



170021112938



# 检测报告

## TEST REPORT

证书编号 DCW202102160  
Certificate No.

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委托方 Client	Fiberfox Inc.	
委托方联络信息 Contact information	Kwang Yi B/D 2F, 80, Dongseo-daero 179Beon-gil, Yuseong-gu, Daejeon, Korea.	
样品名称 Description	锂离子聚合物电池模组 Lithium-ion Polymer Battery Pack	
型号/规格 Model/Type	FFLBT-3000	
制造厂 Manufacturer	Fiberfox Inc.	
出厂编号 Serial No.	1#~46#	设备管理编号 Equipment No. _____
接收日期 Date of Receipt	2020 年 12 月 14 日 Y M D	
结论 Conclusion	见检测结果 Shown in the results of test report	
检测日期 Date of Test	2021 年 01 月 19 日 Y M D	

批准人  
Approved Signatory 吴海益 吴海益

核 验  
Reviewed by 张剑 张剑

检 测  
Tested by 邓瑞伟 邓瑞伟

证书专用章  
Stamp



扫一扫查真伪



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说明

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DIRECTIONS

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1. 本中心是国家市场监督管理总局在华南地区设立的国家法定计量检定机构, 本中心的质量管理体系符合 ISO/IEC 17025:2017 标准的要求。

This laboratory is the National Legal Metrological Verification Institution in southern China set up by the State Administration for Market Regulation. The quality system is in accordance with ISO/IEC 17025:2017.

2. 本中心所出具的数据均可溯源至国家计量基准和国际单位制(SI)。

All data issued by this laboratory are traceable to national primary standards and International System of Units (SI).

3. 检测地点、环境条件:

Place and environmental conditions of the test:

地点 本院货物鉴定室

Place (Cargo Certificate Lab)

温度 (20±5) °C

Temperature

相对湿度 (30~60) %

R.H.

4. 本次检测的技术依据:

Reference documents for the test:

ST/SG/AC. 10/11/Rev. 7-2020 联合国《关于危险货物运输的建议书 试验和标准手册》第三部分 条款38.3
Recommendations on the transport of dangerous goods / Manual of tests and criteria Part III, Subsection 38.3

5. 本次检测所使用的主要计量标准器具:

Major standards of measurement used in the test:

Table with 4 columns: Equipment Name/Model/Type, Serial No., Certificate No./Due Date/Traceability to, and Metrological Characteristic. Rows include Electronic Balance, Digital Display Caliper, Temperature Signal, and Simulated High Altitude and Low Pressure Test Box.

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注: 1. 本证书(报告)结果只适用于收到的样品。The results in the report apply to the sample as received.
Note: 2. 未经本机构书面批准, 不得部分复制此报告。This report shall not be reproduced except in full, without the written approval of our laboratory.
3. “委托方”、“委托方联络信息”由委托方提供, “制造厂”、“型号规格”、“出厂编号”以及“设备编号”为仪器上标注。The information “client” and “contact information of the client” are provided by client, and the “manufacturer”, “Model/Type”, “Serial No.” and “Equipment No.” are marked on the items.
4. 本次检测日期视为发布日期。The test date is the date of issue of the report.



