

受控 07

HIGHTAR

**PRODUCT
SPECIFICATION**

DOC NO.: NaCR46145-20ER
SHEET : 1 OF 23
ECN NO.: Q/KAGG1492-2023

Specitification Approval Sheet(Cell)

产品规格确认书（电芯）

Model: NaCR46145-20ER

型号: NaCR46145-20ER

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	Company Stamp:	



PRODUCT SPECIFICATION

DOC NO.: NaCR46145-20ER

SHEET : 2 OF 23

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AMENDMENT RECORDS

(规格变更记录)

[illegible]



PRODUCT SPECIFICATION

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SHEET : 3 OF 23
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1 Scope

适用范围

This document describes the Product Specification of the Sodium-ion rechargeable cells supplied by JiangSu Highstar Battery Manufacturing ,LTD.

本规格书描述了江苏海四达电源有限公司生产的可充电钠离子电芯的产品性能指标。

2 Model: NaCR46145-20ER

型号: NaCR46145-20ER

3 Specification

产品规格

No.	Items (项目)	Specifications (规格)
1	Limited Charge Voltage 充电限制电压	4.0V
2	Nominal Voltage 标称电压	3.0V
3	Rated Capacity 额定容量(0.2C)	20Ah
4	Standard Charging Current 标准充电电流	10A
5	Max. charge current 允许最大充电电流	20A
6	Standard Discharging Current 标准放电电流	10A
7	Max Discharge Current 最大放电电流	Under the conditions of 25℃±2℃, Discharging at 100A at 100% SOC 在25℃±2℃条件下, 100%SOC状态下, 100A放电
8	Discharge End Voltage 放电终止电压	1.5V
9	Operating Temperature (Cell Surface temperature) 工作温度 (电芯表面温度)	Charging :0℃-55℃, 65%±20%RH 充电: 0℃-55℃, 65%±20%RH
		discharging : -40℃-60℃, 65%±20%RH 放电: -40℃-60℃, 65%±20%RH
10	Storage Temperature 存储温度	15℃-35℃
11	Cell Weight 电芯重量	485g±5g
12	AC Impedance 交流内阻	≤2mΩ
13	Cell Dimension(for shipping state) 电芯尺寸	长度: 159mm±0.5mm 肩高: 146.5±0.1mm 直径: 46.7±0.3 mm

4 Performance Specification

性能指标

4.1 Standard test conditions

标准测试条件

Unless otherwise specified, all tests stated in this Product Specification are conducted at below conditions:

Temperature : 25℃±2 ℃

Relative Humidity : 65%±20%

Atmospheric Pressure: 86kPa~106kPa

除非特别说明，本规格书中所有测试均在以下环境条件下进行：

温度： 25℃±2℃

标准湿度： 65%± 20%

大气压力： 86kPa~106kPa

4.2 Electrical characteristics

电性能

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
1	Standard Charging Method 标准充电	Charging the cell with constant current at 10A and then with constant voltage at 4.0V till charge current declines to ≤1A. 10A恒流充电至4.0V，再恒压4.0V充电直至充电电流≤1A。	Limited Charge Voltage=4.0V Charge Current =10A 充电限制电压=4.0V 充电电流=10A
2	Rapid Charging Method 快速充电	Charging the cell with constant current at 20A and then with constant voltage at 4.0V till charge current declines to ≤1A. 20A恒流充电至4.0V，再恒压 4.0V充电直至充电电流≤1A。	Limited Charge Voltage = 4.0V Charge Current =20A 充电限制电压=4.0V 充电电流=20A
3	Standard Discharge condition 标准放电	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.5C with 1.5V cut-off voltage after standard charge. 该容量是指标准充电后，0.5C放电至1.5V。	Discharge Voltage =1.5V Discharge RCurrent =0.5C 放电限制电压=1.5V 放电电流=10A
4	Initial Impedance 初始内阻	Internal resistance measured at AC 1KHz within 1 hour after standard charge . 将电池按标准充电方法充电后，在1h内测量其AC 1KHz下的交流阻抗。	≤2mΩ
5	Cell Voltage 电池电压	Cell state upon shipment 出货状态	2.5-3.0V

