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中国认可
检测
TESTING
CNAS L2065

检 测 报 告
TEST REPORT

SAMPLE INFORMATION: 样品信息：	Primary Lithium-Metal Cell, Model CR2, 3.0V, 1000mAh, 3.0Wh 不可充式锂金属电芯, 型号 Model CR2, 3.0V, 1000mAh, 3.0Wh
APPLICANT: 申请单位：	Jiangmen Hongli Energy Co., Ltd. 江门市宏力能源有限公司
TYPE OF TEST: 检测类别：	Commercial Inspection and Testing Services 商业委托检测

苏州UL美华认证有限公司广州分公司
UL-CCIC Company Limited Guangzhou Branch

Date Issued: 2017-08-21
Date Revised:2018-07-13

Applicant information 申请资料	
Name of samples 样品名称	Primary Lithium-Metal Cell 不可充式锂金属电芯
Type/ Model 型号规格	Cell Model CR2, 3.0V, 1000mAh, 3.0Wh; Li Content: 0.5g 电芯型号CR2, 3.0V, 1000mAh, 3.0Wh；锂含量：0.5g
Trade mark 商标	N/A 不适用
Applicant 申请单位	江门市宏力能源有限公司 Jiangmen Hongli Energy Co., Ltd.
Applicant address 申请单位地址	9 Building, No. 82 Xin Nan Road, Tangxia Town, Pengjiang District, Jiangmen, Guangdong, China 中国广东省江门市蓬江区棠下镇新南路82号9栋
Manufacturer 制造商	江门市宏力能源有限公司 Jiangmen Hongli Energy Co., Ltd.
Manufacturer address 制造商地址	9 Building, No. 82 Xin Nan Road, Tangxia Town, Pengjiang District, Jiangmen, Guangdong, China 中国广东省江门市蓬江区棠下镇新南路82号9栋
Appearance 样品外观颜色	White Cell 白色电芯
Quantity of sample 样品数量	Cell/ 电池芯: 40 pcs.
Sample identification 样品标识序号	Cell/ 电池芯: 1981336-21~1981336-25, 1981336-46~1981336-55; 1981339-1~1981339-15, 1981339-21~1981339-30
Testing standard 参考标准	United Nations: Recommendations on the Transport of Dangerous Goods - Manual of Tests and Criteria, Sixth revised edition, 2015 (ST/SG/AC.10/11/Rev.6), Section 38.3: Lithium Batteries联合国《关于危险品货物运输的建议书》试验和标准手册第六修订版(2015)，第38.3节：锂电池
Received date / 接样日期	2018-12-13, 2018-12-18
Completion date / 完成日期	2019-02-03
Remark/备注: N/A	

Test Conclusion 测试结论					
No. 序号	Name of test 测试项目名称	Sample Condition 样品状态	Sample Number 样品编号	Conclusion 单项结论	Remarks 备注
T.1	Altitude simulation 高度模拟	Undischarged state/ 未放电	1981336-46~1981336-55	Pass 通过	--
		Fully discharged state/完全放电	1981339-1~1981339-10		
T.2	Thermal test 温度试验	Undischarged state/ 未放电	1981336-46~1981336-55	Pass 通过	--
		Fully discharged state/完全放电	1981339-1~1981339-10		
T.3	Vibration 振动	Undischarged state/ 未放电	1981336-46~1981336-55	Pass 通过	--
		Fully discharged state/完全放电	1981339-1~1981339-10		
T.4	Shock 冲击	Undischarged state/ 未放电	1981336-46~1981336-55	Pass 通过	--
		Fully discharged state/完全放电	1981339-1~1981339-10		
T.5	External Short-circuit 外部短路	Undischarged state/ 未放电	1981336-46~1981336-55	Pass 通过	--
		Fully discharged state/完全放电	1981339-1~1981339-10		
T.6	Impact 撞击	Undischarged state/ 未放电	N/A 不适用	N/A 不适用	Cylindrical cell less than 18 mm in diameter 圆柱形电芯,直径小于18 mm.
		Fully discharged state/完全放电	N/A 不适用		
	Crush 挤压	Undischarged state/ 未放电	1981336-21~1981336-25	Pass 通过	--
		Fully discharged state/完全放电	1981339-11~1981339-15		

