UN38.3 检测报告

UN38.3 Test Report

报告编号： Report No.:	S20240322549001
申请者： Applicant:	深圳市孔明科技有限公司 Shenzhen Coming Technology Co., Ltd
申请者地址： Applicant's address:	广东省深圳市龙岗区横岗街道荷坳社区长金路 25 号 No.25, Heao Changjin Road, Heng gang Street, Long gong District, Shenzhen City, China
样品名称： Description:	锂离子电池组 Lithium-Ion Battery Pack
型号： Type / Model:	D24-500

方圆广电检验检测股份有限公司
Fangguang Inspection & Testing Co.,Ltd.

检 测 报 告
Test Report

申请编号： Application No.:	S202403225490		
制造商： Manufacturer:	深圳市孔明科技有限公司 Shenzhen Coming Technology Co., Ltd		
制造商地址： Manufacturer's address:	广东省深圳市龙岗区横岗街道荷坳社区长金路 25 号 No.25, Heao Changjin Road, Heng gang Street, Long gong District, Shenzhen City, China		
电话、邮箱、网址： Phone number, email address and website:	+86-755 2846 2760, info@co-ming.com, www.co-ming.com		
生产厂： Factory:	深圳市孔明科技有限公司 Shenzhen Coming Technology Co., Ltd		
生产厂地址： Factory's address:	广东省深圳市龙岗区横岗街道荷坳社区长金路 25 号 No.25, Heao Changjin Road, Heng gang Street, Long gong District, Shenzhen City, China		
商标： Trade mark:	COMING		
样品数量： Number of Samples:	电池组 Batteries:16pcs 电池 Cells: 30pcs	样品外观： Sample Appearance:	长方体 Cuboid
接收日期： Accepted date:	2024.03.25	检测日期： Test date:	2024.03.28 至 2024.04.10
检测地点： Test address:	广东省广州市黄埔区云埔工业区方达路 2 号 No. 2, Fangda Road, Yunpu Industrial Zone, Huangpu District, Guangzhou, Guangdong, China		
检测依据： Test criterions:	联合国《关于危险货物运输的建议书-试验和标准手册》（第七修订版修正一，第 38.3 节金属锂和锂离子电池组）ST/SG/AC.10/11/Rev.7/Amend.1 United Nations "Recommendations on the TRANSPORT OF DANGEROUS GOODS-Manual of Tests and Criteria" (seventh revised edition Amendment 1, Section 38.3 Lithium metal and lithium ion batteries) ST/SG/AC.10/11/Rev.7/Amend.1		
检测结果： Test result:	所检项目的检测结果符合上述标准的要求。 The test results are in compliance with the above mentioned standards.		
签发日期： Issue date:	2024.04.19		

主检 Tested by: 江梓杨	**审核 Reviewed by:** 杨丽君	**批准 Approved by:** 石荃维
江梓杨	杨丽君	石荃维

广东省广州市黄埔区云埔工业区方达路 2 号 检验检测专用章 (01)

其他描述 Other aspects: N/A
缩写说明: *P = 符合标准要求; F = 不符合标准要求; N/A = 不适用标准该项要求* **Abbreviations:** *P = passed; F = failed; N/A = not applicable*
本检测报告仅适用于所测试的样品，未经本实验室书面批准，不得部分复制检测报告。 The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced, except in full, without the written approval of FGTEST. 未加盖资质认定（CMA）标志的检测报告，仅作为科研、教学或内部质量控制之用。 This test report is only used for scientific research, teaching or internal quality control if there is no China Metrology Accreditation (CMA) mark.

章节 Clause	测试项目名称 Name of test	测试标准 Test standard	测试结果 Test result	本项结论 Conclusion	备注 Remarks
38.3.4.1	试验 T.1： 高度模拟 Test T.1: Altitude simulation	联合国《试验和标准手册》 ST/SG/AC.10/11/Rev.7+Amend.1 UN Manual of Tests and Criteria ST/SG/AC.10/11/Rev.7+Amend.1	见附表 T.1 See Appendix T.1	合格 Passed	/
38.3.4.2	试验 T.2： 温度试验 Test T.2: Thermal test		见附表 T.2 See Appendix T.2	合格 Passed	/
38.3.4.3	试验 T.3： 振动 Test T.3: Vibration		见附表 T.3 See Appendix T.3	合格 Passed	/
38.3.4.4	试验 T.4： 冲击 Test T.4: Shock		见附表 T.4 See Appendix T.4	合格 Passed	/
38.3.4.5	试验 T.5： 外部短路 Test T.5: External Short-circuit		见附表 T.5 See Appendix T.5	合格 Passed	/
38.3.4.6	试验 T.6： 撞击 Test T.6: Impact		见附表 T.6a See Appendix T.6a	合格 Passed	/
	试验 T.6： 挤压 Test T.6: Crush		见附表 T.6b See Appendix T.6b	不适用 Not Applicable	/
38.3.4.7	试验 T.7： 过度充电 Test T.7: Overcharge		见附表 T.7 See Appendix T.7	合格 Passed	/
38.3.4.8	试验 T.8： 强制放电 Test T.8: Forced discharge		见附表 T.8 See Appendix T.8	合格 Passed	/

