锂离子电芯规格书

Specification
For
Lithium-ion Rechargeable Cell

电芯型号 :INR21700PL-5000mAh

Cell Type :INR21700PL-5000mAh

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Contents 目录

1 Preface 前言

2 Definition 定义

2.1 Rated capacity 标称容量

2.2 Standard charge method 标准充电方式

2.3 Standard discharge method 标准放电方式

3 Cell type、bar code and size 电芯型号、喷码及尺寸

3.1 Description and model 电芯说明及型号

3.2 Cell bar code and explanation 电芯喷码及说明

3.3 Cell size 电芯尺寸

4 Cell specification 电芯特性

5 Technical characteristic 测试技术要求

5.1 Cell usage conditions 电芯使用环境

5.2 Cell testing conditions 电芯实验环境

5.3 Requirement of the testing equipment 测量仪表要求

6 Electronic performance 电性能

6.1 Fast charging 快速充电

6.2 Temperature Dependence of Max.ChargingCurrent 不同温度区间最大充电电流

6.3 Discharge capacity at multiple rates 倍率放电容量

6.4 High-Low temperature discharge performance 高低温放电性能

6.5 Cycle life of cells with different current charging and discharging 不同电流充放电电芯循环寿命

6.6 Storage performance 存储性能

7 Mechanical properties 机械性能

8 Safety characteristics安全性能

9 Shipping voltage standard 出货电压标准

10 Warning and cautions in handling the lithium-ion cell 电芯使用时警告事项及注意事项

11 Contact information 联系方式

12 The restriction of the use of hazardous substances 有害物质控制要求

1 Preface 前言

This specification describes the type and size, performance, technical characteristics, warning and caution of the lithium ion rechargeable cell. The specification only applies to INR21700PL-5000mAh cell supplied by He Nan Yi Chuan New Energy Technology Co., Ltd.

本标准描述了圆柱型锂离子电芯的外型尺寸、特性、技术要求及注意事项。本标准适用于河南一川新能源科技有限公司生产的圆柱型 INR21700PL-5000mAh 锂离子电芯。

2 Definition 定义

2.1 Rated capacity:

标称容量：

Rated capacity: Cap=5000mAh.Under 25±3℃, It means the capacity of discharge at 0.2C current to 2.50V termination voltage, which is signed Cap, the unit is mAh.

标称容量 Cap=5000mAh，指在 25±3℃环境下，以 0.2C 的电流放电至终止电压 2.50 V 时的容量，以 Cap 表示，单位为毫安培时(mAh)。

2.2 Standard charge method:

标准充电方式：

Under 25±3℃, it can be charged to 4.2V with constant current of 0.5C, and then, charged continuously with constant voltage of 4.2V until the charged current is 0.01C.

指在 25±3℃环境下，以 0.5C 的电流恒流充电至单体电芯电压 4.2 V 后，转为恒压 4.2 V 充电，至充电电流小于 0.01C 时，停止充电。

2.3 Standard discharge method:

标准放电方式：

Under 25±3℃, it can be discharged to the voltage of 2.50V with constant current of 0.2C.

指在 25±3℃环境下，以 0.2C 的电流恒流放电至单体电芯电压 2.50 V。

3 Cell type and size 电芯型号及尺寸

3.1 Description and model 电芯说明及型号

Description: Cylindrical Li-ion rechargeable cell

Model: INR21700PL-5000mAh

INR21700PL-5000mAh 型号的圆柱锂离子二次电芯

3.2 Cell bar code and explanation 电芯喷码及说明(可根据客户要求喷码)

Cell bar code as following:

电芯喷码大概具体如下：

Cell type 电芯型号		220Normal voltage 标称电压	Watt hour 瓦时
The name of the company 公司名称	Capacity 容量	Cell batch code 电芯批号	Serial number 流水号

备注：（可根据客户具体要求喷码）



3.3 Cell size 电芯尺寸

Cell physical dimension and Safety header structure listed in Figure 1(unit: mm).
电芯尺寸示意图如图 1 所示（单位：mm）。

