钛酸锂电池规格书

Specifications for Lithium titanate Battery

Model：PLITR60165CSTA-40Ah-2.4V

目录 Abstract

1. 目的 Purpose

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。

Technical specifications for sales, quality, production and delivery of ZHJ's products.

2. 适用范围 Scope

本产品规格书规定了 PLITR60165CSTA-40Ah-2.4V 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，本标准仅适用于深圳市种花家科技有限公司生产的 PLITR60165CSTA-40Ah-2.4V 电芯。

This document describes the type, dimensions, structure, electrochemical performance, environmental characteristics, warning and cautions of the PLITR60165CSTA-40Ah-2.4V cell. The specification only applies to the PLITR60165CSTA-40Ah-2.4V cell that is supplied by Shenzhen Zhonghuajia Technology Co.,Ltd.

3. 术语和定义 Terms and Definition

3.1. 标称容量 Nominal Capacity

标称容量 C=40Ah，指在 25±3℃， 65±20%RH 环境条件下，以 1 小时率放电至终止电压 1.5V 时的容量，以 C_1 表示，单位为安时。

Nominal capacity is 40Ah, which means that the capacity value of being discharged with 1-hour ratio to the cut-off voltage 1.5V at the condition of 25±3℃, 65±20%RH. It is expressed as C_1 and its unit is Ah.

3.2. 标准充电方法 Standard Charge Method

将电芯放在 25±3℃， 65±20%RH 的环境条件下，先以 $1C_1A$ (40A)的电流恒流充到 2.8V，然后 2.8V 恒压充电，直至充电电流减少到 $0.05C_1A$(2A)。

The cell is charged with $1C_1A$ (40A) constant current to 2.8V, and then charged with 2.8V constant voltage until the current decreases to $0.05C_1A$ (2A) at the condition of 25±3℃, 65±20%RH.

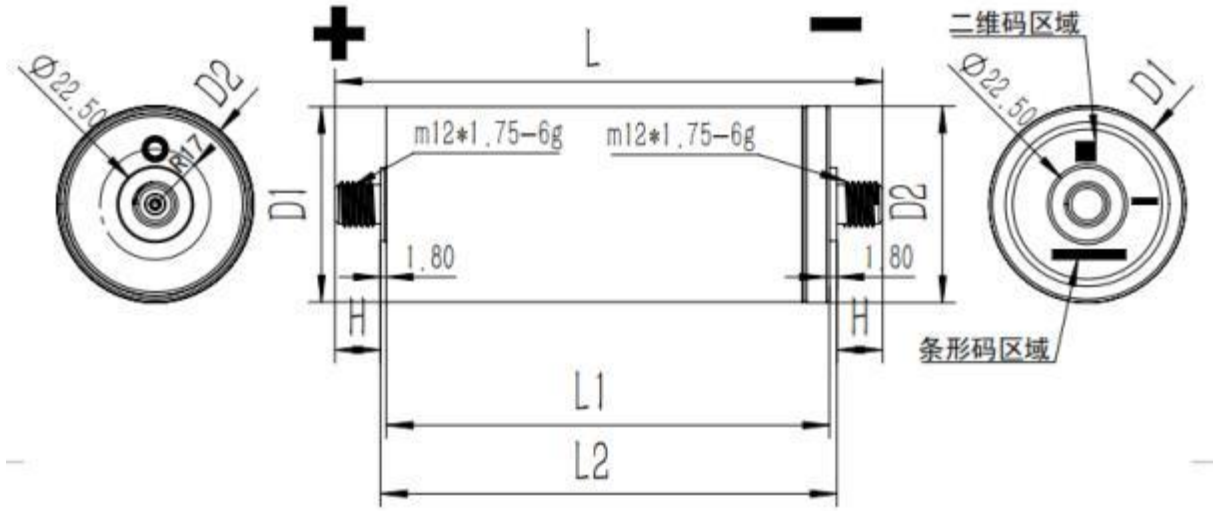
3.3. 标准放电方法 Standard Discharge Method

将电芯放在 25±3℃， 65±20%RH 的环境条件下，以 1C₁A (40A)的电流恒流放到 1.5V。

The fully-charged cell is discharged with 1C₁A (40A) constant current to 1.5V at the condition of 25±3℃, 65±20%RH.