产品描述
Product description

--	电池组 Battery	元件电池 Component Cell
型号 Model	D24-500	18650INR
标称电压 Nominal Voltage	24.5V	3.7V
额定容量 Rated Capacity	20Ah	2500mAh
额定瓦时数 Watt-hour rating	490Wh	9.25Wh
锂含量，仅限锂金属电池 Lithium content, for lithium metal battery only	不适用 Not applicable	不适用 Not applicable
标准充电电流 Standard charge current	3000mA	500mA
标准放电电流 Standard discharge current	3000mA	500mA
最大充电电流 Maximum charge current	4000mA	2500mA
最大放电电流 Maximum discharge current	4000mA	7500mA
充电截止电流 End of charge current	1A	50mA
标准充电电压 Standard charge Voltage	29.4V	4.20V
最大充电电压 Maximum charge Voltage	29.4V	4.20V
放电截止电压 Discharge cut-off Voltage	19.25V	2.75V
尺寸 Size	313mm * 109mm * 101mm	Φ18.1mm*65.2mm
质量 Mass	2997.1g	44.7g
电池组装 Cell assembly	7S7P	
电池制造商 Cell Manufacturer	深圳市孔明科技有限公司 Shenzhen Coming Technology Co., Ltd	江西东腾锂业有限公司 Jiangxi Dong Teng Lithium Co. Ltd

<table>
<tr><th colspan="2">测试方法和要求
Test method and requirement</th></tr>
<tr><td>测试标准
Test Standard</td><td>联合国《关于危险货物运输的建议书-试验和标准手册》（第七修订版修正一，第38.3 节金属锂和锂离子电池组）ST/SG/AC.10/11/Rev.7/Amend.1
United Nations “Recommendations on the TRANSPORT OF DANGEROUS GOODS-Manual of Tests and Criteria” (seventh revised edition Amendment 1, Section 38.3 Lithium metal and lithium ion batteries) ST/SG/AC.10/11/Rev.7/Amend.1</td></tr>
<tr><td>测试项目
Test Item</td><td>T.1 高度模拟，T.2 温度试验，T.3 振动，T.4 冲击，T.5 外部短路，T.6 撞击 T.7 过度充电，T.8 强制放电
T.1 Altitude simulation, T.2 Thermal test, T.3 Vibration, T.4 shock, T.5 External short circuit, T.6 Impact, T.7 Overcharge, T.8 Forced discharge</td></tr>
<tr><td>测试程序
Test Procedure</td><td>小型电池或电池组应按顺序进行试验 T.1 至 T.5。试验 T.6 和 T.8 应使用另外未试验过的电池或电池组。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，以便测试经过充放电的电池组。
Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or 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.</td></tr>
<tr><td>质量损失
Mass Loss</td><td>Mass loss means a loss of mass that exceeds the values in Table 38.3.1 below.
质量损失是指超过下表 38.3.1 所列数值的质量损失。
<table>
<tr><th>Mass M of cell or battery
电芯或电池质量 M</th><th>Mass loss limit
质量损失限值</th></tr>
<tr><td>M<1g</td><td>0.5%</td></tr>
<tr><td>1g≤M≤75g</td><td>0.2%</td></tr>
<tr><td>M>75g</td><td>0.1%</td></tr>
</table>
质量损失的量化数值可用下式计算：
In order to quantify the mass loss, the following procedure is provided:
Mass loss (%)=((M1-M2))/M1×100
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”.</td></tr>
<tr><td>测试环境条件
Test Environment Condition</td><td>环境温度：15℃~25℃，环境湿度：45%RH~75%RH
Ambient temperature: 15℃~25℃, Ambient humidity: 45%RH~75%RH</td></tr>
</table>

