钠离子电池规格书

Specification For Sodium-ion Battery

Prepared By/Date 编制/日期	Checked By/Date 审核/日期	Approved By/Date 批准/日期

Customer Approval	Signature/Date (签名/日期)	
	Company Name (公司名称)	
	Company Stamp (公司印章)	

Contents 目 录

1 Preface 前言

This standard describes the external dimensions, characteristics, technical requiremen -ts, and precautions of cylindrical Sodium-ion battery.
本标准描述了圆柱钠离子电池的外型尺寸、特性、技术要求及注意事项。
This product mainly refers to the following standards for evaluation of performance indicators:
本产品主要参考以下标准进行性能指标的评价
UN 38.3
UL 2595
GB/T34570 《电动工具电池标准检测》"Power Tool Battery Standard Test"
GB/T34570.2-2017 《电动工具用可充电电池包和充电器的安全》Safety of Rechargeable Battery Packs and Chargers for Power Tools
GB/T31485-2015 《电动汽车用动力蓄电池安全要求及试验方法》"Safety Requirements and Test Methods for Power Batteries for Electric Vehicles"
GB/T31484《电动汽车用动力蓄电池循环寿命要求及试验方法进行性能指标的评价》"Cycle life requirements and test methods for evaluation of performance indicators of power batteries for electric vehicles"

2 Definition 定义

2.1 电池类别 Battery category :
圆柱钠离子电池 Cylindrical sodium-ion battery

2.2 标准充电方式 Standard charging method
在25.0±3.0℃环境中，以0.50C的电流恒流充电至单体电池电压3.95V后，转为恒压3.95V充电，截至电流等于0.05C时，停止充电。
In an environment of 25.0±3.0℃, charge with a constant current of 0.50C until the single cell voltage is 3.95V, then switch to constant voltage charging of 3.95V, and stop charging when the current equals 0.05C.

2.3 标准放电方式 Standard discharge method
在25.0±3.0℃环境中，以0.50C 的电流恒流放电至单体电池电压1.50V。
In an environment of 25.0±3.0℃, discharge at a constant current of 0.50C until the single cell voltage is 1.50V.

2.4 标称容量 Nominal capacity :
标称容量 Cap=3.2Ah，指在25.0±3.0℃环境下，依据标准充放电制度2.3和2.4,以Cap 表示电池容量，单位为安培小时(Ah)。
Nominal capacity Cap=3.2Ah, refers to the battery capacity expressed in Cap based on the standard charge and discharge rules 2.3 and 2.4 in an environment of 25.0±3.0℃, and the unit is ampere hours (Ah).

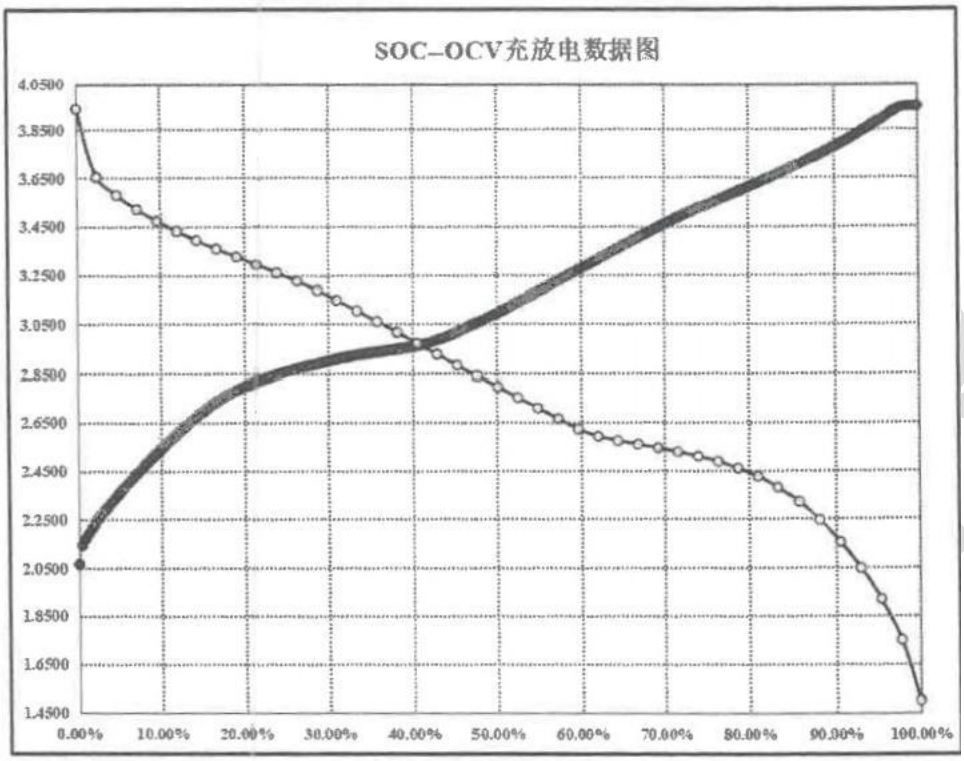
2.5 测试温度与湿度 Test temperature and humidity :
若无特别要求，此规格书上的产品测试，条件均为温度25℃±3℃:湿度：65%±20%RH
If there is no special requirement, the product test conditions in this specification are temperature 25°C±3°C; humidity: 65%±20%RH

