中国认可
国际互认
检测
TESTING
CNAS L4065

Report No.:
报告编号：FHLD20221028U01

# UN38.3 TEST REPORT
# UN38.3 检 测 报 告

| | |
|---|---|
| **Product Name:** 产品名称： | Rechargeable Li-ion battery 可充电锂离子电池 |
| **Model and Parameters:** 型号参数： | BL-L5H, 3.7V, 1400mAh/5.18Wh(Rated); 1450mAh/5.36Wh(Typical) |
| **Test Classification:** 检测类别： | Commission test 委托检测 |
| **Issue Date:** 签发日期： | 2022-12-07 |

| Tested by/测试 | Reviewed by/审核 | Approved by/批准 |
|---|---|---|
| Zangxing Xiao | Albert Yip | Hongbin Ku |
| Test Engineer | Audit Engineer | Approval Engineer |

**Guangzhou MCM Certification & Testing Co., Ltd.**

广州邦禾检测技术有限公司

# General Information
# 基本信息

| | |
|---|---|
| **Application Information/申请信息：** | |
| Applicant:<br>申请单位： | Guangdong Fenghua New Energy Co., Ltd.<br>广东风华新能源股份有限公司 |
| Address:<br>申请单位地址： | No.3 East of Sanrong Road, Duanzhou District, Zhaoqing, Guangdong Province, China<br>中国广东省肇庆市端州区三榕东路 3 号 |
| Contact Information:<br>联系方式： | Tel: 0758-2870335<br>E-mail: wuzc@fenghua-lib.com<br>Website: http://www.fenghua-lib.com |
| **General Information/基本信息：** | |
| Product Name:<br>产品名称： | Rechargeable Li-ion battery<br>可充电锂离子电池 |
| Product Classification:<br>产品分类： | Rechargeable Lithium Ion Single-cell Battery<br>可充电锂离子单电芯电池 |
| Trade Mark:<br>商标名称： | NOKIA |
| Model and Parameters:<br>型号参数： | BL-L5H, 3.7V,<br>1400mAh/5.18Wh(Rated); 1450mAh/5.36Wh(Typical) |
| Manufacturer:<br>制造单位： | Guangdong Fenghua New Energy Co., Ltd.<br>广东风华新能源股份有限公司 |
| Address:<br>制造单位地址： | No.3 East of Sanrong Road, Duanzhou District, Zhaoqing, Guangdong Province, China<br>中国广东省肇庆市端州区三榕东路 3 号 |
| Contact Information:<br>联系方式： | Tel: 0758-2870335<br>E-mail: wuzc@fenghua-lib.com<br>Website: http://www.fenghua-lib.com |
| Factory:<br>生产单位： | Guangdong Fenghua New Energy Co., Ltd.<br>广东风华新能源股份有限公司 |
| Address:<br>生产单位地址： | No.3 East of Sanrong Road, Duanzhou District, Zhaoqing, Guangdong Province, China<br>中国广东省肇庆市端州区三榕东路 3 号 |
| **Testing Laboratory/测试实验室：** | |
| Laboratory:<br>测试单位： | Guangzhou MCM Certification & Testing Co., Ltd.<br>广州邦禾检测技术有限公司 |
| Address:<br>测试单位地址： | Building 2 No. 45 Zhong Er Section of Shiguang Road, Zhongcun Street, Panyu District, Guangzhou City, Guangdong Province, China.<br>中国 广东省广州市番禺区钟村街市广路钟二路段 45 号 2 栋 |
| Testing Location:<br>测试实验室地址： | As above<br>同上 |
| **Test Standard/测试标准：** | |
| Standard Used:<br>使用标准： | Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》 ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 |
| Deviation Description:<br>偏差描述： | None |

**Product Information/产品信息：**

This battery is constructed with1 lithium ion cells through 1S1P and has overcharge, over-discharge, over current and short-circuits proof circuit.
电池由 1 个电芯通过 1 串 1 并组成，含有过充、过放、过流和短路的保护线路。

**Label/标签：**




**Technical Parameters/技术参数：**

| | | Cell | Battery |
|---|---|---|---|
| Model 型号 | | FHP503862AR | BL-L5H |
| Rated Capacity 额定容量 | (mAh) | 1420 | 1400 |
| Nominal Voltage 标称电压 | (V) | 3.7 | 3.7 |
| Standard Charge Current 标准充电电流 | (mA) | 284 | 280 |
| Standard Discharge Current 标准放电电流 | (mA) | 284 | 280 |
| Maximum Charge Current 最大充电电流 | (mA) | 710 | 700 |
| Maximum Discharge Current 最大放电电流 | (mA) | 1420 | 1400 |
| Maximum Charge Voltage 最大充电电压 | (V) | 4.2 | 4.2 |
| Cut-Off Voltage 放电截至电压 | (V) | 3.0 | 3.0 |

**Remark/备注：**

/

| Test Conclusion<br>测试结论 | | | | |
|---|---|---|---|---|
| **Clause<br>条款** | **Test item<br>测试项目** | **Sample No.<br>样品编号** | **Test Result<br>测试结论** | **Remark<br>备注** |
| 38.3.4.1 | Altitude simulation<br>高度模拟 | C1#～C10# | P | / |
| 38.3.4.2 | Thermal test<br>温度循环测试 | | P | / |
| 38.3.4.3 | Vibration<br>振动 | | P | / |
| 38.3.4.4 | Shock<br>冲击 | | P | / |
| 38.3.4.5 | External short circuit<br>外部短路 | | P | / |
| 38.3.4.6 | Impact<br>撞击 | / | N/A | / |
| | Crush<br>挤压 | C11#～C20# | P | / |
| 38.3.4.7 | Overcharge<br>过度充电 | C21#～C28# | P | / |
| 38.3.4.8 | Forced discharge<br>强制放电 | C29#～C48# | P | / |
| Ambient Temperature:<br>环境温度： | | 20 ± 5°C | | |
| Receipt Date:<br>接收日期： | | 2022-10-28 | | |
| Test Date:<br>测试时间： | | 2022-10-31 ～ 2022-12-01 | | |

**Test Conclusion/测试结论：**

The Rechargeable Li-ion batteries submitted by Guangdong Fenghua New Energy Co., Ltd. have passed the test items of Manual of Test and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3.

