Li-ion Cylindrical Battery Specification

锂离子圆柱电池说明书

MODEL

型 号: INR18650NP

Nominal Capacity

标 称 容 量: 3500mAh

Customer

客 户:

Total Page

文件页数: 9

Registered 编制	Checked 审核	Approved 批准
张强	/	
2023.05.03	/	2023.05.03

Customer Approve 客户确认		
Dept. 部门	Signature 签名	Date 日期
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R&D Dept 研发		
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Product Modified Record List
产品变更履历表

Revision 版本	Date 日期	Mark 标记	Modified content 变更内容	Approved by 批 准
A0	2023-05-03		First Edition 初版发行	

1.Scope 适用范围

This specification describes the basic performance, technical requirement, testing method, warning and caution of the Li- ion Cylindrical rechargeable battery .The specification only applies to Naccon Power Technology Co., Ltd.

本标准规定了圆柱锂离子可充电池的基本性能、技术要求、测试方法及注意事项，本标准只适用于深圳市耐科森电源科技限公司。

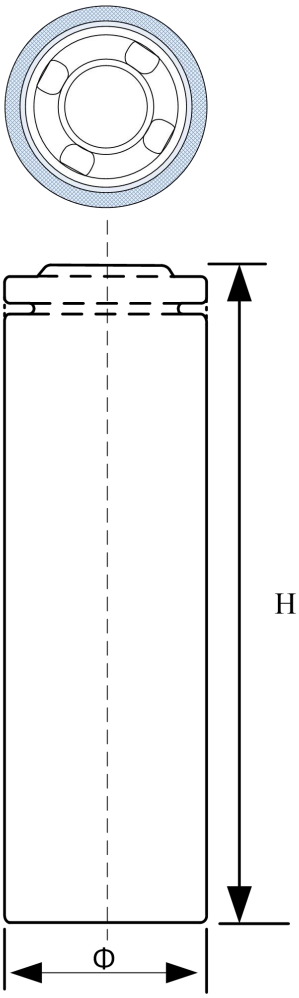
2.Description and Model 型号及说明

2.1 Description 说明 Cell（Cylindrical Lithium-Ion Cell) 圆柱型锂离子电芯

2.2 Model 电芯型号 INR18650

3. Products assembly drawing and size refers to picture

产品组装图及尺寸参考图



NO.	Item 项 目	Specifications 规格
1	Diameter 直径Φ	Max：ϕ18.6mm (含 PVC)
2	Height 高度 H	Max：65.2mm
3	Shell material 壳体材质	SPCC

4.Specification 产品规格

NO. 序号	Item 项目	Specifications 规格要求
4.1	Normal capacity 标称容量	3500mAh @ 0.2C Discharge (0.2C 放电)
	Minimum capacity 最小容量	3400mAh@0.2C (Discharge the cell from 4.2V to 2.75V by 0.2C current) (电芯以 0.2C 从 4.2V 放电至 2.75V)
4.2	Nominal voltage 标称电压	3.7V
4.3	Standard Charge 标准充电	CC/CV,0.5C5A, 4.20V
4.4	Standard Discharge 标准放电	CC,0.2C5A, 2.75V
4.5	End-of-charge Voltage 充电截止电压	4.20V±0.05V
4.6	End-of-charge Current 充电截止电流	0.02C5A （At CV mode）
4.7	End-of-discharge Voltage 放电截止电压	2.75V
4.8	Charging Time 充电时间	3 hours（standard charge） 3 小时
4.9	Max charge current（continuous） 最大持续充电电流	3.5A(45℃>T≥20℃) 1.75A(20℃>T≥10℃) 0.7A(10℃>T≥0℃)
4.10	Max discharge current（continuous） 最大持续放电电流	10.5 A(45℃>T≥20℃) 3.5A (20℃>T≥10℃) 1.75A (10℃>T≥0℃)
4.11	Max pulse discharge current<1s 最大瞬间放电电流<1s	17.5A(25±3℃)
4.12	Initial Impedance 初始内阻	Max:32mΩ
4.13	Weight 重量	Approx(约)：47±2g
4.14	Operating temperature(Cell surfacs temperature) 电芯工作表面温度	Charging(充电)： 0℃~45℃ Discharging(放电)：-20℃~65℃
4.15	Storage temperature 储存温度	-5℃~35℃
4.16	Storage Humidity 储存湿度	≤75% RH
4.17	Appearance 外观	Without scratch, distortion, contamination and leakage (无划痕、变形污迹、电解液泄露)
4.18	Standard environmental condition 标准环境	Temperature(温度) ： 25±3℃ Humidity（湿度） ： 45-75%RH Atmospheric Pressure（大气压） ： 86-106 KPA