4. 内容 Contents

4.1. 外观尺寸 Appearance and Dimension



L (±0.5mm)	L2 (±0.5mm)	L1 (±0.5mm)	D1 (±0.2mm)	D2 (±0.4mm)	H (±0.2mm)
193.6	165.6	162.0	60.0	60.4	14.0

Image 1

4.2. 电芯规格 Cell Specifications

项目 Items	规格 Specifications
重量 Weight	=1050g
标称容量 Nominal capacity	40Ah@1C₁A(40A)

标称电压 Nominal voltage	2.4V
标称能量 Nominal Energy	96Wh
能量密度 Energy Density	91.4Wh/kg
内阻 Resistance	≤0.5mΩ(AC, 1000Hz)
充电截止电压 Charging cut-off voltage	2.8V
放电截止电压 Discharging cut-off voltage	1.5V
标准充电电流 Standard charging current	1C_1A(40A)
标准放电电流 Standard discharging current	1C_1A(40A)
最大持续充电电流 Max. Constant Charging Current	4C_1A(160A)
最大持续放电电流 Max. Constant Discharging Current	8C_1A(320A)
最大充电电流 Max. Charging Current	12C_1A(480A)
最大放电电流 Max. Discharging Current	20C_1A(800A)
存储温度范围 Temperature Range for Storage	小于 1 年： -10~25℃; 小于 3 个月： -30~45℃; Less than one year：-10~25℃; Less than three months：-30~45℃
运输电压 Transportation Voltage	≥2.4V
外观 Appearance	电芯表面无破裂、划痕、变形、凸点、电解液泄露等缺陷 No crack, scratch, distortion, prominence，leakage, etc.

4.3. 技术要求 Technical Requirement

4.3.1. 电芯工作温度 Operating Temperature

充电温度 Charging Temperature：-40°C～+60°C

放电温度 Discharging Temperature：-50°C～+60°C

4.3.2. 电芯试验条件 Testing Conditions

测试电芯必须是本公司出厂时间不超过一个月的新电芯，且电芯未进行过三次以上充放电循环。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：

The battery under testing must be manufactured within no more than 1 month and charged-discharged for less than 3 cycles. Unless otherwise specified, all tests stated in the Specifications shall be conducted in accordance with the following conditions:

温　度　Ambient Temperature：　25±3°C

相对湿度　Relative Humidity：　65±20%RH

大气压力 Atmospheric Pressure：　86kpa~106kpa

4.3.3. 测量仪表要求 Testing Meters

电压仪表要求：　测量电压的仪表准内阻不小于 10kΩ/V。

Voltage Meter：Internal resistance of the voltage meter should be larger than 10 kΩ/V.

温度仪表要求：　测量温度的仪表准确度不低于±0.5℃。

Termometer：　The precision of the termometer should be better than ±0.5℃.

4.4 电化学性能 Electrochemical Performance

序号	项目		标准	测试方法
1	高低温放电特性 Discharging	-40°C	-40℃放电容量≥80%标称容量。 Discharge	• 电芯按照标准充电方式充满电后，于 25±3℃条件下存放 8h，之后在该温度下以 $1C_1A$ (40A)的电流放电至 1.5V；

	Performance at High and Low Temperature		capacity at -40℃ should be no less than 80% of nominal capacity.	After being fully charged with standard method, the cell shall be rested for 8 hours at 25±3℃, and then it shall be discharged with 1C$_1$A (40A) to 1.5V. • 然后电芯按照标准充电方式充满电后，于-40±2℃条件下存放 24h 后，在该温度下以 1C$_1$A (40A)电流放电至 1.2V； After being fully charged with standard method, the cell shall be rested for 24 hours at -40±2℃, and then it shall be discharged with 1C$_1$A (40A) to 1.2V. • 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后，于-20±2℃条件下存放 24h 后，在该温度下以 1C$_1$A (40A)电流放电至 1.2V； Rest the cell at RT for 1 hour, and then get fully-charged with standard method；the cell shall be rested for 24 hours at -20±2℃， and then discharged with 1C$_1$A (40A) to 1.2V. • 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后，于55±2℃条件下存放 8 h 后，在该温度下以 1C$_1$A (40A)电流放电至 1.5V。 Rest the cell at RT for 1 hour, and then get fully-charged with standard
		-20℃	-20℃放电容量≥85%标称容量。 Discharge capacity at -20℃ should be no less than 85% of nominal capacity.	
		55℃	55℃放电容量≥98%标称容量。 Discharge capacity at 55℃ should be no less than 98% of nominal capacity.	