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设备名称/型号规格 Name of Equipment /Model/Type	编号 Serial No.	证书号/有效期/溯源单位 Certificate No./Due Date /Traceability to	计量特性 Metrological Characteristic
高低温冲击试验箱 High and Low Temperatures Shock Tester /TSG2055W	08110652	RZD202007720 /2021-07-30 /本中心	$U=0.3 \text{ } ^\circ\text{C} (k=2)$
热冲击试验箱 Thermal Shock Test Box /BE-101-1A	20180310013	RZD202005700 /2021-06-09 /本中心	$U=0.4^\circ\text{C}, k=2$
电磁式振动试验机 Electromagnetic Vibration Testing Machine /EV102-VT630	L141155	SSD202003521 /2021-06-16 /本中心	加速度: $\pm 10\%$ , 振动频率: $\pm 2\%$ Acceleration: $\pm 10\%$ , Vibrati on Frequency: $\pm 2\%$
冲击台 Shock Testing Machine /SKT25	L081001	SSD202004141 /2021-07-20 /本中心	加速度: $U_{rel}=5.0\% (k=2)$ Acceleration: $U_{rel}=5.0\% (k=2)$
电池短路试验机 Battery Short-circuit Testing Machine /BE-1500A	201404230001	DYL202060971 /2021-09-14 /本中心	电流: $U_{rel}=0.5\%$ , 电压: $U_{rel}=0.5\% (k=2)$ Current: $U_{rel}=0.5\%$ , Voltage: $U_{rel}=0.5\% (k=2)$
电池充放电机 Battery Charge-discharge Machine /CDS-120V/200A	RN20171123C	DYL202060471 /2021-05-25 /本中心	电流: $U_{rel}=0.5\%$ , 电压: $U_{rel}=0.5\% (k=2)$ Current: $U_{rel}=0.5\%$ , Voltage: $U_{rel}=0.5\% (k=2)$
DC ELECTRONIC LOAD /IT8512C	60002601268771 0014	DBB202002927 /2021-05-08 /本中心	直流电压允差: $\pm (0.02\%$ 读 数+ $0.02\%$ 量程), 直流电流允 差: $\pm (0.1\%$ 读数+ $0.1\%$ 量程) DCV MPE: $\pm (0.02\%$ RDG+ $0.02\%$ FS), D CA MPE: $\pm (0.1\%$ RDG+ $0.1\%$ FS)
Auto Range DC power Supply /IT6522A	60006101168762 0010	DBB202002928 /2021-05-08 /本中心	直流电压允差: $\pm (0.03\%$ 读 数+ $0.02\%$ ), 直流电流允 差: $\pm (0.1\%$ 读数+ $0.025\%$ ) DCV MPE: $\pm (0.03\%$ RDG+ $0.02\%$ ), DCA MPE: $\pm (0.1\%$ RDG+ $0.025\%$ )
电池挤压试验机 Battery Extrusion Testing Machine /BE-6045D	201404230002	LCC202002657 /2021-08-27 /本中心	$U_{rel}=0.3\%, (k=2)$

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### I Test summary 测试摘要

#### Test summary 测试摘要

Sample name 样品名称	Lithium-ion Polymer Battery Pack 锂离子聚合物电池模组
Manufacturer's name 制造厂名称	Fiberfox Inc.
Manufacturer's address 制造厂地址	Kwang Yi B/D 2F,80,Dongseo-daero 179Beon-gil,Yuseong-gu,Daejeon,Korea.
Manufacturer's phone number 制造厂电话号码	8242-716-7220
Manufacturer's email address 制造厂电子邮箱地址	skmin@fiberfox.co.kr
Manufacturer's website 制造厂网址	www.fiberfox.co.kr
Test laboratory 检测实验室名称	广东省计量科学研究院(华南国家计量测试中心) GUANGDONG INSTITUTE OF METROLOGY(SOUTH CHINA NATIONAL CENTER OF METROLOGY)
Test laboratory Address 检测实验室地址	中国广东省广州市广园中路松柏东街30号 No.30, Songbaidong Street, Guangyuanzhong Road, GuangZhou, Guangdong Province, China
Test laboratory Telephone number 检测实验室电话号码	(8620)86594172
Test laboratory's email address 检测实验室电子邮箱地址	scm@scm.com.cn
Test laboratory website 检测实验室网址	www.scm.com.cn



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Test summary to continue  
测试摘要(续)