5.Technical characteristics 技术要求

5.1 Cell testing conditions 电芯试验环境

Unless otherwise specified, all tests stated according to following: Temperature： 25±3℃.
除非有特殊说明，所有测试的环境条件要求如下：温度： 25±3℃。

5.2. Measuring equipment 测试设备

(1) Amp-meter and volt-meter 容量电压测试

The amp-meter and volt-meter should have an accuracy of the grade 0.5mA and mV or higher. 容量电压测试设备的精度需达到 0.5mV/mA 以上。

(2) Slide caliper 尺寸测试

The slide caliper should have 0.01 mm scale.测量尺寸时量具需达 0.01 mm 以上精度。

(3) Impedance meter 内阻测试

The impedance meter with AC 1kHz should be used.内阻测试在 AC 1kHz 的条件下进行

5.3 Electronic performance 电性能

5.3.1 Standardcharge 标准充电

This "Standard charge" means charging the cell with constant current 0.5C and then withconstant voltage 4.2V,0.02C cut-offat 25±3℃.
标准充电定义为 25±3℃下，0.5C 恒流充电至截止电压 4.2V，恒压截止电流至 0.02C。

5.3.2 Standard discharge capacity 标准放电容量

The standard discharge capacity is the initial discharge capacity of the cell, which ismeasured with discharge current of 0.2Cwith 2.75V cut-off at 25±3℃ after the standardcharge.
标准放电容量是指 25±3℃时标准充满电后，0.2C 恒流放电至截止电压 2.75V 所得到的容量。

5.3.3 Temperature dependence of discharge capacity 温度与放电容量的关系

Capacity comparison at each temperature, measured with discharge constant current 0.2C and 2.75V cut-off after the standard charge is as follows.
不同温度下容量的对比，按如下形式测试，标准充电后按 0.2C 恒流放电至截止电压 2.75V 所得到的容量，数据如下：

Discharge temperature 放电温度					
-20℃	-10℃	0℃	15℃	25℃	40℃
≥60%	≥70%	≥80%	≥90%	≥100%	≥100%

5.3.4 Discharge rate capabilities 倍率放电性能

The standard rate discharge capacity is defined as the initial discharge capacity of the battery, which is obtained by constant current discharge to cut-off voltage of 2.75V at 25 ± 3 °C, 0.7A, 1.75 A, 3. 5A,10. 5A, after standard charge
标准倍率放电容量是指电池的初始放电容量，按如下形式，在 25±3℃下，按照标准充满电后，0. 7A, 1. 75 A, 3. 5A,10. 5A,恒流放电至截止电压 2.75V 所得到的容量.

DischargeCondition 放电条件				
Current 电流	0.7A	1.75A	3.5 A	10.5A
Relative Capacity 容量比率	≥100%	≥95%	≥92%	≥90%

6.General Performance 常规性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
6.1	0.2C Capacity 0.2C 容量	After standard charging, rest battery for 10min, then discharging at 0.2C to voltage 2.75V, recording the discharging time. 标准充饱电后,搁置 10 分钟,然后用 0.2C 电流放电至 2.75V,所记录放电时间	≥291min
6.2	Cycle Life 循环寿命	Constant current 0.5C charge to 4.2V, then constant voltage charge to current declines to 0.01C, rest 10min，constant current 0.5C discharge to 2.75V， rest 15min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells 先用 0.5C 恒流充电至 4.2V，再恒压 4.2V 充电直至充电电流≤0.01C,搁置 10 分钟,再用 0.5C 电流放电至 2.75V;又搁置 15 分钟,重复以上步骤,直到放电容量是初始容量的 80%	≥500cycles
		Constant current 0.5C charge to 4.2V, then constant voltage charge to current declines to 0.01C, rest 10min，constant current 1C discharge to 2.75V， rest 15min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells 先用 0.5C 恒流充电至 4.2V，再恒压 4.2V 充电直至充电电流≤0.01C,搁置 10 分钟,再用 1C 电流放电至 2.75V;又搁置 15 分钟,重复以上步骤,直到放电容量是初始容量的 80%	≥300cycles
6.3	Capability of keeping electricity 荷电保持能力	25±3℃, After standard charging, rest the battery 28days, discharging at 0.2C to voltage 2.75V, recording the discharging time. 在 25±3℃状态下,标准充饱电后,电芯搁置 28 天,然后用 0.2C 放电至 2.75V,所记录放电时间.	≥240min