可充电电芯或电池规定试验概要表—锂离子电池组 Summary table of required tests for rechargeable cells and batteries—Lithium-ion Battery									
样品类别 Sample category	样品状态 Sample status	T.1	T.2	T.3	T.4	T.5	T.6	T.7	T.8
锂离子电池组 Lithium ion Battery	First cycle, fully charged state 第 1 个充电周期，完全充电状态	4(B1#~B4#)					/	4(B9#~B12#)	/
	25th cycle, fully charged state 第 25 个充电周期，完全充电状态	4(B5#~B8#)					/	4(B13#~B16#)	/
Cells not transported separately from a battery 不与电池组分开运输的电池	First cycle, 50% charged state 第 1 个充电周期，50%充电状态	/	/	/	/	/	5 (C1#~C5#)	/	/
	25th cycle, 50% charged state 第 25 个充电周期，50%充电状态	/	/	/	/	/	5 (C6#~C10#)	/	/
	First cycle, fully discharged state 第 1 个充电周期，完全放电状态	/	/	/	/	/	/	/	10 (C11#~C20#)
	25th cycle, fully discharged state 第 25 个充电周期，完全放电状态	/	/	/	/	/	/	/	10 (C21#~C30#)

附表 T.1 Appendix T.1	高度模拟 Altitude simulation

T.1.1	**目的** **purpose**
	本试验模拟在低压条件下的空运。 This test simulates air transport under low-pressure conditions.
T.1.2	**试验程序** **Test procedure**
	试验电池和电池组应在压力等于或低于 11.6kPa 和环境温度(20±5℃)下存放至少 6 小时。 Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20±5°C).
T.1.3	**要求** **Requirement**
	如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电芯或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%，电芯和电池即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。 Cells and 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 cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.
T.1.4	**测试结果** **Result**

样品编号 Sample No.	测试前 Before		测试后 After		质量损失 Mass loss (%)	试验前后样品电压比 Voltage ratio (%)	测试结果 Test result
	样品质量 Mass (g)	开路电压 Voltage (V)	样品质量 Mass (g)	开路电压 Voltage (V)			
B1#	2985.400	29.035	2985.300	29.029	0.003	99.98	A, B
B2#	2985.200	29.057	2984.900	29.053	0.010	99.99	A, B
B3#	2981.700	29.059	2981.500	29.050	0.007	99.97	A, B
B4#	2995.500	29.045	2995.400	29.033	0.003	99.96	A, B
B5#	2997.100	29.055	2996.900	29.046	0.007	99.97	A, B
B6#	2991.300	29.048	2991.200	29.042	0.003	99.98	A, B
B7#	2987.200	29.045	2987.100	29.041	0.003	99.99	A, B
B8#	2993.100	29.057	2992.900	29.052	0.007	99.98	A, B

备注：
A - 无渗漏、无排气、无解体、无破裂和无起火；
B - 每个试验电池或电池组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%；
C - 每个试验电池或电池组在试验后的开路电压小于其在进行这一试验前电压的 90%；
D - 漏液； E -排气； F -解体； G -破裂； H -起火。
Note:

A - No Leakage, No Venting, No Disassembly, No Rupture and No Fire;

B - the open circuit voltage of each cell or battery after testing was not less than 90%;

C - the open circuit voltage of each cell or battery after testing was less than 90%;

D - Leakage, E - Venting, F - Disassembly, G - Rupture, H - Fire.

附表 T.2 Appendix T.2	温度试验 Thermal test

T.2.1	**目的** **Purpose**
	本试验评估电池和电池组的密封完善性和内部电连接。试验利用迅速和极端的温度变化进行。 This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.
T.2.2	**测试程序** **Test procedure**
	将电芯和电池在试验温度为 72±2℃的条件下存放不少于 6 小时/12 小时，，接着再在试验温度-40±2℃条件下存放不少于 6 小时/12 小时，两个极端试验温度之间的最大时间间隔为 30 分钟。此程序重复进行，共完成 10 次，接着将所有试验电池和电池组在环境温度(20±5℃)的条件下存放 24 个小时。对于大型电池和电池组，暴露于极端试验温度的时间至少应为 12 小时。 Test cells and batteries are to be stored for at least 6/12 hours at a test temperature equal to 72±2°C, followed by storage for at least 6/12 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). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.
T.2.3	**要求** **Requirement**
	如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组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%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。 Cells and 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 cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.
T.2.4	**测试结果** **Result**

样品编号 Sample No.	测试前 Before		测试后 After		质量损失比 Mass loss (%)	试验前后样品电压比 Voltage ratio (%)	测试结果 Test result
	样品质量 Mass (g)	开路电压 Voltage (V)	样品质量 Mass (g)	开路电压 Voltage (V)			
B1#	2985.300	29.029	2985.300	28.773	0.000	99.12	A, B
B2#	2984.900	29.053	2984.800	28.760	0.003	98.99	A, B
B3#	2981.500	29.050	2981.500	28.764	0.000	99.02	A, B
B4#	2995.400	29.033	2995.400	28.764	0.000	99.07	A, B
B5#	2996.900	29.046	2996.800	28.771	0.003	99.05	A, B