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
6	Capacity 容量	(1)Prior to charging, the cell shall be discharged at a constant current of 0.5C down to the cutoff discharge voltage 1.5V, rest for 10 minutes. 充电前, 电池以0.5C的恒流放电至截止电压1.5V, 休息10分钟。 (2)The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.2C with 1.5V cut-off voltage after standard charge. 该容量是指标准充电后, 0.2C放电至1.5V的容量。 (3)If the discharge capacity fails to meet the standard requirements, this test is allowed to be repeated 3 times. 如果放电容量达不到标准要求,此项测试允许重复3次。	$\geq 20\text{Ah}$
7	Rate Discharge Performance 倍率放电性能	(1)Prior to charging,the cell shall be discharged at a constant current of 0.5C down to cutoff discharge voltage 1.5V,rest for 10 minutes. 充电前, 电池应以0.5C的恒流放电至截止电压1.5V, 休息10分钟。 (2)0.5C CC to 4.0V,and CV to 0.05C cut off, rest for 10 minutes. 0.5C恒流充电至4.0V, 再4.0V恒压充电至电流小于0.05C, 搁置10分钟 (3) The capacity means the discharge capacity of the cell, which is measured with discharge current of 1C with 1.5V cut-off voltage. 以1C放电至1.5V。	Discharge capacity rate $\geq 98\%$ $\geq 98\%$ 标称容量
8	Low Temperature Performance 低温性能	(1)The cell shall be charged in accordance with the standard charge. 电池按标准充电方法充电后。 (2) The cell shall be stored in the temperature of $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 4h. 放入 $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 低温箱中恒温4小时。 (3)Discharge at the constant current of 1C down to the end-of-discharge voltage 1.5V. 在此条件下1C放电至1.5V。	discharge capacity $\geq 80\%$ Nominal capacity 放电容量 $\geq 80\%$ 标称容量

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
9	High Temperature Performance 高温性能	<p>(1)The cell shall be charged in accordance with the standard charge. 按标准充电方法充电后。</p> <p>(2) The cell shall be stored in the temperature of $55^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 4h. 放入$55^{\circ}\text{C}\pm 2^{\circ}\text{C}$高温箱中恒温4小时。</p> <p>(3)Discharge at the constant current of 1C down to the end-of-discharge voltage 1.5V. 以1C电流放电，直到放电终止电压1.5V</p>	<p>discharge capacity\geq95% Nominal capacity 放电容量\geq95%标称容量</p>
10	Charge Retention and Recovery at Room Temperature 常温荷电保持与容量恢复能力	<p>After the cell is fully charged according to the standard method, it is stored at $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 30 days, and then discharged at 0.5C at $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ until the discharge termination voltage is 1.5V. This discharge capacity is maintained by charge. After the cell is recharged, the cell is discharged at a current of 0.5C at $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ until the discharge termination voltage is 1.5V. This discharge capacity is restored by the charge.</p> <p>电池按标准方法充满电后，在$25^{\circ}\text{C}\pm 2^{\circ}\text{C}$下储存30天后，在$25^{\circ}\text{C}\pm 2^{\circ}\text{C}$下以0.5C电流放电，直到放电终止电压1.5V，此放电容量为荷电保持。电池再充电后在$25^{\circ}\text{C}\pm 2^{\circ}\text{C}$下以0.5C电流放电，直到放电终止电压1.5V，此放电容量为荷电恢复。</p>	<p>Capacity Retention\geq90% Nominal capacity 荷电保持\geq90%标称容量 Capacity Recovery\geq95% Nominal capacity 荷电恢复\geq95%标称容量</p>
11	Standard Cycle Life 标准循环寿命	<p>Temperature : $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ Relative Humidity : $65\%\pm 20\%$ Charge:Charging the cell with constant current at 0.5C and then with constant voltage at 3.9V till charge current declines to $\leq 0.05\text{C}$, rest for 30mins. Discharge:0.5C discharge to 1.8V, one cycle is finished, then rest for 30mins. Then repeat above steps,when capacity is less than 80% of nominal capacity,the cell life is over.</p> <p>温度: $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ 湿度: $65\%\pm 20\%$ 充电: 0.5C 恒流恒压充电至 3.9V，截止电流 0.05C，充完后搁置 30分钟，放电: 0.5C 放电到 1.8V，完成一个循环，搁置30分钟。重复上述步骤。当放电容量小于80%标称容量，寿命终止。</p>	<p>2000cls capacity remaining rate $\geq 80\%$ 2000周容量保持率$\geq 80\%$</p>

4.3 Safety Performance

安全性能

4.3.1 Cell Safety Tests

电芯安全试验

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
1	Overcharge Test 过充试验	After standard discharge, the cell shall be charged at 1C with cutoff voltage 5V or charging time reached 90min, Observe 1h (one of the conditions is preferred to stop test). 电池放电后, 以1C电流充电, 至电池电压达到5V或充电时间达到90分钟, 观察1小时 (其中一个条件优先达到即停止试验)。	No Fire, No Explosion. 不起火, 不爆炸
2	Low Pressure Test 低气压试验	The full charged cells are to be stored for at least 6h at an vacuum environment with pressure of less than 11.6kPa, and temperature of 25℃±2℃. 在25℃±2℃的环境温度下, 将充满电的电池在大气压≤11.6 kPa的真空环境中储存至少6小时。	No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. 电池应不起火, 不爆炸, 每个电池试验后的开路电压不小于其在进行测试前电压的90%。
3	Heating Test 加热试验	The cells are fully charged with standard charging method, and put into oven with nature air or cycled air convected, heat cell by velocity of 5℃/min ±2℃/min to 130℃±2℃, and maintain for 30 minutes. 电池按标准充满电后放于自然或循环空气对流的恒温箱中, 温度以5℃/分钟±2℃/分钟的速率升至130℃±2℃并保持30分钟。	No Fire, No Explosion. 不起火, 不爆炸