7.Environment Performance　环境性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
7.1	Discharge at high temperature 高温放电	After standard charging, rest the cells 4h at 60 ± 2 ℃, then discharging at 1C to voltage 2.75V, recording the discharging time. 标准充电后，在 60±2℃条件下贮存 4h，然后用 1C 放电至 2.75V,所记录放电时间.	≥54min
7.2	Discharge at low temperature 低温放电	After standard charging, rest the cells for 4h at -20 ± 2 ℃, then discharging at 0.2C to voltage 2.75V, recording the discharging time. 标准充电后，在-20±2℃条件下贮存 4h，然后用 0.2C 放电至 2.75V,所记录放电时间.	≥180min
7.3	Thermal shock 热冲击	Put the cells in the oven. The temperature of the oven is to be raised at 5±2℃ per minute to a temperature of 130±2℃ and remains 30 minutes. 将电池放进烘箱内，以 5±2℃/min 速度升高烘箱内温度至 130±2℃后,恒温 30min.	No fire or explosion 不起火,不爆炸

8. Safe Characteristic　安全性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
8.1	Over charge testing 过充测试	At 25±3℃, charging cells with constant current 2C to voltage 5.0V, Stop test till cells temperature 10 ℃ lower than max temperature. 在 25±3℃状态下, 电池用 2C 电流充电至 5.0V, 监视电池温度变化, 当电池温度下降一峰值低约 10℃时, 停止实验.	No fire or explosion 不起火,不爆炸
8.2	Forced discharge 强制放电	At 25±3℃, discharge to the termination voltage according to the standard discharge requirements, and then reverse charge at 1C current for 90 minutes 在 25±3℃状态下, 按标准放电的要求放电至终止电压后, 然后以 1C 电流反向充电 90 分钟	No fire or explosion 不起火,不爆炸
8.3	Short-circuit testing 短路测试	After being charged according to standard, place it in an environment of 25±5° and 55±5°, and then connect the positive and negative extremes with a wire to ensure that all the external resistance is 80±20m Ω .The battery temperature drops to 20% lower than the peak value or the short circuit time reaches 24h. 按标准充满电后，放置在 25±5° 和 55±5° 环境中，然后用导线连接正负极端，确保全部外部电阻为 80±20mΩ 。电池温度下降到比峰值低 20%或短路时间达 24h。	No fire or explosion 不起火,不爆炸
8.4	Vibration test 振动试验	Standard charged and fixed on the vibration table and subjected to vibration cycling that the frequency is to bevaried at the rate of 1Hz per minute between 10Hz and 55Hz, battery is to be subjected to simple harmonicmotion with an amplitude of 0.8 mm (0.03 in) [1.6mm(0.06 in) total maximum excursion]The cells shall be vibrated for 90 -100minutes per axis of X, Y axes. 标准充电后固定在振动台上，以振幅 0.8mm,总位移 1.6mm 的单谐振动，振动频率范围为 10Hz~55Hz，频率变化速率 1Hz/min。沿 X、Y 两个个方向振动，每个方向振动 90-100 分钟	No remarkable damage、No smoking 、No explosion 电池外观无明显损伤、不泄漏、不冒烟、不爆炸
8.5	Free drop test 自由跌落试验	Each fully charged cell is dropped three times from a height of 1,0m onto aconcrete floor. The cells are dropped so as to obtain impacts in randomorientations. 标准充电后，从 1.0m 高度自由跌落到水泥地面上 3 次，单体电池在跌落时，应保证每个随机方向均受到冲击。	No fire 、 No、 explosion 不起火、不爆炸
8.6	Altitude/Low Pressure simulation test 高空低压模拟测试	Standard charged and stored for 6 hours in an vacuum environment with pressure of less than 11.6kPa and temperature of 25±3℃. 标准充电后，储存在 25±3℃、大气压≤11.6 kPa 的真空环境中储存 6 小时。	no leakage, no fire, no explosion 不泄漏，不起火、不爆炸