由广东风华新能源股份有限公司送检的可充电锂离子电池符合《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 的要求。

Seal:
检测专用章：

MCM Technology & Service

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| **38.3.2** | **Scope 范围** | | **P** |
| | All cell types shall be subjected to tests T.1 to T.6 and T.8.<br>所有电芯类型应该进行 T.1 到 T.6 和 T.8。 | | N/A |
| | All non-rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5.<br>所有不可充电电池，包括由测试合格的电芯组成的电池应该进行 T.1 到 T.5。 | | N/A |
| | All rechargeable battery types, including those composed of previously tested cells, shall be subjected to tests T.1 to T.5 and T.7.<br>所有可充电电池，包括由测试合格的电芯组成的电池应该进行 T.1 到 T.5，以及 T.7 的测试。 | | P |
| | In addition, rechargeable single cell batteries with overcharge protection shall be subjected to test T.7.<br>另外，有过充保护的可充单电芯电池应该进行 T.7 的测试。 | | P |
| | A component cell that is not transported separately from the battery it is part of needs only to be tested according to tests T.6 and T.8.<br>不单独运输的作为配件的电芯进行 T.6 和 T.8 的测试。 | | P |
| | A component cell that is transported separately from the battery it is part of needs only to be tested according to tests T.1 to T.6 and T.8.<br>单独运输的作为配件的电芯进行 T.1 到 T.6，以及 T.8 的测试。 | | N/A |
| | A cell or battery that is an integral part of the equipment it is intended to power that is transported only when installed in the equipment may be in accordance with the applicable tests when installed in the equipment.<br>作为设备组成部分的用作设备电源的电芯或电池，如果只能在设备中运输，可按照装在设备中的适用测试要求进行试验。 | Batteries may be shipped separately<br>电池可能单独运输 | N/A |
| **38.3.3(d)** | Batteries or single cell batteries not equipment with battery overcharge protection that are design for use only as a component in another battery or in equipment, which affords such protection, are not subjected to the requirement of T.7.<br>未安装过充电保护装置、按设计要求只能在另一个带过充保护装置的电池组或设备中的电芯或单电芯电池，无需 T.7 试验。 | With overcharge protection<br>带过充电保护装置 | N/A |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| **38.3.3(f)** | When testing a battery assembly in which the aggregate lithium content of all anodes when fully charged, is not more than 500g, or in the case of a lithium battery, with a Watt-hour rating of not more than 6200Wh, that is assembled from batteries that have passed all applicable tests, one assembled battery in a fully charged state shall be tested under tests T3, T4 and T5, and in addition, test T7 in the case of a rechargeable battery.<br>当试验集成电池时，如果集成电池在完全充电时所有阳极的合计锂含量不大于 500g，或在锂离子电池组的情况下，额定瓦特-小时不超过 6200Wh 时，并且是用通过所有试验的电池集合而成的，须对一个完全充电状态的集成电池做试验 T.3、T.4 和 T5，另外，如果是可充电电池，则还需进行 T.7 试验。 | Not battery assembly<br>非集成电池 | N/A |
| **38.3.3(g)** | When batteries that have passed all applicable tests are electrically connected to form battery in which the aggregate lithium content of all anodes, when fully charged more than 500g, or in the case of a lithium ion battery, with a Watt-hour rating of more than 6200Wh, the assembled battery does not need to be tested if the assembled battery is of a type that has been verified as preventing:<br>- Overcharge;<br>- Short circuits; and<br>- Over discharge between the batteries.<br>对于已通过所有适用试验的若干电池组成的集成电池，如在完全充电时所有阳极的总锂含量超过 500g，或在锂离子电池的情况下，如额定的瓦特-小时数超过 6200Wh 时，当集成电池如经过验证属于可防止下列情况，即无需进行试验：<br>- 过充电；<br>- 短路；且<br>- 电池之间的过放。 | Not battery assembly<br>非集成电池 | N/A |
| | For an assembled battery not equipped with overcharge protection that is designed for use only as a component in another battery, in equipment, or in a vehicle, which affords such protection:<br>- the overcharge protection shall be verified at the battery, equipment or vehicle level, as appropriate, and<br>- the use of charging systems without overcharge protection shall be prevented through a physical system or process controls.<br>用于未配备过充保护装置的集成电池，该集成电池仅作为提供过充保护的另一电池、设备或车辆的组件使用<br>-过充保护应在电池、设备或车辆级别进行验证<br>-应通过物理系统或过程控制来防止使用无过充保护的充电系统。 | | N/A |
| **38.3.4** | **Procedure 程序** | | **P** |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | Test T.1 to T.5 shall be conducted in sequence on the same cell or battery.<br>小型电芯或电池应按顺序进行试验 T.1 至 T.5。<br>Test T.6 and T.8 shall be conducted using not otherwise tested cells or batteries.<br>试验 T.6 和 T.8 应使用未试验过的电芯或电池。<br>Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purpose of testing on cycled batteries.<br>试验 T.7 可以使用原先在试验 T.1 至 T.5 中使用过的未损坏电池进行。 | Complied.<br>符合 | P |
| **38.3.4.1** | **Altitude Simulation 高度模拟** | | **P** |
| | Test samples shall be stored at a pressure of 11.6kPa or less for at least six hour at ambient temperature (20±5°C).<br>试验电芯和电池在环境温度(20±5°C)下，储存在小于等于 11.6kPa 的压力下至少 6 小时。 | | P |
| | Results: no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90%.<br>试验结果：无泄漏、无排气、无解体、无破裂、无着火和开路电压降不低于 90%。 | See the TABLE: 38.3.4.1 | P |
| | The requirement relating to voltage is not applicable to test cells and batteries at fully discharge states.<br>测试电压的要求不适用于完全放电的电芯和电池。 | | N/A |
| **38.3.4.2** | **Thermal Test 温度试验** | | **P** |
| | Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72±2°C, followed by storage for at least six hours at a test temperature equal to -40±2°C, The maximum time interval between test temperature extremes is 30 minutes, This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5°C).<br>For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12hours.<br>将电芯和电池在温度为 72±2°C 的条件下贮存不少于 6 个小时；然后，在温度-40±2°C 条件下贮存不少于 6 个小时；两个温度间的间隔最长为 30min,重复操作上述步骤到 10 次；然后，在环境温度为 20±5°C 的条件下放置 24 个小时。<br>大电芯和大电池储存时间至少 12h。 | 6h applied on 72±2°C and -40±2°C | P |
| | Results: no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90%.<br>试验结果：无泄漏、无排气、无解体、无破裂、无着火和开路电压降不低于 90%。 | See the TABLE: 38.3.4.2 | P |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | The requirement relating to voltage is not applicable to test cells and batteries at fully discharge states.<br>测试电压的要求不适用于完全放电的电芯和电池。 | | N/A |
| **38.3.4.3** | **Vibration 振动** | | **P** |
| | For cells and small batteries: from 7 Hz a peak acceleration of $1g_n$ is maintained until 18 Hz reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of $8g_n$ occurs (approximately 50Hz). A peak acceleration of $8g_n$ is then maintained until the frequency is increased to 200Hz.<br>对于电芯和小电池：保持峰值加速度 $1g_n$，从 7Hz 到 18Hz。然后振幅保持在 0.8mm（总偏移量为 1.6mm），增加频率，直到峰值加速度达到 $8g_n$（约 50Hz）。然后保持 $8g_n$ 的峰值加速度，直到频率增加到 200Hz。 | | P |
