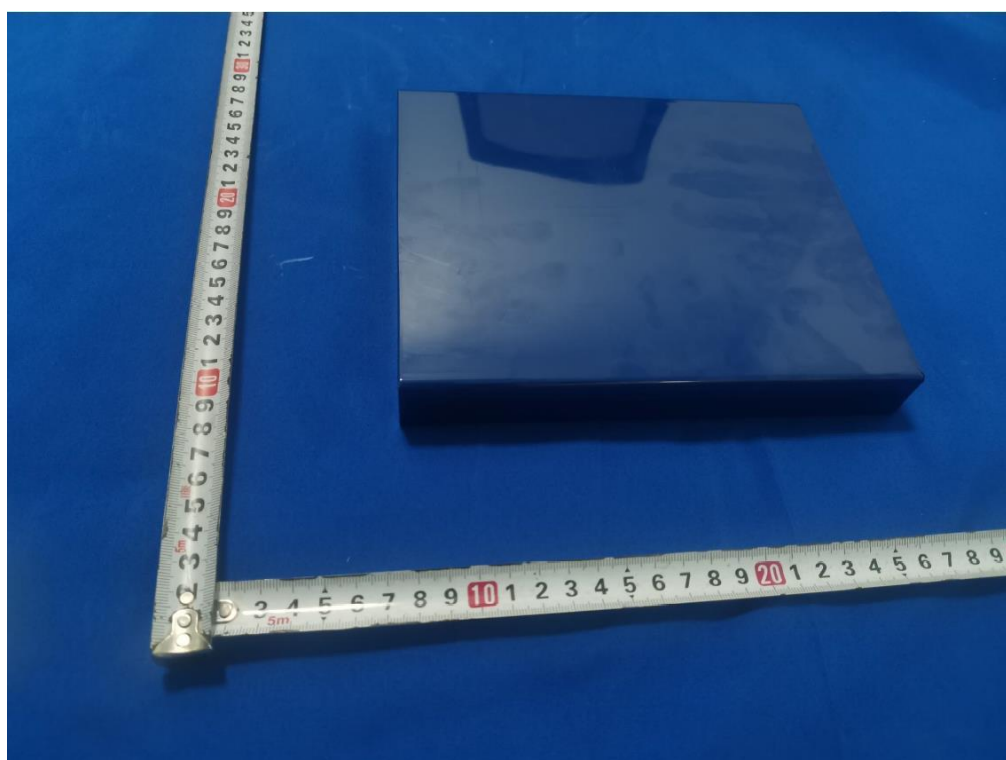
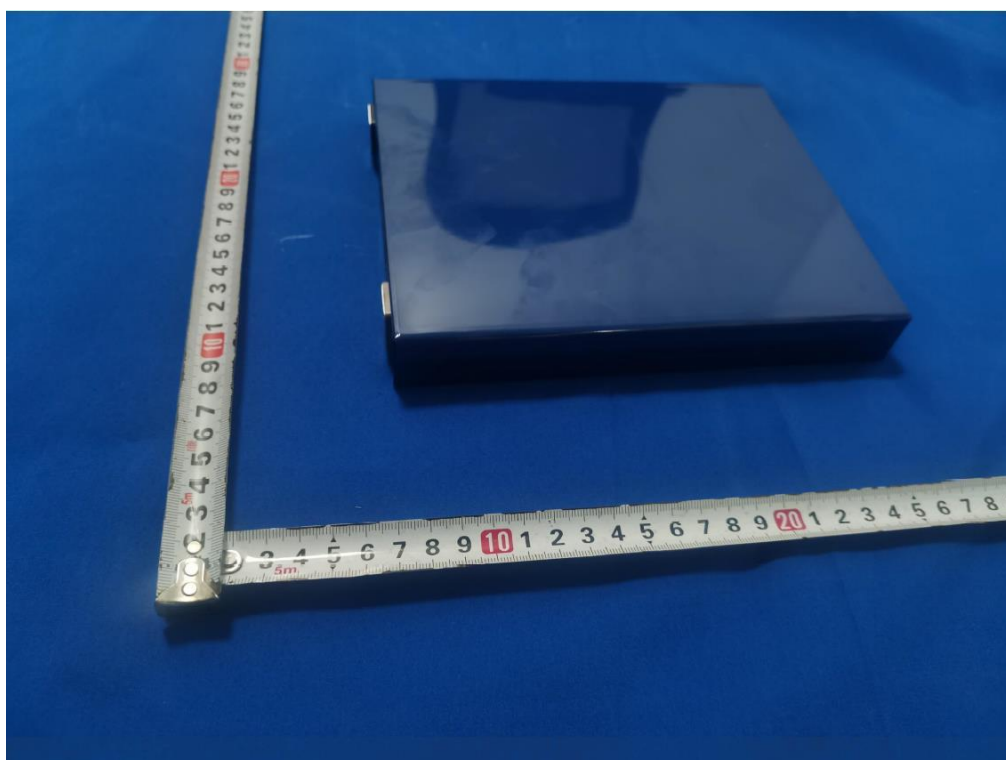
## Photos of Samples and Labels/样品照片及标识