UN38.3 test report number UN38.3检测报告编号	DCW202102160		
Date of test report 检测报告日期	2021 年 1 月 19 日		
Classification of battery 电池分类	Lithium ion battery 锂离子电池		
Nominal voltage 标称电压	11.1V	Type 型号规格	FFLBT-3000
Limited charge voltage 限制充电电压	12.6V	Watt-hour rating 额定瓦时	3000mAh 33.3Wh
Physical description 物理形状	Prismatic 菱形	Trade mark 商标	
Sample Mass 样品质量	0.245kg	Size (L×W×T) 样品尺寸(L×W×T)	( 123.3 × 88.6 × 23.2 ) mm
Assembled battery testing requirements 集成锂电池试验要求	<input checked="" type="checkbox"/> Not applicable 不适用 <input type="checkbox"/> Applicable and testing reference to 38.3.3 (f). 适用且测试依据条款号为38.3.3 (f) <input type="checkbox"/> Applicable and testing reference to 38.3.3 (g). 适用且测试依据条款号为38.3.3 (g)		
Test reference 检测依据	Seventh revised edition of Manual of Test and Criteria, Part III, subsection 38.3. (ST/SG/AC.10/11/Rev.7) 第7修订版《试验和标准手册》第三部分条款38.3。(ST/SG/AC.10/11/Rev.7)		
Test conclusion 检测结论	The battery samples pass all of the requirement test items. 经检测, 全部检测项目符合要求。 本次检测结论为合格。		



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### Test summary to continue 测试摘要(续)

Test item 试验项目	Test reference 试验依据	Conclusion 结果	Remark 备注
Altitude simulation 高度模拟	UN Manual of Tests and Criteria, part III, subsection 38.3.4.1 UN 试验和标准手册, 第三部分, 条款38.3.4.1	Pass 符合要求	----
Thermal test 热冲击	UN Manual of Tests and Criteria, part III, subsection 38.3.4.2 UN 试验和标准手册, 第三部分, 条款38.3.4.2	Pass 符合要求	----
Vibration 振动	UN Manual of Tests and Criteria, part III, subsection 38.3.4.3 UN 试验和标准手册, 第三部分, 条款38.3.4.3	Pass 符合要求	----
Shock 机械冲击	UN Manual of Tests and Criteria, part III, subsection 38.3.4.4 UN 试验和标准手册, 第三部分, 条款38.3.4.4	Pass 符合要求	----
External short circuit 外部短路	UN Manual of Tests and Criteria, part III, subsection 38.3.4.5 UN 试验和标准手册, 第三部分, 条款38.3.4.5	Pass 符合要求	----
Crush 挤压	UN Manual of Tests and Criteria, part III, subsection 38.3.4.6 UN 试验和标准手册, 第三部分, 条款38.3.4.6	Pass 符合要求	----
Overcharge 过充电	UN Manual of Tests and Criteria, part III, subsection 38.3.4.7 UN 试验和标准手册, 第三部分, 条款38.3.4.7	Pass 符合要求	----
Forced discharge 强制放电	UN Manual of Tests and Criteria, part III, subsection 38.3.4.8 UN 试验和标准手册, 第三部分, 条款38.3.4.8	Pass 符合要求	----
Remark 备注	----		
Tested by 检测员	邓瑞伟		
Reviewed by 核验员	张剑		
Approved Signatory 批准人	吴海益		



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### II Test result 测试结果

#### Procedure 说明

Test T.1 to test T.5 must be conducted in sequence on the same cell or battery. Test T.6 and test 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.  
必须用相同的电芯或电池按顺序进行试验1到试验5。试验6和试验8须用没进行过其它试验的电芯或电池。为了测试循环后的电池，试验7可用试验1到试验5后没损坏的电池。

- Batteries of 1#~8# are full charged after one cycle;  
电池1#~8#为1次循环满电状态;
- Batteries of 9#~16# are full charged after 25th cycles;  
电池9#~16#为25次循环满电状态;
- Component cells of 17#~21# are 50% charged after one cycle;  
组成电芯17#~21#为1次循环后50%充电状态;
- Component cells of 22#~26# are 50% charged after 25th cycle;  
组成电芯22#~26#为25次循环后50%充电状态;
- Component Cells of 27#~36# are full discharged after one cycle;  
组成电芯27#~36#为1次循环完全放电状态;
- Component Cells of 37#~46# are full discharged after 25th cycles.  
组成电芯37#~46#为25次循环后完全放电状态。

### 1 Altitude simulation 高度模拟

#### 1) Requirement 要求

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.