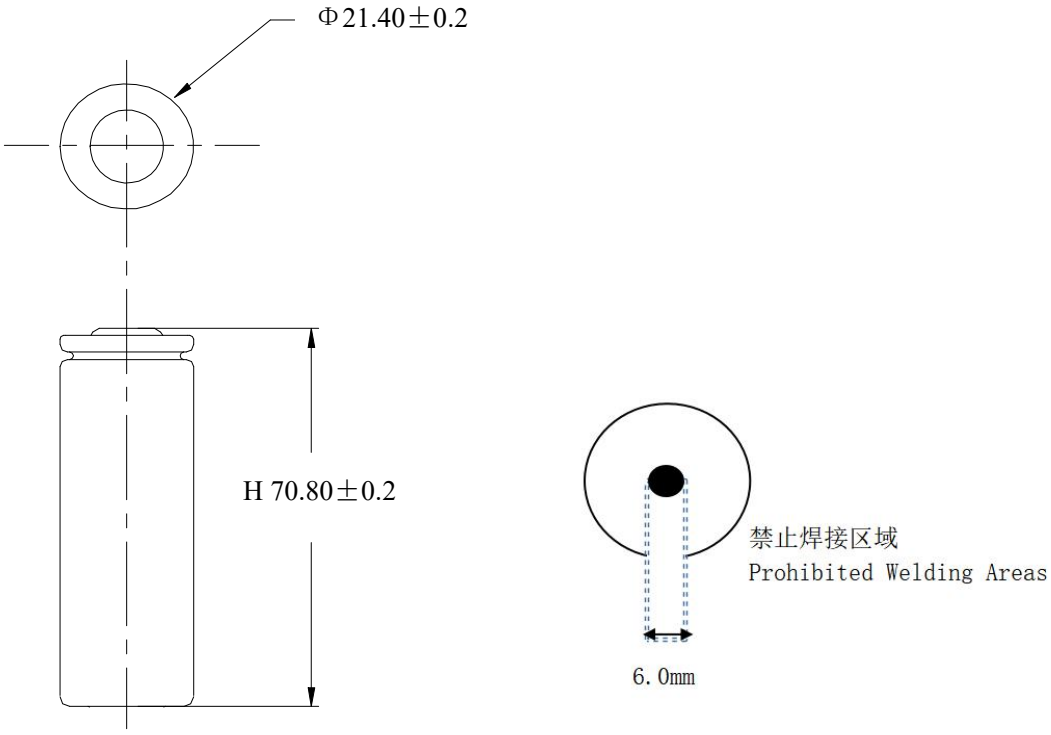


Figure 1/ 图 1

4 Cell specification 电芯特性

ITEM 项目	SPECIFICATION 特性
Normal capacity 标称容量	5000 mAh@0.2C
Minimum capacity 最小容量	4950 mAh@0.2C (Discharge the cell from 4.2V to 2.50V by 0.5C current) (电芯以 0.5C 从 4.2V 放电至 2.50V)
Normal voltage 标称电压	3.6V
Charging voltage 充电电压	4.2 ±0.05 V
Discharge ending voltage 放电终止电压	2.50±0.05 V
Standard charging current 标准充电电流	0.5C(2500 mA)
Standard discharge current 标准放电电流	0.2C(1000mA)

Max charge current 最大充电电流	3C(T≥10℃)	
Max continuous discharge current 最大持续放电电流	10C(50A) Without Temperature Cut-off	12C(60A) With 80℃Temperature Cut-off
Ambient temperature 环境温度	Charge: -10~ 50℃ Discharge: -40~ 60℃ 充电时：-10~ 50℃ 放电时：-40~60℃	
Maximum short term allowable charge and discharge cell body temperature. Charging and discharging at these conditions will shorten cell cycle life. 充放电过程中电芯表面的短时间最大温度（在这些情况下充放电将会导致电池循环寿命很快衰减）	Charge: 50℃ Discharge: 80℃ 充电时：50℃ 放电时：80℃	
Humidity range 湿度范围	0～70％RH(non-condensing 不冷凝)	
Internal resistance 内阻	≤5 mΩ(AC Impedance, 1000 Hz)	
Cell dimension 电芯尺寸	Height ： 70.80±0.2mm 高度：70.80±0.2mm Diameter ： 21.40±0.2mm 直径：21.40±0.2mm	
Weight 重量	≤ 70g	
Storage temperature 储存温度	1 months 1 个月 -20℃～60℃ 3 months 3 个月 -20℃～45℃ 12 months 12 个月 -20℃～25℃	