|                     |                 |
|---------------------|-----------------|
| Battery Type        | LiFePO4 Battery |
| Battery Model       | GSL10000U       |
| Battery Power       | 10.24Kwh        |
| Battery Voltage     | 51.2V           |
| Capacity Of Battery | 200Ah           |
| Charge Voltage      | 56V             |



## Photos of Samples and Labels/样品照片及标识



| 38.3.4   | Procedure / 测试步骤                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 判定<br>Verdict                                                                                                                    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 38.3.4.1 | <b>Test 1: Altitude simulation / 测试1: 高度模拟</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>P</b>                                                                                                                         |
|          | 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℃).<br>试验电芯和电池在温度为20±5℃, 大气压力为不大于11.6kpa 的环境中贮存不少于6 个小时。                                                                                                                                                                                                                                                                                                                                                                                                                                                          | P                                                                                                                                |
|          | Requirement / 标准要求:<br>1. Cells and batteries Mass loss limit: ≤0.1%.<br>样品质量损失≤0.1%。<br>2. Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states.<br>样品试验后开路电压应不低于试验前开路电压的90%,此要求不适用于完全放完电的电芯和电池。<br>3. No leakage, no venting, no disassembly, no rupture and no fire.<br>样品应无漏液、无排气、无解体、无破裂以及无着火现象的发生。                                                                                                                                                                                                                                       | No leakage, no venting, no disassembly, no rupture and no fire.<br>无漏液、无排气、无解体、无破裂以及无着火现象。<br>The data see table 1.<br>/测试数据见表1。 |
| 38.3.4.2 | <b>Test 2: Thermal test / 测试 2: 温度试验</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>P</b>                                                                                                                         |
|          | Test cells and batteries are to be stored for<br>试验电芯和电池存储条件如下:<br>1. one temperature cycle: 72±2℃(6h) — -40±2℃(6h).<br>一次温度循环为72±2℃(6h) — -40±2℃(6h)。<br>2. The maximum time interval between test temperature extremes is 30 minutes.<br>温度转换最大间隔时间为30mins。<br>3. This procedure is to be repeated 10 times.<br>重复10 次循环。<br>4. after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5℃).<br>循环结束后, 所有试验电芯和电池在 20±5℃的条件下 搁置24 小时。<br>5.For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.<br>对于大型电芯和电池, 暴露于极端试验温度的时间至少应为12小时 | P                                                                                                                                |
|          | Requirements / 标准要求:<br>1. Cells and batteries Mass loss limit: ≤0.1%.<br>样品质量损失≤0.1%。<br>2. Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states.<br>样品试验后开路电压应不低于试验前开路电压的90%,此要求不适用于完全放完电的电池和电芯。<br>3. No leakage, no venting, no disassembly, no rupture and no fire.                                                                                                                                                                                                                                                                       | No leakage, no venting, no disassembly, no rupture and no fire.<br>无漏液、无排气、无解体、无破裂以及无着火现象。<br>The data see table 1.<br>/测试数据见表1。 |