				method；the cell shall be rested for 8 hours at 55±2℃， and then it shall be discharged with 1C_1A (40A) to 1.5V.
2	常温循环寿命 RT Cycle Life		10000 次循环后，放电容量≥80%标称容量。 After 10000 cycles, the discharge capacity should be no less than 80% of nominal capacity.	首先以标准充电方式充满电，然后再以标准放电方式放电，中间充放电的时间间隔不少于 30 分钟，重复上述步骤。 Fully charge the cell with standard method， and then discharge the cell with standard method. The time interval between charge and discharge should be no less than 30 minutes, and then repeat the steps mentioned above.
3	常温荷电保持 RT Charge Retention		静置 28 天后，放电容量不低于 92%标称容量。 After resting for 28 days, the discharge capacity should be no less than 92% of nominal capacity.	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，然后将电芯在常温环境中放置 28 天， 放置 28 天后用标准放电方法放电，记录放电容量。 Conduct the capacity test for the fully charged-discharged cell with standard method. After getting fully charged with standard method, the cell shall be rested for 28 days at RT. Then discharge the cell with standard method and record the discharge capacity.
4	常温荷电恢复 RT Charge Recovery		放电容量不低于 95%标	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放电。

		称容量。 The discharge capacity should be no less than 95% of nominal capacity.	After the charge retention test, the cell shall get fully charged with standard method and then get discharged with standard method.
5	55℃ 荷电保持 55℃ Charge Retention	静置 7 天后，放电容量不低于 92%标称容量。 After resting for 7 days, the discharge capacity should be no less than 92% of nominal capacity.	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，然后将电芯在 55℃±2℃环境中放置 7 天，放置 7 天后用标准放电方法放电，记录放电容量。 Conduct the capacity test for the fully charged-discharged cell with standard method. After getting fully charged with standard method, the cell shall be rested for 7 days at the temperature of 55℃±2℃. Then discharge the cell with standard method and record the discharge capacity.
6	55℃ 荷电恢复 55℃ Charge Recovery	放电容量不低于 95%标称容量。 The discharge capacity should be no less than 95% of nominal capacity.	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放电。 After the charge retention test, the cell shall get fully charged with standard method and then get discharged with standard method.
7	倍率性能 Rate Performance	8C_1A (320A)放电容量≥90%标称容	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 8C_1A (320A)的恒定电流进行

		量。 Discharge capacity at $8C_1A$ (320A) should be no less than 90% of nominal capacity.	放电至 1.5V。 Conduct the capacity test for the fully charged-discharged cell with standard method. After getting fully charged with standard method, the cell shall be discharged with $8C_1A$ (320A) constant current to 1.5V.

4.5 环境适应性测试 Environmental Characteristics

序号	测试项目	性能标准	测试条件与方法
1	温度循环 Temperature impact test	不泄露、不起火、不爆炸 No leakage, no fire, no explosion.	将用标准充电方法充满电的电芯放入-40°C 的低温环境中搁置 150min，再在 25±3°C条件下搁置 60min，最后在 85°C 条件下搁置 200min，两个温度变换时时间不超过 30min。如此循环 5 次结束实验，试验结束后将样品取出，在 25±3°C环境中搁置 70min。 The cell is fully charged with standard method, and then it is rested for 150 mins at the temperature of -40 °C, and then 60 mins at 25±3°C, and then 200mins at 85°C. The time interval between two temperature impact tests shall be no more than 30mins, and the test shall be repeated for 5 times. After that, the test cells shall be rested for 70mins at 25±3°C.
2	低压测试 Low Pressure Test	不爆炸、不起火、不泄露 No explosion, no fire, no leakage.	将电芯在绝对压力为 11.6Kpa、25±3°C 条件下贮存 6 小时。 The fully charged cell shall be stored for 6 hours at absolute pressure of 11.6Kpa and temperature of 25±3°C.

3	130℃ 储存 130°C storage	不起火、不爆炸 No fire, no explosion.	将标准充电方法充满电的电芯放在一自然对流或强制对流烘箱中加热，烘箱温度以 5±2℃/min 的速度升温至 130±2℃， 并保持 30 分钟。 The fully charged cell shall be heated in gravity convection or circulating air oven, the temperature of which is raised at a rate of 5±2℃ per minute to temperature of 130±2℃ and remains for 30 minutes at that temperature before the test is discontinued.
4	海水浸泡 Seawater immersion	不起火、不爆炸 No fire, no explosion.	将标准充电方法充满电的电芯浸入 3.5wt%的 NaCl 溶液中 2h，水深应完全没过电芯。 The fully charged cell shall be completely immersed in the 3.5wt% of NaCl solution for 2 hours.