T.7	Overcharge 过度充电	Undischarged state/ 未放电	N/A 不适用	N/A 不适用	Primary cell without overcharge protection
		Fully discharged state/完全放电	N/A 不适用	N/A 不适用	Primary cell without overcharge protection
T.8	Forced discharge 强制放电	Fully discharged state/完全放电	1981339-21~1981339-30	Pass 通过	--
				Pass 通过	--

Test Conclusion / 检验结论：

The Primary Lithium-Metal Cell, Model CR2, 3.0V, 1000mAh, 3.0Wh submitted by Jiangmen Hongli Energy Co., Ltd. is tested according to Section 38.3 of the Sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6, Section 38.3). The test items are full items.

由江门市宏力能源有限公司送检的不可充式锂金属电芯, 型号CR2, 3.0V, 1000mAh, 3.0Wh，依据《关于危险品货物运输的建议书》试验和标准手册第六修订版第38.3节进行检测。试验为全项目。

The test results: Pass.

测试结果：通过。

Date of issue / 签发日期: 2019-02-03

Approved by: 批准：

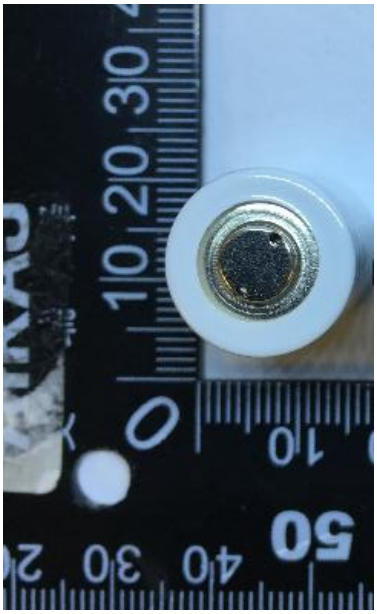
Reviewed by: 审核：

Tested by: 检测：

Photos of samples and markings
样品及标识照片

Primary Lithium-Metal Cell, Model CR2, 3.0V, 1000mAh, 3.0Wh
不可充式锂金属电芯, 型号CR2, 3.0V, 1000mAh, 3.0Wh





T.1 Altitude simulation
高度模拟

Test Method
测试方法

The samples were stored for at least 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of 20 ± 5°C (68 ± 9°F). The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 将测试样品放在温度为20±5°C，大气压力为不大于11.6kpa的环境中贮存不少于6个小时。对样品在测试前后进行称重，并记录电压。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1981339-1	(A)	10.498	10.498	0.000	--	--	--	(6), (7)
1981339-2	(A)	10.462	10.462	0.000	--	--	--	(6), (7)
1981339-3	(A)	10.394	10.394	0.000	--	--	--	(6), (7)
1981339-4	(A)	10.564	10.564	0.000	--	--	--	(6), (7)
1981339-5	(A)	10.503	10.503	0.000	--	--	--	(6), (7)
1981339-6	(A)	10.439	10.439	0.000	--	--	--	(6), (7)
1981339-7	(A)	10.658	10.658	0.000	--	--	--	(6), (7)
1981339-8	(A)	10.295	10.295	0.000	--	--	--	(6), (7)
1981339-9	(A)	10.453	10.453	0.000	--	--	--	(6), (7)
1981339-10	(A)	10.396	10.396	0.000	--	--	--	(6), (7)
1981336-46	(B)	11.553	11.553	0.000	3.270	3.271	100.000	(6), (7)
1981336-47	(B)	11.630	11.630	0.000	3.271	3.272	100.000	(6), (7)
1981336-48	(B)	11.588	11.588	0.000	3.277	3.277	100.000	(6), (7)
1981336-49	(B)	11.669	11.670	0.000	3.274	3.274	100.000	(6), (7)
1981336-50	(B)	11.685	11.686	0.000	3.272	3.273	100.000	(6), (7)
1981336-51	(B)	11.755	11.756	0.000	3.270	3.270	100.000	(6), (7)
1981336-52	(B)	11.603	11.603	0.000	3.280	3.280	100.000	(6), (7)
1981336-53	(B)	11.674	11.674	0.000	3.272	3.271	99.969	(6), (7)
1981336-54	(B)	11.661	11.661	0.000	3.277	3.277	100.000	(6), (7)
1981336-55	(B)	11.555	11.555	0.000	3.270	3.270	100.000	(6), (7)