5 Technical characteristics 测试技术要求

5.1 Cell usage conditions 电芯使用环境

Temperature of charge 充电温度： -10～50℃

Temperature of discharge 放电温度： -40～80℃

5.2 Cell testing conditions 电芯试验环境

Unless otherwise specified, all tests stated according to following:

除非有特殊说明，所有测试的环境条件要求如下：

Temperature 温 度： 25±3℃

5.3 Requirement of the testing equipment 测量仪表要求

Voltage meter: The voltage tester internal resistance is ≥ 10 KΩ/V

电压仪表要求：测量电压的仪表内阻不小于 10KΩ/V

Temperature meter: The precision is ≤0.5℃

温度仪表要求：测量温度的仪表精度不低于 0

6 Electronic performance 电性能

NO. 序号	ITEM 测试项目	Test method and conditions 测试方法与条件	CRITERION 性能标准
6.1	Fast charging 快速充电	At a temperature of 25 ± 3℃, perform a constant current and constant voltage charging with 3C (15A) until the voltage reaches 4.2V, with a cutoff current of 50mA. 25±3℃下，3C(15A)恒流恒压充电到 4.2V，50mA 截止。	T_{Max}:50℃
6.2	Temperature Dependence of Max.ChargingCurrent 不同温度区间最大充电电流	Cell Surface Temperature Range 电芯表面温度范围 35℃≤T≤50℃ 15℃≤T＜35℃ 0℃≤T＜15℃ -10℃≤T＜0℃ -20℃≤T＜-10℃	Max. Charging Current 最大充电电流 10A 15A 5A 2.5A 2A
6.3	Dischargerate capability 倍率放电性能	(1) Charge: At 25± 3℃, 1Cconstant current charge to 4.2 V followed by 4.2V constant voltage charge to cut-off current 0.01C; (2) Discharge: Perform constant current discharge at currents of 1A, 10A, 20A, 30A, 40A, 50A, 60A, etc. until the voltage reaches 2.50V or the temperature reaches 80℃. (1) 充电：在 25± 3℃下，以 1C 恒流充电至 4.2 V 后，以 4.2V 恒压充电至截止电流 0.01C； (2) 放电:以 1A, 10A, 20A,, 30A, 40A, 50A,, 60A 的电流恒流放电至 2.50V 或者 80℃截止。	Cap(10A)/Cap(1A)≥97% Cap(20A)/Cap(1A)≥96% Cap(30A)/Cap(1A)≥95% Cap(40A)/Cap(1A)≥95% Cap(50A)/Cap(1A)≥90% Cap(60A)/Cap(1A)≥60%
6.4	High-Low temperature discharge performance 高低温放电性能	(1) Charge: At 25± 3℃,1Cconstant current charge to 4.2 V followed by 4.2V constant voltage charge to cut-off current 0.01C; (2) The sample was kept at constant temperature of -20℃/-10℃/0℃/25℃/45℃ for 4 hours, and then discharged at a constant current of 40A until it reached 2.5V or 80℃, with the discharge capacity at 40A at 25±3℃ serving as the 100% reference. (1) 充电：25±3℃下，以 1C 恒流充电至 4.2 V 后，以 4.2V 恒压充电至截止电流 0.01C； (2) 放电：在-20℃/-10℃/0℃/25℃/45℃的条件下恒温 4h，然后以 40A 电流恒流放电至 2.5V 或者 80℃截止，以 25±3℃下 40A 放电容量作为 100%基准。	Cap(-20℃)/Cap(25℃)≥80% Cap(-10℃)/Cap(25℃)≥90% Cap(0℃)/Cap(25℃)≥95% Cap(25℃)/Cap(25℃)=100% Cap(45℃)/Cap(25℃)=85%