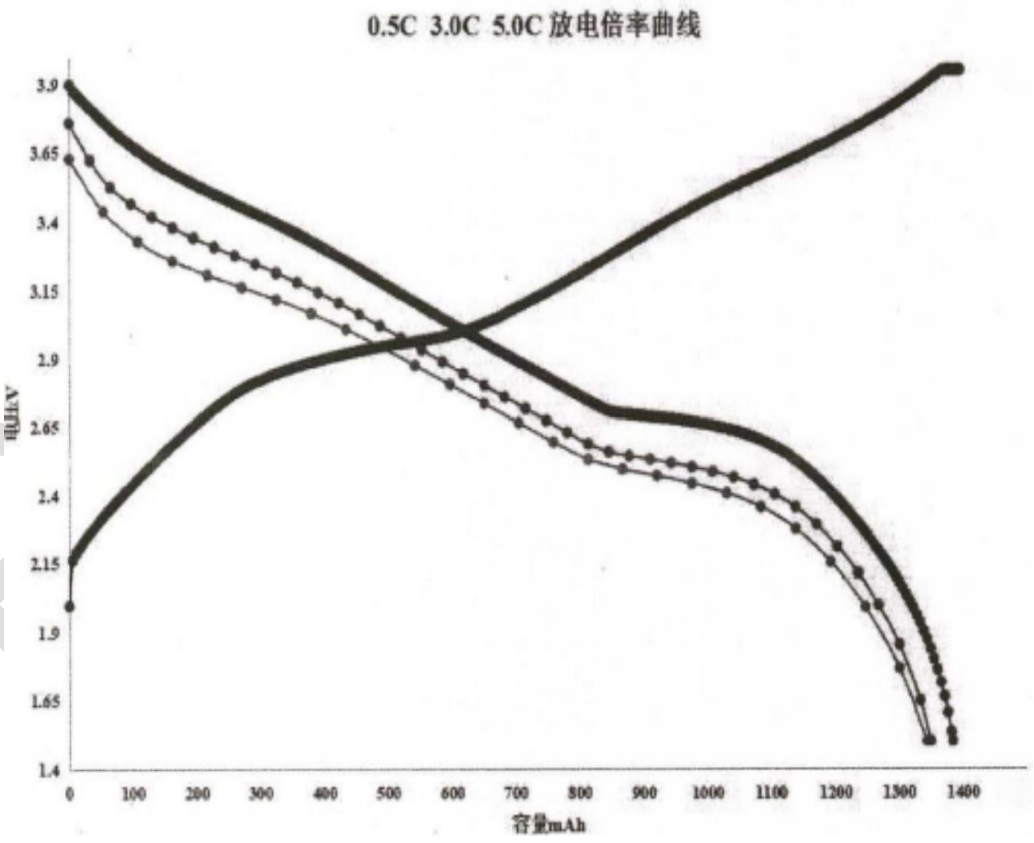
3 电池参数 Battery parameters

3.1 常规参数 General parameters

项 目 Project	规 格 Specification
标称容量 Nominal capacity	3.20Ah@0.50C at 25.0±3.0℃
典型容量 Typical capacity	3.25Ah@0.50C at 25.0±3.0℃
标称电压 Nominal voltage	≈3.10V
上限电压 Upper limit voltage	3.95±0.05V
下限电压 Lower limit voltage	1.50±0.05 V Can be discharged to OV without affecting battery performance
直流内阻 DC internal resistance	≤20.00mΩ2
电池尺寸 Battery size	Diameter: 26.40±0.10mm Height: 71.00±0.15mm
能量密度 Energy Density	≥125.00Wh/Kg
电池重量 Battery weight	84.00±2.00g
储存温度(出货时的荷电态) Storage temperature (state of charge at shipment)	-20 ~ 60℃ 通风避光Ventilated and protected from light
温度与充电性能 Temperature and charging performance	≤ -20℃:使用时，钠电池性能受到影响 Sodium battery performance is affected when used -20~0℃:≤0.20C 0~45℃:≤0.50C ≥45℃:使用时，钠电池性能受到影响 Sodium battery performance is affected when used
温度与放电性能 Temperature and discharge performance	≤ -40℃: Sodium battery performance is affected when used -40~0℃:≤0.50C 0~45℃:0.50 ~ 5.0C 45~60℃:≤0.50C ≥60℃:使用时，钠电池性能受到影响 Sodium battery performance is affected when used
瞬间最大放电电流 Instantaneous maximum discharge current	Instantaneous current 瞬间电流 ： 5.00C Duration 持续时间 ： ≤60s