4.6 安全性能 Safety Characteristics

序号	测试项目	性能标准	测试条件与方法
1	自由跌落 Free fall test	不冒烟、不起火、不爆炸 No smoke, no explosion，no fire.	将电芯用标准充电方法充满电；然后将电芯从 1.5m 高度自由落到水泥地面上，观察 1h; The cell is fully charged with standard method, and then falls freely at a height of 1500mm down to cement ground. After the free fall, the cell is monitored for 1 hour.
2	过充 Over-charge	不爆炸、不起火 No explosion, no fire.	将电芯按标准放电方法充电，然后以 $1C_1A$(40A) 的恒定电流充电至 4.2V 或者充电时间达 1h 后停止充电。 First charge the cell with standard method, and then the cell is charged with $1C_1A$ (40A) constant current to 4.2V or charged for 1h before the test is discontinued.

3	过放 Over-discharge	不爆炸、不起火、不漏液 No explosion, no fire, no leakage.	将电芯用标准充电方法充满电，然后以恒电流 $1C_1A$(40A) 继续放电 90min。 The cell is fully charged with standard method, and then discharged with $1C_1A$ (40A) constant current for 90min.
4	常温短路 RT short-circuit test	不爆炸、不起火 No explosion, no fire.	将电芯用标准充电方法充满电，然后在常温下用小于 5mΩ 的导线将电芯短路 10min，观察 1h。The cell is fully charged with standard method, and then short-circuited by connecting the positive and negative terminals of the cell with wire which has a resistance load of less than 5 mΩ at RT for 10 minutes. After that, the cell is monitored for 1 hour.
5	针刺 Nail	不爆炸、不起火 No fire, no explosion.	将充满电的单体电芯固定于夹具上，用直径为 φ5-φ8mm 的耐高温钢针（针尖的圆锥度为 45°~60°，钢针表面光洁、无锈蚀、氧化层及油污），以（25±5）mm/s 的速度，从垂直于电芯极板方向贯穿，贯穿位置靠近刺面的几何中心，钢针停留在电芯中，观察 1h。 The fully charged cell is fixed on the fixture, and a steel needle with a diameter of 5~8mm is used to Pierce the cell forcefully along the radial direction at the speed of（25±5）mm/s, and the needle is left in the cell for 1h.
6	挤压测试 Crush test	不起火、不爆炸 No fire, no explosion.	将电芯按照标准方法充满电，然后在垂直于电池极板方向以 5±1mm/s 速度施压，挤压板为半径为 75mm 的半圆柱体（见图 2），半圆柱体的长度（L）大于被挤压电池的尺寸，直至电池电压变为 0V 或者变形量达到 30%或挤压力达到200kN 后停

			止挤压，观察 1h，试验过程中记录电芯电压、温度变化。 The cell is fully charged with standard method, and then pressed at speed of 5±1mm/s at perpendicular direction of the battery plates until the cell's open voltage turns down to 0V or the deformation of the cell reaches to 30%, or the extrusion force reaches to 200kN, and then monitored for 1 hour. The cell is pressed by the extrusion head of a half cylinder, the radius of which is 75mm and the length is longer than the cell. The voltage and temperature shall be monitored in the whole test.

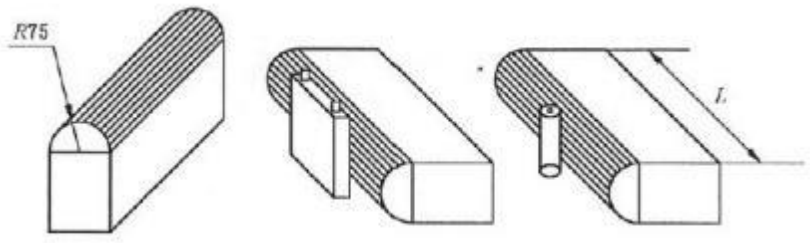


图 2 单体挤压板和挤压示意图

Image 2 Illustrations for the Crush Plate and Crush Test

5. 警告及注意事项 Warning and Cautions

5.1. 危险警告 Warning for Dangers

为防止电池可能发生泄露， 发热， 爆炸，请注意以下预防措施：

To prevent the battery from leaking, over-heating, explosion, please pay attention to the following precautions:

- 严禁将电池浸入水中，保存不用时，应放置在阴凉干燥的环境中。

  Don't immerse the battery into water, and keep the battery in a cool dry environment during stand-by.

- 禁止将电池放在热高温源旁，如火，加热器等旁边使用和留置。

  Do not use and leave the battery near a heat source such as fire or heater.

- 充电时请选用锂离子电池专用充电器。

  When charging, use a battery charger specifically for that purpose.

- 严禁颠倒正负极后使用电池。

  Don’t reverse the positive and negative terminals.

- 严禁将电池直接插入电源插座。

  Don’t connect the battery to an electrical outlet directly.