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
4	Temperature Cycling Test 温度循环试验	<p>The fully charged cells are placed in a test chamber and subjected to the following cycles:</p> <p>a) Raising the temperature to $75^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and maintaining this temperature for at least 6 hours.</p> <p>b) Reducing the temperature to $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ within 30 minutes and maintaining this temperature for at least 6 hours. c) Repeating the sequence for a further 9 cycles. d) After the 10th cycle, storing the cells for 24 hours prior to examination, in the temperature of $20 \pm 5^{\circ}\text{C}$.</p> <p>充满电的电池：$75^{\circ}\text{C} \pm 2^{\circ}\text{C}$搁置至少6小时；$-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$搁置至少6小时，两个极端温度之间最大间隔时间为30分钟。循环10次后将电池于$20 \pm 5^{\circ}\text{C}$下搁置24小时进行检测。</p>	No Fire, No Explosion. 不起火，不爆炸
5	External Short Test 外部短路试验	<p>The fully charged cells are placed in a test chamber and subjected to the following cycles:</p> <p>short the positive and negative terminals with wire resistance of $80\text{m}\Omega \pm 20\text{m}\Omega$. Tests are to be conducted at standard test conditions, keep 24h or surface temperature decline to 20% of max. temperature, test is end.</p> <p>充满电的电池置于标准测试环境下，用外部电阻为$80\text{m}\Omega \pm 20\text{m}\Omega$的导线将每支电池短路。持续24小时或外壳温度下降至最高温度的20%时，结束试验。</p>	No Fire, No Explosion. The surface temperature of samples shall not exceeding 150°C . 电池应不起火、不爆炸，电池外部温度不超过 150°C 。
6	Forced Discharge Test 强制放电试验	<p>The cell is discharged with standard discharging method.</p> <p>Inverse charge current = 20A; time: $\geq 90\text{minutes}$</p> <p>按标准放电要求对电池放电，以20A反向充电，充电时间不低于90分钟。</p>	No Fire, No Explosion. 不起火，不爆炸

4.3.2 Mechanical Tests

机械试验

No.	Items (项目)	Test Methods and Conditions (测试方法和条件)	Criteria (标准)
1	Shock Test 冲击测试	<p>The full charged cell is fixed on shock table. Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.</p> <p>将充满电的单体电池固定在夹具上，每个电池须经受最大加速度150gn和脉冲持续时间6毫秒的半正弦波冲击。每个电池须在三个互相垂直的电池或电池组安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。</p>	<p>No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.</p> <p>电池应不起火，不爆炸，每个电池试验后的开路电压不小于其在进行测试前电压的90%。</p>
2	Crush Test 挤压试验	<p>A cell is crushed between two flat surfaces. The applied force is 13 kN±1kN by hydrocylinder. Once the maximum pressure has been obtained, or voltage decrease to 1/3 of nominal voltage sharply, or 10% of deformation has occurred compared to the initial dimension, the force is released.</p> <p>电池在两个平面间承受挤压，由液压油缸施加13 kN±1kN的挤压力。一旦挤压力达到最大或电池电压锐减到电池电压的三分之一，或者电芯表面发生了10%的形变时，卸压。</p>	<p>No Fire, No Explosion. 不起火，不爆炸</p>

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No.	Items（项目）	Test Method and Condition （测试方法和条件）	Criteria（指标）
3	Free Drop Test 自由跌落试验	The fully charged cell drops on the concrete ground from 1m height,total 3 times,to obtain the shock of random directions. After the test, the cell shall rest for a minimum of one hour and then a visual inspection shall be performed. 充满电的电池三次从1m高的地方跌落到混凝土地面，以此获得随机方向的冲击。试验结束后至少搁置1小时后观察电池外观。	No Fire, No Explosion. 不起火，不爆炸

4.4 Visual inspection

外观检测

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

不允许有任何影响电芯性能的外观缺陷，诸如裂纹、裂缝、泄漏等。

5 Others

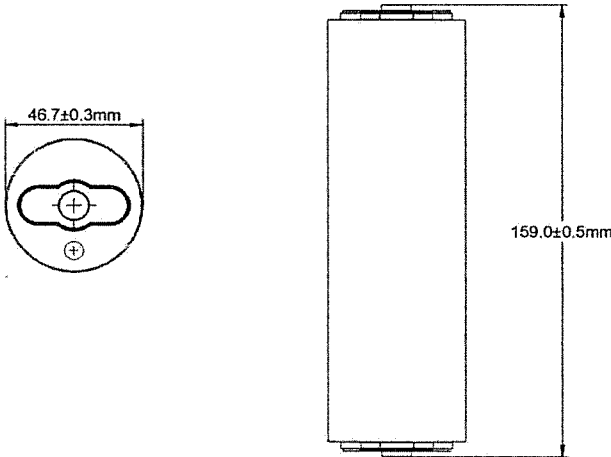
其他事项

Any matters not mentioned in this specification shall be determined through consultation between both parties.