最大持续放电电流 Maximum continuous discharge current	持续电流 Continuous current ： 3.00C 放电温升 Discharge temperature rise ≤30℃

3.2 充放电数据图 Charge and discharge data chart





0.5C 0.0C 5.0C Discharge rate curve

3.3 倍率性能 Rate capability

3.3.1 1.0C 放电容量/0.5C 放电容量≥98.00%;
1.0C discharge capacity/0.5C discharge capacity ≥98.00%;

3.3.2 2.0C 放电容量/0.5C 放电容量≥97.00%;
2.0C discharge capacity/0.5C discharge capacity ≥97.00%;

3.3.3 3.0C 放电容量/0.5C 放电容量≥95.00%。
3.0C discharge capacity/0.5C discharge capacity ≥95.00%.

3.4 循环参数 Loop parameters

3.4.1 按照2.3和2.4的制度测试循环，实际容量/标称容量=70%时，循环次数≥4000次。
Test cycles according to the rules of 2.3 and 2.4. When actual capacity/nominal capacity = 70%, the number of cycles is ≥ 4000 times.

3.5 低温性能 Low temperature performance

3.5.1 -40℃ 0.5C放电容量 discharge capacity/25℃
0.5C放电容量 discharge capacity≥65.00%;

3.5.2 -30℃ 0.5C放电容量 discharge capacity/25℃
0.5C 放电容量 discharge capacity≥80.00%;

3.5.3 -20℃ 0.5C放电容量discharge capacity/25℃
0.5C 放电容量 discharge capacity≥90.00%;

3.5.4 -10℃ 0.5C放电容量 discharge capacity/25℃
0.5C 放电容量 discharge capacity≥97.00%。

3.6 高温性能 High temperature performance

3.6.1 80℃ 0.5C放电容量 discharge capacity /25℃
0.5C 放电容量 discharge capacity≥90.00%;

3.6.2 60℃ 0.5C放电容量 discharge capacity /25℃
0.5C 放电容量 discharge capacity≥95.00%;