Results/结果:
(1) Leakage/漏液.
(2) Venting/排气.
(3) Disassembly/解体.
(4) Rupture/破裂.

(5) Fire/着火.
(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.
(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90％.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) Undischarged state/未放电.
(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.
(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.
(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.2 Thermal test
温度试验

Test Method
测试方法

The samples were subjected to temperature cycling consisting of the following. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 测试样品将进行如下温度循环测试。样品测试前后进行称重，并记录电压。

Samples In/样品进箱:	The chamber temperature was raised to 72 ± 2°C (162 ± 4°F) within 30 minutes and maintained at this temperature for **[6] ~~[12]~~** hours. 烤箱温度在30分钟内上升到72 ± 2°C，并维持此温度 **[6] ~~[12]~~**小时。
	The chamber temperature was reduced to -40 ± 2°C (-40 ± 4°F) within 30 minutes and maintained at this temperature for **[6] ~~[12]~~** hours. 烤箱温度在30分钟内降低到-40 ± 2°C，并维持此温度 **[6] ~~[12]~~**小时。
	Repeat the sequence for 9 additional cycles (total of 10 cycles). 重复此顺序测试额外9个循环（总共10个循环）。
Samples Out/样品出箱:	After the 10th cycle, store the batteries at ambient temperature 20 ± 5°C (68 ± 9°F) for 24 hours prior to examination. 在第10个循环后，于20 ± 5°C环境下储存24小时，然后检查其状态。

Note: The duration of exposure to the test temperature extremes was determined as below:
注：样品承受极端温度的持续时间按如下确定：

- Small cells and small batteries: 6 hours; 小电芯和小电池为6小时;
- Large cells and large batteries: 12 hours. 大电芯和大电池为12小时。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1981339-1	(A)	10.498	10.490	0.076	--	--	--	(6), (7)
1981339-2	(A)	10.462	10.455	0.067	--	--	--	(6), (7)
1981339-3	(A)	10.394	10.387	0.067	--	--	--	(6), (7)
1981339-4	(A)	10.564	10.556	0.076	--	--	--	(6), (7)
1981339-5	(A)	10.503	10.496	0.067	--	--	--	(6), (7)
1981339-6	(A)	10.439	10.431	0.077	--	--	--	(6), (7)
1981339-7	(A)	10.658	10.650	0.075	--	--	--	(6), (7)
1981339-8	(A)	10.295	10.288	0.068	--	--	--	(6), (7)
1981339-9	(A)	10.453	10.445	0.077	--	--	--	(6), (7)
1981339-10	(A)	10.396	10.390	0.058	--	--	--	(6), (7)
1981336-46	(B)	11.553	11.547	0.052	3.271	3.277	100.000	(6), (7)
1981336-47	(B)	11.630	11.622	0.069	3.272	3.278	100.000	(6), (7)
1981336-48	(B)	11.588	11.580	0.069	3.277	3.281	100.000	(6), (7)
1981336-49	(B)	11.670	11.663	0.060	3.274	3.279	100.000	(6), (7)
1981336-50	(B)	11.686	11.675	0.094	3.273	3.279	100.000	(6), (7)

