

CUSTOMER NO: _____

Specification Approval Sheet

规格确认书

MODEL/型号: INR21700-5000Q

(5000mAh 3.6V)

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Customer Approval 客户确认	Signature/签 字	Date/日 期
	Company Name/公司名称	
	Company Stamp/公司印章	

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1 Scope/适用范围

This specification is applies to describe the related Battery product in this Specification and the Battery/cell supplied by Amprius Energy Co., Ltd.

本说明书适用于描述本规格书中相关的产品以及矽谷能源（南京）有限公司提供的电池。

2 Model/型号: INR21700-5000Q

3 Cell Specification/电芯产品规格

No.	Items/项目	Specifications/规格		Remark 备注
1	Nominal capacity 标称容量	5000mAh		0.2C Standard discharge 0.2C 标准放电
2	Minimum capacity 最小容量	4950mAh		
3	Nominal voltage 标称电压	3.6V		Mean operation voltage 即工作电压
4	Delivery Voltage 交货电压	3.2~3.4V		Within 10 days from Factory 在出厂 10 天内
5	Limited Charge Voltage 充电限制电压	4.20V		By standard charge method 标准充电方式
6	Discharge cut-off voltage 放电截止电压	2.50V		By standard discharge method 标准放电方式
7	Standard charge method 标准充电方式	CC-CV, 5A, 4.2V, 100mA cut-off		5A 恒流充电至 4.2V 4.2V 恒压充电至电流≤100mA 截止
8	Standard discharge method 标准放电方式	CC, 5A, 2.5V		5A CC to 2.5V 5A 恒流放电至 2.5V
9	Maximum charge current 最大充电持续电流	2C	10A	Charging time: 60 min (Ref) 时间约 60 min(供参考)
10	Maximum discharge current 最大放电持续电流	50A (@RT)		截止电压 2.5V(End of discharge) 适用于循环
11	Maximum discharge current 最大放电持续电流	125A @ 75°C温度截止 (With 75°C temperature cut)		Not for cycle 不适用于循环
12	Pulse discharge 脉冲放电电流	180A discharge 2s 180A 放电 2s		/

PRODUCT SPECIFICATION

No.	Items/项目	Specifications/规格		Remark 备注
13	Initial internal impedance 单电芯交流内阻	<5mΩ		Internal impedance measured at AC 1kHz after standard charged at 30%SOC 标准充电后在 30%SOC 交流法测量内阻
14	DCIR 单电芯直流内阻	<20mΩ(25℃) <100mΩ(-20℃)		Discharge:10A/10sec→2A/10sec→10A/4sec, measure the voltage at 18sec and 23sec as V1 and V2, DCIR=(V1-V2)/(10-2) 放电：10A放电10秒，然后2A放电10秒，接着10A放电4秒，测试第18秒的V1和23秒的V2, DCIR=(V1-V2)/(10-2)
15	Weight 重量	70.0±2.0g		
16	Operation temperature (Cell surface temperature) 适用温度 (电芯表面温度)	Charge/充电	0~60℃ 60±25%R.H.	Charge below 0℃ will get a lower capacity and reduce cycle life of the cell 低于 0℃ 的充电效率会下降，会影响电池使用寿命
		Discharge/放电	-40~80℃ 60±25%R.H.	Similarly, temperature above 45℃ will also reduce cycle life of the battery. 同样，高于 45℃，也会降低电池循环寿命
17	Storage temperature for a long time 长时间储存温度	≤6 个月 ≤ 6 months		-20~25℃ 60±25%R.H.
		≤3 个月 ≤ 3 months		-20~45℃ 60±25%R.H.
		≤1 个月 ≤ 1 month		-20~60℃ 60±25%R.H.
18	Voltage range of the battery for pre-charge mode is 1.0~ 3.0V with a charging current of 0.1-0.5C 预充电模式电池电压范围为 1.0~3.0V，充电电流为 0.1-0.5C			

4 Battery/Cell Performance Test Criteria/电池性能标准

4.1 Visual Appearance Inspection/外观目测

There shall be no such defects as scratch, rust, discoloration, leakage, which may adversely affect commercial value of the cell.

