



UN38.3 Test Report

UN38.3 检测报告

Report No.:

P22092603501

报告编号:

Name of Products: Button Type Lithium Ion Cell

产品名称: 扣式锂离子电池

Model and Spec.:

CH1140AA, 3.85V 46mAh 0.1771Wh

型号规格:

Applicant: Shenzhen Hynotech Company Limited

委托单位: 深圳市合壹新能技术有限公司

Manufacturer: Shenzhen Hynotech Company Limited

生产厂商: 深圳市合壹新能技术有限公司

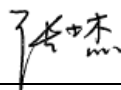
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Shenzhen NTEK New Energy Technology Co., Ltd.

深圳市北测新能源技术有限公司

Applicant 委托单位	Shenzhen Hynotech Company Limited 深圳市合壹新能技术有限公司		
Address of Applicant 委托单位地址	Room 402, No. 3 Plant, Huayilong Park, No. 43 Cuijing Road, Zhukeng Community, Longtian Street, Pingshan District, Shenzhen, P.R.China 深圳市坪山区龙田街道竹坑社区翠景路 43 号华意隆厂区 3 号厂房 402		
Manufacturer 生产厂商	Shenzhen Hynotech Company Limited 深圳市合壹新能技术有限公司		
Address of manufacturer 生产厂商地址	Room 402, No. 3 Plant, Huayilong Park, No. 43 Cuijing Road, Zhukeng Community, Longtian Street, Pingshan District, Shenzhen, P.R.China 深圳市坪山区龙田街道竹坑社区翠景路 43 号华意隆厂区 3 号厂房 402		
Name of Products 产品名称	Button Type Lithium Ion Cell 扣式锂离子电池		
Model/Type 型号	CH1140AA		
Ratings 额定参数	3.85V 46mAh 0.1771Wh		
Date of receipt of test item 接收日期	2022-11-01		
Completion Date 完成日期	2022-11-12		
Tested according to 测试依据: United Nations Manual of Tests and Criteria, PART III, section 38.3 Lithium metal and lithium ion batteries, the seventh revised edition (ST/SG/AC.10/11/Rev.7). 联合国《试验和标准手册》, 第三部分, 38.3 节锂金属和锂离子电池要求, 第七修订版(ST/SG/AC.10/11/Rev.7)			
Tests performed 测试项目: Test T.1: Altitude simulation 试验 T.1: 高度模拟 Test T.5: External short circuit 试验 T.5: 外部短路 Test T.2: Thermal Test 试验 T.2: 温度试验 Test T.6: Crush 试验 T.6: 挤压 Test T.3: Vibration 试验 T.3: 振动 Test T.8: Forced discharge 试验 T.8: 强制放电 Test T.4: Shock 试验 T.4: 冲击			
Test Conclusion 试验结论: The Button Type Lithium Ion Cell submitted by Shenzhen Hynotech Company Limited is tested according to the United Nations <i>Manual of Tests and Criteria, PART III, section 38.3 Lithium metal and lithium ion batteries, the seventh revised edition (ST/SG/AC.10/11/Rev.7)</i> . Test results: PASS 由深圳市合壹新能技术有限公司提交的扣式锂离子电池按照联合国《试验和标准手册》, 第三部分, 38.3 节锂金属和锂离子电池要求, 第七修订版(ST/SG/AC.10/11/Rev.7)进行测试。 测试结果: 合格			
Tested by: 主检人:	Jeremy Wu 吴定杰		
Reviewed by: 审核人:	Snow Liu 刘雪娟		
Approved by: 批准人:	Jesse Zhang 张士杰	 报告单位 (盖章) Seal of NTEK	

General product information 通用产品信息:			
Model/Type 型号	CH1140AA	Rated Rating 额定值	3.85V 46mAh 0.1771Wh
Standard Charging Current 标准充电电流	23mA	Max. Charging Current 最大充电电流	92mA
Standard Discharge Current 标准放电电流	9.2mA	Max. Discharge Current 最大放电电流	92mA
Limited Charging Voltage 充电限制电压	4.40V	Cut-off Voltage 放电截止电压	3.00V
Appearance 外观	Silvery, Button 银色、扣式	Dimension (D×H) 尺寸(mm)	Φ11.2×4.3
Classification 类别	Small Lithium ion Cells 小型锂离子电池		