※ Above testing of safe characteristic must be with protective equipment.(安全性能测试应在有保护措施下进行)

9. CAUTIONS IN USE 使用警告

To ensure proper use of the battery please read the manual carefully before using it. Handling
为了使电池安全的使用及处理请在使用前认真的阅读操作说明

- Do not expose to, dispose of the battery in fire.
- 不能把电池曝晒或丢在火中
- Do not put the battery in a charger or equipment with wrong terminals connected.
- 电池充电时不能把正负极性装反
- Avoid shorting the battery
- 避免短路电池
- Avoid excessive physical shock or vibration.
- 避免过分的物理震动和冲击电池
- Do not disassemble or deform the battery.
- 不能拆解或使电池变形
- Do not immerse in water.
- 不能将电池浸入水中
- Do not use the battery mixed with other different make, type, or model batteries.
- 不能将其它不同厂家，类型，型号的电池混合使用
- Keep out of the reach of children.
- 禁止小孩接触电池

charge and discharge 充放电

- Battery must be charged in appropriate charger only.
- 电池必须在合适的条件下充电
- Never use a modified or damaged charger.
- 决不能用故障的充电器给电池充电
- Do not leave battery in charger over 24 hours.
- 电池持续充电不能超过 24H

. storage 贮存

- Store the battery in a cool, dry and well-ventilated area.
- 电池贮藏在通风干燥的环境中

. disposal 处理

- Regulations vary for different countries. Dispose of in accordance with local regulations.
- 不同国家法规的不同，处理时根据当地的法规。

10. Battery operation instruction 电池操作说明

10.1 Charging 充电

Charging current：Cannot surpass the biggest charging current which in this specification book stipulated。

充电电流：不能超过规格书规定的最大的充电电流

Charging voltage：Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage。

充电电压：不能超过规格书规定的最高的限制电压

Charge temperature：The battery must carry on the charge in the ambient temperature scope which this specification book stipulated。

充电温度：电池充电温度必须按照规格书的温度范围执行

Uses the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive electrode and the cathode meet instead, can damage the battery。

先恒流后恒压方式充电，禁止颠倒的方式充电。如果电池正负极颠倒充电会带来危险。

10.2 Discharging current 放电电流

The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity play to reduce and to cause the battery heat。

电池放电电流不能超过规格书规定的最大放电电流，过大的电流放电会造成电池发热和容量衰减。

10.3 discharge temperature 放电温度

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated

电池放电温度必须按照规格书的温度范围执行

10.4 Over-discharges 过放电

After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity。

短时间的的过充过放不影响电池的使用，但是长时间的过放电会影响到电池的功能失效，电池永久性不能适用，电池可能过放还有一个原因是自动能量的消失。预防电池过放的出现方法是电池应保持一定的电量。

10.5 Storing the Batteries 贮存电池。

The battery should store in the product specification book stipulation temperature range. If has surpasses above for six months the long time storage, suggested you should carry on additional charge to the battery。

电池贮存在规格书规定的温度范围内，如果电池贮存超过六个月，建议你开始给电池充电。

11. Period of Warranty 保质期

The period of warranty is one year from the date of shipment. guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customers abuse and misuse.

电池的保质期从出货之日算起为 1 年。如果证明电池的缺陷是在制造过程中形成的而不是由于用户滥用及错误使用造成，本公司负责退换电池。

12. Other The Chemical Reaction 其它化学反应

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

由于电池是利用化学反应的原理，所以随时间的增加电池的性能会降低，即使是存放很长一段时间而不使用。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，也会缩短电池的使用寿命，或者产生漏液导致设备损坏。如果电池长周期不能充电，即使充电方法正确，这样需要更换电池了。

13.Note: 备注

Any other items which are not covered in this specification shall be agreed by both parties.

本说明书未包括事项应由双方协议确定。