



中国认可
国际互认
检测
TESTING
CNAS L0095

Page 1 of 13 Pages

No.: GJW2018-1906

检测报告

TEST REPORT

NAME OF SAMPLE:

Lithium Manganese Dioxide Battery

产品名称:

锂锰电池

CLIENT:

Titanium Innovations

委托单位:

-

CLASSIFICATION OF TEST:

Commission Test

检测类别:

委托测试

威凯检测技术有限公司
Vkan Certification & Testing Co., Ltd.




检测报告

TEST REPORT

Ref.No. GJW2018-1906

Page 2 of 13 Pages

Name of samples: Lithium Manganese Dioxide Battery 产品名称: 锂锰电池	Trade mark: 商标: TITANIUM INNOVATIONS
Type/Model: 型号规格: CR9V 9.0V 1200mAh	Sample status: 样品状态: -
Manufacturer: Titanium Innovations 生产单位: -	Commissioned by: Titanium Innovations 委托单位: -
Manufacturer address: 50 School House Road Unit 2, Old Saybrook CT 06475, USA 生产单位地址: -	Commissioner address: 50 School House Road Unit 2, Old Saybrook CT 06475, USA 委托单位地址: -
Quantity of sample: 13 batteries, 20 cells 样品数量: 13 个电池, 20 个电芯	Sample identification: 样品标识序号: b1#~ b13#, c1#~c20#
Means of receiving: Submitted by Commissioner 接样方式: 委托单位送样	Classification of test: Commission Test 检测类别: 委托测试
Receiving date: 接样日期: 2018-10-25	Completing date: 完成日期: 2018-11-30
Tested according to: 测试标准: IEC 60086-4:2014	Test item: 10 items 测试项目: 10 项
<p>Test conclusion: 检测结论:</p> <p>The Lithium Manganese Dioxide Batterys submitted by Titanium Innovations are tested according to IEC 60086-4:2014 Safety of lithium batteries. 由 Titanium Innovations 送检的锂锰电池, 依据 IEC 60086-4:2014 进行检测。</p> <p>Tested items: Altitude, Thermal cycling, Vibration, Shock, External short-circuit, Crush, Forced discharge, Abnormal charging, Free fall, Thermal abuse. 试验项目: 低气压、温度循环、振动、冲击、外部短路、挤压、强制放电、异常充电、自由跌落、热冲击。</p> <p>The results of the tested items comply with the relevant requirements of the standard. 测试结果符合标准相关要求。</p> <div style="text-align: center;">  <p>Seal of CVC: CVC检测专用章</p> <p>Date of issue: 签发日期: 2018.11.30</p> </div>	

Approved by:

批准:

Lin Guang

Reviewed by:

审核:

Zhang Sigao

Tested by:

检测:

Wei Guohua

Description and illustration of the sample:

样品说明及描述:

The sample's status is good

样品状况良好。

Description of the sampling procedure:

取样程序的说明:

/

Description of the deviation from the standard, if any:

测试结果不符合标准项的说明:

/

Remarks:

备注:

Throughout this report a comma is used as the decimal separator.

本报告中以逗号代替小数点。

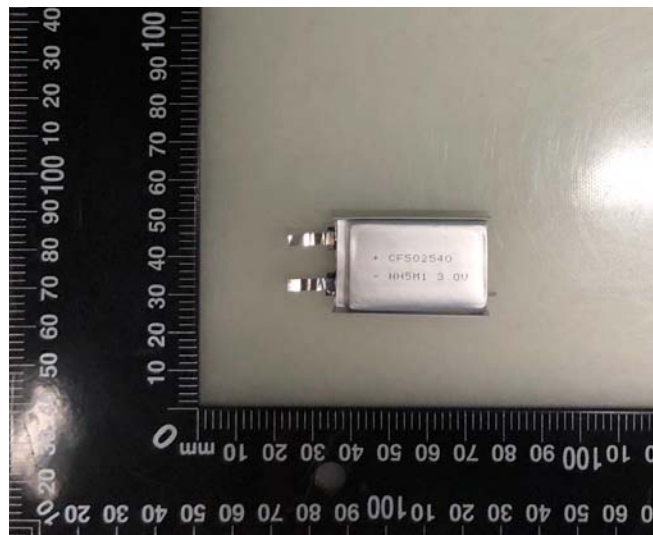
Photos of Samples and Labels/样品照片及标识

Lithium Manganese Dioxide Battery / 锂锰电池
(CR9V 9,0V 1200mAh)