任何本规格书中未提及的事项，须经双方协商确定。

6 Cell Dimension

电芯尺寸



单位:mm



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7 Special Warning

特别提示

Handling Precautions and Guideline for Sodium-ion Rechargeable Batteries

钠离子充电电芯使用指示及注意事项

Statement (1):

声明一:

Customers are requested to contact HIGHSTAR in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

客户若需要将电芯用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电芯，应事先联系海四达，因为需要进行特定的实验测试以核实电芯在该使用条件下的性能及安全性。

Statement (2):

声明二:

HIGHSTAR will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

对于在超出文件规定以外的条件下使用电芯而造成的任何意外事故,海四达概不负责。

Statement (3):

声明三:

HIGHSTAR will inform, in a written form, customers of improvement(s) regarding proper usage and handling of cells, if it is deemed necessary.

如有必要，海四达会以书面形式告知客户有关正确操作使用电芯的改进措施。

Statement (4):

声明四:

The cell must be used under the protection of power management system; When used in combination, the power management system must have the equalization function to balance the voltage difference in the battery pack and ensure the normal performance of the battery pack.

电池使用时须在有电源管理系统保护下使用；组合使用时，电源管理系统必须具有均衡功能，能对电池组内电压差进行均衡，确保电池组发挥正常性能。

Statement (5):

声明五:

During designation of host device or battery pack, it's better for customers to get HIGHSTAR involve to review the cell installation and safety protection scheme. This is very helpful to safety of cell application.

客户在产品的设计过程中，最好邀请海四达共同完成电池安装及电池安全保护装置部分的设计，这对电池的安全使用会很有帮助。

7.1 Charging

充电

7.1.1 Charging current

充电电流:

Charge current should be less than the maximum value specified in the Product Specification. Charging with higher current than recommended value may cause damage to cells' electrical, mechanical, and safety performance and could lead to heat generation or leakage. If you have special needs, please contact with the company.

充电电流不得超过本标准书中规定的最大充电电流。使用高于推荐值电流充电将可能引起电芯的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。如有特殊需要，请与公司联系沟通。

7.1.2 Charge Voltage

充电电压:

Batteries shall be charged shall be done by voltage less than that specified in the Product Specification (4.0V/cell). Charging beyond 4.0V, which is the absolute maximum voltage, must be strictly prohibited. The charger and protection circuit of battery pack shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than the maximum value and may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage. In serious cases, it will affect the service life of the cell and even cause safety problems.

充电电压不得超过本规格书中规定的额定电压（4.0V/电芯）。4.0V为充电电压最高极限，充电器和电池保护电路的设计应满足此条件。电芯电压高于额定电压值时，将可能引起电芯的充放电性能变差、可能会导致发热或泄漏，严重时会影响电池使用寿命甚至会产生安全问题。

7.1.3 Charge Temperature:

充电温度:

Batteries shall be charged at 0°C-55°C environment temperature specified in the Product Specification.

电芯必须在0°C~55°C的环境温度范围内才能进行充电。

7.1.4 Prohibition of Reverse Charge:

禁止反向充电:

Reverse charging is prohibited. Cells shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. the reverse charging may cause damage to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

正确连接电池的正负极，严禁反向充电。若电池正负极接反，应保证无法对电芯进行充电。反向充电会降低电芯的充放电性能、安全性，并会导致发热、泄漏。

7.2 Discharge

放电

7.2.1 Discharge Current:

放电电流:

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharge capacity significantly or cause over-heat. At the same time, it will seriously affect the service life of the cell.

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放电电流不得超过本规格书规定的最大放电电流，大电流放电会导致电芯容量剧减并导致过热，同时会严重影响电池使用寿命。

7.2.2 Discharge Temperature:
放电温度：
Cells shall be discharged at -40℃~60℃ environment temperature specified in the Product Specification. The optimum discharge temperature range is 25℃~ 35℃; The discharge current shall be controlled when it exceeds the optimal temperature range, otherwise the service life will be affected. If necessary, please contact the company.

电芯可在 -40℃~60℃ 的环境温度范围内进行放电，最佳放电温度范围25℃~35℃；超出最佳温度范围使用时需对放电电流进行控制，不然会影响使用寿命，如有需要，请与公司联系沟通。

7.2.3 Over-discharge:
过放电：
It should be noted that cells would be at an over-discharged status due to self-discharge characteristics in case they were not used for a long time. In order to prevent over-discharging, cells shall be charged periodically to maintain the voltage between1.5V and 3.0V. Over-discharging may cause the loss of cell performance, characteristics , or cell functions.
需注意的是，在电芯长期停止使用期间，它可能会因其自放电特性而处于某种过放电状态。为防止过放电的发生，电芯应定期充电，将其电压维持在1.5V至3.0V之间。过放电会导致电芯性能、电池功能的丧失。

