

UN38.3 检测报告

UN38.3 TEST REPORT

样品名称
PRODUCT
DESIGNATION : 锂离子电芯
Li-ion Cell

商 标
TRADE MARK(s) : /

样品型号
MODEL NAME : INR18650 2200mAh

委托单位
APPLICANT :

测试标准
STANDARD : 联合国《试验和标准手册》（第8版）38.3节
UN "Manual of Tests and Criteria"
ST/SG/AC.10/11/Rev.8/Subsection 38.3

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深标智能检测与评定技术服务（深圳）有限公司
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基本信息 General Information

样品名称 Product Designation	锂离子电芯 Li-ion Cell	型号参数 Model and Parameters	INR18650 2200mAh, 3.7V, 2200mAh, 8.14Wh		
委托单位 Applicant					
委托单位地址 Applicant's Address					
制造商 Manufacturer					
制造商地址 Manufacturer's Address					
生产商 Factory					
生产商地址 Factory's Address					
生产商联系电话 Factory's Contact Telephone					
商标/识别码 Trade Mark(s)/ Identification	/	形状 Shape	近圆柱体 /Approximate Cylinder	尺寸 Size	(ϕ 18.21*65.17) mm
标准 Standard	联合国《试验和标准手册》(第8版) 38.3 节 UN "Manual of Tests and Criteria" ST/SG/AC.10/11/Rev.8/Subsection 38.3				
接收日期 Receipt Date	2025-06-01		测试时间 Test Date	2025-06-02 ~ 2025-06-25	
检测结论: Test Conclusions	合格。 PASS.				
备注: Remark:	无 None				
检测 (签名): 刘翔 Tested by: 刘翔	审核 (签名): 叶文兵 Reviewed by: 叶文兵	批准 (签名): 彭育华 Approved by: 彭育华	深标智能检测与评定技术服务(深圳)有限公司 Shenzhen Standard Robot Test and Assessment Technology Service Co., LTD. 2025-06-25 章		

产品信息
Product Information

型号 Model	电池芯 Cell	电池组 Battery
	INR18650 2200mAh	/
标称电压 Nominal Voltage	3.70V	/
额定容量 Rated Capacity	2200mAh	/
充电限制电压 Limited Charge Voltage	4.20V	/
标准充电电流 Standard Charge Current	1100mA	/
最大充电电流 Maximum Charge Current	2200mA	/
充电截止电流 End Charging Current	110mA	/
标准放电电流 Standard Discharge Current	1100mA	/
最大放电电流 Maximum Discharge Current	1100mA	/
放电截止电压 Cut-Off Voltage	2.75V	/
重量 Mass	43.100g	/

测试项目及结论

Test Items and conclusions

条款 Clause	检测项目 Test item	样品编号 Sample No.	状态 State	测试结论 Test Result	备注 Remark
38.3.4.1	高度模拟 Altitude simulation	C1~C5	第1个充电周期，完全充电 First cycle fully charged	合格 Pass	/
		C6~C10	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.2	温度试验 Thermal test	C1~C5	第1个充电周期，完全充电 First cycle fully charged	合格 Pass	/
		C6~C10	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.3	振动 Vibration	C1~C5	第1个充电周期，完全充电 First cycle fully charged	合格 Pass	/
		C6~C10	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.4	冲击 Shock	C1~C5	第1个充电周期，完全充电 First cycle fully charged	合格 Pass	/
		C6~C10	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.5	外部短路 External short circuit	C1~C5	第1个充电周期，完全充电 First cycle fully charged	合格 Pass	/
		C6~C10	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.6	撞击 Impact / 挤压 Crush	C11~C15	第 1 个充电周期，50%容量 First cycle 50% Capacity	合格 Pass	撞击 Impact
		C16~C20	第 25 个充电周期，50%容量 25 cycle 50% Capacity		
38.3.4.7	过度充电 Overcharge	/	第1个充电周期，完全充电 First cycle fully charged	不适用 N/A	/
		/	第25个充电周期，完全充电 25 cycles fully charged		
38.3.4.8	强制放电 Forced discharge	C21~C30	第1个充电周期，完全放电 First cycle fully discharge	合格 Pass	/
		C31~C40	第25个充电周期，完全放电 25 cycles fully discharge		
检测结果不符合标准项的说明： Description of the deviation from the standard, if any:		无 None			