| | For large batteries: from 7 Hz to a peak acceleration of $1g_n$ is maintained until 18 Hz reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of $2g_n$ occurs (approximately 25 Hz). A peak acceleration of $2g_n$ is then maintained until the frequency is increased to 200 Hz.<br>对于大电池：保持峰值加速度 $1g_n$，从 7Hz 到 18Hz。然后振幅保持在 0.8mm（总偏移量为 1.6mm），增加频率，直到峰值加速度达到 $2g_n$（约 25Hz）。然后保持 $2g_n$ 的峰值加速度，直到频率增加到 200Hz。 | | N/A |
| | Results: no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90%.<br>试验结果：无泄漏、无排气、无解体、无破裂、无着火和开路电压降不低于 90%。 | See the TABLE: 38.3.4.3 | P |
| | The requirement relating to voltage is not applicable to test cells and batteries at fully discharge states.<br>测试电压的要求不适用于完全放电的电芯和电池。 | | N/A |
| **38.3.4.4** | **Shock 冲击** | | **P** |
| | Each cell shall be subjected to a half-sine shock of peak acceleration of $150g_n$ and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of $50g_n$ and pulse duration of 11 milliseconds.<br>每一个电芯应承受峰值加速度为 $150g_n$、脉宽为 6 毫秒的半正弦冲击。或者，大电芯可以按峰值加速度为 $50g_n$、脉宽为 11 毫秒的半正弦冲击。 | $150g_n$, 6ms applied. | P |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | 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.<br>每个电池应承受的峰值加速度取决于电池的质量。小电池的脉宽应为 6 毫秒，大电池的脉宽应为 11 毫秒。 | | N/A |
| | - For small battery, smaller one of 150$g_n$ or $\sqrt{100850/mass}$ | | N/A |
| | - For large battery, smaller one of 50$g_n$ or $\sqrt{30000/mass}$ | | N/A |
| | Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.<br>每一个电芯或电池在安装位置的 3 个垂直的轴向的正方向和负方向各进行 3 次冲击，总共 18 次。 | | P |
| | Results: no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90%.<br>试验结果：无泄漏、无排气、无解体、无破裂、无着火和开路电压降不低于 90%。 | See the TABLE: 38.3.4.4 | P |
| | The requirement relating to voltage is not applicable to test cells and batteries at fully discharge states.<br>测试电压的要求不适用于完全放电的电芯和电池。 | | N/A |
| **38.3.4.5** | **External Short Circuit 外部短路** | | **P** |
| | The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4°C, measured on the external case.<br>待测电芯或电池应加热一段时间，以稳定均衡在 57±4°C 的温度，并测量外壳上的温度。 | | P |
| | The exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries.<br>小电芯或小电池的暴露/加热时间应至少为 6 小时，大电芯或大电池的暴露/加热时间应至少为 12 小时。 | | P |
| | Then the cell or battery at 57± 4°C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.<br>然后，在 57±4°C 下的电芯或电池应经受一次短路，外部线路总的电阻小于 0.1 欧姆。 | See the TABLE: 38.3.4.5 | P |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4°C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.<br>在电芯或电池外部外壳温度恢复到 57±4°C 后，短路状态继续持续至少一小时，或对于大电池的情况下，降至试验期间观察到的最大温升的一半，并保持在该值以下。 | | P |
| | The short circuit and cooling down phases shall be conducted at least at ambient temperature.<br>短路和冷却阶段应至少在环境温度下进行。 | | P |
| | Results: external case temperature does not exceed 170°C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.<br>试验结果：外部温度不超过 170°C，试验期间和试验后 6 小时内，无解体、破裂或起火现象。 | See the TABLE: 38.3.4.5 | P |
| **38.3.4.6** | **Impact, Crush 撞击，挤压** | | **P** |
| **38.3.4.6.2** | **Impact 撞击** | | **N/A** |
| | Applicable to cylindrical cells not less than 18.0 mm in diameter.<br>适用于直径不小于 18.0 mm 的圆柱型电芯。 | Prismatic cell<br>棱柱形电芯 | N/A |
| | The test cell is placed on a flat smooth surface. A stainless steel bar (type 316 or equivalent) (Ø 15.8 mm ±0.1mm, length: ≥60 mm or of the longest dimension of the cell, whichever is greater) is placed across the centre of the test sample.<br>试验电芯放置平坦表面上。一根直径为 15.8± 0.1 毫米，长度至少 6 厘米（或该电芯的最大尺寸，以较大者为准）的 316 型不锈钢棒横放在样品的中心。 | | N/A |
| | A mass of 9.1 kg ±0.1 kg is dropped from a height of 61cm± 2.5cm at the intersection of the bar and the test sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass.<br>一个重达 9.1 ± 0.1 千克的铁锤从 61±2.5 厘米高处以几乎无摩擦和零拉力的姿态沿垂直轨道或通道跌落至不锈钢棒与样品的交结点上。 | | N/A |
| | The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the steel bar lying across the centre of the test sample. Each sample is to be subjected to only a single impact.<br>被撞击的测试样品的长轴平行于平面，并与横放在样品中心的不锈钢棒垂直，每只样品只经受一次撞击。 | | N/A |
| **38.3.4.6.3** | **Crush 挤压** | | **P** |
| | Applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter.<br>适用于棱柱形、袋形、硬币/纽扣式电池和直径小于 18.0 mm 的圆柱型电芯。 | Prismatic cell<br>棱柱形电芯 | P |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5cm/s at the first point of contact.<br>在两个平面间对电芯或元件电芯进行挤压，挤压在第一个接触点的速度约为 1.5cm/s 。 | | P |
| | The crushing is to be continued until the first of the three options below is reached.<br>(a) The applied force reaches 13kN±0.78kN;<br>(b) The voltage of the cell drops by at least 100 mV; or<br>(c) The cell is deformed by 50% or more of its original thickness.<br>Once the maximum pressure has been obtained, the voltage drops by 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.<br>直到发生下述三个条件中的任一条件：<br>(a) 作用力达到 13kN±0.78kN；<br>(b) 电芯电压下降至少 100mV；或<br>(c) 电芯厚度和最初比较变形 50%以上。<br>一旦达到最大压力，电压降超过 100 mV 或者电芯变形至少 50%，压力应该解除。 | The crushing force is released until condition (a) was reached.<br>作用力达到了条件(a)时压力解除。 | P |
| | A prismatic or pouch cell shall be crushed by applying the force to the widest side.<br>棱形或袋装电芯应该在宽面施加挤压力<br>A button/coin cell shall be crushed by applying the force on its flat surface.<br>纽扣/硬币电芯应该在平面施加挤压力<br>For cylindrical cells, the crush force shall be applied perpendicular to longitudinal axis.<br>圆柱型电芯应该在长轴的垂直方向施加挤压力。 | | P |
| | Each test cell or component cell is to be subjected to one crushed only. The test sample shall be observed for a further 6h. The test shall be conducted using test cell or component cells that have not previously been subjected to others tests.<br>每一个测试的电芯或元件电芯只进行一次挤压，测试后再观察 6h。用于测试的电芯或元件电芯之前没有进行过其它的测试。 | | P |
| **38.3.4.6.4** | **Result of Impact and Crush /撞击和挤压试验结果** | | **P** |
| | Results: External temperature does not exceed 170°C and there is no disassembly and no fire during the test and within six hours after this test.<br>试验结果：外部温度不超过 170°C，试验期间和试验后 6 小时内，无解体或起火现象。 | See the TABLE: 38.3.4.6 | P |
| **38.3.4.7** | **Overcharge 过度充电** | | **P** |

| Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3<br>《试验和标准手册》ST/SG/AC.10/11/Rev.7/Amend.1, section 38.3 | | | |
|---|---|---|---|
| **Clause<br>条款** | **Requirement + Test<br>要求+测试方法** | **Result - Remark<br>结果-备注** | **Verdict<br>判断** |
| | Applicable to rechargeable lithium cell/battery with overcharge protection.<br>适用于具有过充电保护功能的可充电锂电芯/电池。 | With overcharge protection<br>带有过充保护装置 | P |
| | The charge current shall be twice the manufacturers' recommended maximum continuous charge current.<br>充电电流应为制造商推荐的最大持续充电电流的两倍。 | 1.4A applied. | P |
| | - When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.<br>制造商建议的充电电压不大于 18 伏时，实验的最小电压应是电池组最大充电电压的两倍或 22 伏两者中的较小者。 | 8.4V applied. | P |
| | - When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times maximum charge voltage.<br>制造商建议的充电电压大于 18 伏时，实验的最小电压应是最大充电电压的 1.2 倍。 | | N/A |
| | Tests are to be at ambient temperature. The duration of the test shall be 24 hours.<br>测试在室温下进行，测试时间为 24h。 | | P |
| | Results: there is no disassembly and no fire during the test and within seven days after this test.<br>试验结果：试验期间和试验后 7 天内，无解体或起火现象。 | See the TABLE: 38.3.4.7 | P |
| **38.3.4.8** | **Forced Discharge 强制放电** | | **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>在环境温度下，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的初始电流为制造厂指定的最大放电电流。 | | P |
| | Results: there is no disassembly and no fire during the test and within seven days after this test.<br>试验结果：试验期间和试验后 7 天，无解体或起火现象。 | See the TABLE: 38.3.4.8 | P |