7.3 Other requirements for charging and discharging:
充放电其余要求：
If many cells are used in the same group, try to make the cells charge and discharge under the same current and temperature. If there are differences, there will be differences in the performance of the same group of cells, which will affect the performance of the whole battery pack if in serious case.
如是许多电芯同组使用，要尽量使电芯在相同的电流和温度等环境下进行充放电使用，如有差异会对同组电芯的性能产生差异，严重时会影响整组电池性能的发挥。

7.4 Notice for Designing Battery Pack
电池结构设计注意事项

7.4.1 Pack Design
外壳设计
Battery pack should have sufficient strength to make sure the cell(s) inside is protected from mechanical shock.
电池外壳应有足够的机械强度以保证其内部电芯免受机械损伤，材质为阻燃性材料。

7.4.2 Cell Fixing
电芯的安装

7.4.2.1 No cell movement in the battery pack should be allowed.
电芯不得在壳内活动。

7.4.2.2 Prevention of short circuit in a battery pack or host device.
防止电芯在电池包装或主机内产生短路。

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack or host device shall be structured with no any potential short circuit, which may cause generation of smoke or firing.

引线与电芯之间要有足够的绝缘层以保证绝对安全。电池壳内不得有任何短路发生隐患，以防止冒烟或着火。

7.5 Storage

贮存

The cell shall be stored at the environmental condition of -20°C- 45°C and 65%±20% RH. Long term storage will cause irreversible damage to cell performance.

The voltage for a long time storage shall be 1.8V-3.0V range.

If the cell has to be stored for a long time (Over 3 months), the environmental condition should be:

Temperature: 15°C-35°C

Humidity: 65%±20% RH

During the warranty period, the cell with cell voltage lower than 2.0V shall be recharged with 4000mA ~ 10000mA at regular intervals until the voltage reaches 3.0V, otherwise it will cause great irreversible damage to the cell performance.

电芯储存可在温度 -20°C~ 45°C，湿度为65%±20% RH的环境中，长期储存会对电池性能产生不可

逆损伤。

长期存储电池（超过3个月）须置于温度为15°C-35°C、湿度为65%±20% RH的环境中，电压为1.5V~3.0V。

保质期内每隔一段时间对电池电压低于2.0V的电池用4000mA~10000mA电流进行补充电，至电压达到

3.0V，不然会对电池性能产生较大不可逆损伤。

7.6 Application conditions

应用条件

Customer shall ensure that the following application conditions in connection with the products are strictly observed:

客户应当确保严格遵守以下与电池相关的应用条件：

7.6.1 Customer shall procure that each product shall be used under the strict monitor, control and protection by the BMS incorporated by HIGHSTAR. When the cell is first used, it must be fully charged and discharged for activating it and giving fully capacity.

客户应配置电池管理系统，严密监控、管理与保护每个电池。电芯初次使用必须进行小电流满充满放以激活，以保证后续使用中容量的充分发挥。

7.6.2 Customer shall keep relevant records of the BMS monitoring data throughout the entire service life of each product, including keeping record of number of occurrence of rush charge, which could be used in the determination and judgment of any product warranty and liability claim entitlement. No warranty or liability claim should be considered without BMS diagnosis records (at a regular basis, esp. during maintenance) of the relevant product.

客户应保存完整的电池运转的监测数据，用作产品质量责任划分的参考。不具备完整的电池系统使用期限内的监测数据的，海四达不承担产品质量保证责任。

7.6.3 Prevent draining any product down to over discharge state. A product may be permanently damaged internally when the cell voltage is lower than 1.5V and which shall be strictly prohibited, failing what HIGHSTAR's warranties under the contract shall cease to apply, thereby releasing the HIGHSTAR from any liability in connection therewith. After discharge cut-off in accordance with paragraph 3.6, Customer undertakes to educate the users of the products or other parties who may come to handle the products to recharge the cells at minimum time intervals to prevent reaching the over-discharge state.

避免电池到达过放状态。电池电压低于1.5V时，电池内部可能会遭到永久性的损坏，此时海四达的产品质量保证责任失效。根据本技术协议第3.6条，客户需要培训使用者在最短的时间内重新充电，防止电池进入过放状态。

7.6.4 Batteries should avoid charging at low temperatures prohibited by this Technical Agreement (including standard charging, fast charging and emergency charging), otherwise accidental capacity reduction may occur. Battery management system should be controlled with different charging current according to different temperatures specified in this agreement. It is forbidden to charge under the temperature stipulated in this technical agreement. Otherwise, HIGHSTAR will not undertake the responsibility of quality assurance.

电池避免在本技术协议禁止的低温条件下充电(包括标准充电，快充，紧急情况充电)，否则可能出现意外的容量降低现象。电池管理系统应依照本协议规定的不同温度以不同的充电电流进行控制。禁止在低于本技术协议规定的温度条件下充电，否则海四达不承担质量保证责任。

7.6.5 The design of the electric box must fully consider the heat dissipation problem of the cell. HIGHSTAR does not take the responsibility due to the overheating of the cell or batteries caused by the thermal design problem of the electric box. .