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                  |          |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|----------|
|                 | 样品应无漏液、无排气、无解体、无破裂以及无着火现象的发生。                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                  |          |
| <b>38.3.4.3</b> | <b>Test 3: Vibration / 测试 3: 振动</b><br><br>1. Cells and batteries are firmly secured to the platform of the vibration machine.<br>电芯和电池牢固地安装在振动台（的台面）上。<br><br>2. The vibration :a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.<br>振动以正弦波形式，以7Hz 增加至200Hz，然后在减少回到7Hz 为一个循环，一个循环持续15 分钟的对数前移传送。<br><br>3. For cells and small batteries. The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached, The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50Hz), A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.<br>对于电芯和小型电池，对数扫频为:从7 赫兹开始保持1gn 的最大加速度直到频率为18 赫兹，然后将振幅保持在0.8 毫米（总偏移1.6 毫米）并增加频率直到最大加速度达到8gn（频率约为50 赫兹），将最大加速度保持在8gn 直到频率增加到200 赫兹。<br><br>4. For large batteries: from 7 Hz to a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 gn occurs (approximately 25 Hz). A peak acceleration of 2 gn is then maintained until the frequency is increased to 200 Hz.<br>对于大型电池：从7 赫兹开始，保持1 gn 的最大加速度，直到频率达到18 赫兹。然后将振幅保持在0.8 毫米(总偏移1.6 毫米)，并增加频率直到最大加速度达到2 gn (频率约为25 赫兹)。将最大加速度保持在2 gn 直到频率增加到200 赫兹。<br><br>5. This cycle 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.<br>这一振动过程须对三个互相垂直的电池安装方位的每一方向重复进行12次，总共为时3小时。其中一个振动方向必须与端面垂直。 |                                                                                                                                  | <b>P</b> |
|                 | Requirements / 标准要求:<br>1. Cells and batteries Mass loss limit: ≤0.1%.<br>样品质量损失≤0.1%.<br>2. Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states.<br>样品试验后开路电压应不低于试验前开路电压的90%,此要求不适用于完全放完电的电芯和电池。<br>3. No leakage, no venting, no disassembly, no rupture and no fire.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | No leakage, no venting, no disassembly, no rupture and no fire.<br>无漏液、无排气、无解体、无破裂以及无着火现象。<br>The data see table 1.<br>/测试数据见表1。 | <b>P</b> |