测试方法和要求 Test Method and Requirement

38.3.4.1	检测 1: 高度模拟 Test 1: Altitude simulation 将电池芯或电池组在温度为 $20\pm5^{\circ}\text{C}$, 大气压力为不大于 11.6kPa 的环境中贮存不少于 6 小时。 Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature ($20\pm5^{\circ}\text{C}$). 标准要求 Requirements: 1) 样品质量损失限值参考: 表 38.3.1 Cells and batteries Mass loss limit reference: Table 38.3.1 2) 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或电池组。 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 3) 样品 (电池芯或电池组) 应无渗漏、无排气、无解体、无破裂以及无起火现象的发生。 No leakage, no venting, no disassembly, no rupture and no fire.
38.3.4.2	检测 2: 温度试验 Test 2: Thermal test 电池芯或电池组存储条件如下: Test cells and batteries are to be stored for: 1) 对于小型电池芯和电池组: 一次温度循环为 $72\pm2^{\circ}\text{C}$ (6h) ~ $-40\pm2^{\circ}\text{C}$ (6h) For small cells and batteries: one temperature cycle: $72\pm2^{\circ}\text{C}$ (6h) ~ $-40\pm2^{\circ}\text{C}$ (6h) 对于大型电池和电池组: 一次温度循环为 $72\pm2^{\circ}\text{C}$ (12h) ~ $-40\pm2^{\circ}\text{C}$ (12h) For large cells and batteries: one temperature cycle: $72\pm2^{\circ}\text{C}$ (12h) ~ $-40\pm2^{\circ}\text{C}$ (12h) 2) 温度转换最大间隔时间为 30min。 The maximum time interval between test temperature extremes is 30minutes. 3) 重复 10 次循环。 This procedure is to be repeated 10 times. 4) 循环结束后, 电池芯和电池组在 $20\pm5^{\circ}\text{C}$ 的条件下搁置 24 小时。 After which all test cells and batteries are to be stored for 24 hours at ambient temperature ($20\pm5^{\circ}\text{C}$). 标准要求 Requirement: 1) 样品质量损失限值参考: 表 38.3.1 Cells and batteries Mass loss limit reference: Table 38.3.1 2) 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芯和电池组。 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 3) 样品 (电池芯或电池组) 应无渗漏、无排气、无解体、无破裂以及无起火现象的发生。 No leakage, no venting, no disassembly, no rupture and no fire.

