

3.6V/60000mAh Li-polymer Rechargeable Cell

Cell Model: 165100330 60ah

制 定: 日期

标准化审核: 日期

审 核: 日期

批 准: 日期

文件变更记录

修 订 序 号	生 效 日 期	变更前叙述	变更后叙述	修 改 人
A/00	2014-10-14	原版发行	N. A	孙翠平
A/01	2015-01-20	电芯厚度 Thickness 16.5 -0.2/+0.1mm	16.5 ±0.2mm	孙翠平
A/01	2015-01-20	负极极耳边距 length for the positive tap (C) 15 ± 1mm	负极极耳边距 length for the positive tap (C) 15±1.5mm	孙翠平
		length for the negative tap (C) 15±1mm	length for the negative tap (C) 15±1mm	

1. Purpose 目的

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The specification sheet is designed to build up and improve VICTPOWER technical documentation so as to instruct production and product shipment and consequently guarantee product quality. At the same time, it is convenient for VICTPOWER to confirm product specifications with customers and finally reach an agreement.

为建立健全的公司技术资料，确保产品质量，用于指导产品生产、出货。方便与客户确认产品规格，并达成一致，制定本产品规格书。

2. Scope 适用范围

This product specification describes the type, size, structure, electrochemistry performance, environmental characteristics, warning and cautions of the 165100330 (P10a) cell. This PS only applies to the 165100330 (P10a) cell that supplied by Tianjin EV Energies Co, Ltd.

本产品规格书规定了 165100330 cell.电芯的类型、尺寸、结构、电化学性能、环境适应性能及注意事项,本标准仅适用于本公司生产的 165100330 电芯。

3. Responsibility and Authority 职责与权限

None 无

4. Term and Definition 术语和定义

4.1 Rated Capacity 标称容量

Rated Capacity is 60Ah, cells shall be tested at 25±3°C, 65±20%RH, it means the capacity value of being discharged by 1-hours ratio to the cut-off voltage 2.0V, which is signed as C3, the unit is Ah.

标称容量 C=60Ah，指在 25±3°C, 65±20%RH 环境条件下，以 2 小时率放电至终止电压 2.5V 时的容量，以 C<sub>2</sub> 表示，单位为安时(Ah)。

4.2 Standard Charging Method 标准充电方法

The cell is to be conditioned at 25±3°C, 65±20%RH, charging the battery with 0.5C<sub>2</sub> (30A) constant current to 4.2V, then 4.2V constant voltage charge with current taper to 0.02C<sub>2</sub> (30A).

标准充电方法是指将电芯放在 25±3°C, 65±20%RH 的环境条件下，先以 0.5 C<sub>2</sub> (30A)的电流恒流充到 4.2V，然后 4.2V 恒压充电，直至充电电流减少到 0.02C<sub>2</sub> (30A)时，充电停止。

4.3 Standard Discharging Method 标准放电方法

Full charged cell is to be conditioned at 25±3°C, 65±20%RH, discharging the cell with 0.5C<sub>2</sub> (30A) constant current to 2.5V.

标准放电方法是指将电芯放在 25±3°C, 65±20%RH 的环境条件下，以 0.5C<sub>2</sub>(30A)的电流恒流放到 2.5V。

4.4 Quick Charging Method 快速充电方法

The Cell is to be conditioned at 25±3°C, 65±20%RH, charging the Cell with 1C<sub>2</sub>A (60.0A)constant current to 4.2V, then 4.2V constant voltage charge with current taper to 0.02C<sub>2</sub> (1.2A).

快速充电方法是指将电芯放在 25±3°C, 65±20%RH 的环境下，先以 1C<sub>2</sub>(60.0A)的电流恒流充到 4.2V，然后 4.2V 恒压充电，直至充电电流减少到 0.02C<sub>2</sub> (1.2A)时，充电停止。

4.5 Quick Discharging Method 快速放电方法

Full charged cell is to be conditioned at 25±3°C, 65±20%RH, discharging the cell with 2C<sub>2</sub> (120.0A) constant current to 2.5V.