Sample description 样品说明			
Type 类型	Sample No. 样品编号	Sample Sub-No. 样品子编号	State of samples 样品状态
Cell 电池芯	NE220923188018-X*	001~005	Fully charged at first cycle 首次循环满电状态
		006~010	Fully charged after 25 cycles 25 次循环后满电状态
		011~015	50% of the design rated capacity at first cycle 首次循环 50%电荷状态
		016~020	50% of the design rated capacity after 25 cycles 25 次循环后 50%电荷状态
		021~030	Fully discharged at first cycle 首次循环完全放电状态
		031~040	Fully discharged after 25 cycles 25 次循环后完全放电状态
* “X” contained in Sample No. represents Sample Sub-No., it consists of three digit. 包含在样品编号中的 “X” 表示样品子编号，由 3 位数字组成。			

Test environment condition: Room temperature: 15°C-25°C; Room humidity: 40-70%

试验环境条件: 环境温度: 15°C-25°C; 环境湿度: 40-70%

Remark 备注: None 无

Summaries of testing 测试摘要:

All cell types are subjected to tests T.1 to T.6 and T.8. Tests T.1 to T.5 are conducted in sequence on the same cells. Tests T.6 and T.8 are conducted using not otherwise tested cells.

所有类型的电芯均应进行T.1至T.6和T.8项试验。电芯必须按顺序在相同的一组电芯上进行试验T.1至T.5。试验T.6和T.8应使用另外未试验过的电芯。

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:

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

Where M_1 is the mass before the test and M_2 is the mass after the test. When mass loss does not exceed the values in Table below, it is considered as "no mass loss".

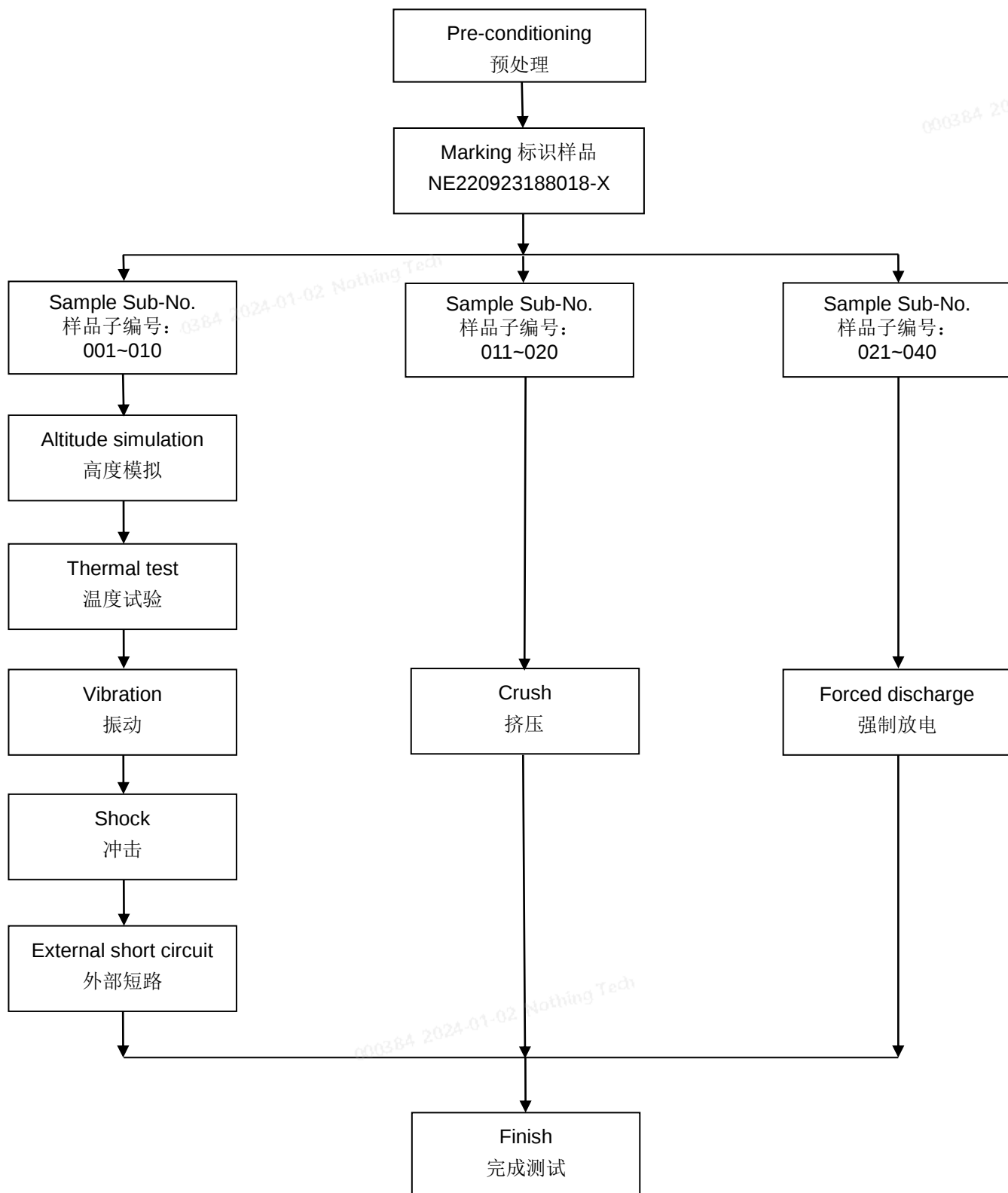
式中: M_1 是试验前的质量, M_2 是试验后的质量。如果质量损失不超过下表所列的数值, 应视为“无质量损失”。