38.3.4.3	检测 3: 振动 Test 3: Vibration 1) 电池芯和电池组牢固地安装在振动台（的台面）上。 Cells and batteries are firmly secured to the platform of the vibration machine. 2) 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。 The vibration: a sinusoidal waveform with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes. 3) 对于电池芯和小型电池组：从 7Hz 开始，以 1gn 的峰值加速度保持不变，直到达到 18Hz。然后将振幅保持在 0.8mm（总偏移 1.6mm）并且频率增加直到出现 8gn 的峰值加速度（大约 50Hz）。然后保持 8gn 的峰值加速度，直到频率增加到 200Hz。 For cells and small batteries: from 7Hz a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 8gn occurs (approximately 50Hz). A peak acceleration of 8gn is then maintained until the frequency is increased to 200Hz. 对于大型电池组：从 7Hz 开始，以 1gn 的峰值加速度保持不变，直到达到 18Hz。然后将振幅保持在 0.8mm（总偏移 1.6mm）并且频率增加直到出现 2gn 的峰值加速度（大约 25Hz）。然后保持 2gn 的峰值加速度，直到频率增加到 200Hz。 For large batteries: from 7Hz a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 2gn occurs (approximately 25Hz). A peak acceleration of 2gn is then maintained until the frequency is increased to 200Hz. 4) 以振动的其中一个方向必须是垂直样品极性，对每个电池从三个互相垂直的方向上循环 12 次，每个方向 3 个小时，共 9 小时。 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. 标准要求 Requirements: 1) 样品质量损失限值参考：表 38.3.1 Cells and batteries Mass loss limit reference: Table 38.3.1 2) 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芯和电池组。 Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 3) 样品（电池芯或电池组）应无渗漏、无排气、无解体、无破裂以及无起火现象的发生。 No leakage, no venting, no disassembly, no rupture and no fire.
38.3.4.4	检测 4: 冲击 Test 4: Shock 1) 试验电池芯和电池组用刚性支架紧固在试验装置上，支架支撑着每个试验电池芯和电池组的所有安装面。 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. 2) 每个电池芯须经受峰值加速度 150 gn 和脉冲持续时间 6 ms 的半正弦波冲击。不过，大型电池芯须经受峰值加速度 50 gn 和脉冲持续时间 11 ms 的半正弦波冲击。 Each cell 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 subjects to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds.

- 3) 每个电池芯须经受半正弦波冲击，峰值加速度需要根据电池的重量来决定。小型电池的脉冲持续时间为 6 ms，大型电池的脉冲持续时间为 11ms。下面的公式是用来计算合适的最小峰值加速度。

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.

- 4) 每个电池芯或电池组须在三个互相垂直的电芯或电池安装方位的正方向经受三次冲击，接着在

Battery	Minimum peak acceleration	Pulse duration
Small batteries	150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms
Large batteries	50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms

* Mass is expressed in kilograms.

反方向经受三次冲击，总共经受 18 次冲击。

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.

标准要求 Requirements :

- 样品质量损失限值参考：表 38.3.1
Cells and batteries Mass loss limit reference: Table 38.3.1
- 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或电池组。
Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states.
- 样品（电池芯或电池组）应无渗漏、无排气、无解体、无破裂以及无起火现象的发生。
No leakage, no venting, no disassembly, no rupture and no fire.

38.3.4.5

检测 5: 外部短路

Test 5: External Short Circuit

- 加热电池芯或电池组样品直到温度稳定在 57±4°C
The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature 57±4°C.
- 将样品正负极用小于 0.1Ω 的总电阻回路进行短路，样品的外表温度恢复到 57±4°C 之后保持短路状态 1 小时以上。
The cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 57±4°C, 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.
- 对电池芯或电池组必须进一步观察 6 个小时才能下结论。
The cell or battery must be observed for a further six hours for the test to be concluded.

Requirements 标准要求:

- 电池芯或电池组的最高表面温度应不超过 170°C。
Cell or battery external temperature not exceed 170°C.