电芯或电池应满足以下要求：试验后没有泄漏、开口、解体、破裂、以及起火，并且每个试验的电芯或电池的开路电压不低于其试验前电压的90%，要求中有关电压方面不适用于完全放电状态的电芯或电池。

#### 2) Test procedure 试验过程

Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature (20±5) °C.

试验的电芯或电池应在11.6kPa或更少的气压下存放至少6h，温度控制在(20±5) °C。

#### 3) The equipment used in this test 试验设备号: DCB106 DCB016 DCP154

#### 4) Testing time 试验时间: 2020 年 12 月 16 日 至 2020 年 12 月 16 日

#### 5) Data showed in table 1 数据见表1

Table 1 表1



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The state of batteries 电池状态	NO. 序号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test / Voltage pre-test 试验后电压 / 试验前电压 (%)	Status 结论
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
First cycle, fully charged state 1个循环, 充满电状态	1#	243.40	12.55	243.40	12.54	0.00	99.9	Pass 符合要求
	2#	244.47	12.54	244.47	12.53	0.00	99.9	Pass 符合要求
	3#	240.23	12.53	240.23	12.52	0.00	99.9	Pass 符合要求
	4#	243.68	12.53	243.68	12.53	0.00	100.0	Pass 符合要求
25th cycle, fully charged state 25个循环, 充满电状态	9#	243.49	12.52	243.49	12.52	0.00	100.0	Pass 符合要求
	10#	245.24	12.54	245.24	12.53	0.00	99.9	Pass 符合要求
	11#	240.88	12.55	240.88	12.54	0.00	99.9	Pass 符合要求
	12#	241.84	12.55	241.84	12.54	0.00	99.9	Pass 符合要求
Sample status after test 试验后样品状态	no leakage 无泄漏, no venting 无开口, no disassembly 无解体, no rupture 无破裂, no fire 无起火, others 其他: none 无							Pass 符合要求

## 2 Thermal test 热冲击

### 1) Requirement 要求

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.

电芯或电池应满足以下要求: 没有泄漏、开口、解体、破裂、以及起火, 并且每个试验的电芯或电池的开路电压不低于其试验前电压的90%。要求中有关电压方面不适用于完全放电状态的电芯或电池。

### 2) Test procedure 试验过程

Test cells and batteries 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 until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature  $(20 \pm 5)^\circ\text{C}$ . For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验的电芯或电池应在温度为  $(72 \pm 2)^\circ\text{C}$  的条件下至少放置 6h, 然后在温度为  $(-40 \pm 2)^\circ\text{C}$  的条件下至少放置 6h。试验温度限值变化的最大时间间隔为 30min。此过程重复进行 10 次, 试验后所有试验的电芯或电池应在环境温度为  $(20 \pm 5)^\circ\text{C}$  下存放 24h。对于大电池或大电芯, 在极端温度下放置时间应为 12h。

### 3) The equipment used in this test 试验设备号: DCB106 DCB016 DCP081

4) Testing time 试验时间: 2020 年 12 月 17 日 至 2020 年 12 月 24 日

5) Data showed in table 2 数据见表 2





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Table 2 表2

Table with 9 columns: The state of batteries, NO., Pre-test, After test, Mass loss, Voltage after test, Status. Includes test results for 1st and 25th cycles and sample status after test.

3 Vibration 振动

1) Requirement 要求

Cells and batteries 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 or battery after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.

电芯或电池应满足以下要求: 没有泄漏、开口、解体、破裂、以及起火, 并且每个试验的电芯或电池的开路电压不低于其试验前电压的90%。

2) Test procedure 试验过程

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes.



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The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12kg (cells and small batteries), and for batteries with a gross mass of more than 12kg (large batteries).

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.

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.

电芯或电池固定在振动仪器的平台上, 并且没有扭曲, 以此保证有效的振动传播. 振动应为一个正弦波, 在15min内完成对数频率转换从7Hz到200Hz再回到7Hz的过程. 这个循环应在电池的三个空间正交位置各进行12次 (总时间为3h). 每个方向必须正交到终端面.