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

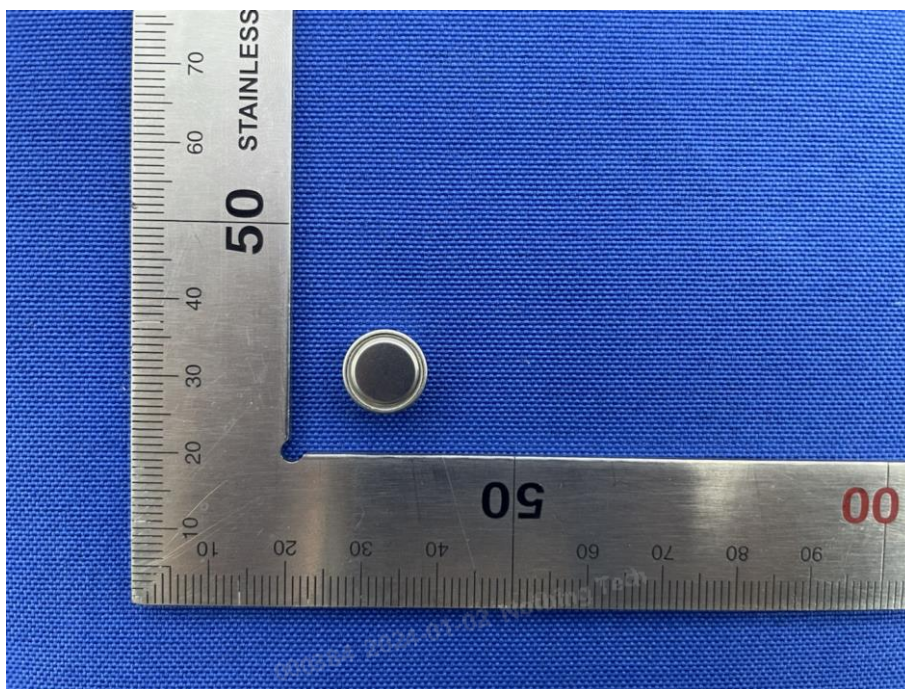
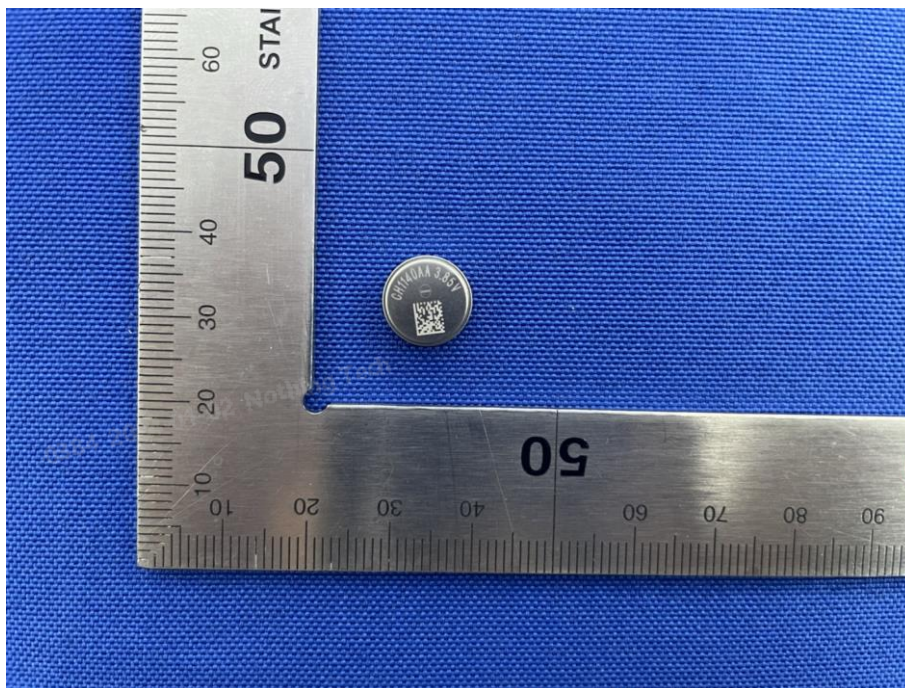
In tests T.1 to T.4, cells meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.