快速放电方法是指将电芯放在 25±3°C, 65±20%RH 的环境下，以 2C<sub>2</sub>(120.0A)的电流恒流放到 2.5V。

5. Content 内容

5.1 Cell Structure 电芯结构

The cell consists of the cathode electrode, anode electrode, separator, tab, electrolyte, Al-plastic film, etc.  
电芯由正极极片、负极极片、隔离膜、极耳、电解液、铝塑膜等组成。

5.2 Cell Specification 电芯规格

Item 项目	Specification 规格
Cell Weight 电芯重量	≤820g
Cell Dimension 电芯尺寸	Thickness: 16.5 mm 厚: 16.5 mm Length: 330 mm Width:100mm
Normal Capacity 标称容量	60Ah@1/2C <sub>2</sub> (30A)
Capacity Range 容量范围	≥60Ah@1/2C <sub>2</sub> (30A)
Normal Voltage 标称电压	3.6V
Charging Cut-off Voltage 充电截止电压	4.2 ±0.05 V
Discharging Cut-off Voltage 放电截止电压	2.5±0.05V
Standard Charging Current 标准充电电流	1/2 C <sub>2</sub> (30A)
Standard Discharging Current 标准放电电流	1/2C <sub>2</sub> (30A)
Max. Continuous Charging Current 最大连续充电电流	1.0C <sub>2</sub> A (60A)
Max. Continuous Discharging Current 最大连续放电电流	2.0C <sub>2</sub> A (120.0A)
Transport Voltage 运输电压	3.7-3.8V
Storage Temperature 储存温度	-20~ 45℃
Appearance 外观	电芯外观参照公司 A3 标准，文件编号 WI-009-269

5.3 Technical Request 技术要求

5.3.1 Cell Operating Temperature 电芯工作温度

Charging Temperature 充电温度: -20°C ~ 45°C  
Discharging Temperature 放电温度: -20°C ~ 45°C

5.3.2 Cell Testing Conditions 电芯试验条件

Tests should be conducted with new cells within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. All of the testing is done on the conditions hereinafter, unless there is individually requirement:

测试电芯必须是本公司出厂时间不超过一个月的新电芯，且电芯未进行过五次以上充放电循环。除非测试项目另有规定，本产品规格书中各项测试应在以下条件下进行：

Ambient Temperature 温度: 25±3°C  
Relative Humidity 相对湿度: 65±20%RH  
Atmospheric Pressure 大气压力: 86kPa~106kPa

5.3.3 Requirements of the Testing Meters 测量仪表要求

Voltage Meter: Internal resistance of the voltage meter should be no less than 10 kΩ/V.  
电压仪表要求：测量电压内阻的仪表准确度不小于 10kΩ/V。

Temperature Meter: The precision of the temperature meter should be no less than 0.5°C.  
温度仪表要求：测量温度的仪表准确度不低于 0.5°C。

5.4 Electro Chemistry Performance 电化学性能

No. 序号	Items 项目		Criterion 标准	Testing Method 测试方法	Remark 备注
1	Discharging Performance at High and Low Temperature 高低温 放电特 性	-20°C	Discharge capacity retention ratio at 0.5C <sub>2</sub> A(30A) should be no less than 70% of the nominal capacity. 0.5C <sub>2</sub> A(30A) 放电容量≥70%标称容量	<ul style="list-style-type: none"><li>Cell shall be charged following the standard charging method. And then standby for 8 hours at -20±2°C followed by a discharge at 0.5C<sub>2</sub>A(30A) to 2.75V at this temperature.</li><li>Then cell shall be allowed to rise to room temperature for one hour, followed by standard charging and then standby for 5 hours at 0 ±2°C followed by a discharge at 0.5C<sub>2</sub>A(30A) to 2.75V at this temperature.</li><li>The discharge times and capacity at different temperatures shall be recorded.</li><li>电芯按照标准充电方式充满电后，于-20±2°C条件下存放 8 h 后，在该温度下以 0.5C<sub>2</sub>A(30A)的电流放电至 2.75V；</li><li>将温度恢复到室温，静置 1h 后，然后电芯按照标准充电方式充满电，再于 0±2°C 条件下存放 5 h，在该温度下以 0.5C<sub>2</sub>A(30A)的电流放电至 2.75V；</li><li>记录不同温度条件下的放电时间和放电容量。</li></ul>	
		0°C	Discharge capacity retention ratio at 0.5C <sub>2</sub> A(30A) should be no less than 80% of the nominal capacity 0.5C <sub>2</sub> A (30A) 放电容量≥80%标称容量		