电池外观应没有划伤、锈渍、褪色、漏液等影响电池商业价值的缺陷。

4.2 Environmental Conditions/外界环境条件

Unless otherwise specified, all tests stated in this specification are conducted at below test conditions

所有测试应按以下环境条件进行，除特殊指定外。

Temperature: $25\pm 5^{\circ}\text{C}$

Relative Humidity: $60\%\pm 25\%$

4.3 Electrical Characteristics/电气特性

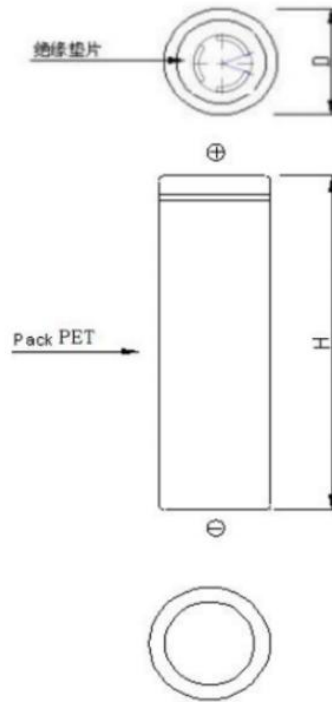
No	Items/项目	Conditions				Remark/备注	
1	Temperature dependence of discharge capacity 不同温度下的放电容量	Capacity comparison at each temperature, measured with discharge constant current 2.5A and 2.5V cut-off after rated charge is as follows 不同温度下的放电容量对比 测试条件：标准充电后，2.5A 放电，2.5V 截止 (-40℃下放电截止电压需设置为 2.0V, The cut-off voltage for discharge at -40℃ should be set to 2.0V)				If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours Percentage as an index of the Rated discharge capacity at 25±5℃ is 100% 如果充电温度与放电温度不同，变温间隔要大于 3 小时； 以 25±5℃度下的放电容量做为基准；	
Discharge temperature (℃)							
-40		-20		0	25	60	
70%		80%		90%	100%	100%	
2	Discharge rate capabilities 倍率放电能力		5A CC-CV charge, ≤100mA cut off, discharge to 2.5V or 75℃ cut-off by different current at R.T. 5A 恒流恒压充电，≤100mA 截止，在 R.T.下通过不同电流放电至 2.5V 或 75℃截止。			Based on the 2A discharge capacity at 25±5℃，以25±5℃度下1A的放电容量做为基准	
	Current	1A	20A	30A	40A	50A	
	Rate	0.2C	4C	6C	8C	10C	
	Relative capacity	100%	97%	97%	95%	90%	
3	High temperature storage characteristics 高温存储特性	Capacity after storage for 7 days at 60℃ from the rated charge, measured with discharge current 5A with 2.5V cut-off at 25±5℃ 充电后，60℃下存储 30 天，然后在 25±5℃条件下以 5A 放电到 2.5V 截止				Capacity recovery (after the storage)≥4500mAh (90% of the rated capacity at 25±5℃) 容量恢复率≥90%	
4	Cycle life 循环寿命	Charge at 5A CC to 4.2V and then CV to ≤100mA.Wait 10 min Discharge at 50A CC to 2.5V or 75℃，wait 30 min 5A 恒流恒压充电到 4.2V，≤100mA 截止，搁置 10min； 50A 恒流放电到 2.5V 或者 75℃截止，搁置 30min；				300 cycles capacity ≥70%;	