在T.1至T.4的试验中, 电芯须满足无渗漏、无泄气、无解体、无破裂和无起火, 并且每个试验电芯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%。

Test Procedure 测试程序



Photos of sample 样品照片



Test results 测试结果:

Test T.1: Altitude simulation 试验T.1: 高度模拟

Test method 测试方法

Cells are stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature ($20 \pm 5^{\circ}\text{C}$).

试验电芯被放置在压力等于或低于11.6 kPa和环境温度($20\pm 5^{\circ}\text{C}$)下存放至少6小时。

Requirement 要求

Cells 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 after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯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%。

Test Data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Prior to test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/ voltage prior to test 试验后电压/试验前电压(%)	Results 结果
	Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
001	0.9988	4.385	0.9987	4.384	0.010	99.98	PASS 合格
002	0.9929	4.386	0.9929	4.384	0.000	99.95	PASS 合格
003	0.9881	4.386	0.9881	4.385	0.000	99.98	PASS 合格
004	0.9919	4.387	0.9919	4.385	0.000	99.95	PASS 合格
005	0.9924	4.385	0.9924	4.384	0.000	99.98	PASS 合格
006	0.9950	4.386	0.9950	4.385	0.000	99.98	PASS 合格
007	0.9985	4.386	0.9985	4.384	0.000	99.95	PASS 合格
008	0.9922	4.387	0.9922	4.385	0.000	99.95	PASS 合格
009	0.9914	4.385	0.9914	4.384	0.000	99.98	PASS 合格
010	0.9917	4.385	0.9916	4.383	0.010	99.95	PASS 合格

Notes 注释:

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire.

测试后，电芯未渗漏、未泄气、未解体、未破裂和未起火。

Room temperature 环境温度: 20.8°C

Test T.2: Thermal test 试验T.2: 温度试验**Test method 测试方法**

Cells are to be stored for at least six hours at a test temperature equal to $72 \pm 2^{\circ}\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2^{\circ}\text{C}$. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test cells are to be stored for 24 hours at ambient temperature ($20 \pm 5^{\circ}\text{C}$).

电芯放置在试验温度等于 $72 \pm 2^{\circ}\text{C}$ 的条件下存放至少6小时,接着再在试验温度等于 $-40 \pm 2^{\circ}\text{C}$ 的条件下存放至少6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,接着将所有试验电芯在环境温度($20 \pm 5^{\circ}\text{C}$)下存放24小时。

Requirement 要求

Cells 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 after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯须无渗漏、无泄气、无解体、无破裂和无起火,并且每个试验电芯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%。

Test Data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Prior to test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/ voltage prior to test 试验后电压/试验前电压(%)	Results 结果
	Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
001	0.9987	4.384	0.9983	4.293	0.040	97.92	PASS 合格
002	0.9929	4.384	0.9924	4.294	0.050	97.95	PASS 合格
003	0.9881	4.385	0.9877	4.292	0.040	97.88	PASS 合格
004	0.9919	4.385	0.9914	4.293	0.050	97.90	PASS 合格
005	0.9924	4.384	0.9920	4.294	0.040	97.95	PASS 合格
006	0.9950	4.385	0.9945	4.292	0.050	97.88	PASS 合格
007	0.9985	4.384	0.9982	4.293	0.030	97.92	PASS 合格
008	0.9922	4.385	0.9918	4.294	0.040	97.92	PASS 合格
009	0.9914	4.384	0.9910	4.292	0.040	97.90	PASS 合格
010	0.9916	4.383	0.9913	4.292	0.030	97.92	PASS 合格

Notes 注释:

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire.

测试后,电芯未渗漏、未泄气、未解体、未破裂和未起火。

Room temperature 环境温度: 21.0°C

Test T.3: Vibration 试验T.3: 振动**Test method 测试方法**

Cells 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 waveform with a logarithmic sweep between 7 Hz and 200 Hz 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 positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 g_n 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 g_n occurs (approximately 50 Hz). A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200 Hz.