|                                                                                                                                                                                                                                                                                                   | 样品应无漏液、无排气、无解体、无破裂以及无着火现象的发生。                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                           |                           |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------|----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------|-----|-----------------|------------------------------------------------------------------------------------------------------------------------|------|--|--|
| 38.3.4.4                                                                                                                                                                                                                                                                                          | Test 4: Shock / 测试 4: 冲击                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                           | 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 half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds.<br><br>试验电芯和电池应通过坚固的方式紧固在试验设备上，可以支撑每个被测电池的所有面。每个电芯或电池应用峰值加速度150 gn、脉冲时间6 ms的半正弦波进行冲击。或者大电芯应用峰值加速度50 gn、脉冲时间11 ms的半正弦波进行冲击。 |                           | P                         |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
|                                                                                                                                                                                                                                                                                                   | Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass 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.<br><br>每个电池应用半正弦波冲击的峰值加速度大小取决于电池的质量。小电池应用6 ms的脉冲时间以及大电池应用11 ms的脉冲时间。根据下面的公式来计算合适的最小峰值加速度。                                                                                                                                                   |                           | P                         |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
|                                                                                                                                                                                                                                                                                                   | <table><tr><th>Battery</th><th>Minimum peak acceleration</th><th>Pulse duration</th></tr><tr><td>Small batteries</td><td>150 gn or result of formula<br/>Acceleration (gn)<br/><math display="block">= \sqrt{\left(\frac{100850}{mass*}\right)}</math><br/>Whichever is smaller</td><td>6ms</td></tr><tr><td>Large batteries</td><td>50 gn or result of formula<br/>Acceleration (gn)<br/><math display="block">= \sqrt{\left(\frac{30000}{mass*}\right)}</math><br/>Whichever is smaller</td><td>11ms</td></tr></table>                                     | Battery                   | Minimum peak acceleration | Pulse duration | Small batteries | 150 gn or result of formula<br>Acceleration (gn)<br>$= \sqrt{\left(\frac{100850}{mass*}\right)}$<br>Whichever is smaller | 6ms | Large batteries | 50 gn or result of formula<br>Acceleration (gn)<br>$= \sqrt{\left(\frac{30000}{mass*}\right)}$<br>Whichever is smaller | 11ms |  |  |
|                                                                                                                                                                                                                                                                                                   | Battery                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Minimum peak acceleration | Pulse duration            |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
| Small batteries                                                                                                                                                                                                                                                                                   | 150 gn or result of formula<br>Acceleration (gn)<br>$= \sqrt{\left(\frac{100850}{mass*}\right)}$<br>Whichever is smaller                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6ms                       |                           |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
| Large batteries                                                                                                                                                                                                                                                                                   | 50 gn or result of formula<br>Acceleration (gn)<br>$= \sqrt{\left(\frac{30000}{mass*}\right)}$<br>Whichever is smaller                                                                                                                                                                                                                                                                                                                                                                                                                                       | 11ms                      |                           |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
| Each cell or battery is 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.<br><br>每个电芯或电池应在三个垂直面的正向各承受三次冲击，负向再各承受3次冲击，共18次。            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | P                         |                           |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |
| Requirements / 标准要求：<br>1. Cells and batteries Mass loss limit: ≤0.1%.<br>样品质量损失≤0.1%。<br>2. Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states.<br>样品试验后开路电压应不低于试验前开路电压的90%,此要求不适用于完全放完电的电芯和电池。 | No leakage, no venting, no disassembly, no rupture and no fire.<br>无漏液、无排气、无解体、无破裂以及无着火现象。<br>The data see table 1.<br>/测试数据见表1。                                                                                                                                                                                                                                                                                                                                                                                                                             | P                         |                           |                |                 |                                                                                                                          |     |                 |                                                                                                                        |      |  |  |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                             |            |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|          | <p>3. No leakage, no venting, no disassembly, no rupture and no fire.</p> <p>样品应无漏液、无排气、无解体、无破裂以及无着火现象的发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                             |            |
| 38.3.4.5 | <b>Test 5: External Short Circuit / 测试5 外接短路</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                             | <b>P</b>   |
|          | <p>1. The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches <math>57\pm4^{\circ}\text{C}</math>.</p> <p>保持试验环境温度稳定在<math>57\pm4^{\circ}\text{C}</math>，以使电芯或电池样品外表温度达到<math>57\pm4^{\circ}\text{C}</math>。</p> <p>2. The cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at <math>57\pm4^{\circ}\text{C}</math>. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to <math>57\pm4^{\circ}\text{C}</math>.</p> <p>将样品正负极用小于<math>0.1\Omega</math>的总电阻回路进行短路，样品的外表温度恢复到<math>57\pm4^{\circ}\text{C}</math>之后保持短路状态1 小时以上。</p> <p>3. The small cell and small battery must be observed for a further six hour for the test to be concluded and 12 hours for large cells and large batteries</p> <p>对小型电芯和小型电池必须进一步观察6 个小时才能下结论。对大型电芯和小型电池的暴露时间应至少12小时</p>                                     |                                                                                                                                                                                                                                             | <b>P</b>   |
|          | <p>Requirements / 标准要求:</p> <p>During the test and within six hours after test, the cells or batteries.</p> <p>在测试过程中以及之后6 个小时内，电芯或电池样品。</p> <p>1. External temperature not exceed <math>170^{\circ}\text{C}</math>.</p> <p>外表温度不超过<math>170^{\circ}\text{C}</math>。</p> <p>2. No disassembly, no rupture and no fire.</p> <p>样品应无解体、无破裂和无着火现象发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>External temperature not exceed <math>170^{\circ}\text{C}</math></p> <p>外表温度不超过<math>170^{\circ}\text{C}</math></p> <p>No disassembly, no rupture and no fire.</p> <p>无解体、无破裂和无着火现象发生。</p> <p>The data see table 1.</p> <p>/测试数据见表1。</p> | <b>P</b>   |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                             |            |
| 38.3.4.6 | <b>Test 6: Impact / Crush / 测试6: 撞击 / 挤压</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                             | <b>P</b>   |
|          | <p>Impact (applicable to cylindrical cells not less than 18mm in diameter).</p> <p>撞击（适用于直径不小于18 毫米的圆柱形电芯）。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                             | <b>N/A</b> |
|          | <p>1. The test sample cell or component cell is to be placed on a flat smooth surface.</p> <p>试样电芯或元件电芯放在平坦光滑的表面上。</p> <p>2. A <math>15.8\text{mm}\pm0.1\text{mm}</math> diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A <math>9.1\text{ kg}\pm0.1\text{kg}</math> mass is to be dropped from a height of <math>61\pm2.5\text{ cm}</math> at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented <math>90^{\circ}</math> degrees from the horizontal supporting surface.</p> <p>一根316型不锈钢棒横放在试样中心，钢棒直径<math>15.8\text{毫米}\pm0.1\text{毫米}</math>，长度至少6厘米，或电池最长端的尺寸，取二者之长者。将一块<math>9.1\text{千克}\pm0.1\text{千克}</math>的重锤从<math>61\pm2.5\text{厘米}</math>高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦</p> |                                                                                                                                                                                                                                             | <b>N/A</b> |