6.5	Cycle life 循环寿命	(1) Charge: At 25± 3℃,8Aconstant current charge to 4.2 V followed by 4.2V constant voltage charge to cut-off current 0.01C,rest for10 minutes; (2) Discharge: discharged to the voltage of 3.0V with constant current of 10A, rest for 10 minutes.Capacity less than 80% of the initial capacity, cycle test ends) (1) 充电：在 25± 3℃下，以 8A 恒流充电至 4.2 V 后，以 4.2V 恒压充电至截止电流 0.01C ，搁置 10min; (2) 放电:以 10A 的电流恒流放电至 3.0 V。搁置 10min，重复循环工步。(容量低于初始容量 80%，循环测试结束）	8A/10A Cap(1000th)/Cap(Initial capacity)≥80% 1000 次容量≥初始容量 80%
		(1) Charge: At 25± 3℃, 8Aconstant current charge to 4.2 V followed by 4.2V constant voltage charge to cut-off current 0.01C,rest for10 minutes; (2) Discharge: discharged to the voltage of 2.50V with constant current of 40A,(When the surface temperature of the cell reaches 75 ℃, the discharge terminates, a cycle is completed, and the cycle step is repeated for 40 minutes. Capacity less than 60% of the initial capacity, cycle test ends) (1) 充电：在 25± 3℃下，以 8A 恒流充电至 4.2 V 后，以 4.2V 恒压充电至截止电流 0.01C ，搁置 10min; (2) 放电:以 40A 的电流恒流放电至 2.50 V。（电芯表面温度达到 75℃时，放电终止，完成一个循环，搁置 40min，重复循环工步。容量低于初始容量 60%，循环测试结束）	8A/40A Cap(500th)/Cap(Initial capacity) ≥60% 500 次容量≥初始容量 60%
		(1) Charge: At 25± 3℃, 3Cconstant current charge to 4.2 V followed by 4.2V constant voltage charge to cut-off current 0.01C,rest for20 minutes; (2) Discharge: discharged to the voltage of 2.50V with constant current of 30A,(When the surface temperature of the cell reaches 75 ℃, the discharge terminates, a cycle is completed, and the cycle step is repeated for 40 minutes. Capacity less than 60% of the initial capacity, cycle test ends) (1) 充电：在 25± 3℃下，以 3C 恒流充电至 4.2 V 后，以 4.2V 恒压充电至截止电流 0.01C ，搁置 20min; (2) 放电:以 30A 的电流恒流放电至 2.50 V。（电芯表面温度达到 75℃时，放电终止，完成一个循环，搁置 40min，重复循环工步。容量低于初始容量 60%，循环测试结束）	3C/30A Cap(300th)/Cap(Initial capacity) ≥60% 300 次容量≥初始容量 60%
6.6	Storage performance 存储性能	Measure the initial state and initial capacity of the battery, after the battery is charged at 0.5C,Open the circuit for 30 days to measure the final state of the battery; Discharge at 0.5C to 2.50V to measure the remaining capacity of the battery; 0.5C/0.5C Measure the recovery capacity of the cell and cycle twice. 测量电池的初始状态和初始容量，电池 0.5C 充电后， 开路放置 30 天，测量电池最终状态；以 0.5C 放电 至 2.50V，测量电池的剩余容量； 0.5C/0.5C 测量电 池的恢复容量，循环两次。	Residual capacity / Original discharge capacity ≥90% Recover capacity / Original discharge capacity ≥95%