	2) 测试中与测试后 6 小时内无解体、无破裂、无起火。 No disassembly, no rupture and no fire during the test and within six hours after the test.
38.3.4.6	检测 6: 撞击/挤压 Test 6: Impact / Crush 撞击 (适用于直径不小于 18 毫米的圆柱形电池) Impact (applicable to cylindrical cells not less than 18mm in diameter) 1) 将试验样品用的电池芯或元件电池芯放在一个平坦光滑的平面上 This test sample cell or component cell is to be placed on a flat smooth surface. 2) 将一直径为 15.8mm±0.1mm 的不锈钢圆棒横过电池中部放置后, 将一质量为 9.1kg±0.1 kg 的物体从 61±2.5cm 的高度落向样品。 A 15.8 mm±0.1mm diameter bar is to be placed across the center of the sample, A 9.1kg±0.1 kg mass is to be dropped from a height of 61±2.5cm onto the sample. 3) 接受撞击的试样, 纵轴应与平坦的表面平行并与横放在试样中心的直径 15.8±0.1 毫米弯曲表面的纵轴垂直。每一个试样只经受一次撞击。 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 center of the test sample. Each sample is to be subjected to only a single impact. 标准要求 Requirements: 1) 电池芯的最高表面温度应不超过 170°C。 Cells external temperature not exceed 170°C. 2) 测试中与测试后 6 小时内无解体、无破裂、无起火。 No disassembly, no rupture and no fire during the test and within six hours after the test. 挤压 (适用于棱柱形、袋装、硬币/纽扣电池和直径小于 18 毫米的圆柱形电池芯)。 Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18mm in diameter). 1) 将电池芯或元件电池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: A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached. (a) 施加的力达到 13 千牛顿±0.78 千牛顿。 The applied force reaches 13kN ± 0.78kN. (b) 电池的电压下降至少 100 毫伏。 The voltage of the cell drops by at least 100mV. (c) 电池变形达原始厚度的 50%或以上。 The cell is deformed by 50% or more of its original thickness. 2) 棱柱形或袋装电池芯应从最宽的一面施压。纽扣/硬币形电池芯应从其平坦表面施压。圆柱形电池芯应从与纵轴垂直的方向施压。 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. 标准要求 Requirements: 1) 电池芯的最高表面温度应不超过 170°C。 Cells external temperature not exceed 170°C. 2) 测试中与测试后 6 小时内无解体、无破裂、无起火。 No disassembly, no rupture and no fire during the test and within six hours after the test.

38.3.4.7	检测 7: 过度充电 Test 7: Overcharge 1) 以制造商建议的最大持续充电电流的两倍对电池组充电。 The charge current shall be twice the manufacturer's recommended maximum continuous charge current. 2) 试验的最小电压如下: The minimum voltage of the test shall be as follows: a) 制造商建议的充电电压不大于 18V 时, 试验的最小电压应是电池组最大充电电压的两倍或 22V 两者中的较小者。 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. b) 制造商建议的充电电压大于 18V 时, 试验的最小电压应为最大充电电压的 1.2 倍。 when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage. 3) 试验应在环境温度 (20±5°C) 下进行。进行试验的时间应为 24 小时。 Tests are to be conducted at ambient temperature 20±5°C, The duration of the test shall be 24 hours. 标准要求 Requirements: 试验过程中和试验后 7 天内无解体, 无起火。 No disassembly and no fire during the test and within seven days after the test.
38.3.4.8	检测 8: 强制放电 Test 8: Forced discharge 每个电池芯应在环境温度 (20±5°C) 下与 12V 直流电源串联在起始电流等于制造商给定的最大放电电流的条件下强制放电。 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. 将适当大小和额定值的电阻负荷与试验电池芯串联, 计算得出给定的放电电流。对每个电池芯进行强制放电, 放电时间(小时)应等于其额定容量除以初始试验电流(安培)。 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). 标准要求 Requirements: 试验过程中和试验后 7 天内无解体, 无起火。 No disassembly and no fire during the test and within seven days after the test.

表 38.3.1:质量损失限值
Table 38.3.1:Mass loss limit

电池或电池组质量 M Mass M of cell or battery	质量损失限值 Mass loss limit
$M < 1 \text{ g}$	0.5%
$1 \text{ g} \leq M \leq 75 \text{ g}$	0.2%
$M > 75 \text{ g}$	0.1%

质量损失的量化值，可用以下公式计算：

$$\text{质量损失}(\%) = (M_1 - M_2)/M_1 \times 100$$

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

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

式中：M1 是试验前的质量，M2 是试验后的质量。如果质量损失不超过表 38.3.1 所列的数值，应视为“无质量损失”。

Where M1 is the mass before the test and M2 is the mass after the test. When mass loss does not exceed the values in Table 38.3.1, it shall be considered as "no mass loss".