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2	RT Cycle Life 常温循环寿命	After 2000 cycles, the discharge capacity retention ratio should be no less than 80% of the nominal capacity. 2000 次循环后, 容量保持率 $\geq$ 80% 标称容量	First charge and discharge the cell with 0.5C <sub>2</sub> A(30A), the time interval between charging and discharging should not less than 30 minutes, then repeat the steps mentioned above. 首先以 0.5C <sub>2</sub> A (30A)将电芯充放电, 连续循环, 中间充放电的时间间隔不少于 30 分钟。	
3	RT Charge Retention 常温荷电保持 (25℃, 30 天, 50%SOC)	After standing for 30 days, discharge capacity retention ratio should be no less than 95% of the nominal capacity. 静置 30 天后, 放电容量保持率不低于 95%标称容量	The capacity of the cell is tested by fully charged and discharged with standard method. Charging the cell with standard charging method, then stored with open- circuit at RT for 30days, discharged the cell with standard discharging method. The discharging capacity should be recorded. 将电芯用标准充放电模式做容量测试, 再以标准充电方式充电, 然后将电芯放置在常温环境中 30 天, 放置 30 天后用标准放电方法放电, 记录放电容量。	
4	55 ℃ Charge Retention 55 ℃ 荷电保持 (55℃, 7 天, 100%SOC)	After standing for 7 days, discharge capacity retention ratio should be no less than 95% of the nominal capacity. 静置 7 天后, 放电容量保持率不低于 95%标称容量	The capacity of the cell is tested by fully charged and discharged with standard method. Charging the cell with standard charging method, then stored with open- circuit at 55℃ for 7days, discharged the cell with standard discharging method. The discharging capacity should be recorded. 将电芯用标准充放电模式做容量测试, 再以标准充电方式充电, 然后将电芯放置在 55℃环境中 7 天, 放置 7 天后用标准放电方法放电, 记录放电容量。	
5	55℃ Charge recovery 55℃ 荷电恢复	Discharge capacity retention ratio should be no less than 97%. 放电容量保持率不低于 97%	The cell which had been through charge retention test is to be fully charged with standard charging method, then discharge the cell standard discharging method. 经过荷电保持测试的电芯, 标准充满电后, 再用标准放电方法进行。	
6	Rated Charge Performance 倍率充电性能	Charge capacity retention ratio at 2C <sub>2</sub> A(120A) should be no less than 80% of the nominal capacity. 2C <sub>2</sub> A(120A) 充电	The capacity of the cell is tested by fully charged and discharged with standard method. Charging the cell with 2C <sub>2</sub> A(120A) constant to 4.2V. The charging capacity should be recorded. 将电芯用标准充放电模式做容量测试, 再以 2C <sub>2</sub> A (120A)的恒电流进行充电, 记录充电容量。	

		容量≥80%标称容量。		
7	Rated Discharge Performance 倍率放电性能	Discharge capacity retention ratio at 2C <sub>2</sub> A(120A) should be no less than 90% of the nominal capacity. 2C <sub>2</sub> A(120A) 放 电 容量≥90%标称容量。	The capacity of the cell is tested by fully charged and discharged with standard method. Charging the cell with standard charging method, then discharge the cell with 2C <sub>2</sub> A(120A) constant current to 2.75V. The discharging capacity should be recorded. 将电芯用标准充放电模式做容量测试，再以标准充电方式充电，然后将电芯以 2C <sub>2</sub> A(120A)的恒定电流进行放电至 2.75V，记录放电容量。	