7 Mechanical properties 机械性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
7.1	Vibration 振动性能	There shall be no electrolyte leakage 电解液无泄漏	After standard fully charge, cell shall be attached to a vibration table directly and subjected to vibration that consists of 10 Hz to 55 Hz to 10 Hz at the speed of 1Hz/min in 90~100mins.The total excursion of the vibration is 0.8mm(0.060 inches). The cell shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder. 将满电电芯放在振动实验台上，在 90~100mins 由 10 Hz 到 55 Hz 再到 10Hz 以 1Hz/min 的速率变化，振幅为 0.8mm(0.060 英寸)进行振动实验。电芯在电芯的轴向和与电芯轴向垂直的两个方向上振动。
7.2	Drop test 跌落测试	No fire、No explode 电芯不起火、不爆炸	The cell was placed at a height of 1.2m and freely dropped to the cement floor. The positive and negative end faces of the battery were dropped once respectively, and the cylinder face was dropped once, for a total of three times 将电芯放置于 1.2m 的高度处自由跌路到水泥地面，电池的正、负极端面各跌落一次，圆柱面跌落一次，共进行 3 次跌落
7.3	Crush test 挤压测试	No fire、No explode 电芯不起火、不爆炸	After charging a cell following the standard charge method, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is to be applied by a hydraulic ram with a 32mm diameter piston. Crushing force is approximately 13 KN. Once the maximum pressure has been obtained it is to be released. 电芯按照标准充电方式充满电后，放在两个平整的表面进行挤压测试，压力器必须施加一个与圆柱电芯轴向垂直的力，平压于电芯。采用 32 mm 直径的液压活塞，所用压力为 13 KN，一旦达到最大压力值，即释放压力。

8 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
8.1	Overcharge test 过充测试	No fire、No explode 电芯不起火、不爆炸	After charging according to the standard procedure, leave it for 10 minutes; then charge at 3C until the voltage reaches 10V. (Or charge at 3C for 90 minutes). 按标准充电后，搁置 10mins；3C 恒流充电至电压 10V。 （或 3C 充电 90mins）
8.2	Forced discharge test 强制放电测试	No fire、No explode 电芯不起火、不爆炸	The battery cell is discharged in accordance with the standard discharge mode, and then charged with 1C current for 90 minutes.电芯按照标准放电方式放电后，然后用 1C 电流反向充电 90min。

8.3	130℃Chot oven test 130℃热箱测试	No fire、No explode 电芯不起火、不爆炸	The cell is charged following the standard charge method. After charging the cell is put in the oven. And then the oven temperature will be ramped at 5℃ per minute to 130℃ and held at 130℃. When the temperature of the cell reach 130℃, the cell is maintained in the 130℃ oven for a maximum of 60 minutes or until a fire or explosion is obtained, whichever comes first. Record the time that the cell temperature reaches 130℃ and the time when a fire or explosion occurs. 电芯按照标准充电方式充满电后，将电芯放进热箱里，然后将热箱按5℃/min 升温到 130℃，当电芯的温度也达到 130℃时，电芯在热箱130℃环境下保持 60 分钟或者电芯起火爆炸为止。记录电芯温度升至130℃起直到电芯起火或爆炸的时间。
8.4	Short circuit test 短路测试	No fire、No explode 电芯不起火、不爆炸	After the battery cell is fully charged according to the standard charging method, the short-circuit experiment is carried out at room temperature, the battery cell connected with the thermocouple is placed in the ventilator, and the positive and negative terminals are shorted with copper wire (the total resistance of the line is not more than 50 milliohm). The temperature change of the battery cell is monitored during the experiment. When the temperature of the battery cell drops to 10℃ lower than the peak value, the experiment is ended. 电芯按照标准充电方式充满电后，在室温进行短路实验，将接有热电偶的电芯置于通风橱中，用铜线短路其正负极(线路总电阻不大于 50 毫欧)，实验过程中监视电芯温度变化，当电芯温度下降到比峰值低10℃时，结束实验。
8.5	Short circuit test at 55±5℃ 55±5℃短路测试	No fire、No explode 电芯不起火、不爆炸	After the battery cell is fully charged in accordance with the standard charging method, the short-circuit experiment is carried out at 55±5℃, the battery cell connected with the thermocouple is placed in the ventilator, and the positive and negative electrodes are short-circuit with copper wire (the total resistance of the line is not more than 50 milliohm). The temperature change of the battery cell is monitored during the experiment. When the temperature of the battery cell drops to 10℃ lower than the peak value, the experiment is ended. 电芯按照标准充电方式充满电后，在 55±5℃进行短路实验，将接有热电偶的电芯置于通风橱中，用铜线短路其正负极(线路总电阻不大于 50 毫欧)，实验过程中监视电芯温度变化，当电芯温度下降到比峰值低 10℃时，结束实验。