对于对数频率扫描, 质量小于12kg的电池或电芯 (电芯或小电池) 与质量大于12kg的大电池应有所不同

对于电芯或小电池: 从7Hz起以峰值加速度1gn持续到18Hz. 振幅维持在0.8mm (总共1.6mm) 和频率增加直到峰值加速度为8gn (大约为50Hz). 然后频率以峰值加速度为8gn上升持续到200Hz.

对于大电池: 从7Hz起以峰值加速度1gn持续到18Hz. 振幅维持在0.8mm (总共1.6mm) 和频率增加直到峰值加速度为2gn (大约为25Hz). 然后频率以峰值加速度为2gn上升持续到200Hz.

3) The equipment used in this test 试验设备号: DCB106 DCB016 DCP130

4) Testing time 试验时间: 2020 年 12 月 25 日 至 2020 年 12 月 28 日

5) Data showed in table 3 数据见表3

Table 3 表3

Table with 9 columns: The state of batteries, NO., Pre-test, After test, Mass loss, Voltage after test, Status. Includes checkboxes for test sample types and a data table for battery cycles.



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Table with 9 columns: Test Item, Sample No., Voltage 1, Voltage 2, Voltage 3, Voltage 4, Voltage 5, Voltage 6, Voltage 7, Result. Includes rows for 25 cycles, sample status, and test results.

4 Shock 机械冲击

1) Requirement 要求

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.

电芯或电池应满足以下要求: 没有泄漏、开口、解体、破裂、以及起火, 并且每个试验的电芯或电池的开路电压不低于其试验前电压的90%。

2) Test procedure 试验过程

Test cells and batteries shall be secured to the testing machine by means of rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150gn and pulse duration of 6 milliseconds.

Table with 3 columns: Battery, Minimum peak acceleration, Pulse duration. Contains formulas for calculating acceleration based on mass for small and large batteries.

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.



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中国认可  
国际互认  
检测  
TESTING  
CNAS L0730

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试验电芯或电池应固定在试验仪器上, 用刚性的衬底支撑每一测试电池的所有表面。每一电芯或电池应进行峰值加速度为150gn和脉宽6ms的半正弦波冲击。另外大电芯应进行峰值加速度为50gn脉宽为11ms的正弦波冲击。

每块电池应进行正弦波冲击的峰值加速度值应根据电池的质量来定。小电池的冲击脉冲宽度应为6ms, 而大电池的冲击脉冲宽度应为11ms。电池适当的冲击峰值加速度值由下面公式算出。

电池	最小峰值加速度	脉冲宽度
小电池	150gn或以下公式的结果: 加速度 (gn) = $\sqrt{\left(\frac{100850}{\text{电池质量}}\right)}$ 以上两者取最小值	6ms
大电池	50gn或以下公式的结果: 加速度 (gn) = $\sqrt{\left(\frac{30000}{\text{电池质量}}\right)}$ 以上两者取最小值	11ms

每一电芯或电池应在正的方向进行3次冲击, 在反方向进行3次冲击, 即电芯或电池总共在3个正交位置上进行18次冲击。

3) The equipment used in this test 试验设备号: DCB106 DCB016 DCP080

4) Testing time 试验时间: 2020 年 12 月 29 日 至 2020 年 12 月 29 日

5) Data showed in table 4 数据见表4

Table 4 表4

The test sample weight 本次试验样品重量为: 0.245 kg								
The appropriate minimum peak accelerations 试验重力加速度为: 150 gn								
<input checked="" type="checkbox"/> 本次试验样品为小电池或小电芯, 采用小电池的试验过程. This test sample is small battery, adapt to the small battery test procedure.								
<input type="checkbox"/> 本次试验样品为大电池或大电芯, 采用大电池的试验方案. This test sample is large battery, adapt to the large battery test procedure.								
The state of batteries 电池状态	NO. 序号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test / Voltage pre-test 试验后电压 / 试验前电压 (%)	Status 结论
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
First cycle, fully charged state	1#	243.37	12.51	243.37	12.50	0.00	99.9	Pass 符合要求
	2#	244.45	12.50	244.45	12.50	0.00	100.0	Pass 符合要求



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Table with 9 columns: Test Item, Sample No., Voltage 1, Voltage 2, Voltage 3, Voltage 4, Current, Capacity, and Result. Rows include 1 cycle fully charged, 25th cycle fully charged, 25 cycles fully charged, and Sample status after test.