5.5 Environmental Characteristics 环境适应性测试

No. 序号	Item 测试项目	Criterion 性能标准	Testing method 测试条件与方法
1	Vibration Test 振动测试	No explosion no fire, and no leak. 不泄露、不起火、不爆炸。	The cell is fully charged with standard charging method, and then the voltage and resistance of the cell is to be measured after 4 hours' standing. After that, the cell is to be fixed and tested as followed: a) The vibration direction: uprightness; b) The frequency: from 10 to 55 Hz; c) peak acceleration: 30m/s <sup>2</sup> ; d) Swept cycle: 10cycles; e) The vibration time: 2h. 将电芯以标准充电方法充满电，静置 4 小时后测试电压和内阻，然后将充满电样品固定夹在振动机平台上，按下述条件进行线性扫频振动试验： a) 振动方向：上下单振动； b) 振动频率：10~55Hz； c) 最大加速度：30m/s <sup>2</sup> ； d) 扫频循环：10 次； e) 振动时间：2h；
2	Temperature Cycling Test 温度循环测试	No explosion, no fire, and no leak. 不泄露、不起火、不爆炸。	The cell is fully charged with standard charging method, and then it is to be stored for four hours at a test temperature equal to -40±2 °C, followed by a storage for two hours at a test temperature equal to 25 ± 3°C, the temperature of the oven is to be raised at 75±2°C and remain for four hours at that temperature, the maximum time interval between test temperature extremes is 30 minutes, this procedure is to be repeated for 9 times, after which all test cells are to be stored for six hours at ambient temperature (25±3°C). 将用标准充电方法充满电的电芯放入-40±2°C 的低温环境中搁置 4 小时，再在 25±3°C 条件下搁置 2 小时，最后在 75±2°C 条件下搁置 4 小时，两个温度变换时时间不超过 30min。如此循环 9 次结束实验，试验结束后将样品取出，在 25±3°C 环境中搁置 6 小时。
3	Low Pressure Test 低压测试	No explosion, no fire, and no leak. 不泄露、不起火、	The fully charged cell is to be stored for 6 hours at an absolute pressure of 11.6kPa and a temperature of 25±3°C. 将电芯在绝对压力为 11.6kPa、25±3°C 条件下贮存 6 小时。

		不爆炸。	
4	130°C Storage Test 130°C 储存测试	No fire and no explosion. 不起火、不爆炸。	The fully charged cell is to be heated in gravity convection or circulating air oven, the temperature of the oven is to be raised at a rate of 5±2°C per minute to a temperature of 130±2°C and remain for 30 minutes at that temperature before the test is discontinued. 将标准充电方法充满电的电芯放在自然对流或强制对流烘箱中加热, 烘箱温度以 5±2°C/min 的速度升温至 130±2°C, 并保持 30 分钟。
5	Constant Temperature and Constant Humidity Test 恒温恒湿测试	No explosion, no fire, no leak and retention capacity≥80%. 不泄露、不冒烟、不爆炸、电池容量不低于初始容量的 80%。	The cell is fully charged with standard charging method, the cell is to be stored for 48 hours in an oven with a constant temperature of 45±2°C and a relative humidity of 90~95% RH, after testing the cell should be stored for 2 hours at a temperature of 25±3°C, 65±20% RH relative humidity and a pressure of 86kPa~106kPa. 将电芯用标准充电方法充满电, 然后放入温度 45±2°C,相对湿度 90~95%RH 的恒温恒湿箱中,持续时间 48 小时,试验结束后将样品放在 25±3°C,相对湿度 65±20%RH,大气压力 86kPa~106kPa 的环境中搁置 2 小时。