4.4 Safety Performance/安全性能

No	Items/项目	Test Method and Condition/测试方法及条件	Criteria/标准
1	Forced discharge test 过放电测试	A discharged cell is subjected to a reverse charge at 1C(5A) for 90 min 将放电后的电芯以1C(5A)的电流反向充电90 min。	No explosion ,no fire 无爆炸，无起火
2	Over charge test 过充电测试	After standard charged, the cell is then to be charged with a constant current of 3C until the voltage reaches 10.0V or the charge time is over 1h 电芯在标准满充后，以 3C 电流恒流充电至 10.0V 或充电时间达 1 小时后停止充电。	No explosion, No fire 无爆炸，无起火
3	External short-circuit test 外部短路测试	After fully charged, the cell is to be short-circuited by connecting the positive and negative terminals of the cell for 10min with a circuit load having a resistance of 5/10/20/80mΩ, then observe for 1h. 电芯在满充后，正负极经外部短路 10min，外部线路电阻为 5/10/20/80mΩ，观察 1h。	No explosion, No fire 无爆炸，无起火
4	Drop test 自由跌落测试	Fully rated charged Cells drop onto the concrete floor from 1.0m height at a random direction. After the test, the sample shall be put on rest for a minimum of one hour and then a visual inspection shall be performed. 电芯在满充后，以任意方向从1.0m高度处自由跌落到水泥地面上，然后将电池静置至少 1h 后观测电芯。	No explosion ,no fire 无爆炸，无起火

No	Items/项目	Test Method and Condition/测试方法及条件	Criteria/标准
5	Heating test 高温热冲击测试	To heat up the standard charged cell at heating rate 5°C per minute up to 130°C and keep the cell in oven for 30 min.. 充满电的电池温度稳定到常温后，放置入循环空气烘箱里，从常温以5°C/分的速率升至130°C后，在130°C放置30分钟后，停止加热，观察1h。	No explosion, No fire 无爆炸，无起火
6	Crush test 挤压测试	After standard charged, the battery is to be crushed between two flat surfaces. The force is to be applied by a hydraulic ram with a 32mm diameter piston. The crush is to be continued until the applied force reaches to 13 KN. Once the maximum pressure has been obtained, it is to be released. 电芯在标准满充后，放置在两块挤压板间。压缩力通过一个直径为32mm的液压活塞施加，挤压持续进行直至施加的压力达到13 KN，当压力达到最大压力后泄压。	No explosion, No fire 无爆炸，无起火

5 Initial Cell Dimensions/电芯初始尺寸



With PET

NO	Items	Units: mm
1	diameter/直径(D)	21.70±0.2
2	Height/高度(H)	70.80±0.3

6 Cautions in Use(使用注意事项)

To ensure proper use of the battery, please read the manual carefully before using it. (为确保正确使用电池, 使用前请仔细阅读本细则)

- 7.1 Do not close and expose the battery to fire. (不要靠近和放置电池于火中)
- 7.2 Do not put the battery in a charger or equipment with wrong terminals connected. (在充电器或设备仪器中不要把电池接错电极)
- 7.3 Avoid shorting the battery (避免电池短路)
- 7.4 Avoid excessive physical shock or vibration. (避免电池过多的物理撞击和震动)
- 7.5 Do not disassemble or deform the battery. (不要解剖和使电池变形)
- 7.6 Do not immerse in water. (不要把电池浸泡在水中)
- 7.7 Do not use the battery mixed with other different make, type, or model batteries. (不要和其它不同类型的电池混和使用)
- 7.8 Keep out of the reach of children. (放置电池于儿童不易接触的地方)
- 7.9 Battery must be charged in appropriate charger only. (电池必须用适当的充电器充电)
- 7.10 Never use a modified or damaged charger. (不要使用改装或损坏的充电器)
- 7.11 Do not leave battery in charger over 24 hours. (不要把电池放置于充电器超过 24h)
- 7.12 Storage(储存): Store the battery in a cool, dry and well-ventilated area. (应把电池置于凉爽、干燥及通风良好的区域)
- 7.13 Dispose of batteries in accordance with local regulations. (电池处理要符合当地的规定)

7 Warranty Period /质保期

The **Warranty Period** is one year from the date of shipment. Amprius guarantees to give a replacement proven in case of cells with defects due to manufacturing process instead of the customer abuse and misuse.

电池的质保期从出货之日算起为一年。如果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。

8 Batteries Storage /电池存储

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that batteries be charged about once per half a year to prevent over discharge.

电池应当在室温下存放, 应充到 30%至 50%的电量。如长时间储存, 建议每半年充一次电以防止电池过放电。

9 The Other 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 expected life of battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot be charged for a 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, 会使缩短电池的使用寿命, 或者会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。

10 Note /注释

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。