渗漏是指可以看到的电解液或者其他物质从电池芯或电池组中漏出，或电池芯或电池组中的物质损失（不包括电池外壳、搬运装置、或标签），质量损失超过表 38.3.1 所列的数值。

Leakage means the visible escape of electrolyte or other material from a cell or battery or the loss of material (except battery casing, handling devices or labels) from a cell or battery such that the loss of mass exceeds the values in Table 38.3.1.

排气是指按设计方式释放电池芯或电池组内部过高的压力，防止其破裂或解体。

Venting means the release of excessive internal pressure from a cell or battery in a manner intended by design to preclude rupture or disassembly.

解体是指排气或破裂使电池芯或电池组任何部分的固体物质穿过放在离电池芯或电池 25 cm 处的丝网筛（直径 0.25 mm 的软铝丝，网格密度每厘米 6 至 7 条铝丝）。

Disassembly means a vent or rupture where solid matter from any part of a cell or battery penetrates a wire mesh screen (annealed aluminium wire with a diameter of 0.25 mm and grid density of 6 to 7 wires per cm) placed 25 cm away from the cell or battery.

破裂是指内部或外部原因引起的电池容器或电池组外壳机械损坏，造成内装物暴露或溢出，但无固体喷射。

Rupture means the mechanical failure of a cell container or battery case induced by an internal or external cause, resulting in exposure or spillage but not ejection of solid materials.

起火是指试验电池芯或电池组有火焰冒出。

Fire means that flames are emitted from the test cell or battery.

检测数据

Test Data

(表 T.1) Table T.1 高度模拟 Altitude simulation

检测样品 状态 Test sample status	编号 No.	质量 Mass (g)		质量损失 Mass loss (%)	电压 Voltage (V)		电压亏损 Voltage loss (%)	结果 Status
		测试前 Pre-test	试验后 After test		测试前 Pre-test	试验后 After test		
首次循环 满电状态 First cycle, fully charged state	C1	43.055	43.053	0.005	4.11	4.11	0.000	合格 Pass
	C2	43.061	43.061	0.000	4.11	4.11	0.000	合格 Pass
	C3	43.031	43.031	0.000	4.11	4.11	0.000	合格 Pass
	C4	43.055	43.051	0.009	4.11	4.11	0.000	合格 Pass
	C5	43.026	43.026	0.000	4.11	4.10	0.195	合格 Pass
25 次循环 满电状态 25th cycle, fully charged state	C6	43.048	43.042	0.014	4.11	4.11	0.000	合格 Pass
	C7	43.047	43.047	0.000	4.11	4.11	0.000	合格 Pass
	C8	43.066	43.066	0.000	4.11	4.11	0.000	合格 Pass
	C9	43.038	43.032	0.014	4.11	4.11	0.000	合格 Pass
	C10	43.055	43.055	0.000	4.11	4.11	0.000	合格 Pass
注释 Notes : 大气压强 Atmospheric pressure :101.1kPa, 环境温度 Ambient temperature : 22.9℃ 检测后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。 After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %.								

(表 T.2)Table T.2 温度试验 Thermal test

检测样品 状态 Test sample status	编号 No.	质量 Mass (g)		质量损失 Mass loss (%)	电压 Voltage (V)		电压亏损 Voltage loss (%)	结果 Status
		测试前 Pre-test	试验后 After test		测试前 Pre-test	试验后 After test		
首次循环 满电状态 First cycle, fully charged state	C1	43.053	43.048	0.012	4.11	4.06	1.144	合格 Pass
	C2	43.061	43.054	0.016	4.11	4.05	1.339	合格 Pass
	C3	43.031	43.024	0.016	4.11	4.06	1.362	合格 Pass
	C4	43.051	43.044	0.016	4.11	4.06	1.241	合格 Pass
	C5	43.026	43.021	0.012	4.10	4.06	1.122	合格 Pass
25 次循环 满电状态 25th cycle, fully charged state	C6	43.042	43.037	0.012	4.11	4.06	1.266	合格 Pass
	C7	43.047	43.042	0.012	4.11	4.06	1.338	合格 Pass
	C8	43.066	43.060	0.014	4.11	4.05	1.364	合格 Pass
	C9	43.032	43.026	0.014	4.11	4.06	1.217	合格 Pass
	C10	43.055	43.047	0.019	4.11	4.06	1.193	合格 Pass
注释 Notes : 大气压强 Atmospheric pressure :101.2kPa, 环境温度 Ambient temperature : 23.5℃ 检测后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。 After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %.								