- 禁止将电池丢入火或加热器中。

  Don’t dispose the battery in fire or heater.

- 禁止用金属直接连接电池正负极， 造成短路。

  Don’t short-circuit the battery by connecting the positive and negative terminals directly with metal objects.

- 禁止将电池与金属，如发卡、项链等一起运输或存储。

  Don’t transport and store the battery together with metal objects such as necklaces, hairpins, etc.

- 禁止敲击，抛掷或踩踏电池等。

  Don’t strike, throw or trample the battery.

- 禁止直接焊接电池。

  Don’t directly solder the battery.

- 禁止用钉子或其它利器刺穿电池。

  Don’t pierce the battery with a nail or other sharp objects.

5.2. 注意事项 CAUTIONS

- 禁止在高温下（直热的阳光下或很热的汽车中） 使用或放置电池， 否则可能

会引起电池过热，起火或功能失效，寿命减短。

Don’t use or leave the battery at very high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it may overheat, cause fire or its performance will degenerate and life be shortened.

- 禁止在强静电和强磁场的地方使用，否则容易破坏电池安全保护装置，带来安全隐患。

Do not use it in a location where static electricity is rich and magnetic field is strong. Otherwise, the safety devices maybe damaged and cause danger.

- 如果电池发生泄露， 电解液进入眼睛，请不要搓揉，应用清水冲洗眼睛，必要时请立即前往医院接受治疗，否则会伤害眼睛。

If the battery leaks and the electrolyte get into your eyes, don’t rub the eyes! Rinse the eyes with clean running water, and immediately seek medical attention. Otherwise, it may injure eyes or cause a loss of sight.

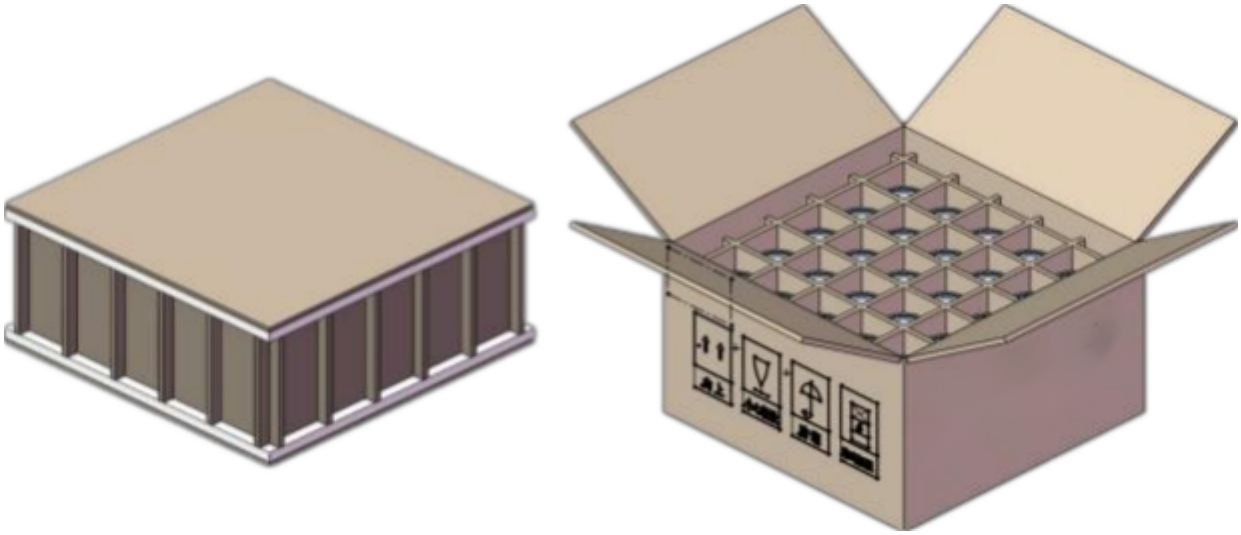
- 如果电池发出异味，发热，变色，变形或使用、存储、充电过程中出现任何异常现象，立即将电池从装置或充电器中移开并停用。

If the battery gives offan odor, generates heat, becomes discolored or deformed, or any abnormal during usage, recharging or storage, immediately remove it from the device or battery charger and stop using it.

- 如果电池弄脏， 使用前应用干布抹净，否则可能会导致接触不良，功能失效。

In case the battery terminals get dirty, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection with the device.

6. 包装 Package



数量（pcs）	纸箱尺寸（W×L×H）mm	总重量（kg）
25	380×380×250	28

7. 联系方式 Contact Us

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