| TABLE: 38.3.4.1 Altitude simulation 高度模拟 | | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before Test | | After Test | | Mass loss (%) | Residual OCV (%) | Results |
| | Mass(g) | OCV(V) | Mass(g) | OCV(V) | | | |
| Fully charged at first cycle | | | | | | | |
| C1# | 28.849 | 4.17 | 28.849 | 4.17 | 0.000 | 100.00 | O |
| C2# | 28.881 | 4.17 | 28.881 | 4.17 | 0.000 | 100.00 | O |
| C3# | 29.024 | 4.16 | 29.023 | 4.16 | 0.003 | 100.00 | O |
| C4# | 28.993 | 4.17 | 28.993 | 4.17 | 0.000 | 100.00 | O |
| C5# | 29.078 | 4.17 | 29.077 | 4.16 | 0.003 | 99.76 | O |
| Fully charged after 25 cycles | | | | | | | |
| C6# | 29.034 | 4.17 | 29.033 | 4.16 | 0.003 | 99.76 | O |
| C7# | 28.984 | 4.17 | 28.984 | 4.17 | 0.000 | 100.00 | O |
| C8# | 28.936 | 4.17 | 28.935 | 4.17 | 0.003 | 100.00 | O |
| C9# | 28.975 | 4.17 | 28.975 | 4.17 | 0.000 | 100.00 | O |
| C10# | 29.012 | 4.16 | 29.012 | 4.16 | 0.000 | 100.00 | O |
| Results: O = no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90% | | | | | | | |

| TABLE: 38.3.4.2 Thermal test 温度试验 | | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before Test | | After Test | | Mass loss (%) | Residual OCV (%) | Results |
| | Mass(g) | OCV(V) | Mass(g) | OCV(V) | | | |
| Fully charged at first cycle | | | | | | | |
| C1# | 28.849 | 4.17 | 28.840 | 4.09 | 0.031 | 98.08 | O |
| C2# | 28.881 | 4.17 | 28.873 | 4.10 | 0.028 | 98.32 | O |
| C3# | 29.023 | 4.16 | 29.016 | 4.09 | 0.024 | 98.32 | O |
| C4# | 28.993 | 4.17 | 28.985 | 4.11 | 0.028 | 98.56 | O |
| C5# | 29.077 | 4.16 | 29.069 | 4.09 | 0.028 | 98.32 | O |
| Fully charged after 25 cycles | | | | | | | |
| C6# | 29.033 | 4.16 | 29.023 | 4.09 | 0.034 | 98.32 | O |
| C7# | 28.984 | 4.17 | 28.976 | 4.10 | 0.028 | 98.32 | O |
| C8# | 28.935 | 4.17 | 28.928 | 4.11 | 0.024 | 98.56 | O |
| C9# | 28.975 | 4.17 | 28.968 | 4.10 | 0.024 | 98.32 | O |
| C10# | 29.012 | 4.16 | 29.006 | 4.10 | 0.021 | 98.56 | O |
| Results: O = no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90% | | | | | | | |

| TABLE: 38.3.4.3 Vibration 振动 | | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before Test | | After Test | | Mass loss (%) | Residual OCV (%) | Results |
| | Mass(g) | OCV(V) | Mass(g) | OCV(V) | | | |
| Fully charged at first cycle | | | | | | | |
| C1# | 28.840 | 4.09 | 28.839 | 4.08 | 0.003 | 99.76 | O |
| C2# | 28.873 | 4.10 | 28.872 | 4.10 | 0.003 | 100.00 | O |
| C3# | 29.016 | 4.09 | 29.015 | 4.08 | 0.003 | 99.76 | O |
| C4# | 28.985 | 4.11 | 28.985 | 4.10 | 0.000 | 99.76 | O |
| C5# | 29.069 | 4.09 | 29.067 | 4.09 | 0.007 | 100.00 | O |
| Fully charged after 25 cycles | | | | | | | |
| C6# | 29.023 | 4.09 | 29.023 | 4.09 | 0.000 | 100.00 | O |
| C7# | 28.976 | 4.10 | 28.974 | 4.09 | 0.007 | 99.76 | O |
| C8# | 28.928 | 4.11 | 28.928 | 4.10 | 0.000 | 99.76 | O |
| C9# | 28.968 | 4.10 | 28.966 | 4.09 | 0.007 | 99.76 | O |
| C10# | 29.006 | 4.10 | 29.006 | 4.10 | 0.000 | 100.00 | O |
| Results: O = no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90% | | | | | | | |

| TABLE: 38.3.4.4 Shock 冲击 | | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before Test | | After Test | | Mass loss (%) | Residual OCV (%) | Results |
| | Mass(g) | OCV(V) | Mass(g) | OCV(V) | | | |
| Fully charged at first cycle | | | | | | | |
| C1# | 28.839 | 4.08 | 28.839 | 4.08 | 0.000 | 100.00 | O |
| C2# | 28.872 | 4.10 | 28.872 | 4.09 | 0.000 | 99.76 | O |
| C3# | 29.015 | 4.08 | 29.015 | 4.08 | 0.000 | 100.00 | O |
| C4# | 28.985 | 4.10 | 28.985 | 4.10 | 0.000 | 100.00 | O |
| C5# | 29.067 | 4.09 | 29.067 | 4.09 | 0.000 | 100.00 | O |
| Fully charged after 25 cycles | | | | | | | |
| C6# | 29.023 | 4.09 | 29.023 | 4.08 | 0.000 | 99.76 | O |
| C7# | 28.974 | 4.09 | 28.974 | 4.09 | 0.000 | 100.00 | O |
| C8# | 28.928 | 4.10 | 28.927 | 4.09 | 0.003 | 99.76 | O |
| C9# | 28.966 | 4.09 | 28.965 | 4.09 | 0.003 | 100.00 | O |
| C10# | 29.006 | 4.10 | 29.006 | 4.10 | 0.000 | 100.00 | O |
| Results: O = no leakage, no venting, no disassembly, no rupture, no fire, and the open circuit voltage drop not less than 90% | | | | | | | |