1981336-51	(B)	11.756	11.748	0.068	3.270	3.280	100.000	(6), (7)
1981336-52	(B)	11.603	11.596	0.060	3.280	3.283	100.000	(6), (7)
1981336-53	(B)	11.674	11.668	0.051	3.271	3.278	100.000	(6), (7)
1981336-54	(B)	11.661	11.654	0.060	3.277	3.278	100.000	(6), (7)
1981336-55	(B)	11.555	11.549	0.052	3.270	3.277	100.000	(6), (7)

Results/结果:
(1) Leakage/漏液.
(2) Venting/排气.
(3) Disassembly/解体.
(4) Rupture/破裂.
(5) Fire/着火.
(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.
(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) Undischarged state/未放电.
(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.
(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.
(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.3 Vibration
振动

Test Method
测试方法

The samples were subjected to vibration tests consisting of the following. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 测试样品将进行如下振动测试。

The samples were 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 was a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle was 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 was perpendicular to the terminal face. 电芯和电池牢固地安装在振动台上。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。以振动的其中一个方向必须是垂直样品极性，对每个电芯从三个互相垂直的方向上循环12次，每个方向3个小时。

The logarithmic frequency sweep was as follows/对数扫频如下:

[X] For cells and small batteries: From 7 Hz a peak acceleration of 1 g was maintained until 18 Hz is reached. The amplitude was then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g occurred (approximately 50 Hz). A peak acceleration of 8 g was then maintained until the frequency was increase to 200 Hz. 对于小电芯和小电池：7赫兹开始保持1gn的最大加速度直到频率为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8gn直到频率增加到200赫兹。

[ ] For large batteries: From 7 Hz a peak acceleration of 1 g was maintained until 18 Hz is reached. The amplitude was then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 g occurred (approximately 25 Hz). A peak acceleration of 2 g was then maintained until the frequency was increase to 200 Hz. 对大电芯和大电池： 7赫兹开始保持1gn的最大加速度直到频率为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。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1981339-1	(A)	10.490	10.490	0.000	--	--	--	(6), (7)
1981339-2	(A)	10.455	10.455	0.000	--	--	--	(6), (7)
1981339-3	(A)	10.387	10.386	0.010	--	--	--	(6), (7)
1981339-4	(A)	10.556	10.557	0.000	--	--	--	(6), (7)
1981339-5	(A)	10.496	10.496	0.000	--	--	--	(6), (7)
1981339-6	(A)	10.431	10.430	0.010	--	--	--	(6), (7)
1981339-7	(A)	10.650	10.649	0.009	--	--	--	(6), (7)
1981339-8	(A)	10.288	10.287	0.010	--	--	--	(6), (7)

1981339-9	(A)	10.445	10.445	0.000	--	--	--	(6), (7)
1981339-10	(A)	10.390	10.389	0.010	--	--	--	(6), (7)
1981336-46	(B)	11.547	11.546	0.009	3.277	3.282	100.000	(6), (7)
1981336-47	(B)	11.622	11.621	0.009	3.278	3.287	100.000	(6), (7)
1981336-48	(B)	11.580	11.580	0.000	3.281	3.290	100.000	(6), (7)
1981336-49	(B)	11.663	11.662	0.009	3.279	3.287	100.000	(6), (7)
1981336-50	(B)	11.675	11.674	0.009	3.279	3.286	100.000	(6), (7)
1981336-51	(B)	11.748	11.747	0.009	3.280	3.286	100.000	(6), (7)
1981336-52	(B)	11.596	11.595	0.009	3.283	3.289	100.000	(6), (7)
1981336-53	(B)	11.668	11.667	0.009	3.278	3.284	100.000	(6), (7)
1981336-54	(B)	11.654	11.652	0.017	3.278	3.286	100.000	(6), (7)
1981336-55	(B)	11.549	11.548	0.009	3.277	3.284	100.000	(6), (7)

Results/结果:

(1) Leakage/漏液.

(2) Venting/排气.