5 External short circuit 外部短路

1) Requirement 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.

电芯或电池应满足以下要求: 在试验过程中以及试验后6h内不起火、不解体、无破裂、表面温度不超过170°C。

2) Test procedure 试验过程

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. 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 0.1 ohm

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.

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

测试的电芯或电池先加热一段时间直到电芯或电池的表面温度能均匀稳定在(57 ± 4)°C, 加热时间取决于电芯或电池的外形设计与尺寸且应把加热时间评估记录下来, 如果加热时间无法评估那么小电池或小电芯的加热时间至少为6h, 大电池或大电芯的加热时间至少为12h. 然后(57 ± 4)°C的电芯或电池在外部线路电阻小于0.1Ω这一条件下进行外部短路。

在电池或电芯的表面温度回到(57 ± 4)°C后这一外部短路情况还要再持续至少1h; 如果是大电池或大电芯其表面温度升到最高值再降回到最高值的一半后, 还要再持续短路1h以上。

此外部短路和降温过程至少应在环境温度下进行。

3) The equipment used in this test 试验设备号: DCB016 DCP124 DCP134 DCP153

4) Testing time 试验时间: 2020年12月30日至2020年12月31日

5) Data showed in table 5 数据见表5



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Table 5 表5

Table with 5 columns: The state of batteries (电池状态), NO. (序号), Voltage pre-test (试验前电压(V)), External Peak temperature (表面最高温度 (°C)), and Status (结论). It contains test results for various cycles and a summary of sample status during the test.

6 Impact/Crush 重物冲击/挤压

1) Requirement 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 the test.

电芯或组成电芯应满足以下要求: 在试验过程中及试验后6h内不起火、不解体、表面温度不超过170°C。

2) Test procedure-Impact (applicable to cylindrical cells not less than 18.0mm in diameter) 试验过程—重物冲击 (适用于直径不小于18.0mm的圆柱形电芯)

The test sample cell or component cell is to be placed on a flat surface. A (15.8±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±0.1) kg 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 of channel with minimal drag on the falling mass. The vertical track of channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.



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The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the (15.8±0.1) mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

试验电芯或组成电芯样品放在一个平坦表面上。一根直径为(15.8±0.1) mm的长度取6cm或比电芯更长的尺寸中的最长那个的不锈钢棒横放在样品中心，一块(9.1±0.1) kg的重锤从(61±2.5cm)高处跌落到钢棒与试验样品交叉点上。重锤跌落由一个没有摩擦的、对重锤阻力最小的垂直轨道或管道加以控制用以引导落锤沿与水平支撑表面呈90°落下。

接受撞击的样品应使长轴线与平坦表面平行地横放在表面上，钢棒与长轴线垂直地横放到电池表面上进行撞击。每块电芯只经受一次撞击。

3) Test procedure-Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter) 试验过程—挤压 (适用于菱形、袋状、纽扣电芯和直径小于18.0mm的圆柱形电芯)

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) The applied force reaches (13±0.78) kN;
- (b) The voltage of the cell drops by at least 100mV; 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 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be 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 test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6h. The test shall be conducted using test cells of component cells that have not previously been subjected to other tests.

将一块电芯或组成电芯放在两个平面之间进行挤压。挤压应以缓慢的速度进行，初步接触时速度为1.5cm/s，挤压持续进行直到出现以下三种情况之一：

- (a) 施加的力值达到(13±0.78) kN;
- (b) 电芯的电压下降至少100mV; 或
- (c) 电芯比原来变形50%以上。

菱形和袋状电芯应从最宽的一面施压，纽扣电芯应从平坦表面施压，圆柱形电芯应从与纵轴垂直的方向施压。

每块电芯或组成电芯只进行一次挤压试验，试验样品应持续观察6h。本试验应用从未进行过其他试验的电芯或组成电芯。

4) The equipment used in this test 试验设备号: DCB016 DCP124 DCP135

5) Testing time 试验时间: 2021 年 1 月 5 日 至 2021 年 1 月 5 日

6) Data showed in table 6 数据见表6

Table 6 表6

This test samples are cylindrical cells not less than 18.0mm in diameter, adopt to the Impact test procedure. 本次试验样品为直径不小于18.0mm的圆柱形电芯，采用重物冲击试验过程。