8.6	Thermal cycling performance 热循环性能	No fire, no explosion, no leak 不起火、不爆炸、不漏液	After standard battery charging, the battery was placed in an open circuit at an ambient temperature of 75±2 ° C for 48 hours, then in an open circuit at -20 ° C for 6 hours, and then in an open circuit at room temperature for 24 hours. 电池标准充电后，在环境温度为 75±2℃的条件下开路 放置 48h,后在-20 ℃条件下开路放置 6h，后在室温条件 下开路放置24h, 观察电池外观变化。
Note 备注	All above safety tests will be conducted at 25℃±3℃ except where specified differently. Use proper ventilation with protective equipment. 除特殊说明，以上所有安全测试均应在 25℃±3℃通风橱中，且附带有保护装置的条件下进行。		

9 Shipping voltage standard 出货电压标准

The cell shall be shipped in voltage range of 3.55 ~ 3.65V or in accordance with customers' requirement. The remaining capacity before charging shall be changed depending on the storage time and conditions.
单体电池按 3.55 ~ 3.65 V 的充电电压或客户要求出货，电池出货后充电前的剩余容量取决于储存时间和条件

10 Warning and cautions in handling the lithium-ion cell
电芯使用时警告事项及注意事项

To prevent the possibility of the cell from leaking, heating, explosion, please observe the following precautions:
为防止电芯可能发生泄露，发热，爆炸，请注意以下预防措施：

- Don't immerse the cell in water.
- 严禁将电芯浸入水中，保存不用时，应放置在阴凉干燥的环境中。
- Don't use and leave the cell near a heat source such as fire or heater.
- 禁止将电芯在热高温源旁，如火，加热器等旁边使用和留置。
- When charging, use a cell charger specifically for that purpose.
- 充电时请选用锂离子电芯专用充电器。
- Don't reverse the positive and negative terminals.
- 严禁颠倒正负极后使用电芯。
- Don't connect the cell to an electrical outlet directly.
- 严禁将电芯直接插入电源插座。
- Don't discard the cell in fire or heater.
- 禁止将电芯丢入火或加热器中。
- Don't connect the positive and negative terminal directly with metal objects.

- 禁止用金属直接连接电芯正负极，造成短路。
- Don’t transport and store the cell together with metal objects such as necklaces, hairpins.
- 禁止将电芯与金属，如发卡、项链等一起运输或存储。
- Don’t strike, throw or trample the cell.
- 禁止敲击，抛掷或踩踏电芯等。
- Don’t directly solder the cell.
- 禁止直接焊接电芯。
- Don’t pierce the cell with a nail or other sharp object.
- 禁止用钉子或其它利器刺穿电芯。

Caution 小心

- Don’t use or leave the cell at very high temperature conditions (for example, strong direct sunlight or a vehicle in extremely hot conditions).
- 禁止在高温下（直热的阳光下或很热的汽车中）使用或放置电芯，否则可能会引起电芯过热，起火或功能失效，寿命减短。
- If the cell leaks and the electrolyte get into your eyes, don’t wipe eyes, instead, thoroughly rinse the eyes with clean running water for at least 15 minutes, and immediately seek medical attention. Otherwise, eyes injury can result.
- 如果电芯发生泄露，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 cell gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during usage, recharging or storage, immediately remove it from the device or cell charger and stop using it.
- 如果电芯发出异味，发热，变色，变形或使用、存储、充电过程中出现任何异常现象，立即将电芯从装置或充电器中移开并停用。
- In case the cell terminals get dirty, clean the terminals with a dry cloth before use.
- 如果电芯弄脏，使用前应用干布抹净。

11 Contact information 联系方式

If you have any questions regarding the cell, please contact the following address:

如有疑问，请按以下地址联系：

厂址：河南省商丘市虞城县高新区（江浙大道东段南侧）21 号 河南一川新能源科技有限公司

12 The restriction of the use of hazardous substances 有害物质控制要求

This model of lithium-ion cell is in accordance with our company's request of "environmental substances control standard".

本型号锂离子电芯符合本公司“环境物质控制标准”要求！