电芯紧固于振动台面，但不得造成电芯变形，并能准确可靠地传播振动。振动应是正弦波形，对数扫描频率在7 Hz和200 Hz之间，再回到7 Hz，1次循环时间为15分钟。这一振动过程须对三个互相垂直的电芯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。

对数扫频方式：从7 Hz开始，保持1 g_n的最大加速度，直到频率达到18 Hz。然后将振幅保持在0.8mm（总位移1.6mm），并增加频率直到峰值加速度达到8 g_n（频率约为50 Hz）。将峰值加速度保持在8 g_n直到频率增加到200 Hz。

Requirement 要求

Cells meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.

测试中和测试后电芯须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯在第三个垂直安装方位上的试验后立即测得的开路电压不小于在进行这一试验前电压的90%。

Test Data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Prior to test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/ voltage prior to test 试验后电压/试验前电压(%)	Results 结果
	Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
001	0.9983	4.293	0.9983	4.291	0.000	99.95	PASS 合格
002	0.9924	4.294	0.9924	4.292	0.000	99.95	PASS 合格
003	0.9877	4.292	0.9877	4.290	0.000	99.95	PASS 合格
004	0.9914	4.293	0.9914	4.291	0.000	99.95	PASS 合格
005	0.9920	4.294	0.9920	4.292	0.000	99.95	PASS 合格
006	0.9945	4.292	0.9945	4.290	0.000	99.95	PASS 合格
007	0.9982	4.293	0.9982	4.292	0.000	99.98	PASS 合格
008	0.9918	4.294	0.9918	4.292	0.000	99.95	PASS 合格
009	0.9910	4.292	0.9910	4.290	0.000	99.95	PASS 合格
010	0.9913	4.292	0.9913	4.291	0.000	99.98	PASS 合格

Notes 注释:

During and after the test, there is no leakage, no venting, no disassembly, no rupture and no fire.

测试中和测试后，电芯未渗漏、未泄气、未解体、未破裂和未起火。

Room temperature 环境温度: 22.6°C

Test T.4: Shock 试验 T.4: 冲击**Test method 测试方法**

Cells are secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test cell. Each cell is subjected to a half-sine shock of peak acceleration of 150 g_n and pulse duration of 6 milliseconds. Each cell is subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

试验电芯用刚性支架紧固在试验装置上，支架支撑着每个试验电芯的所有安装面。每个电芯须经受峰值加速度 150 g_n和脉冲持续时间6 ms的半正弦波冲击。每个电芯须在三个互相垂直的电芯安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。

Requirement 要求

Cells 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 after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯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%。

Test Data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Prior to test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/ voltage prior to test 试验后电压/试验前电压(%)	Results 结果
	Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
001	0.9983	4.291	0.9983	4.291	0.000	100.0	PASS 合格
002	0.9924	4.292	0.9924	4.290	0.000	99.95	PASS 合格
003	0.9877	4.290	0.9876	4.290	0.010	100.0	PASS 合格
004	0.9914	4.291	0.9914	4.291	0.000	100.0	PASS 合格
005	0.9920	4.292	0.9920	4.291	0.000	99.98	PASS 合格
006	0.9945	4.290	0.9945	4.290	0.000	100.0	PASS 合格
007	0.9982	4.292	0.9982	4.292	0.000	100.0	PASS 合格
008	0.9918	4.292	0.9918	4.291	0.000	99.98	PASS 合格
009	0.9910	4.290	0.9910	4.290	0.000	100.0	PASS 合格
010	0.9913	4.291	0.9913	4.290	0.000	99.98	PASS 合格

Notes 注释:

After the test, there is no leakage, no venting, no disassembly, no rupture and no fire.

测试后，电芯未渗漏、未泄气、未解体、未破裂和未起火。

Room temperature 环境温度: 21.5°C

Test T.5: External short circuit 试验T.5: 外部短路**Test method 测试方法**

Cells to be tested are 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 and is assessed and documented. Then the cell at 57 ± 4 °C is subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell external case temperature has returned to 57 ± 4 °C.

The short circuit and cooling down phases are conducted at least at ambient temperature.