(表 T.3) Table T.3 振动 Vibration

检测样品状态 Test sample status	编号 No.	质量 Mass (g)		质量损失 Mass loss (%)	电压 Voltage (V)		电压亏损 Voltage loss (%)	结果 Status
		测试前 Pre-test	试验后 After test		测试前 Pre-test	试验后 After test		
首次循环 满电状态 First cycle, fully charged state	C1	43.048	43.048	0.000	4.06	4.06	0.000	合格 Pass
	C2	43.054	43.054	0.000	4.05	4.05	0.000	合格 Pass
	C3	43.024	43.024	0.000	4.06	4.06	0.000	合格 Pass
	C4	43.044	43.043	0.002	4.06	4.06	0.000	合格 Pass
	C5	43.021	43.021	0.000	4.06	4.06	0.000	合格 Pass
25 次循环 满电状态 25th cycle, fully charged state	C6	43.037	43.035	0.005	4.06	4.06	0.000	合格 Pass
	C7	43.042	43.042	0.000	4.06	4.06	0.000	合格 Pass
	C8	43.060	43.058	0.005	4.05	4.05	0.000	合格 Pass
	C9	43.026	43.026	0.000	4.06	4.06	0.000	合格 Pass
	C10	43.047	43.046	0.002	4.06	4.06	0.000	合格 Pass

注释 Notes :

大气压强 Atmospheric pressure :101.3kPa, 环境温度 Ambient temperature : 21.4℃

检测后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %.

(表 T.4) Table T.4 冲击 Shock

检测样品状态 Test sample status	编号 No.	质量 Mass (g)		质量损失 Mass loss (%)	电压 Voltage (V)		电压亏损 Voltage loss (%)	结果 Status
		测试前 Pre-test	试验后 After test		测试前 Pre-test	试验后 After test		
首次循环 满电状态 First cycle, fully charged state	C1	43.048	43.048	0.000	4.06	4.06	0.000	合格 Pass
	C2	43.054	43.054	0.000	4.05	4.05	0.000	合格 Pass
	C3	43.024	43.024	0.000	4.06	4.06	0.000	合格 Pass
	C4	43.043	43.043	0.000	4.06	4.06	0.000	合格 Pass
	C5	43.021	43.021	0.000	4.06	4.06	0.000	合格 Pass
25 次循环 满电状态 25th cycle, fully charged state	C6	43.035	43.035	0.000	4.06	4.06	0.000	合格 Pass
	C7	43.042	43.042	0.000	4.06	4.06	0.000	合格 Pass
	C8	43.058	43.058	0.000	4.05	4.05	0.000	合格 Pass
	C9	43.026	43.026	0.000	4.06	4.06	0.000	合格 Pass
	C10	43.046	43.046	0.000	4.06	4.06	0.000	合格 Pass

注释 Notes :

大气压强 Atmospheric pressure :101.5kPa, 环境温度 Ambient temperature : 23.7℃

检测后, 样品无渗漏、无排气、无解体、无破裂和无起火。电压比不小于 90 %。

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. And change ratio is not less than 90 %.