| TABLE: 38.3.4.5 External Short-circuit 外部短路 | | | | P |
|---|---|---|---|---|
| **Sample No.** | **Ambient(ºC) (At 57± 4ºC )** | **Testing resistance (mΩ)** | **Max. External Temperature(ºC)** | **Results** |
| Fully charged at first cycle | | | | |
| C1# | 57.3 | 86.2 | 58.6 | O |
| C2# | 57.3 | 84.3 | 58.9 | O |
| C3# | 57.3 | 85.6 | 58.7 | O |
| C4# | 57.3 | 88.5 | 58.8 | O |
| C5# | 57.3 | 87.7 | 58.5 | O |
| Fully charged after 25 cycles | | | | |
| C6# | 57.5 | 83.3 | 58.6 | O |
| C7# | 57.5 | 87.5 | 58.5 | O |
| C8# | 57.5 | 86.6 | 58.7 | O |
| C9# | 57.5 | 88.8 | 58.3 | O |
| C10# | 57.5 | 86.7 | 58.4 | O |
| Results: O = no disassembly, no rupture, no fire during the test and within six hours after the test. | | | | |

| TABLE: 38.3.4.6 Impact 撞击 | | | | | N/A |
|---|---|---|---|---|---|
| **TABLE: 38.3.4.6 Crush 挤压** | | | | | **P** |
| **Sample No.** | **Max. External Temperature(ºC)** | **Results** | **Sample No.** | **Max. External Temperature(ºC)** | **Results** |
| 50% of the design rated capacity at first cycle | | | 50% of the design rated capacity after 25 cycles | | |
| C11# | 23.5 | O | C16# | 24.3 | O |
| C12# | 24.5 | O | C17# | 24.1 | O |
| C13# | 23.7 | O | C18# | 23.9 | O |
| C14# | 24.1 | O | C19# | 24.0 | O |
| C15# | 23.8 | O | C20# | 24.2 | O |
| Results: O = no disassembly, no fire during the test and within six hours after this test. | | | | | |

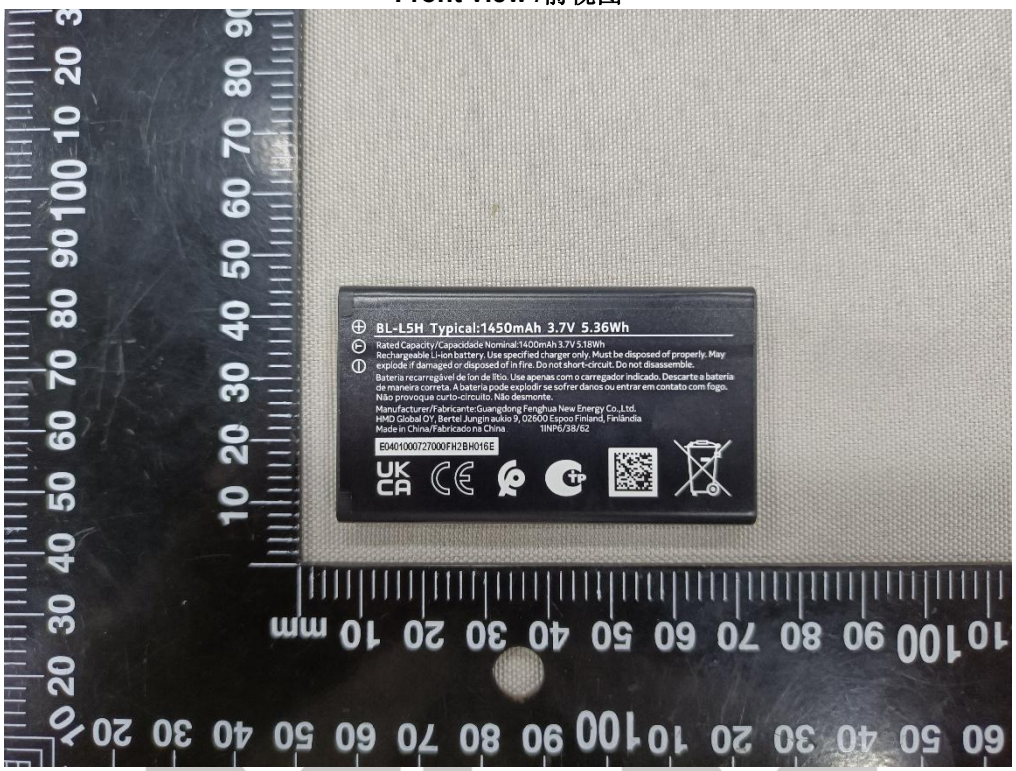
| TABLE: 38.3.4.7 Overcharge 过度充电 | | | | | P |
|---|---|---|---|---|---|
| The test current = 1.4A | | | | | - |
| The test voltage = 8.4V | | | | | - |
| **Sample No.** | **OCV(V)** | **Results** | **Sample No.** | **OCV(V)** | **Results** |
| Fully discharged at first cycle | | | Fully discharged after 25 cycles | | |
| C21# | 4.17 | O | C25# | 4.17 | O |
| C22# | 4.16 | O | C26# | 4.17 | O |
| C23# | 4.17 | O | C27# | 4.17 | O |
| C24# | 4.17 | O | C28# | 4.17 | O |
| Results: O = no disassembly, no fire during the test and within seven days after this test. | | | | | |