|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                         |     |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
|  | <p>的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿与水平支撑表面呈90度落下。</p> <p>3. The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm±0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.</p> <p>接受撞击的试样，纵轴应与平坦表面平行并与横放在试样中心的直径15.8毫米±0.1毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                         |     |
|  | <p>Requirements / 标准要求:</p> <p>1. Test cells or component cells external temperature not exceed 170°C.</p> <p>电芯或元件电芯的最高表面温度应不超过170°C。</p> <p>2. No disassembly and no fire within six hours of this test.</p> <p>试验结束后6个小时之内，应无解体和无着火现象发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                         | N/A |
|  | <p>Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18mm in diameter).</p> <p>挤压（适用于棱柱形、袋装、硬币/纽扣电芯和直径小于18毫米的圆柱形电芯）。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                         | P   |
|  | <p>1. A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/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>将电芯或元件电芯放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为1.5 厘米/秒。挤压持续进行，直到出现以下三种情况之一:</p> <p>(a) The applied force reaches 13 kN ± 0.78 kN.</p> <p>施加的力达到13 千牛±0.78 千牛。</p> <p>(b) The voltage of the cell drops by at least 100 mV.</p> <p>电芯的电压下降至少100 毫伏。</p> <p>(c) The cell is deformed by 50% or more of its original thickness.</p> <p>电芯变形达原始厚度的50%以上。</p> <p>2. A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.</p> <p>棱柱形或袋装电芯应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形电芯应从与纵轴垂直的方向施压。</p> | <p>The applied force reaches 13 kN ± 0.78 kN.</p> <p>施加的力达到13 千牛 ±0.78 千牛。</p>                                                          | P   |
|  | <p>Requirements / 标准要求:</p> <p>1. Cells external temperature not exceed 170°C.</p> <p>电芯或电池的最高表面温度应不超过170°C。</p> <p>2. No disassembly no rupture and no fire within six hours of this test</p> <p>试验结束后6个小时之内，电芯和聚合物电芯应无解体、无破裂和无着火现象发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>External temperature not exceed 170°C</p> <p>外表温度不超过170°C</p> <p>No disassembly, no rupture and no fire.</p> <p>无解体、无破裂和无着火现象发生。</p> | P   |