5.6 Safety Characteristics 安全性能

No. 序号	Item 测试项目	Criterion 性能标准	Testing Method 测试条件与方法
1	Drop Test 自由跌落测试	No smoke, no explosion and no fire. 不冒烟, 不起火, 不爆炸。	The cell is fully charged with standard charging method, standby for 1 hour and then it is submitted to free fall at a height of 1.5m down to one solid board. It should be fallen for 1 times on each direction. 将电芯用标准充电方法充满电后放置 1 小时; 然后将电芯从 1.5m 高度自由落到硬木板上, 每个面上各试验 1 次。
2	Over-charge Test 过充测试	No fire and no explosion. 不起火、不爆炸。	First discharge the cell with standard discharging method, then the cell is to be charged with 0.5C <sub>2</sub> (30A) constant current to 4.2V and continue to be charged for 8 h with the constant voltage before the test is discontinued. 将电芯按标准放电方法放电, 然后以 0.5C <sub>2</sub> (30A)的恒定电流充电至 4.2V, 并在此电压下继续恒压充电 8 小时。
3	Over-discharge Test 过放测试	No smoke, no explosion and no fire. 不冒烟, 不起火, 不爆炸。	The cell is discharged to 2.75V with standard discharging method, then continue discharging the cell with 0.5C <sub>2</sub> A (30A) current to 0±0.2V. 将以标准放电模式完全放电至 2.75V 的电芯再以恒电流 0.5C <sub>2</sub> A (30A)继续放电到 0±0.2V。
4	RT External Short-circuit Test 常温短路测试	No explosion and no fire. 不爆炸、不起火	The cell is fully charged with standard charging method and it is to be stored at room temperature(25±3°C) for 1hour, the cell is to be short-circuited by connecting the positive and negative terminals of the cell with wire having a resistance load of less than 5mOhm at RT for 10 minutes.

			将电芯用标准充电方法充满电后，在常温下放置 1 小时，然后在常温下用小于 5mOhm 的导线将电芯短路 10 分钟。
5	55°C External Short-circuit Test 55°C 短路测试	No fire and no explosion, the cell temperature should not exceed 150°C. 不爆炸、不起火，表面温度不超过 150°C。	The cell is fully charged with standard charging method and it is to be stored at room temperature for 1hour, then standby for 5 hours at 55±2°C, and the cell is to be short-circuited by connecting the positive and negative terminals of the cell with wire having a resistance load of less than 5mOhm at 55±2°C for 10 minutes. 将电芯用标准充电方法充满电后，在常温下放置 1 小时，然后在 55±2°C 下搁置 5h，在此温度下再用小于 5mOhm 的导线将电芯短路 10 分钟。
6	Nail Test 针刺测试	No fire and no explosion, the cell temperature should not exceed 150°C, but deformation is allowed 不爆炸、不起火，但允许电芯变形，表面温度不超过 150°C。	The cell is fully charged with standard charging method, then it is to be penetrated vertically through the center of the largest side of the cell with a speed of 10~40mm/s and left for over 30s, the diameter of the nail is 3-8mm. 将电芯按照标准充电方法充满电，然后用一个直径 3-8mm 的钉子(对方形电芯必须以垂直于宽度的方向)以 10~40mm/s 的速度穿过电芯最大表面的中心，并把钉子停留在电芯内 30 秒以上。
7	Crush Test 挤压测试	No fire and no explosion. 不起火、不爆炸。	The cell is fully charged with standard charging method, stand by for 1 hour, and then it is pressed by the perpendicular direction t of the battery plates. The cell is pressed by the extrusion head which the area is no less than 20cm <sup>2</sup> until the cell rupture or short (open voltage turn down to 0V). The voltage and temperature are monitored in whole test. 将电芯按照标准方法充满电，静置 1h 后再垂直于电池极板方向施压，挤压头面积不小于 20cm <sup>2</sup> ，直至电池壳体破裂或内部短路（开路电压变为 0V），试验过程中记录电芯电压和温度变化。

6. Handling Precautions and Guidelines for Lithium-ion Batteries 锂离子电池使用警告事项及指南

This document of this “Handling Precautions and Guidelines for Lithium-ion Batteries” shall apply to the cells that are be manufactured by LG Chem

这份“锂离子电池使用警告事项及指南”适用于 LG Chem 制造的电芯。

Remark 备注:

- 1) The customer is requested to contact JEVE in advance, if and when the customer needs other applications or operating conditions that are not described in this document. Additional experimentation may be required to verify performance and safety under such conditions.



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客户若对电池有超出本规格书所列之外的性能要求，或在本规格书规定以外的使用条件下使用，应事先同天津市捷威动力工业有限公司联系，因为需要进行特定的实验测试以验证电池在该使用条件下的性能及安全。

- 2) VICTPOWER will take no responsibility for any accident when the cell is used under other conditions than those described in this document.

对于在超出本规格书规定以外的条件下使用电池而造成的任何意外事故，伟创源科技有限公司概不负责。

- 3) VICTPOWER will inform, in a written form, the customer of improvement regarding proper use and handling of the cell, if it is deemed necessary.