电箱设计中应充分考虑电芯的散热问题，由于电箱散热设计问题导致的电芯或电池过热损坏，海四达不承担质量保证责任。

7.6.6 The design of the electric box must fully consider the waterproof and dustproof problems of the cells. The electric box must meet the waterproof and dustproof grade stipulated by the relevant national standards. The HIGHSTAR does not take the responsibility due to damage to the cell or batteries (such as corrosion, rust, etc.) caused by water and dust.

电箱设计中应充分考虑电芯的防水、防尘问题，电箱必须满足UL和IEC有关标准规定的防水、防尘等级。由于防水、防尘问题而导致的电芯或电池的损坏（如腐蚀、生锈等），海四达不承担质量保证责任。

7.6.7 It is forbidden to mix different P/N batteries in the same battery system, otherwise, HIGHSTAR will not be responsible for quality assurance.


禁止不同P/N料号电芯在同一电池系统中混用，否则海四达不承担质量保证责任。

7.7 User's Guideline for Safety Handling:

用户安全操作信息:

7.7.1 The following information, or equivalent statements, shall be made available to the user through one or more of the following means, as appropriate: printed on the label for the cell, printed on the label for host device, printed in the owner's manual, or posted in a help file or Internet website:

下列信息或类似的申明必须通过一种或多种适当的途径让用户知晓，可选择的途径包括：电池标签、主机标签、用户手册、储存于帮助文档或互联网：

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<p>7.7.1.1 Do not disassemble or open, crush, bend or deform, puncture, or shred; 请勿拆解或打开、挤压、弯折、变形、刺穿、敲碎;</p> <p>7.7.1.2 Do not modify or remanufacture, attempt to insert foreign objects into the cell; 请勿修改或改装, 不要试图将外物插入电池;</p> <p>7.7.1.3 Do not immerse cells into water or other liquids, or expose to fire, explosion, or other hazard; 禁止将电池浸入或暴露在水或其它液体中, 远离火源、爆炸物和其他危险;</p> <p>7.7.1.4 Do not expose them to any high temperature environment exceeding operation temperature as set out in paragraphs 3.9&3.10, otherwise it may cause fire. At all use time, cell temperature should not exceed 60 °C, shut down system by BMS when it occurs; 禁止将电池长时间暴露在超过本技术协议第3.9条和第3.10条规定的温度条件的高温环境中, 否则可能会导致火灾。在任何正常的充放电使用情况下, 电芯温度不能超过60°C, 如果电芯温度超过60°C, 电池管理系统需关闭电池, 停止电池运行;</p> <p>7.7.1.5 Only use the cell for the system for which it was specified; 只能使用本系统规定的电池;</p> <p>7.7.1.6 Only use the cell with a charging system that has been qualified with the system per standard. Use of an unqualified cell or charger may present a risk of fire, explosion, leakage, or other hazard; 只能使用通过标准认证具有充电管理系统的电池, 使用未经认证的电池或充电器可能存在起火、爆炸、或其它危险;</p> <p>7.7.1.7 Do not short circuit a cell or allow metallic or conductive objects to contact the cell terminals, otherwise high current and temperature may cause body injury or fire hazards. Metallic cell terminals exposed from plastic packaging and ample safety precautions should be implemented to avoid short circuiting them during system integration or connections; 禁止电池正负极短路, 也不要让金属或其它导体接触电池接电端子; 否则强电流和高温可能导致人身伤害或者火灾。在电池系统组装和连接时, 应有足够的安全保护, 以避免短路;</p> <p>7.7.1.8 Replace the cell only with another cell that has been qualified with the system per standard. Use of an unqualified cell may present a risk of fire, explosion, leakage, or other hazard; 更换电池时只能使用通过标准认证的电池, 使用未经认证的电池可能存在起火、爆炸或其它危险;</p> <p>7.7.1.9 Don't keep a cell at rest for a long time (over 6 months). Safety accident may happen when recharging a cell which has a rest for a long time; 避免电池长时间放置不用(6个月以上), 长期放置不用的电池重新充电时可能会发生安全问题;</p> <p>7.7.1.10 Promptly dispose of used batteries in accordance with local regulations; 按当地法规迅速处理报废电池;</p> <p>7.7.1.11 Cell usage by children should be supervised; 儿童使用电池应受到监督;</p> <p>7.7.1.12 Avoid dropping the phone or cell. If the phone or cell is dropped, especially on a hard surface, and the user suspects damage, take it to a service center for inspection; 不要跌落主机或电池, 如果主机或电池不慎跌落(尤其在硬表面上), 用户怀疑电池损坏, 则应找服务中心检查;</p>		

7.7.1.13 Improper cell use may result in a fire, explosion, or other hazard;

不正确使用电池可能发生燃烧、爆炸或其它危险；

7.7.1.14 Products should be securely fixed to solid platform, and power cables should be securely attached by fastener to avoid intermittent contact which may cause arcing and sparks.;

客户应将电池安全地固定在固体平面上，并将电源线安全地束缚在合适的位置，以避免摩擦而引起电弧和火花；

7.7.1.15 Do not service cells and electrical connections within plastic package of cell. Improper electrical connection within a cell may cause overheating in service.;