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                           |          |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------|
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | The data see table 2.<br>/测试数据见表2。                                                        |          |
| 38.3.4.7 | <b>Test 7: Overcharge / 测试 7: 过充电</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                           | <b>P</b> |
|          | <p>1. The charge current shall be twice the manufacturer's recommended maximum continuous charge current.<br/>以2 倍制造厂推荐的最大持续充电电流对样品充电。</p> <p>2. The minimum voltage of the test shall be as follows:<br/>本测试最小电压为:</p> <p>a) When the manufacturer's recommended charge voltage is not more than 18 V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22 V..<br/>如果制造商建议的充电电压不超过18V, 本测试的最小充电电压应是制造商标定最大充电电压的两倍或者是22V 之中的较小者。</p> <p>b) When the manufacturer's recommended charge voltage is more than 18 V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.<br/>如果制造商推荐的充电电压超过18V, 本测试的最小充电电压应是厂家标定最大充电电压的1.2 倍。</p> <p>3. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.<br/>20±5℃的环境温度下, 试验持续24 小时。</p> | The voltage of the test is 67.2V, and the current is 200A. / 测试电压为67.2V, 电流为200A.         | P        |
|          | <p>Requirements / 标准要求:</p> <p>No disassembly and no fire within seven days of this test.<br/>试验样品在试验中和试验后7 天内, 应无解体和无着火现象发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>No disassembly and no fire.<br/>无解体和无着火现象。<br/>The data see table 2.<br/>/测试数据见表2。</p> | P        |
|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                           |          |
| 38.3.4.8 | <b>Test 8: Forced discharge / 测试 8: 强制放电</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                           | <b>P</b> |
|          | <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 by the manufacturer.<br/>20±5℃的环境温度下, 将单个电芯连接在12V 的直流电源上进行强制放电, 此直流电源提供给每个电芯初始电流为制造厂指定的最大放电电流。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                           | P        |
|          | <p>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).<br/>将适当大小和额定值的电阻负荷与试验电池串联, 计算得出给定的放电电流。对每个电池进行强制放电, 放电时间(小时)应等于其额定容量除以初始试验电流(安培)。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                           | P        |
|          | <p>Requirements / 标准要求:</p> <p>No disassembly and no fire within seven days of this test.<br/>试验样品在试验中和试验后7 天内, 应无解体和无着火现象发生。</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>No disassembly and no fire.<br/>无解体和无着火现象。<br/>The data see table 2.<br/>/测试数据见表2。</p> | P        |

| Table 1: T1-T5 / 表1. 试验1-试验5 |                                |                              |                                           |                        |                                    |                        |                               |                        |                           |                        |                                              |
|------------------------------|--------------------------------|------------------------------|-------------------------------------------|------------------------|------------------------------------|------------------------|-------------------------------|------------------------|---------------------------|------------------------|----------------------------------------------|
| Sample No. / 样品编号            | Mass prior to test / 试验前质量(kg) | OCV prior to test / 试验前电压(V) | Test 1: Altitude simulation<br>测试 1: 高度模拟 |                        | Test 2: Thermal test<br>测试 2: 温度实验 |                        | Test 3: Vibration<br>测试 3: 振动 |                        | Test 4: Shock<br>测试 4: 冲击 |                        | Test 5: External Short Circuit<br>测试 5: 外接短路 |
|                              |                                |                              | Mass loss(%)<br>质量损失 (%)                  | Change ratio<br>电压比(%) | Mass loss(%)<br>质量损失 (%)           | Change ratio<br>电压比(%) | Mass loss(%)<br>质量损失 (%)      | Change ratio<br>电压比(%) | Mass loss(%)<br>质量损失 (%)  | Change ratio<br>电压比(%) | Temp. (°C)<br>温度 (°C)                        |
| B1                           | 100.28                         | 54.34                        | 0.000                                     | 99.94                  | 0.000                              | 99.10                  | 0.000                         | 100.00                 | 0.000                     | 100.00                 | 57.5                                         |
| B2                           | 100.30                         | 54.31                        | 0.000                                     | 99.94                  | 0.000                              | 99.19                  | 0.000                         | 99.98                  | 0.000                     | 100.00                 | 57.6                                         |
| B3                           | 100.33                         | 54.37                        | 0.000                                     | 99.91                  | 0.000                              | 99.06                  | 0.000                         | 100.00                 | 0.000                     | 100.00                 | 57.6                                         |
| B4                           | 100.31                         | 54.33                        | 0.000                                     | 99.96                  | 0.000                              | 99.12                  | 0.000                         | 100.00                 | 0.000                     | 100.00                 | 57.7                                         |