B6#	2991.200	29.042	2991.200	28.752	0.000	99.00	A, B
B7#	2987.100	29.041	2987.100	28.762	0.000	99.04	A, B
B8#	2992.900	29.052	2992.800	28.772	0.003	99.04	A, B

备注：
A - 无渗漏、无排气、无解体、无破裂和无起火；
B - 每个试验电池或电池组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%；
C - 每个试验电池或电池组在试验后的开路电压小于其在进行这一试验前电压的 90%；
D - 漏液； E -排气； F -解体； G -破裂； H -起火。

Note:
A - No Leakage, No Venting, No Disassembly, No Rupture and No Fire;
B - the open circuit voltage of each cell or battery after testing was not less than 90%;
C - the open circuit voltage of each cell or battery after testing was less than 90%;
D - Leakage, E - Venting, F - Disassembly, G - Rupture, H - Fire.

附表 T.3 Appendix T.3	振动 Vibration
T.3.1	**目的** **Purpose**
	本试验模拟运输过程中的振动。 This test simulates vibration during transport.
T.3.2	**测试程序** **Test procedure**
	电池和电池组紧固于振动机平台，但紧固程度不能造成电池变形以致不能准确传递振动。振动应是正弦波形，对数频率扫描从 7 赫兹到 200 赫兹，再回到 7 赫兹，跨度为 15 分钟。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。 Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal wave form with a logarithmic sweep between 7Hz and 200Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. One of the directions of vibration must be perpendicular to the terminal face.
	作对数式频率扫描，对总质量不足 12 千克的电芯和电池(电芯和小型电池)，和对 12 千克及更大的电池(大型电池)应有所不同。 The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).
	对电池和小型电池组：从 7 赫兹开始，保持 1gn 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 8gn (频率约为 50 赫兹)。将最大加速度保持在 8 gn 直到频率增加到 200 赫兹。 For cells and small batteries: 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 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.
	对大型电池组：从 7 赫兹开始，保持 1gn 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 2gn (频率约为 25 赫兹)。将最大加速度保持在 2gn 直到频率增加到 200 赫兹。 For large batteries: from 7Hz to a peak acceleration of 1gn is maintained until 18Hz is reached. The amplitude is then maintained at 0.8mm (1.6mm total excursion) and the frequency increased until a peak acceleration of 2gn occurs (approximately 25Hz). A peak acceleration of 2gn is then maintained until the frequency is increased to 200Hz.
T.3.3	**要求** **Requirement**
	如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组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%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。 Cells and 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 cell or

	battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.
T.3.4	**测试结果** **Result**

样品编号 Sample No.	测试前 Before		测试后 After		质量损失 Mass loss (%)	试验前后样品电压比 Voltage ratio (%)	测试结果 Test result
	样品质量 Mass (g)	开路电压 Voltage (V)	样品质量 Mass (g)	开路电压 Voltage (V)			
B1#	2985.300	28.773	2985.100	28.756	0.007	99.94	A, B
B2#	2984.800	28.760	2984.700	28.747	0.003	99.95	A, B
B3#	2981.500	28.764	2981.400	28.749	0.003	99.95	A, B
B4#	2995.400	28.764	2995.400	28.758	0.000	99.98	A, B
B5#	2996.800	28.771	2996.600	28.758	0.007	99.95	A, B
B6#	2991.200	28.752	2991.100	28.738	0.003	99.95	A, B
B7#	2987.100	28.762	2987.100	28.757	0.000	99.98	A, B
B8#	2992.800	28.772	2992.700	28.763	0.003	99.97	A, B

备注：
A - 无渗漏、无排气、无解体、无破裂和无起火；
B - 每个试验电池或电池组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%；
C - 每个试验电池或电池组在试验后的开路电压小于其在进行这一试验前电压的 90%；
D - 漏液； E -排气； F -解体； G -破裂； H -起火。

Note:
A - No Leakage, No Venting, No Disassembly, No Rupture and No Fire;
B - the open circuit voltage of each cell or battery after testing was not less than 90%;
C - the open circuit voltage of each cell or battery after testing was less than 90%;
D - Leakage, E - Venting, F - Disassembly, G - Rupture, H - Fire.