严禁用塑料封装电池或用塑料进行电气连接。不正确的电气连接方式可能会造成电池使用过程中发生过热现象；

7.7.1.16 When the electrolyte leaks, skin and eye contact with the electrolyte should be avoided. In case of contact, a large amount of clean water should be used to clean the contact area and seek help from the doctor. It is forbidden for any person or animal to swallow any part or substance contained in the cell.;

当电解液泄露时，应避免皮肤和眼睛接触电解液。如有接触，应使用大量的清水清洗接触到的区域并向医生寻求帮助。禁止任何人或动物吞食电池的任何部件或电池所含物质；

7.7.1.17 Protect cells from mechanical shock, impact and pressure. Internal electrical circuit may short circuit to generate high temperature and fire hazards;

尽力保护电池，使其免受机械震动、碰撞及压力冲击，否则电池内部可能短路，产生高温和火灾；

7.7.1.18 When cells charging is terminated improperly for reasons such as exceeding allowable charging time, cut-off due to exceeding charging voltage or cut-off due to exceeding charging current, all these events are defined as “improper charge termination”. Such event may indicate that there is current leaking within a cell system or some components have started to malfunction and subsequent charging of such cell system without finding and fixing root cause of problem may cause potential overheat or fire hazards. When such event occurs, the BMS should lock itself up to prevent subsequent charging and notice should be given to the user to return the vehicle to dealer for servicing. Subsequent charging should only be resumed after the system has been thoroughly checked by qualified technician who can identify and fix root cause attributed to the “improper charge termination”.;

电池充电过程中可能发生不适当的终止充电现象。如:超出允许的充电时间充电，充电电压过高而终止充电或充电电流过强而终止充电。上述现象被定义为“不适当的终止充电”。当发生以上现象时，可能意味着电池系统出现漏电或某些部件出现故障。在没有找到根本原因并彻底解决之前继续对该电池充电可能会引起电池过热或发生火灾。当发生以上现象时，电池管理系统应该通过自动锁定功能，禁止后续的充电，并提醒使用者将装载有该电池的交通工具退回到经销商处进行系统维护。该电池只有经过有认证资格的技术人员全面检查，确定根本原因并彻底解决、改善后方可恢复充电；

7.7.1.19 Cell fire or explosion may be caused by improper operation during abuse test. The test can only be carried out in a professional laboratory by professionals equipped with appropriate protective equipment. Otherwise, it may lead to serious personal injury and property loss.

在进行滥用测试实验时如操作不当可能会引起电池起火或者爆炸。该测试实验只能由配备适当的防护装备的专业人员在专业的实验室进行。否则，可能会导致严重的人身伤害和财产损失。



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7.7.2 The following indications, notifications, and dialog/messages, at the system level, or an equivalent statement, may be displayed along with recommended actions as appropriate:

下列指示、通告、语句、信息或类似的申明应通过适当途径让用户知悉:

7.7.2.1 Abnormal cell temperature alert;

不正常的电池温度警示;

7.7.2.2 Abnormal host device and/or cell dc input voltage alert;

不正常的主机或电池的直流输入电压警示;

7.7.2.3 Abnormal current draw alert;

不正常的电流警示;

7.7.2.4 Cell communication fail/time-out alert;

电池通讯失败或超时警示;

7.7.2.5 Incompatible cell alert;

不相容电池警示;

7.7.2.6 Alert for other malfunctions that may lead to hazards.

可能导致危险的其它故障警示。

7.8 Product end of life management

产品寿命终止管理

7.8.1 This cell is designed to service with a finite life time. The customer shall develop and implement an active tracking system to monitor and record impedance of each Product in its entire service life.

HIGHSTAR and its customer shall come into agreement about internal resistance and capacity measurement methods, HIGHSTAR and/or its customer shall stop using any of the products when its resistance exceeds 200% of its internal resistance or its capacity fading to 70% of typical capacity (70Ah) @25°C. Failure to comply with this requirement shall render HIGHSTAR's warranties under the Contract inapplicable, thereby releasing HIGHSTAR from any liability in connection therewith.

电池的使用期限是有限的。客户应该建立有效的跟踪系统监测并记录每个使用期限内电池的内阻和容量。内阻以及容量的测量方法和计算方法需要客户和海四达共同讨论和双方同意。当使用中的电池的内阻超过这个电池最初内阻的200%或容量小于等于标称容量70%(25°C), 应停止使用电池。违反该项要求, 将免除海四达依据产品销售协议以及本技术协议所应承担的产品质量保证责任。

7.8.2 The cell life determination conditions can refer to paragraph 4.2.11 cycle life. The service conditions not specified in this specification will affect the cycle life.

电芯循环寿命应是指在4.2.11条件下的循环寿命。不在此规格书规定的使用条件下均会影响循环寿命。

7.9 Others:

其它事项:

7.9.1 Prohibition of Disassembly

严禁拆卸电芯

7.9.1.1 Never disassemble cells. The disassembling may generate internal short circuit in the cell, which may cause firing or other problems.