3.6.3 45℃ 0.5C放电容量 discharge capacity /25℃
0.5C 放电容量 discharge capacity≥100.00%。

3.7 安全性能 Safety performance

序号 Serial number	测试项目 Test items	性能标准 Performance standards	测试条件与方法 Test Conditions and Methods
1	振动测试 Vibration test	不起火，不爆炸，无漏液 No fire, no explosion, no leakage	参考：UL1642-16 标准充电后，电池应经受振幅为0.8mm振动，振动频率在10-55HZ范围内以1Hz/min的速率变化，振动60min。 Reference: UL1642-16 After standard charging, the battery should be subjected to vibration with an amplitude of 0.8mm, the vibration frequency changes at a rate of 1Hz/min in the range of 10-55HZ, and the vibration is 60min.
2	加热测试 Heating test	不起火、不爆炸 No fire, no explosion	参考：GB 380318.1.5 标准充电后，烘箱温度以5±2℃/min升高到130℃士2℃,在此温度下保留30min,观察1小时。 Reference: GB 380318.1.5 After standard charging, the oven temperature increases to 130°C ± 5±2°C/min. 2℃, keep at this temperature for 30min and observe for 1 hour.
3	短路测试 Short circuit test	不起火、不爆炸 No fire, no explosion	参考：GB 380318.1.4 标准充电后，在25℃±3℃下，将电池正极端子和负极 端子经外部短路10min(外部线路电阻<5m2),观察1小时 。 Reference: GB 380318.1.4 After standard charging, at 25℃±3℃, externally short-circuit the positive and negative terminals of the battery for 10min (external circuit resistance <5m2) and observe for 1 hour.
4	过充测试 Overcharge test	不起火、不爆炸 No fire, no explosion	参考：GB 380318.1.3 标准充电后，在25℃±3℃下，电池以1C恒流充电至5.0V或120% SOC后停止充电，观察1小时。 Reference: GB 380318.1.3 After standard charging, the battery is charged to 5.0V at a constant current of 1C at 25℃±3℃ or stop charging after 120% SOC and observe for 1 hour.
5	过放测试 Over discharge test	不起火、不爆炸 No fire, no explosion	参考：GB 380318.1.2 标准充电后，在25℃±3℃下，电池以1C电流放电，直至放电时间到达90min,观察1小时。 Reference: GB 380318.1.2 After standard charging, discharge the battery with a current of 1C at 25°C±3°C until the discharge time reaches 90min, and observe for 1 hour.
6	重物冲击 heavy impact	不起火、不爆炸 No fire, no explosion	参考：UL 1642-14 标准充电后，用一条直径为15.8mm的圆棒放置在电池 中央，将一9.1Kg的重锤从610mm的高度垂直落下在电池的中心位置。

			Reference: UL 1642-14 After standard charging, place a round rod with a diameter of 15.8mm in the center of the battery, and drop a 9.1Kg weight vertically from a height of 610mm to the center of the battery.
7	跌落试验 Drop test	不起火、不爆炸 No fire, no explosion	参考：GB/T 314856.2.5 标准充电后，将电池样品的正负极端子向下由高度为1.0m的位置自由跌落到水泥地面上，观察1小时。 Reference: GB/T 314856.2.5 After standard charging, move the positive and negative terminals of the battery sample downward from a height of freely drop to the concrete floor from a 1.0m position and observe for 1 hour.
8	挤压试验 Extrusion test	不起火、不爆炸 No fire, no explosion	参考：GB 380318.1.7 标准充电后，电池放在挤压设备的两个挤压面之间，圆 柱电池芯轴平行于挤压平面，以≤2mm/s的挤压速度逐渐增加压力至变形量达到15%或挤压力达到100kN或1000倍电池重量，保持压力10min,观察1小时。 Reference: GB 380318.1.7 After standard charging, the battery is placed between the two extrusion surfaces of the extrusion equipment, the core axis of the cylindrical battery is parallel to the extrusion plane, and the pressure is gradually increased at an extrusion speed of ≤2mm/s until the deformation reaches 15% or extrusion Force up to 100kN or 1000 times the weight of the battery, keep the pressure for 10 minutes, and observe for 1 hour.
9	低气压测试 Low pressure test	不起火、不爆炸 No fire, no explosion	参考：UL1642-19 标准充电后，电池在绝对压力为11.6Kpa、温度为20±5℃条件下贮存6小时。 Reference: UL1642-19 After standard charging, the battery operates at an absolute pressure of 11.6Kpa and a temperature of 20°C. Store at 5℃ for 6 hours.