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<input checked="" type="checkbox"/> This test sample applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter, adopt to Crush test procedure. 本次试验样品属于菱形、袋状、纽扣电芯和直径小于18.0mm的圆柱形电芯，采用挤压试验过程。				
The state of cells 电芯状态	NO. 序号	Voltage pre-test 试验前电压(V)	External Peak temperature 表面最高温度 (°C)	Status 结论
First cycle, 50% charged state 1个循环, 50%充电 状态	17#	3.68	22.7	Pass符合要求
	18#	3.69	22.3	Pass符合要求
	19#	3.72	22.5	Pass符合要求
	20#	3.67	22.6	Pass符合要求
	21#	3.66	23.0	Pass符合要求
25th cycle, 50% charged state 25个循环, 50%充 电状态	22#	3.69	23.2	Pass符合要求
	23#	3.70	22.9	Pass符合要求
	24#	3.71	23.1	Pass符合要求
	25#	3.68	22.6	Pass符合要求
	26#	3.69	22.8	Pass符合要求
Sample status during the test and within six hours after the test. 试验过程中及试验后6h内样品状 态			no disassembly无解体, no fire无起火, others其他: none无	Pass符合要求

### 7 Overcharge 过充电

#### 1) Requirement 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.

可充电电池应满足以下要求：在试验过程中及试验后七天内不解体、不起火。

#### 2) Test procedure 试验过程

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

(a) 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) When the manufacturer's recommended charge voltage is more than 18 V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Test shall be conducted at ambient temperature. The duration of the test shall be 24 hours.





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充电电流为制造商建议的最大连续充电电流值的两倍, 试验最小充电电压如下:
(a) 当制造商建议的充电电压不超过18V, 试验电压最小值应取最大充电电压的两倍或22V中的较小者。
(b) 当制造商建议的充电电压超过18V, 试验电压最小值应为最大充电电压的1.2倍。
试验应在环境温度下进行。试验持续时间为24h。

3) The equipment used in this test 试验设备号: DCB016 DCP152

4) Testing time 试验时间: 2021 年 1 月 6 日 至 2021 年 1 月 19 日

5) Data showed in table 7 数据见表7

Table 7 表7

Table with 4 columns: The state of batteries, NO., Voltage pre-test, Status. It contains test results for different cycles and sample status, all marked as 'Pass'.

8 Forced discharge 强制放电

1) Requirement 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.

一次或可充电电芯应满足以下要求: 在实验后七天内不解体、不起火。



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2) Test procedure 试验过程

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.

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).

每块电芯应在环境温度下与一台12V直流电源连接进行强制放电, 此直流电源的初始电流等于生产厂家规定的最大放电电流。

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实验初始放电电流大小(单位为A)。

3) The equipment used in this test 试验设备号: DCB016 DBP076 DBP081

4) Testing time 试验时间: 2021 年 1 月 7 日 至 2021 年 1 月 19 日

5) Data showed in table 8 数据见表8

Table 8 表8

Table with 4 columns: The state of cells (电芯状态), NO. (序号), Voltage pre-test (试验前电压(V)), and Status (结论). It contains test data for cells 27# through 40#.