Table 2: T6-T8 / 表 2. 试验 6-试验 8

| Test 6: <del>Impact</del> / Crush<br>/ 测试6: 撞击/挤压 |                              |                      | Test 7: Overcharge<br>/ 测试7:过充电 |                              | Test 8: Forced discharge<br>/ 测试8: 强制放电 |                              |
|---------------------------------------------------|------------------------------|----------------------|---------------------------------|------------------------------|-----------------------------------------|------------------------------|
| Sample No. / 样品编号                                 | OCV prior to test / 试验前电压(V) | Temp. (°C) / 温度 (°C) | Sample No. / 样品编号               | OCV prior to test / 试验前电压(V) | Sample No. / 样品编号                       | OCV prior to test / 试验前电压(V) |
| C1                                                | 3.281                        | 22.9                 | B5                              | 54.33                        | C11                                     | 3.102                        |
| C2                                                | 3.284                        | 23.6                 | B6                              | 54.35                        | C12                                     | 3.132                        |
| C3                                                | 3.280                        | 22.9                 | B7                              | 54.34                        | C13                                     | 3.115                        |
| C4                                                | 3.284                        | 22.3                 | B8                              | 54.31                        | C14                                     | 3.128                        |
| C5                                                | 3.281                        | 24.0                 | --                              | --                           | C15                                     | 3.133                        |
| C6                                                | 3.283                        | 23.0                 | --                              | --                           | C16                                     | 3.114                        |
| C7                                                | 3.285                        | 22.5                 | --                              | --                           | C17                                     | 3.120                        |
| C8                                                | 3.282                        | 22.4                 | --                              | --                           | C18                                     | 3.118                        |
| C9                                                | 3.283                        | 22.7                 | --                              | --                           | C19                                     | 3.134                        |
| C10                                               | 3.282                        | 22.9                 | --                              | --                           | C20                                     | 3.126                        |
| --                                                | --                           | --                   | --                              | --                           | C21                                     | 3.122                        |
| --                                                | --                           | --                   | --                              | --                           | C22                                     | 3.130                        |
| --                                                | --                           | --                   | --                              | --                           | C23                                     | 3.124                        |
| --                                                | --                           | --                   | --                              | --                           | C24                                     | 3.118                        |
| --                                                | --                           | --                   | --                              | --                           | C25                                     | 3.117                        |
| --                                                | --                           | --                   | --                              | --                           | C26                                     | 3.120                        |
| --                                                | --                           | --                   | --                              | --                           | C27                                     | 3.113                        |
| --                                                | --                           | --                   | --                              | --                           | C28                                     | 3.116                        |
| --                                                | --                           | --                   | --                              | --                           | C29                                     | 3.131                        |
| --                                                | --                           | --                   | --                              | --                           | C30                                     | 3.128                        |

--- 报告结束 ---

--- End of Report ---

## 声明 Declaration

1. 本报告无批准人、审核人及检测人签名无效。

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

2. 对检验报告若有异议，应于收到报告之日起十五天内向检验单位提出。

Objections to the test report must be submitted to ESTL within 15 days.

3. 未经本试验室书面同意，不得部分地复制本报告。

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