4 使用说明 Instructions for use

4.1 温度梯度充电方案 Temperature gradient charging solution

	soC	温度梯度 Temperature gradient						
		-20℃~-10℃	-10℃~0℃	0℃~10℃	10℃~2℃	25℃~45℃	45℃~60℃	60℃~80℃
最大充电倍率	100.00%	/	/	0.05C	0.05C	0.05C	/	/
	90.00%	0.05C	0.10C	0.50C	0.50C	0.50C	/	/
	80.00%	0.05C	0.20C	0.50C	0.50C	0.50C	/	/
	70.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	60.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/

Max charge rate	50.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	40.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	30.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	20.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	10.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/
	0.00%	0.10C	0.20C	0.50C	0.50C	0.50C	/	/

4.2 电池储存 Battery storage

钠离子电池储存荷电状态需控制为20%～30%SOC，且每6个月对电池进行一次充放电循环。

The storage state of charge of sodium-ion batteries needs to be controlled at 20% to 30% SOC, and the battery must be charged and discharged every 6 months.

4.3 电池运输 Battery transport

电池运输荷电状态为20%～30%SOC，电池包装成箱进行运输，在运输过程中应防止剧烈振动、冲击 或挤压，防止日晒雨淋，不得倒置。在装卸过程中，产品应轻搬轻放，严防摔掷、翻滚、重压。

The state of charge of the battery during transportation is 20% to 30% SOC. The battery is packed in a box for transportation. During transportation, it should be protected from severe vibration, shock or extrusion, protected from the sun and rain, and must not be turned upside down. During the loading and unloading process, products should be handled with care, and strict precautions should be taken to prevent throwing, rolling, and heavy pressure.

4.4 使用原则 Principles of use

钠离子电池滥用可能会造成电池损害或人身伤害，在使用钠离子电池以前，请仔细阅读以下的安全守 则：The abuse of sodium-ion batteries may cause battery damage or personal injury. Before using sodium-ion batteries, please read the following safety rules carefully:

备注1：如果客户需要将电池在该文件之外的条件下操作应用，请先咨询相关事宜。

Note 1 : If the customer needs to operate the battery under conditions outside of this document, please consult about relevant matters.

备注2：在该文件说明的条件之外使用该电池而产生的事故，不承担任何责任。

Note 2: Does not assume any responsibility for accidents caused by using the battery outside the conditions described in this document.

4.5 防范措施 Precautions

4.5.1 严禁将电池浸入液体中：Do not immerse the battery in liquid:

4.5.2 禁止将电池放置在高温源旁，如火，加热器等；

It is forbidden to place the battery next to high temperature sources, such as fire, heaters, etc.;

4.5.3 充电时请选用钠离子电池专用充电器；

Please use a special charger for sodium-ion batteries when charging;

4.5.4 严禁颠倒正负极后使用电池；

It is strictly forbidden to use the battery after reversing the positive and negative poles;

4.5.5 禁止将电池丢入火或加热器中；Do not throw batteries into fire or heater;

4.5.6 禁止用金属直接连接电池正负极，造成短路；

It is forbidden to directly connect the positive and negative terminals of the battery with metal to cause a short circuit

4.5.7 禁止将电池与金属，如发卡、项链等一起运输或存储：

It is prohibited to transport or store batteries together with metal, such as hairpins, necklaces, etc.:

4.5.8 禁止敲击，抛掷或踩踏电池等；

It is prohibited to knock, throw or step on batteries, etc.;

4.5.9 禁止用钉子或其它利器刺穿电池；

It is prohibited to pierce the battery with nails or other sharp objects;

4.5.10 电池处理时，请将电池和其他电化学体系的产品分开。

When handling batteries, please separate them from other electrochemical system products.