(表 T.5)Table T.5 外部短路 External short circuit

检测样品状态 Test sample status	编号 No.	表面最高温度(°C) Maximum external temperature (°C)	结果 Status
首次循环满电状态 First cycle, fully charged state	C1	113.3	合格 Pass
	C2	110.7	合格 Pass
	C3	107.2	合格 Pass
	C4	107.5	合格 Pass
	C5	109.3	合格 Pass
25 次循环满电状态 25th cycle, fully charged state	C6	107.0	合格 Pass
	C7	112.1	合格 Pass
	C8	112.2	合格 Pass
	C9	104.8	合格 Pass
	C10	110.5	合格 Pass
注释 Notes : 大气压强 Atmospheric pressure :101.1kPa, 环境温度 Ambient temperature :21.6℃ 检测样品表面温度不超过 170 °C, 检测中与检测后 6 小时内无解体、无破裂、无起火。 Test sample external 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.			

(表 T.6)Table T.6 撞击 Impact

检测样品状态 Test sample status	编号 No.	表面最高温度(°C) Maximum external temperature (°C)	结果 Status
首次循环, 50%容量 状态 First cycle, 50% Capacity state	C11	24.2	合格 Pass
	C12	24.4	合格 Pass
	C13	24.5	合格 Pass
	C14	24.5	合格 Pass
	C15	24.5	合格 Pass
25 次充电周期, 50% 容量状态 25th cycle, 50% Capacity state	C16	24.3	合格 Pass
	C17	24.3	合格 Pass
	C18	24.3	合格 Pass
	C19	24.4	合格 Pass
	C20	24.5	合格 Pass
注释 Notes : 大气压强 Atmospheric pressure :101.4kPa, 环境温度 Ambient temperature : 22.2℃ 检测样品表面温度不超过 170 °C, 检测中与检测后 6 小时内无解体、无破裂、无起火。 Test sample external 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.			

(表 T.7) Table T.7 过充电 Overcharge

检测样品状态 Test sample status	编号 No.	结果 Status
首次循环满电状态 First cycle, fully charged state	/	/
	/	/
	/	/
	/	/
25 次循环满电状态 25th cycle, fully charged state	/	/
	/	/
	/	/
	/	/

注释 Notes :
 大气压强 Atmospheric pressure :/kPa, 环境温度 Ambient temperature : /℃
 样品在检测中和检测后 7 天内无解体、无起火。
 There is no disassembly and no fire during the test and within seven days after the test.

(表 T.8)Table T.8 强制放电 Forced discharge

检测样品状态 Test sample status	编号 No.	结果 Status
首次循环空电状态 First cycle, fully discharge state	C21	合格 Pass
	C22	合格 Pass
	C23	合格 Pass
	C24	合格 Pass
	C25	合格 Pass
	C26	合格 Pass
	C27	合格 Pass
	C28	合格 Pass
	C29	合格 Pass
	C30	合格 Pass
25 次循环空电状态 25th cycle, fully discharge state	C31	合格 Pass
	C32	合格 Pass
	C33	合格 Pass
	C34	合格 Pass
	C35	合格 Pass
	C36	合格 Pass
	C37	合格 Pass
	C38	合格 Pass
	C39	合格 Pass
	C40	合格 Pass

注释 Notes :
 大气压强 Atmospheric pressure :101.4kPa, 环境温度 Ambient temperature : 22.2℃
 样品在检测中和检测后 7 天内无解体、无起火。
 There is no disassembly and no fire during the test and within seven days after the test.