附表 T.4 Appendix T.4	冲击 Shock
T.4.1	**目的** **Purpose**
	本试验评估电池和电池组对累积冲击效应的耐受程度。 This test assesses the robustness of cells and batteries against cumulative shocks.
T.4.2	**测试程序** **Test procedure**
	试验电池和电池组用坚固支架紧固在试验机上，支架支撑着每个试验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.
	每个电池须经受最大加速度 150gn 和脉冲持续时间 6 毫秒的半正弦波冲击。 不过，大型电池须经受最大加速度 5 gn 和脉冲持续时间 11 毫秒的半正弦波冲击。 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 subjected to a half-sine shock of peak acceleration of 50 gn, and pulse duration of 11 milliseconds.
	每个电池须经受的正弦波冲击的最大加速度取决于电池的质量。小型电池须经受最大加速度 150gn 或加速度(gn)= √(100850/质量*)，取数值较小者，和脉冲持续时间 6 毫秒的半正弦波冲击。大型电池须经受最大加速度 50gn 或加速度(gn)= √(30000/质量*)，取数值较小者，和脉冲持续时间 11 毫秒的半正弦波冲击。（* 质量单位为千克） Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. Small batteries shall be subjected to a half-sine shock of peak acceleration of 150gn or Acceleration (gn)= √(100850/mass*), whichever is smaller, and pulse duration of 6milliseconds. Large batteries shall be subjected to a half-sine shock of peak acceleration of 50gn or Acceleration (gn)= √(30000/mass*), whichever is smaller, and pulse duration of 11milliseconds. (* Mass is expressed in kilograms.)
	每个电池或电池组须在三个互相垂直的电池或电池组安装方位的正极方向经受三次冲击，接着在负极方向经受三次冲击，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.
T.4.3	**要求** **Requirement**
	如果无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池或电池组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%，电池和电池组即符合这一要求。有关电压的要求不适用于完全放电状态的试验电池和电池组。 Cells and 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 cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.
T.4.4	**测试结果** **Result**

样品编号 Sample No.	测试前 Before		测试后 After		质量损失 Mass loss (%)	试验前后样品电压比 Voltage ratio (%)	测试结果 Test result
	样品质量 Mass (g)	开路电压 Voltage (V)	样品质量 Mass (g)	开路电压 Voltage (V)			
B1#	2985.100	28.756	2984.900	28.737	0.007	99.93	A, B
B2#	2984.700	28.747	2984.500	28.739	0.007	99.97	A, B
B3#	2981.400	28.749	2981.300	28.728	0.003	99.93	A, B
B4#	2995.400	28.758	2995.100	28.742	0.010	99.94	A, B
B5#	2996.600	28.758	2996.400	28.739	0.007	99.93	A, B
B6#	2991.100	28.738	2990.900	28.721	0.007	99.94	A, B
B7#	2987.100	28.757	2986.800	28.743	0.010	99.95	A, B
B8#	2992.700	28.763	2992.600	28.751	0.003	99.96	A, B

备注：
A - 无渗漏、无排气、无解体、无破裂和无起火；
B - 每个试验电池或电池组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%；
C - 每个试验电池或电池组在试验后的开路电压小于其在进行这一试验前电压的 90%；
D - 漏液； E -排气； F -解体； G -破裂； H -起火。

Note:
A - No Leakage, No Venting, No Disassembly, No Rupture and No Fire;
B - the open circuit voltage of each cell or battery after testing was not less than 90%;
C - the open circuit voltage of each cell or battery after testing was less than 90%;
D - Leakage, E - Venting, F - Disassembly, G - Rupture, H - Fire.

附表 T.5 Appendix T.5	外部短路 External short circuit

T.5.1	**目的** **Purpose**
	本试验模拟外部短路。 This test simulates an external short circuit.
T.5.2	**测试程序** **Test procedure**
	对于待试电池或电池组，应加温一段必要的时间，使从外壳测量的温度达到均匀的稳定温度 57 ± 4°C。这段时间的长短取决于电芯或电池的大小和设计，对于这个持续时间应加以评估和记录。如无法进行这种评估，则小型电芯和小型电池的暴露时间应至少 6 小时，大型电芯和小型电池的暴露时间应至少 12 小时。然后，电芯或电池应在 57±4°C 条件下经受总外电阻小于 0.1 欧姆的短路条件。 The cell or battery to be tested shall be shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4°C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57±4°C shall be subjected to one short circuit condition with a total external resistance of less than 0.1Ω.
	这一短路条件应在电芯或电池外壳温度回到 57±4°C 后继续至少 1 小时，或在大型电池的情况下外壳温度降幅达试验中所观察的的最高温升幅的二分之一并保持低于该数值。 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.
	短路和降温阶段的温度应至少相当于环境温度。 The short circuit and cooling down phases shall be conducted at least at ambient temperature.
T.5.3	**要求** **Requirement**
	如果外壳温度不超过170℃，并且在试验过程中及试验后6小时内无解体、无破裂，无起火，电池和电池组即符合本项要求。 Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire during the test and within six hours after the test.
T.5.4	**测试结果** **Result**