Photos of Samples and Labels/样品照片及标识

Cell / 电芯
(CF502540 3,0V 1200mAh)



IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6	Testing and requirements/测试和要求		P
6.4	Intended use/指定用途		P
6.4.1	Altitude/高度模拟		P
	<p>Test cells and batteries shall be stored at a pressure of 11,6 kPa or less for at least 6 h at ambient temperature./ 将电芯和电池在温度为20±5℃，大气压力为不大于11.6kpa的环境中贮存不少于6个小时</p> <p>There shall be no leakage, no venting, no short-circuit, no rupture, no explosion and no fire during this test./ 试验中样品应无泄漏、无排气、无短路、无破裂以及无着火现象。</p>	<p>The samples b1#~b8#: no leakage, no venting, no short-circuit, no rupture, no explosion and no fire. /编号为 b1#~b8#的样品: 无泄漏、无排气、无短路、无破裂以及无着火。 The data see table1/数据见表 1</p>	
6.4.2	Thermal cycling/温度循环		P
	<p>Test cells and batteries shall be stored for at least 6 h at a test temperature of 72 °C, followed by storage for at least 6 h at a test temperature of –40 °C. The maximum time for transfer to each temperature shall be 30 min. Each test cell and battery shall undergo this procedure 10 times. This is then followed by storage for at least 24 h at ambient temperature. For large cells and batteries the duration of exposure to the test temperatures shall be at least 12 h instead of 6 h. The test shall be conducted using the test cells and batteries previously subjected to the altitude test. /将电芯和电池在温度为72℃的条件下贮存不少于6个小时，然后，在温度–40℃条件下贮存不少于6个小时，到达每个温度的最长时间应为30分钟。重复操作上述步骤10次，然后，将其在室温条件下放置24个小时。 对于大型电芯和电池，暴露于测试温度的时间应至少为12小时而不是6小时。 测试应使用先前进行高度测试的测试电芯和电池进行。</p> <p>There shall be no leakage, no venting, no short-circuit, no rupture, no explosion and no fire during this test./ 试验中样品应无泄漏、无排气、无短路、无破裂以及无着火现象。</p>	<p>The samples b1#~b8# : no leakage, no venting, no short-circuit, no rupture, no explosion and no fire. / 编号为 b1#~b8#的样品: 无泄漏、无排气、无短路、无破裂以及无着火。 The data see table1/数据见表 1</p>	

IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6.4.3	Vibration/振动		P
	<p>Test cells and batteries shall be firmly secured to the platform of the vibration machine without distorting them and in such a manner as to faithfully transmit the vibration. Test cells and batteries shall be subjected to sinusoidal vibration according to Table 5 which shows a different upper acceleration amplitude for large batteries. This cycle shall be repeated 12 times for a total of 3 h for each of three mutually perpendicular mounting positions. One of the directions shall be perpendicular to the terminal face. The test shall be conducted using the test cells and batteries previously subjected to the thermal cycling test.</p> <p>/试验电芯和电池应牢固地固定在振动机的平台上，不扭曲振动，并且要实际地传递振动。试验电芯和电池应根据表5进行正弦振动，表5显示了大型电池不同的上限加速度振幅。从三个互相垂直的方向上循环12次，每个方向3个小时。以振动的其中一个方向必须是垂直样品极性。试验应使用先前进行温度循环试验的试验电芯和电池进行。</p>	<p>The samples b1#~b8# : no leakage, no venting, no short-circuit, no rupture, no explosion and no fire./ 编号为 b1#~b8#的样品： 无泄漏、无排气、无短路、无破裂以及无着火。</p> <p>The data see table1/数据见表 1</p>	
6.4.4	Shock/冲击		P
	<p>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 cell or battery. Each test cell or battery shall be subjected to 3 shocks in each direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. For each shock, the parameters given in Table 6 shall be applied. The test shall be conducted using the test cells and batteries previously subjected to the vibration test.</p> <p>/试验电芯和电池应通过刚性支架固定在试验机上，该支架将支撑每个试验电芯或电池的所有安装表面。每个测试电芯或电池应在三个相互垂直安装位置的每个方向上受到 3 次冲击，总共 18 次冲击。对于每次电击，应使用表 6 中给出的参数。试验应使用先前进行振动试验的试验电池和电池进行。</p>	<p>The samples b1#~b8# : no leakage, no venting, no short-circuit, no rupture, no explosion and no fire./编号为 b1#~b8#的样品：无泄漏、无排气、无短路、无破裂以及无着火。</p> <p>The data see table1/数据见表 1</p>	

IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6.5	Reasonably foreseeable misuse/合理可预见的误用		P
6.5.1	External Short Circuit/外部短路		P
	<p>The test cell or battery shall be stabilized at an external case temperature of 55 °C and then subjected to a short-circuit condition with a total external resistance of less than 0,1 Ω at 55 °C. This short-circuit condition is continued for at least 1 h after the cell or battery external case temperature has returned to 55 °C. The test sample shall be observed for a further 6 h. The test shall be conducted using the test samples previously subjected to the shock test.</p> <p>/试验电芯或电池应在 55°C 的外壳温度下稳定，然后在 55°C 下用总外部电阻值小于 0.1 Ω 的电阻进行短路。试验需持续至少 1 小时，除非样品外壳温度恢复至 55°C，才可停止试验。测试样品应再观察 6 小时。 试验应使用先前经过冲击试验的试样进行。</p>		
	<p>There shall be no leakage, no venting, no short-circuit, no rupture, no explosion and no fire during this test./ 试验中样品应无泄漏、无排气、无短路、无破裂以及无着火现象。</p>	<p>The samples b1#~b8# : no leakage, no venting, no short-circuit, no rupture, no explosion and no fire./编号为 b1#~b8#的样品：无泄漏、无排气、无短路、无破裂以及无着火。</p> <p>The data see table1/数据见表 1</p>	

IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6.5.2	Impact / 撞击		
	<p>The impact test is applicable to cylindrical cells greater than 20 mm in diameter./ 冲击测试适用于直径大于20毫米的圆柱形电池。</p> <p>The test cell or component cell is placed on a flat smooth surface. / 将测试电芯或组成电芯放置在平坦光滑的表面上。</p> <p>A stainless steel bar (type 316 or equivalent) with a diameter of 15,8 mm ± 0,1 mm and a length of at least 60 mm or of the longest dimension of the cell, whichever is greater, is placed across the centre of the test sample./ 一个直径为15.8 mm±0.1 mm，长度至少为60mm或电芯长度最长值（取较大者）的不锈钢棒（316型或同等品）横放置在测试样品的中心。</p> <p>A mass of 9,1 kg ± 0,1 kg is dropped from a height of 61 cm ± 2,5 cm at the intersection of the bar and the test 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./ 一质量为9,1 kg ± 0,1 kg 的重锤从高度为61 cm ± 2,5 cm处以接近无摩擦的垂直滑动轨道或通道落下。用于引导坠落物质的垂直轨道或通道应与水平支撑表面成90°角。</p> <p>The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the stainless steel bar lying across the centre of the test sample (see Figure 3)./ 测试样品的纵向轴线平行于平面并垂直于横跨测试样品中心的不锈钢棒的纵向轴线（见图3）。</p>	-	N/A
	<p>There shall be no excessive temperature rise, no explosion and no fire during this test and within the 6 h of observation. / 试验期间和观测 6 小时内不得有温升过高、爆炸和着火。</p>	-	

IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6.5.3	Crush/挤压		P
	<p>A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1,5 cm / s at the first point of contact. The crushing is to be continued until one of the three conditions below is reached:/ 电芯或组成电芯将在两个平面之间被挤压。在第一个接触点，挤压要以大约1.5厘米/秒的速度逐渐进行。挤压将继续进行，直至达到以下三个条件中的一个：</p> <p>1)The applied force reaches 13 kN ± 0,78 kN;/施加的力达到 13 kN±0.78 kN;</p> <p>2)The voltage of the cell drops by at least 100 mV;or/电芯电压下降至少 100mV;或</p> <p>3) The cell is deformed by 50 % or more of its original thickness./电芯至少变形原始厚度的 50%。</p> <p>As soon as one of the above conditions has been obtained, the pressure shall be released./ 一旦获得上述条件之一，应释放压力。</p> <p>Each test cell or component cell is to be subjected to one crush only./每个测试电芯或组成电芯仅受到一次挤压。</p> <p>The test sample shall be observed for a further 6 h./ 测试样品应再观察 6 小时。</p>		
	<p>There shall be no excessive temperature rise, no explosion, and no fire during this test and within the 6h of observation/ 试验期间和观察 6h 内不得有过高的温升，无爆炸，无着火</p>	<p>The samples c1#~c10# : no excessive temperature rise, no explosion and no fire during this test and within the 6 h of observation. The data see table2. /编号为 c1#~c10#的样品：试验期间和观察 6h 内无过高的温升，无爆炸，无着火 The data see table 2/数据见表 2</p>	
6.5.4	Forced discharge/强制放电		P
	<p>Each cell shall be force discharged at ambient temperature by connecting it in series with a 12 V direct current power supply at an initial current equal to the maximum continuous discharge current specified by the manufacturer./ 每个电芯应在室温环境下进行强制放电，将其与 12 V 直流电源串联，初始电流等于制造商规定的最大连续放电电流。</p> <p>The specified discharge current is obtained by connecting a resistive load of appropriate size and rating in series with the test cell and the direct current power supply. Each cell shall be force discharged for a time interval equal to its rated capacity divided by the initial test current./ 规定的放电电流是通过将适当大小和规格的电阻与测试电芯和直流电源串联连接而获得的。每个电芯的放电时间为额定容量除以初始电流。</p> <p>This test shall be conducted with fully discharged test cells or component cells that have not previously been subjected to other tests. /该测试应在未经过其他测试的完全放电电芯或组成电芯上进行。</p>		
	<p>There shall be no explosion and no fire during this test and the 7 days of observation/试验期间和观察 7 天内不得有爆炸和着火</p>	<p>The samples c11#~c20# : no explosion and no fire during this test and the 7 days of observation /编号为 c11#~c20#的样品：在测试中和 7 天的观察期间没有发生爆炸和着火</p>	

Pages

IEC 60086-4:2014			
Cl. 章节	Requirement – Test 测试要求	Result 测试结果	Verdict 判定
6.5.5	Abnormal charging/异常充电		P
	<p>Each test battery shall be subjected to a charging current of three times the abnormal charging current I_c specified by the battery manufacturer by connecting it in opposition to a d.c. power supply. Unless the power supply allows for setting the current, the specified charging current shall be obtained by connecting a resistor of the appropriate size and rating in series with the battery. The test duration shall be calculated using the formula: $t_d = 2,5 \times C_n / (3 \times I_c)$</p> <p>/每个测试电池通过连接直流稳压源，应受到制造商规定异常充电电流I_c的三倍充电电流。除非电源允许设定电流，否则应通过将适当尺寸和额定值的电阻与电池串联来获得指定的充电电流。试验时间计算：$t_d = 2,5 \times C_n / (3 \times I_c)$</p>		
	There shall be no explosion and no fire during this test./试验期间不得有爆炸和着火	The samples b9#~b13# : no explosion and no fire /编号为 b9#~b13#的样品：无爆炸、无着火	
6.5.6	Free fall/跌落		P
	<p>The test batteries shall be dropped from a height of 1 m onto a concrete surface. Each test battery shall be dropped six times, a prismatic battery once from each of its six faces, a round battery twice in each of the three axes shown in Figure 5. The test batteries shall be stored for 1 h afterwards. The test shall be conducted with undischarged test cells and batteries.</p> <p>/试验电池应从1m高处落到混凝土表面上。每个测试电池应进行跌落6次，棱柱形电池六个面每个面跌落一次，圆形电池在标准中图5中所示的三个轴中的每一个上跌两次。跌落后电池应保持观察1小时。试验应使用未放电的试验电芯和电池进行。</p>		
	There shall be no venting, no explosion and no fire during this test and within the 1h of observation / 试验期间和观察 7 天内不得有排气、爆炸和着火	The samples b9#~b13#: no venting, no explosion and no fire /编号为 b9#~b13#的样品：无排气、无爆炸、无着火	
6.5.7	Thermal abuse/热滥用		P
	<p>A test battery shall be placed in an oven and the temperature raised at a rate of 5°C/min to a temperature of 130°C at which the battery shall remain for 10 min.</p> <p>试验电池应置于温箱中，温度以5°C/min的速度升高至130°C，电池应保持10 min。</p>		
	There shall be no explosion and no fire during this test./ 测试过程中不得有爆炸和着火。	The samples b9#~b13# : no explosion and no fire /编号为 b9#~b13#的样品：无爆炸、无着火	