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25th cycle, fully discharged state 25个循环, 完全放电状态	41#	3.43	Pass符合要求
	42#	3.42	Pass符合要求
	43#	3.44	Pass符合要求
	44#	3.45	Pass符合要求
	45#	3.42	Pass符合要求
	46#	3.43	Pass符合要求
Sample status during the test and within seven days after the test. 试验过程中及试验后七天内样品状态		no disassembly无解体, no fire无起火, others其他: none无	Pass符合要求



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### III Major standards and equipment used in the test 主要检测标准器具和设备

序号 No.	设备号 Equipment No.	仪器名称/型号 Name of equipment/type	编号 Serial No.
1	DCB106	电子天平/BS4202S	23392088
2	DCP145	数显卡尺/(0~300)mm/0.01mm	404030132
3	DCB016	数字多用表/34401A	US36073133
4	DCP124	温度采集器/34972A	MY49025573
5	DCP154	模拟高空低压试验箱/BE-8104	20180310012
6	DCP081	高低温冲击试验箱/TSG2055W	08110652
7	DCP153	热冲击试验箱/BE-101-1A	20180310013
8	DCP130	电磁式振动试验机/EV102-VT630	L141155
9	DCP080	冲击台/SKT25	L081001
10	DCP135	电池挤压试验机/BE-6045D	201404230002
11	DCP134	电池短路试验机/BE-1500A	201404230001
12	DCP133	电池检测设备/CTS-20V/5A-GGS	130702120116
13	DCP152	电池充放电机电/CDS-120V/200A	RN20171123C
14	DBP076	DC ELECTRONIC LOAD/IT8512C	600026012687710014
15	DBP081	Auto Range DC power Supply/IT6952A	00061011687620010



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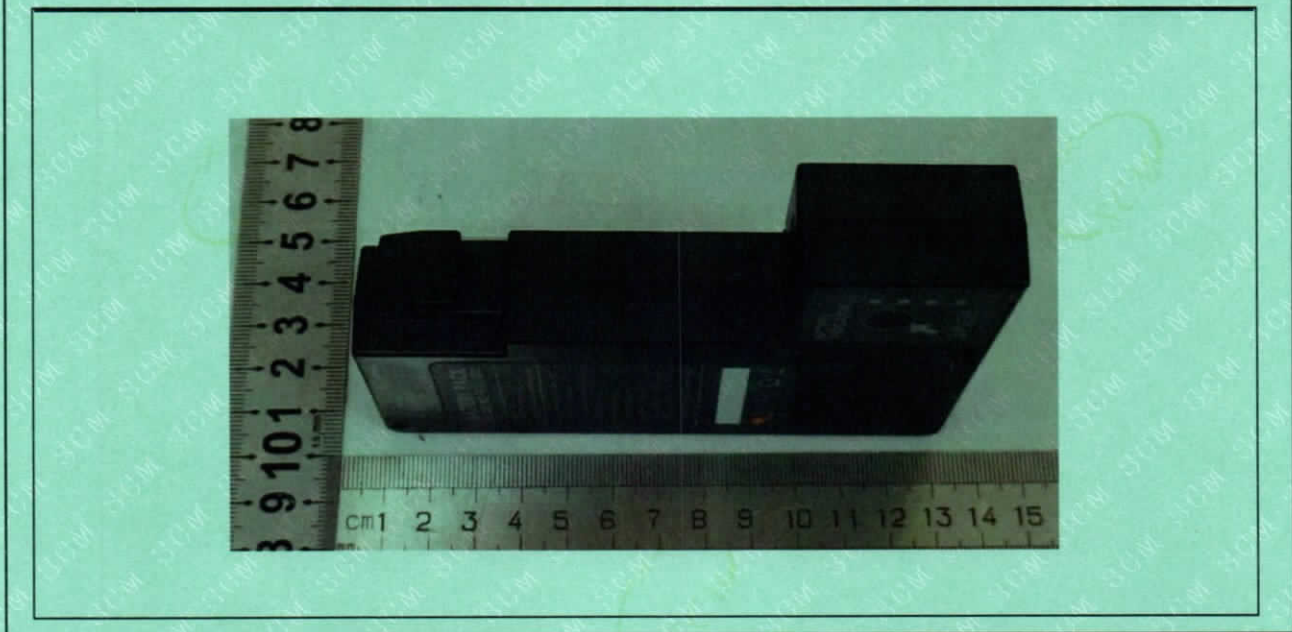
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### IV Photos of the Sample 样品照片

#### Battery 电池





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### Cell 电芯