样品编号 Sample No.	总外部电阻 External resistance(Ω)	样品外壳最大温度 Maximum case temperature(°C)	测试结果 Test result
B1#	0.083	55.9	A, B
B2#	0.076	55.9	A, B
B3#	0.092	55.7	A, B
B4#	0.060	55.7	A, B

B5#	0.068	56.0	A, B
B6#	0.095	55.6	A, B
B7#	0.072	55.8	A, B
B8#	0.083	55.8	A, B

备注：
A - 测试后 6 小时内无解体、无破裂、无起火；
B - 样品表面最高温度不超过 170℃;
C - 样品表面最高温度超过 170℃;
D - 解体；E - 破裂；F - 起火。
Note:
A - No Disassembly, No Rupture & No Fire within 6 hours after the test;
B - Max. external temperature did not exceed 170°C;
C - Max. external temperature exceeds 170°C;
D - Disassembly, E - Rupture; F - Fire.

附表 T.6a Appendix T.6a	撞击 Impact

T.6a.1	**目的** **Purpose**
	本节的试验模拟撞击等可能造成内部短路的机械性破坏。 These tests simulate mechanical abuse from an impact that may result in an internal short circuit.
T.6a.2	**测试程序** **Test procedure**
	适用于直径不小于 18.0mm 的圆柱形电池。 Applicable to cylindrical cells not less than 18.0 mm in diameter
	试样电池或元件电池放在平坦光滑的表面上。一根 316 型不锈钢棒横放在试样中心，钢棒直径 15.8 毫米±0.1 毫米，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 9.1 千克±0.1 千克的重锤从 61 ± 2.5 厘米高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、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。 The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1 mm 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 9.1 kg ± 0.1kg mass is to be dropped from a height of 61 ± 2.5 cm 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 90 degrees from the horizontal supporting surface.
	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±0.1 毫米弯曲表面的纵轴垂直。每一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 centre of the test sample. Each sample is to be subjected to only a single impact.
T.6a.3	**要求** **Requirement**
	如果外壳温度不超过 170℃，并且在试验过程中及试验后 6 小时内无解体、无破裂，无起火，电芯和组成电芯即符合本项要求。 Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test.
T.6a.4	**测试结果** **Result**

样品编号 Sample No.	测试前开路电压 Voltage Before Test (V)	样品外壳最高温度 Max. External Temperature (°C)	测试结果 Test result
C1#	3.666	137.8	A, B
C2#	3.661	97.1	A, B
C3#	3.668	133.2	A, B

C4#	3.661	116.0	A, B
C5#	3.665	115.5	A, B
C6#	3.673	124.9	A, B
C7#	3.665	121.0	A, B
C8#	3.664	118.1	A, B
C9#	3.675	133.0	A, B
C10#	3.664	138.0	A, B

备注：

A - 测试后 6 小时内无解体、无破裂、无起火；

B - 样品表面最高温度不超过 170℃;

C - 品表面最高温度超过 170℃;

D - 解体；E - 破裂；F - 起火。

Note:

A - No Disassembly, No Rupture & No Fire within 6 hours after the test;

B - Max. external temperature did not exceed 170°C;

C - Max. external temperature exceeds 170°C;

D - Disassembly, E - Rupture; F - Fire.

附表 T.7 Appendix T.7	过度充电 Overcharge

T.7.1	**测试步骤** **Test procedure**
	以 2 倍制造商推荐的最大持续充电电流对样品充电 The charge current shall be twice the manufacturer's recommended maximum continuous charge current
	如果厂家推荐的充电电压不超过 18V，本测试的最小充电电压应该是两倍的厂家推荐的最大充电电压或者是 22V。试验应在环境温度下进行，进行试验的时间应为 24 小时。 When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the or 22V. Tests are to be conducted at ambient temperature, the duration of the test shall be 24 hours.
	如果厂家推荐的充电电压超过 18V，本测试的最小充电电压应该为 1.2 倍的厂家推荐的最大充电电压。试验应在环境温度下进行，进行试验的时间应为 24 小时。 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. Tests are to be conducted at ambient temperature; the duration of the test shall be 24 hours.
T.7.2	**要求** **Requirement**
	充电电池组如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。 Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.
T.7.3	**测试结果** **Result**

测试电压 Voltage test (V)	35.28	测试电流 Charging current (A)	8

样品编号 Sample No.	测试前开路电压 Voltage Before test (V)	测试结果 Test result
B11#	29.118	A
B12#	29.144	A
B13#	29.124	A
B14#	29.117	A
B15#	29.119	A
B16#	29.132	A
B17#	29.126	A
B18#	29.137	A

备注：

A - 试验后 7 天内无解体、无起火；

B - 解体；C - 起火；。

Note:

A - No Disassembly, No Fire during the test and within seven days after the test;

B - Disassembly; C - Fire.