Table1: A~E / 表 1: A~E

Sample No. /样品号	Mass prior to test / 试验前质量(g)	OCV prior to test / 试验前电压(V)	Test A: Altitude simulation/ 测试 A: 高度模拟		Test B: Thermal cycling/ 测试 B: 温度循环		Test C: Vibration/ 测试 C: 振动		Test D: Shock/ 测试 D: 冲击		Test E: External Short Circuit/测试 E 外接 短路
			Mass loss / 质量损失(%)	Change ratio / 电压比(%)	Mass loss / 质量损失(%)	Change ratio / 电压比(%)	Mass loss / 质量损失(%)	Change ratio / 电压比(%)	Mass loss / 质量损失(%)	Change ratio / 电压比(%)	Temp.(°C) 温度(°C)
b1#	39,885	9,534	0,005	100,00	0,030	100,00	0,000	100,00	0,000	100,00	63,2
b2#	39,531	9,526	0,002	100,00	0,030	100,00	0,000	100,00	0,002	100,00	64,7
b3#	39,437	9,531	0,005	100,00	0,022	98,97	0,002	100,00	0,000	100,00	62,8
b4#	39,628	9,530	0,007	100,00	0,025	100,00	0,000	100,00	0,000	100,00	66,3
b5#	39,087	–	0,000	–	0,033	–	0,000	–	0,000	–	62,1
b6#	39,151	–	0,002	–	0,025	–	0,000	–	0,000	–	60,8
b7#	39,240	–	0,000	–	0,035	–	0,000	–	0,000	–	61,7
b8#	39,559	–	0,002	–	0,025	–	0,000	–	0,000	–	63,6

Table2: Test G – Crush/表 2: 测试 G-挤压

Test G: Crush/测试 G 挤压	Sample No. 样品号	c1#	c2#	c3#	c4#	c5#	c6#	c7#	c8#	c9#	c10#
	OCV prior to test / 试验前电压 (V)	3,188	3,180	3,204	3,187	3,189	2,697	2,684	2,690	2,688	2,693
	Temp. (°C) 温度(°C)	24,7	25,8	24,8	25,3	25,0	25,7	25,0	24,7	24,9	25,2

注 意 事 项

Important

1. 报告无检测单位印章无效。
The test report is invalid without the official stamp of CVC.
2. 未经本试验室书面同意，不得部分地复制本报告。
Nobody is allowed to photocopy or partly photocopy this test report without written permission of CVC.
3. 本报告无批准人、审核人及检测人签名无效。
The test report is invalid without the signatures of Ratifier, Reviewer and Testing engineer.
4. 本报告涂改无效。
The test report is invalid if altered,
5. 对检测报告若有异议，应于收到报告之日起十五天内向检测单位提出。
Objections to the test report must be submitted to CVC within 15 days,
6. 本报告仅对送检样品负责。
The test report is valid for the tested samples only.
7. 判定栏中“-”表示“不需要判定”，“P”表示“通过”，“F”表示“不通过”，“N/A”表示“不适用”。
As for the Verdict, “-” means “no need for judgement”, “P” means “pass”, “F” means “fail” and “N/A” means “not applicable”.

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