(3) Disassembly/解体.

(4) Rupture/破裂.

(5) Fire/着火.

(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.

(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.

(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.

(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.

(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.4 Shock
冲击

Test Method
测试方法

The samples were subjected to shock. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. The sample cell was secured to the testing machine by means of a rigid mount, which supports all mounting surfaces of the sample. Each sample was subjected to a half-sine shock as below: 样品将进行如下冲击测试。对样品在测试前后进行称重，并记录电压。以稳固的托架固定住每个电芯和电池样品的全部配件表面。每个样品将进行如下半正弦冲击测试：

[X] For small cells: Peak acceleration of 150 gn and pulse duration of 6 milliseconds. 小电芯：峰值为150gn，脉冲持续6毫秒。

[ ] For large cells: Peak acceleration of 50 gn and pulse duration of 11 milliseconds. 大电芯：峰值为50gn，脉冲持续11毫秒。

[ ] For small batteries: Peak acceleration of the smaller of the following, and pulse duration of 6 milliseconds: 小电池：取如下较小值为峰值，脉冲持续6毫秒。

- 150 gn.
- √(100850 / mass of the battery in kg)

[ ] For large batteries: Peak acceleration of the smaller of the following, and pulse duration of 11 milliseconds: 大电池：取如下较小值为峰值，脉冲持续6毫秒。

- 50 gn.
- √(30000 / mass of the battery in kg)

Each sample was 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. 每个测试样品须在三个互相垂直的电池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。

Cell/Battery Model	CR2
[**X**] Weight of Cell/Battery in kg	See the chart below
[**X**] Target Peak Acceleration for Battery in gn	150 g_n

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1981339-1	(A)	10.490	10.489	0.010	--	--	--	(6), (7)
1981339-2	(A)	10.455	10.454	0.010	--	--	--	(6), (7)
1981339-3	(A)	10.386	10.385	0.010	--	--	--	(6), (7)
1981339-4	(A)	10.557	10.556	0.009	--	--	--	(6), (7)
1981339-5	(A)	10.496	10.496	0.000	--	--	--	(6), (7)
1981339-6	(A)	10.430	10.429	0.010	--	--	--	(6), (7)
1981339-7	(A)	10.649	10.648	0.009	--	--	--	(6), (7)

1981339-8	(A)	10.287	10.286	0.010	--	--	--	(6), (7)
1981339-9	(A)	10.445	10.444	0.010	--	--	--	(6), (7)
1981339-10	(A)	10.389	10.388	0.010	--	--	--	(6), (7)
1981336-46	(B)	11.546	11.546	0.000	3.282	3.282	100.000	(6), (7)
1981336-47	(B)	11.621	11.619	0.017	3.287	3.287	100.000	(6), (7)
1981336-48	(B)	11.580	11.578	0.017	3.290	3.290	100.000	(6), (7)
1981336-49	(B)	11.662	11.661	0.009	3.287	3.286	99.970	(6), (7)
1981336-50	(B)	11.674	11.673	0.009	3.286	3.286	100.000	(6), (7)
1981336-51	(B)	11.747	11.745	0.017	3.286	3.286	100.000	(6), (7)
1981336-52	(B)	11.595	11.593	0.017	3.289	3.288	99.970	(6), (7)
1981336-53	(B)	11.667	11.666	0.009	3.284	3.284	100.000	(6), (7)
1981336-54	(B)	11.652	11.650	0.017	3.286	3.286	100.000	(6), (7)
1981336-55	(B)	11.548	11.547	0.009	3.284	3.284	100.000	(6), (7)

Results/结果:

(1) Leakage/漏液.

(2) Venting/排气.

(3) Disassembly/解体.

(4) Rupture/破裂.

(5) Fire/着火.

(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.

(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.

(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.

(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.