附表 T.8 Appendix T.8	强制放电 Forced discharge

T.8.1	**目的** **Purpose**
	本试验评估原电池或充电电池承受强制放电状况的能力。 This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.
T.8.2	**测试步骤** **Test procedure**
	每个电池在环境温度下与 12V 直流电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。将适当大小和额定值的电阻负荷与试验电流串联，计算得出给定的放电电流。对于每个电池进行强制放电，放电时间(小时)为额定容量除以初始电流(安培)。 Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified the manufacturer. The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).
T.8.3	**要求** **Requirement**
	原电池或充电电池如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。 Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.
T.8.4	**测试结果** **Result**

初始放电电流 Initial discharged current (A)	7.5	放电时间 discharged time (Min)	20

样品编号 Sample No.	测试前开路电压 Voltage Before test (V)	测试结果 Test result	样品编号 Sample No.	测试前开路电压 Voltage Before test (V)	测试结果 Test result
C11#	3.335	A	C21#	3.332	A
C12#	3.331	A	C22#	3.337	A
C13#	3.332	A	C23#	3.334	A
C14#	3.336	A	C24#	3.331	A
C15#	3.335	A	C25#	3.335	A
C16#	3.334	A	C26#	3.334	A
C17#	3.336	A	C27#	3.336	A
C18#	3.331	A	C28#	3.332	A
C19#	3.337	A	C29#	3.335	A
C20#	3.332	A	C30#	3.336	A

备注：

A - 试验后 7 天内无解体、无起火；

B - 解体；C - 起火。

Note:

A - No Disassembly, No Fire during the test and within seven days after the test;

B - Disassembly; C - Fire.

使用设备清单

序号	名 称	型 号	编 号	校准有效期至
1.	温湿度计	JR900	FGZDA-2018-007	2025-01-20
2.	数字万用表	17B+	FGZGJC-2017-268	2025-01-18
3.	电子天平（3000g）	JJ3000	FGZGJC-2017-271	2025-01-21
4.	低压真空箱	BE-8104	FGZGJC-2017-248	2025-01-28
5.	可程式高低温试验箱	KWGDS6025IIFA	FGZGJC-2017-236	2025-01-28
6.	振动试验系统	MPA101/L315M	FGZGJC-2017-247	2024-08-01
7.	冲击台	IS300	FGZGJC-2017-246	2024-04-27
8.	高温烘箱	GX-3020-M	FGZGJC-2017-291	2025-01-28
9.	数据采集仪	34970A	FGZGJC-2017-242	2024-08-21
10.	电池内阻测试仪	BT3562	FGZGJC-2017-243	2025-02-20
11.	电池重物冲击试验机	BE-8106	FGZGJC-2017-240	2024-12-13
12.	模组充放电测试系统	RCDS-60V60A	FGZGJC-2021-006	2024-07-27
13.	防爆箱	BE-001-1	FGZGJC-2017-254	长期
14.	电子负载	IT-E151	FTJGDB-2016-029	2024-07-26
15.	直流稳压电源	MCH-K3010DN	FGZDA-2018-002	2024-10-23
16.	秒表	SW8019	FGZDA-2016-040	2024-06-28