如有必要，伟创源科技有限公司将以书面形式告知客户有关正确使用电池的改进措施。

- 4) Any matters that not described in this document shall be decided after the bilateral discussion.

任何本规格书中未提及的事项，需双方协商确定。

6.1 Charging 充电

6.1.1 Charging Current 充电电流:

Charging current should be less than the maximum charging current specified in the Cell Specifications. Charging with higher current than recommended value may cause damage to the electrochemical, environmental and safety performance of the cell and could lead to heat generation or leakage.

充电电流不应超过“电芯规格”中规定的最大充电电流。使用超出本规格书建议的最大充电电流充电，会对电池的电化学性能，环境适应性能及安全性能造成损害，可能会引起漏液或起火。

6.1.2 Charging Upper Limit Voltage 充电上限电压:

Charging shall be done by upper limit voltage less than that specified in the Cell Specifications (4.2V). Charging beyond 4.2V, which is the absolute maximum upper limit voltage, must be strictly prohibited. The charger and protection circuit of battery pack shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than the maximum value and may cause damage to the electrochemical, environmental and safety performance of the cell and could lead to heat generation or leakage.

充电上限电压应低于“电芯规格”中规定的充电上限电压(4.2V)。严禁超过充电上限电压的极限值 4.2V。充电器和保护板的设计也需要符合这个上限电压。如若不然，将会对电池的电化学性能，环境适应性能及安全性能造成损害，可能会引起漏液或着火。

6.1.3 Charging Temperature 充电温度

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Cells shall be charged according to the temperature condition specified in this document. If the cell is charged at the temperature out of the specified range, leakage, heat generation or other damages may be caused.

充电温度范围需在本文件中规定的范围之内。如果充电温度超出本规格书规定之外，可能会引起漏液，着火或其它危险。

Repeated charging and discharging at high and low temperature may cause degradation of the cell performance even within the specified temperature range.

电池反复在高低温下充电，虽然在规格书规定的温度范围内，但也会对电池的性能产生不利影响。

6.1.4 Prohibition of Reverse Charging 禁止反充

Reverse charging is prohibited. Cells shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damage to the cell which may lead to degradation of the cell performance and damage the cell safety, and could cause heat generation or leakage.

禁止反充。充电时，电池的极性必须连接正确。引线前应确认电池的极性。电池极性连接错误时应禁止充电。反充可能会降低电池的性能，甚至对电芯的安全产生影响，引起着火或漏液。

6.1.5 Prohibition of 0V Charging 禁止 0V 充电

It is prohibited to charge the cell that is with 0V voltage. Simultaneously, the 0V charging may cause damage to the cell which may cause heat generation.

禁止对 0V 的电池进行充电。否则会对电池性能产生影响，引起着火。

6.2 Discharging 放电

6.2.1 Discharging Current 放电电流:

Discharging current should be less than the maximum discharging current specified in the Cell Specifications. Discharging with higher current than recommended value may reduce the discharge capacity significantly or cause over-heat.

放电电流不应超过“电芯规格”中规定的最大放电电流。使用超出本规格书建议的最大放电电流放电，会明显降低电池的放电容量，可能引起电池过热的问题。

6.2.2 Over-discharging 过放:

It should be noted that cells would be at an over-discharged status due to self-discharge characteristics in case they were not used for a long time. In order to prevent over-discharging, cells shall be charged periodically to maintain

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3.60±0.05V. Over-discharging may cause loss of the cell performance, characteristics, or battery functions.

应该注意，电池长期不使用时，可能会因电池本身的自放电问题导致电池处于过放的状态。为防止电池过放，电池应定期的进行充电，保证电池的电压在 3.60±0.05V 范围内。过放会导致电池性能降低，并对电池的功能产生不利的影响。

**6.2.3 Discharging Temperature 放电温度**

Cells shall be discharged according to the temperature condition specified in this document. If the cell is discharged at the temperature out of the specified range, it may reduce the discharge capacity significantly.

放电温度范围需在本文件中规定的范围之内。如果放电温度超出本规格书规定之外，会显著降低电池的放电容量。