| TABLE: 38.3.4.8 Forced discharge 强制放电 | | | | | P |
|---|---|---|---|---|---|
| **Sample No.** | **OCV(V)** | **Results** | **Sample No.** | **OCV(V)** | **Results** |
| Fully discharged at first cycle | | | Fully discharged after 25 cycles | | |
| C29# | 3.421 | O | C39# | 3.423 | O |
| C30# | 3.427 | O | C40# | 3.424 | O |
| C31# | 3.435 | O | C41# | 3.438 | O |
| C32# | 3.438 | O | C42# | 3.429 | O |
| C33# | 3.424 | O | C43# | 3.427 | O |
| C34# | 3.434 | O | C44# | 3.420 | O |
| C35# | 3.425 | O | C45# | 3.422 | O |
| C36# | 3.427 | O | C46# | 3.432 | O |
| C37# | 3.431 | O | C47# | 3.433 | O |
| C38# | 3.428 | O | C48# | 3.427 | O |
| Results: O = no disassembly, no fire during the test and within seven days after this test. | | | | | |

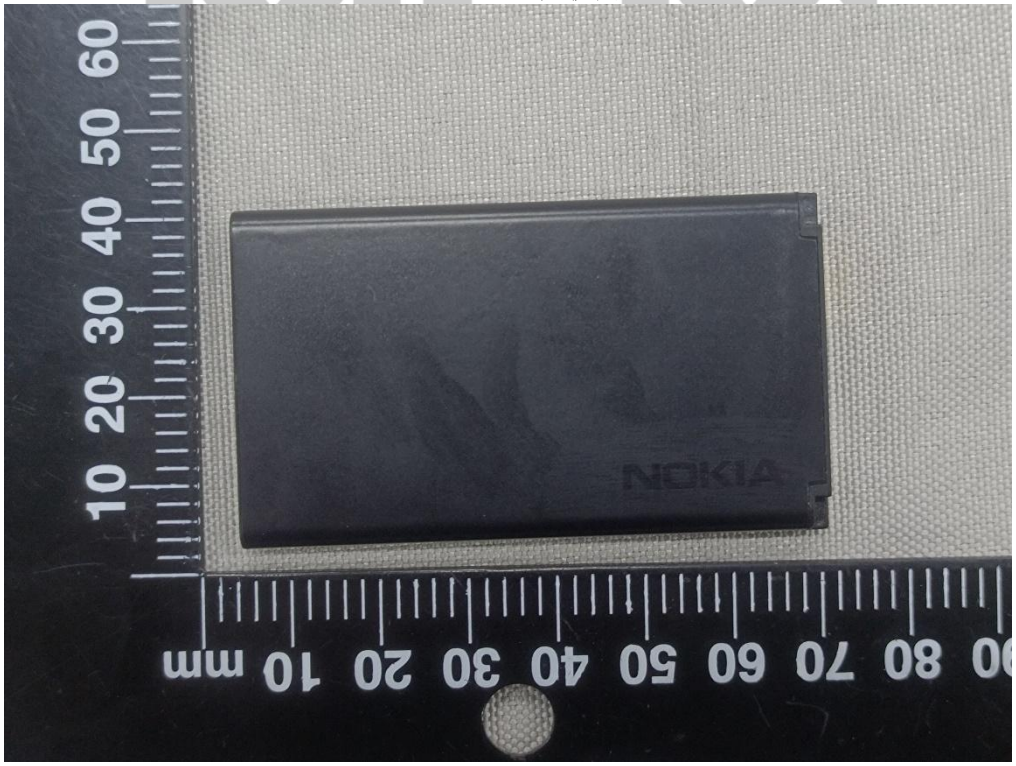
MCM Technology & Service

# Photos of the Battery
# 电池照片

**Front view /前视图**

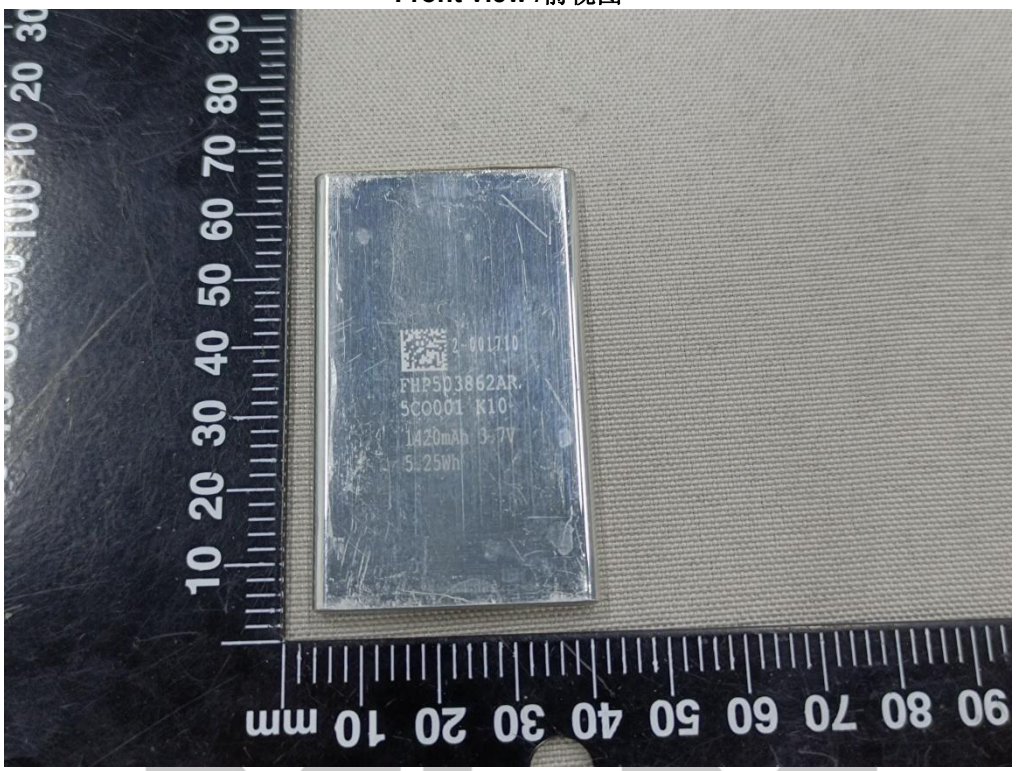



**Back view /后视图**

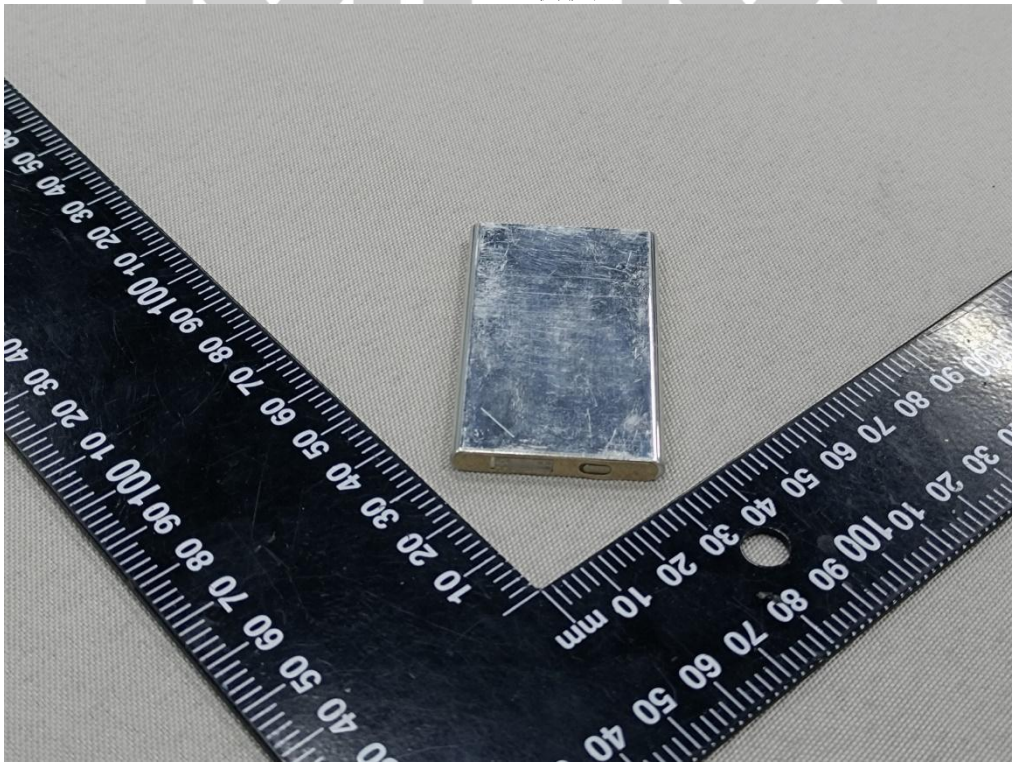


## Photos of the Cell
## 电芯照片

**Front view /前视图**




**Side view /侧视图**



**-- End of Report --**

## Important Note
## 注意事项

1. This test report is invalid without the special testing seal and cross-page seal of Guangzhou MCM Certification & Testing Co., Ltd.
   本检测报告无广州邦禾检测技术有限公司检测专用章、骑缝章无效。