试验电芯首先被加热或恒定一段时间，使其达到 57 ± 4 °C并使其外表面温度均匀恒定在 57 ± 4 °C。该加热时间或热恒定时间的长短取决于该电芯的尺寸和设计，并同时加以评估及提供文件证明。然后该电芯在 57 ± 4 °C的条件下承受一个外部总阻抗小于0.1Ω的短路条件。

该短路测试持续到电芯外表面温度返回至 57 ± 4 °C后再保持至少1小时。

该短路和冷却阶段均被执行在 57 ± 4 °C的环境温度下。

Requirement 要求

Cells 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 test.

电芯外壳温度不超过170°C，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。

Test data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Maximum outer casing temperature 电池表面最高温度 (°C)	Results 结果
001	125.3	PASS 合格
002	123.6	PASS 合格
003	130.2	PASS 合格
004	126.1	PASS 合格
005	129.9	PASS 合格
006	127.7	PASS 合格
007	132.1	PASS 合格
008	128.5	PASS 合格
009	128.5	PASS 合格
010	128.4	PASS 合格

Notes 注释:

There is no disassembly, no rupture and no fire during the test and within six hours after test.

电芯在测试中和测试后 6 小时内未解体、未破裂，未起火。

Room temperature 环境温度: 22.9°C

Test T.6: Crush 试验T.6: 挤压**Test method 测试方法**

A 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.

- (a) The applied force reaches 13 kN $\pm$ 0.78 kN; (b) The voltage of the cell drops by at least 100 mV; or
(c) The cell is deformed by 50% or more of its original thickness.

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure is released.

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.

Each cell is to be subjected to one crush only. The test sample is observed for a further 6 h. The test is conducted using cells that have not previously been subjected to other tests.

将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 cm/s。挤压持续进行，直到出现以下三种情况之一：

- a)施加的力量达到 13 kN $\pm$ 0.78 kN；b)电芯的电压下降至少 100mV；或
c)电芯形变达原始厚度的 50%或更多。

一旦达到最大压力、电压下降 100mV 或更多，或电芯形变至少达原厚度的 50%，即可解除压力。

棱柱形或袋装电芯须从最宽的面施压。扣式或币式电芯，须施加挤压力在它的扁平面之间。圆柱形电芯，挤压力须施加于垂直于电芯纵轴的方向上。

每个试样电芯只做一次挤压试验。试样须继续观察 6 小时。试验须使用之前未做过其他试验的电芯进行。

Requirement 要求

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 the test.

电芯外壳温度不超过170°C，并且在试验过程中及试验后6小时内无解体，无起火。

Test data showed in table below 测试数据见下表

Sample Sub-No. 样品子编号	Maximum outer casing temperature 电池芯表面最高温度 (°C)	Results 结果
011	24.1	PASS 合格
012	40.9	PASS 合格
013	43.2	PASS 合格
014	50.1	PASS 合格
015	39.2	PASS 合格
016	25.2	PASS 合格
017	26.1	PASS 合格
018	38.1	PASS 合格
019	24.9	PASS 合格
020	44.1	PASS 合格

Notes 注释:

There is no disassembly, no rupture and no fire during the test and within six hours after the test.

电芯在测试中和测试后 6 小时内未解体、未起火。

Room temperature 环境温度: 20.1°C

Test T.8: Forced discharge 试验 T.8: 强制放电**Test method 测试方法**

Each cell is 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.

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 is forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

每个电芯在环境温度下与 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。

电芯与一个适当大小的电阻负载串联以调节到规定大小的放电电流。每块电芯的放电时间（单位为 h）等于电芯的额定容量除以试验初始放电电流（单位 A）。

Requirement 要求

Cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

电芯在试验过程中和试验后 7 天内无解体，无起火。

Test data showed in table below 测试数据见下表

Initial current 初始电流(mA)		92mA	
Supply voltage 试验电压(Vdc)		12Vdc	
Time interval 试验时间(Minutes)		30 minutes	
Sample Sub-No. 样品子编号	Results 结果	Sample Sub-No. 样品子编号	Results 结果
021	PASS 合格	031	PASS 合格
022	PASS 合格	032	PASS 合格
023	PASS 合格	033	PASS 合格
024	PASS 合格	034	PASS 合格
025	PASS 合格	035	PASS 合格
026	PASS 合格	036	PASS 合格
027	PASS 合格	037	PASS 合格
028	PASS 合格	038	PASS 合格
029	PASS 合格	039	PASS 合格
030	PASS 合格	040	PASS 合格

Notes 注释:

There is no disassembly and no fire during the test and within seven days after the test.

电芯在测试中和测试后 7 天内未解体，未着火。

Room temperature 环境温度: 20.9°C

*******End of Test Report 检测报告结束*******

Important Notice

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