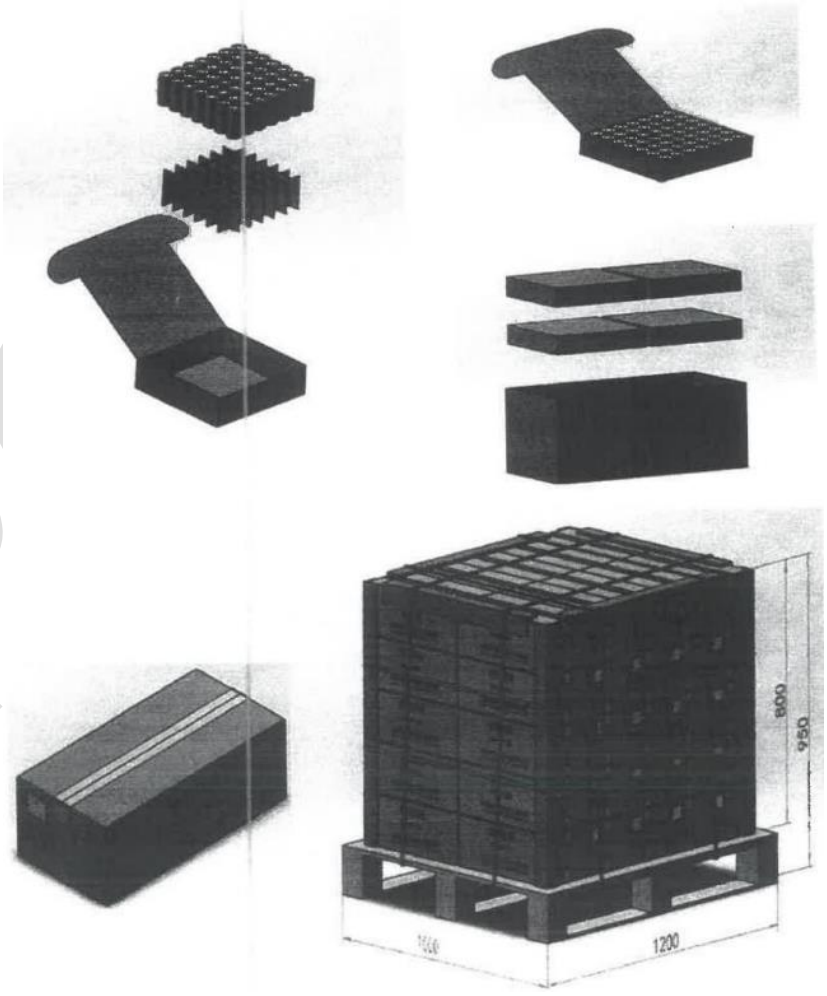
5 包装出货 Packaging and shipping

5.1 圆柱钠离子电池按照20%～30%SOC 的标称容量或客户要求出货，电池出货后充电前的剩余容量取决于储存条件和储存时间。

Cylindrical sodium-ion batteries are shipped according to the nominal capacity of 20% to 30% SOC or customer requirements. The remaining capacity after shipment of the battery before charging Depends on storage conditions and storage time.

5.2 每一小箱采用卡槽放置96支电池，每一大箱放置4小箱密封后贴标签纸，每一托盘放置5层，每一层放置10大箱，总计每一托盘承载的最大电池数量控制在15500支以内。

Each small box uses card slots to place 96 batteries. Each large box is placed with 4 small boxes sealed and labeled. Each pallet is placed in 5 layers, with 10 large boxes placed in each layer. In total, the maximum number of batteries carried by each pallet is controlled. Within 15500 pieces.



6 修改声明 Modify statement

因不断地改善产品质量、特性的需要，本公司有权对产品规格书及维护特性进行修订，修订后将不预 先通知用户。

Due to the need to continuously improve product quality and characteristics, our company has the right to revise product specifications and maintenance characteristics without notifying users in advance.

7 修改记录 Modify records

序列号 serial number	修改项目 Modify project	修改内容 Modify content	修改人 Modifier	修改日期 Modified date
A0	无 NONE	首版发行 First edition released	项邡涛	2023.08.12

8 其他事项 Other matters

本规格书中未提及的事项，须经本公司技术确认，本公司保留对此规格书中所述内容的最终解释权。

Matters not mentioned in this specification must be confirmed by our company's technology, and our company reserves the right of final interpretation of the content described in this specification.

9 电池图片 Battery picture