2. Nobody is allowed to photocopy or partly photocopy this test report without written permission of Guangzhou MCM Certification & Testing Co., Ltd.
   未经广州邦禾检测技术有限公司书面同意，不得全部或部分复制本检测报告。
3. This test report is invalid without the signatures of Approver, Reviewer and Tester.
   本检测报告无批准人、审核人及检测员签名无效。
4. This test report is invalid if altered.
   本检测报告涂改无效。
5. Objection to this test report must be submitted to Guangzhou MCM Certification & Testing Co., Ltd. within 15 days after the publication of the report.
   若对此检测报告有异议，必须在报告发布之日起十五天内向广州邦禾检测技术有限公司提出。
6. This test report is only responsible for the received samples.
   本检测报告仅对收到的样品负责。
7. The test items in this report are not in the scope of CMA. They do not have the impartial function.
   本报告检测项目不在 CMA 范围内，不具备对社会证明作用。
8. As for the test results, “N/A” means “Not applicable”, “P” means “Pass” and “F” means “Fail”.
   本检测结果中“N/A”表示“不适用”，“P”表示“通过”，“F”表示“不通过”。


| | |
|---|---|
| **Testing Lab.:** | Guangzhou MCM Certification & Testing Co., Ltd. |
| **检测单位：** | 广州邦禾检测技术有限公司 |
| **Address:** | Building 2 No. 45 Zhong Er Section of Shiguang Road, Zhongcun Street, Panyu |
| **地址：** | District, Guangzhou City, Guangdong Province, China. |
| | 中国 广东省广州市番禺区钟村街市广路钟二路段 45 号 2 栋 |
| **Tel/电话：** | 0086-20-3477 7662 |
| **Email/电子邮箱：** | service@mcmtek.com |
| **Web/公司网址：** | https://www.mcmtek.com |