(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.5 External short circuit
外部短路

Test Method
测试方法

The samples were shall be heated for a period of time noted below, to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case: 为使样品达到均匀稳定的初始温度：57 ± 4 °C，样品需在此环境下暴露一段时间。

- Small cells and small batteries: 6 hours. 小电芯和小电池至少暴露6小时。
- Large cells and large batteries: 12 hours.大电芯和大电池至少暴露12小时。
- **[ ]** ___hours, assessed depended on the size and design of the sample. _____小时，根据样品尺寸设计评估所得。

The samples were then subjected to a short circuit condition with a total external resistance of less than 0.1 ohm, until: 然后将样品正负极用小于0.1欧姆的总电阻回路进行短路，直到：

- Small cells, small batteries and large cells: 1 hour after the external case temperature of sample has returned to 57 ± 4 °C. 小电芯，小电池和大电芯： 样品外表温度恢复到57 ± 4 °C之后保持短路状态1小时以上。
- Large batteries: After the external case temperature of sample has decreased by half of the maximum temperature increase observed during the test and remains below that value.大电池：样品表面温度下降所测最大温升的一半，然后维持此温度之下。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Voltage Before Test(V) 测试前电压（伏）	Maximum Temperature, °C 最高温度（摄氏度）	Results 结果
1981339-1	(A)	--	57.1	(4), (5)
1981339-2	(A)	--	57.3	(4), (5)
1981339-3	(A)	--	56.9	(4), (5)
1981339-4	(A)	--	57.1	(4), (5)
1981339-5	(A)	--	57.0	(4), (5)
1981339-6	(A)	--	103.0	(4), (5)
1981339-7	(A)	--	57.2	(4), (5)
1981339-8	(A)	--	74.9	(4), (5)
1981339-9	(A)	--	57.0	(4), (5)
1981339-10	(A)	--	78.8	(4), (5)
1981336-46	(B)	3.282	92.9	(4), (5)
1981336-47	(B)	3.287	93.2	(4), (5)
1981336-48	(B)	3.290	95.7	(4), (5)
1981336-49	(B)	3.286	93.2	(4), (5)
1981336-50	(B)	3.286	105.3	(4), (5)
1981336-51	(B)	3.286	103.1	(4), (5)
1981336-52	(B)	3.288	90.7	(4), (5)
1981336-53	(B)	3.284	95.9	(4), (5)
1981336-54	(B)	3.286	89.8	(4), (5)

1981336-55	(B)	3.284	92.5	(4), (5)

Results/结果:

(1) Disassembly/解体.

(2) Rupture/破裂.

(3) Fire/着火.

(4) No disassembly, no rupture, no fire within 6 hours after the test/测试后6小时内无解体，无破裂，无着火.

(5) The maximum temperature did not exceed 170°C/最高温度不超过170摄氏度.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.

(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.

(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.

(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.6 Impact / Crush
撞击 / 挤压

Test Method
测试方法

[ ] Impact (for cylindrical cells not less than 18 mm in diameter)/ 撞击（适用于直径不小于18毫米的圆柱形电池）

A test sample was placed on a flat 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 was placed across the center of the sample. A 9.1 kg ± 0.1 kg mass was 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 was oriented 90 degrees from the horizontal supporting surface. 将试验样品放在一个平坦光滑的平面上。将一条316型不锈钢棒，其直径为15.8 mm ± 0.1 mm，长度为至少6 cm，或电芯的最长边长度（两者中较大者），放置在样品中心。将一质量为9.1 kg ± 0.1 kg的物体于61 ± 2.5 cm的高度, 无摩擦地从垂直滑轨落向样品。垂直滑轨与横向支承面互相垂直，保持90度。

The test sample was impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of a 15.8 mm ± 0.1 mm diameter curved surface lying across the center of the test sample. Separate samples were used for each test. 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 mm ± 0.1 mm弯曲表面的纵轴垂直。每一个试样只经受一次撞击。

[X] Crush (for prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter)/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）

A sample was crushed between two flat surfaces. The crushing was gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing was continued until the first of the three options below has reached/将样品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：:

- The applied force reaches 13 kN ± 0.78 kN/施加的力达到13 kN ± 0.78 kN;
- The voltage of the cell drops by at least 100 mV; or/电池的电压下降至少100毫伏，或者
- The cell is deformed by 50% or more of its original thickness/电池变形达原始厚度的50%以上。

A prismatic or pouch cell was crushed by applying the force to the widest side. A button/coin cell was crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force was applied perpendicular to the longitudinal axis/棱柱形或袋装电池应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形应从与纵轴垂直的方向施压。

The test sample was observed for a further 6 hours. Separate samples that have not previously been subjected to other tests were used for each test/测试样品进一步观察6小时。未进行过其他测试的样品用于此测试。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Voltage Before Test(V) 测试前电压（伏）	Maximum Temperature, °C 最高温度（摄氏度）	Results 结果
1981336-21	(A)	3.274	46.0	(3), (4)
1981336-22	(A)	3.279	55.8	(3), (4)
1981336-23	(A)	3.297	44.3	(3), (4)
1981336-24	(A)	3.257	53.8	(3), (4)
1981336-25	(A)	3.262	56.5	(3), (4)
1981339-11	(B)	--	22.3	(3), (4)

1981339-12	(B)	--	24.6	(3), (4)
1981339-13	(B)	--	25.8	(3), (4)
1981339-14	(B)	--	24.7	(3), (4)
1981339-15	(B)	--	26.1	(3), (4)

Results/结果:

(1) Disassembly/解体.

(2) Fire/着火.

(3) No disassembly, no fire within 6 hours after the test/测试后6小时内无解体，无着火.

(4) The maximum temperature did not exceed 170°C/最高温度不超过170摄氏度.

Condition/状态:

(A) Undischarged/未放电.

(B) Fully discharged/完全放电.

(C) One half discharged/半放电.

T.8 Forced discharge
强制放电

Test Method
测试方法

Each cell was forced discharged at ambient temperature by connecting it in series with a 12 V DC power supply at an initial current equal to the maximum discharge current specified by the manufacturer. 在常温环境下，将单个电芯连接在12V的直流电源上进行强制放电，此直流电源提供给每个电芯初始电流为制造厂指定的最大放电电流。

The specified discharge current was obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell was forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in amperes). 指定的放电电流通过串联在测试电芯上的合适大小和功率的负载来获得，每个电芯的强制放电时间（小时）为额定容量除以初始电流（安培）。

Test Result
测试结果

Sample No. 样品编号	Condition 样品状态	Initial Discharge Current, mA 初始放电电流（毫安）	Voltage of Discharged Cell Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Results 结果
1981339-21	(A)	1.016	2.721	0	(3)
1981339-22	(A)	1.015	2.716	0	(3)
1981339-23	(A)	1.017	2.730	0	(3)
1981339-24	(A)	1.015	2.721	0	(3)
1981339-25	(A)	1.016	2.794	0	(3)
1981339-26	(A)	1.011	2.697	0	(3)
1981339-27	(A)	1.018	2.736	0	(3)
1981339-28	(A)	1.020	2.764	0	(3)
1981339-29	(A)	1.014	2.714	0	(3)
1981339-30	(A)	1.009	2.693	0	(3)

Results/结果:
(1) Disassembly/解体.
(2) Fire/着火.
(3) No disassembly, no fire within seven days after the test/测试后七天内无解体、无着火.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) First cycle in fully discharged state/第一个交替充电放电周期完全放电.
(C) After fifty cycles ending in fully discharged state/第五十个交替充电放电周期完全放电.

注 意 事 项
Important

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2. 本报告无批准人、审核人及检测人签名无效。
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3. 本报告涂改无效。
   The test report is invalid if altered.

4. 对检验报告若有异议，应于收到报告之日起十五天内向检验单位提出。
   Objections to the test report must be submitted to UL within 15 days.

5. 本报告中以点号代替小数点。
   Throughout this report a point is used as the decimal separator.

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