＊ 以上仪器设备均正常工作

样 品 照 片

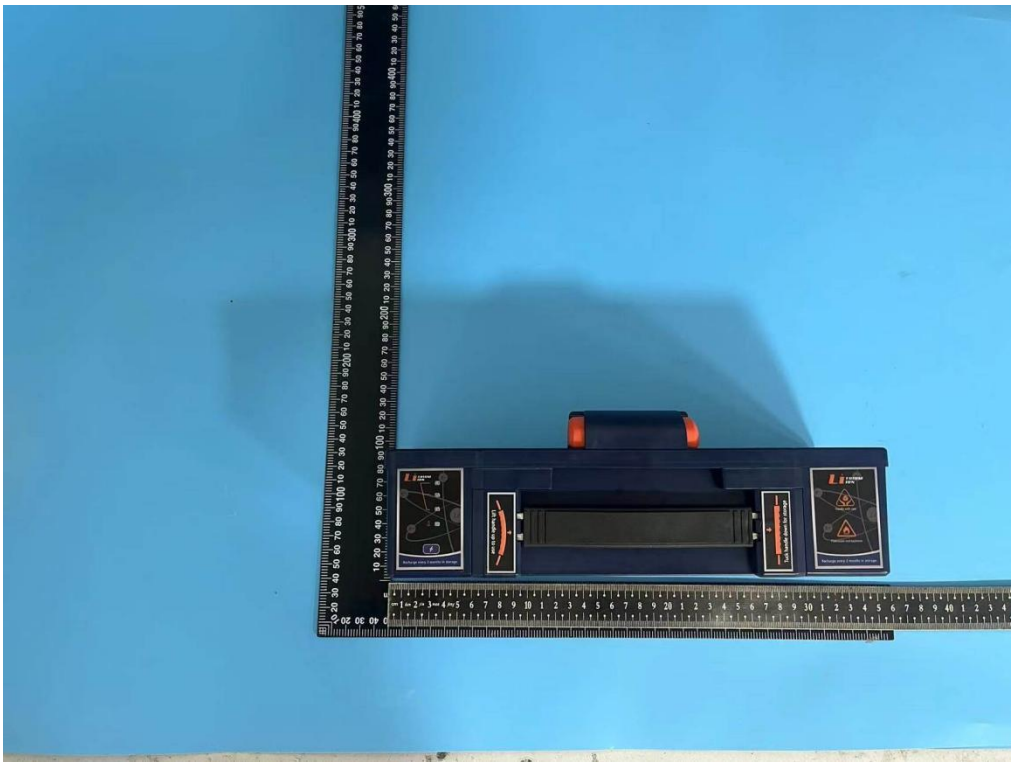

图1：电池组正面照

图2：电池组反面照

图3：电池组侧面照

图4：标签

图5：组成电池正面照

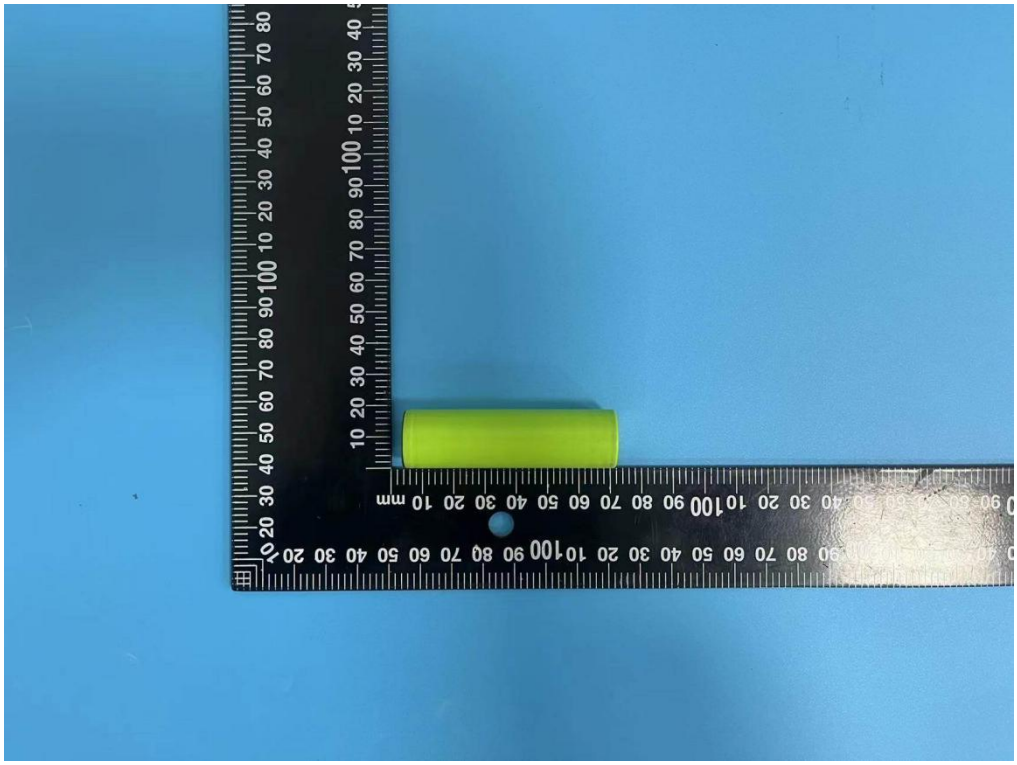

图6：组成电池反面照

-- 报告结束 --
-- end of report --