主要试验仪器设备清单

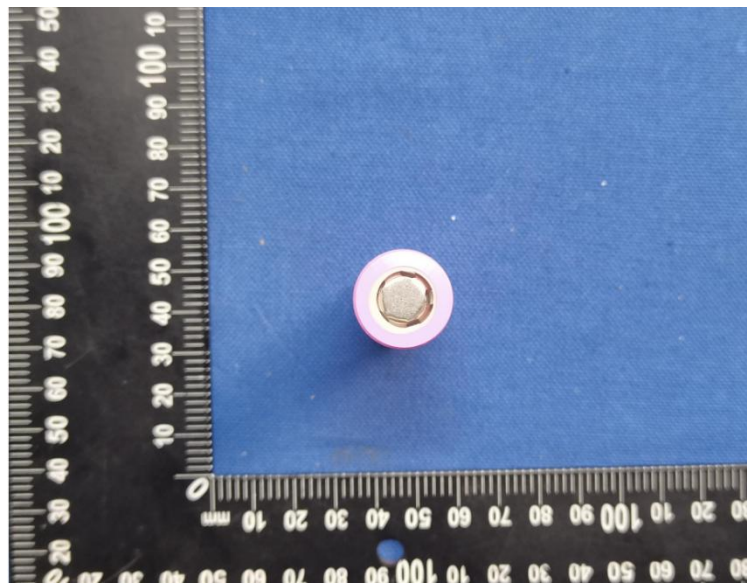
Main Test Apparatus

序号	编号	名 称	型 号	本次使用 (√)
1	SS-DC-01	电池测试仪	AT527L	√
2	SS-DC-02	高性能电池检测系统	CT-4008Tn-5V6A-S1	√
3	SS-DC-09	高性能电池检测系统	CT-4008Tn-5V6A-S1	
4	SS-DC-31	高性能电池检测系统	CT-4008Tn-5V12A-S1	
5	SS-DC-36	高性能电池检测系统	CT-4008Tn-5V12A-S1	
6	SS-DC-06	动力电池检测系统	CE-7004-60V50A-R28	
7	SS-DC-07	高性能电池检测系统	CT-4004-30V10A-NA	
8	SS-DC-08	高性能电池检测系统	CT-4008Tn-5V50mA-164	
9	SS-DC-28	星云电芯能量回馈充放电测试系统	BAT-NEEFLCT-603001K5-V010	
10	SS-DC-29	星云动力电池组工况模拟测试系统	BAT-ENH-30080045002-V003	√
11	SS-DC-13	真空手套箱	LZJ-368	
12	SS-DC-14	纸箱抗压强度试验机	HT-KY-800	
13	SS-DC-15	电池和包装跌落试验机	LZJ-DC-54	
14	SS-DC-16	电池洗涤试验机	LZJ-DC-76	
15	SS-DC-17	热冲击试验箱	LZJ-DC-23	
16	SS-DC-18	温控外部短路试验机	LZJ-DC-51	√
17	SS-DC-19	电池燃烧试验机	LZJ-DC-89	
18	SS-DC-20	电池重物冲击试验机	LZJ-DC-71	√
19	SS-DC-21	电池针刺挤压一体机	LZJ-DC-70	
20	SS-DC-22	电池强制内部短路试验机	LZJ-DC-61	
21	SS-DC-23	电池高空低气压模拟试验机	LZJ-DC-83	√
22	SS-DC-24	电动振动试验系统	EDS-600	√
23	SS-DC-25	机械加速度冲击试验机	LZJ-DC-98	√
24	SS-HJ-01	高温试验箱	PHH-201M	
25	SS-HJ-02	低温试验箱	DW-40	
26	SS-HJ-03	恒温恒湿试验箱	GTTH-408-40-1P	
27	SS-HJ-04	快速温变试验箱	LZJ-150LH	√
28	SS-HJ-05	精密盐雾试验箱	RTE-60L	
29	SS-HJ-06	高低温试验机	ICT-122ST	
30	SS-AG-01	多路数据记录仪	TP700	√
31	SS-AG-09	数字万用表	FLUKE319	√
32	SS-FZ-11	露点仪	HT618	
33	SS-FZ-45	电子台秤	TCS-300	
34	SS-AG-08	直流电子负载	AN23512	√
35	SS-FZ-18	数显式千分尺	300mm,0.01mm	√
36	SS-AG-11	可控式电流源	eTm-5060P	√
37	SS-FZ-36	电子秤	SF-400	
38	SS-FZ-01	电子天平	LQ-C20002	
39	SS-FZ-38	小型电子秤	8068-series	√

样品照片
Photos of Samples



照片 1: 电池芯
Photo 1: Cell



照片 2: 电池芯
Photo 2: Cell

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