在任何情况下不得拆卸电芯。拆卸电芯可能会导致内部短路, 进而引起着火及其它问题。

7.9.1.2 Electrolyte is harmful. In case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

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电解液有害。万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位，应立即用清水冲洗电解液并就医。

7.9.2 Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.
在任何情况下，不得燃烧电芯或将电芯投入火中，否则会引起电芯燃烧，这是非常危险的，应绝对禁止。

7.9.3 The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.
不得将电芯浸泡液体，如淡水、海水、饮料（果汁、咖啡等）。

7.9.4 The cell replacement shall be done only by either cells supplier or device supplier and never be done by the user.
更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换。

7.9.5 Prohibition of use of damaged cells
禁止使用已损坏的电芯

7.9.6 The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more. The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.
电芯在运输过程中可能因撞击等原因而损坏，若发现电芯有任何异常特征，如外壳破损，闻到电解液气味，电解液泄漏等，该电芯不得使用。有电解液泄漏或闻到异常味道的电池应远离火源以避免着火。

8 Limited Warranty and Liabilities
有限保证和责任

8.1 Limited Warranty period
有限保证期限
The cells shall compile with this specification within 12 months from the manufacture date as stipulated on cell marking (“Warranty Period”). In the Warranty Period, HIGHSTAR will replace cells which fail to confirm to this specification at no cost to Customer.
自电芯标识显示的制造日期之日起12月内（“保证期限”），电芯应符合本规格书的规定。在此保证期限内，海四达免费为客户更换不符合本规格书规定的电芯。

8.2 Disclaimer
免责声明
Under the following conditions, HIGHSTAR will not take any responsibility incurred in any losses resulting from the use of cells:
在以下条件下，海四达对客户因使用电芯而引起的任何损失不承担赔偿责任：

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8.2.1 If the product demand unit does not use the product according to the provisions of this specification, causing social impact and affecting the reputation of HIGHSTAR, HIGHSTAR will investigate the responsibility of the product demand unit. According to the degree of impact on HIGHSTAR, the product demander should provide compensation to HIGHSTAR.

如果由于产品需求单位不按本说明书中的规定进行使用，造成社会性影响，并对海四达的声誉造成影响的，海四达将会追究产品需求单位的责任。根据对海四达造成的影响程度，产品需求单位需向海四达提供赔偿。

8.2.2 The cells are misused, abused or are used in any manner deviated or in breach of conditions as set out in this specification and beyond the allowable conditions of this specification.

误用、滥用电芯或违反本规格书规定和超出本规格书的允许条件使用的电芯。

8.2.3 The cells are rendered to be nonconforming to this specification for reasons caused by parties other than HIGHSTAR or by circumstances beyond the control of HIGHSTAR.

非海四达原因导致的或海四达不能控制的原因导致的电芯不符合本规格书的规定。

8.2.4 HIGHSTAR reserves the right to change and revise the design and product specification Approval Sheet without prior notice; Before ordering HIGHSTAR products, the buyer needs to confirm the latest status of the products in advance with HIGHSTAR.

海四达保留在没有预先通知的情况下改变和修正设计及产品规格确认书的权力；买方在订购海四达产品前，需与海四达提前确认产品的最新状态。

8.2.5 English specifications are for reference only. Please refer to the technical specifications of the Chinese version.

英文规格释义仅供参考，请以中文版技术规格要求为准。

8.3 Limited Warranty range

有限保证范围

Customer is recommended to follow this specification to use. Or customer can use an alternative operation method mutually agreed by customer and HIGHSTAR. Using an operation method neither according to the specification nor agreed by HIGHSTAR in written will cause the resulting change in product quality are not applicable to the warranty scope promised by HIGHSTAR.

推荐客户完全按照此产品规格书上所描述的要求进行操作，或采用经过客户与海四达双方确认的其他条件。如果客户采用的使用方法既没有按照本规格书的要求，也没有经海四达具有法定有效的书面同意，所导致产品质量变化不适用于海四达公司承诺的保质保证范围内。

9 Risk Warning

风险警告

9.1 Waring statement

警示声明

WARNING

警告

CELL ARE POTENTIALLY DANGEROUS AND PROPER PRECAUTIONS MUST BE OBSERVED IN HANDLING AND MAINTENANCE.

RUNNING TESTS ON THE CELLS IMPROPERLY MAY RESULT IN SEVERE PERSONAL BODY INJURY OR PROPERTY DAMAGES.

WORK ON CELLS MUST BE PERFORMED ONLY WITH PROPER TOOLS AND PROTECTIVE EQUIPMENT MUST BE USED.

CELL MAINTENANCE MUST BE CARRIED OUT BY PERSONNEL KNOWLEDGEABLE OF CELLS AND TRAINED IN THE SAFETY PRECAUTIONS INVOLVED.

FAILURE TO OBSERVE THE ABOVE MAY CAUSE VARIOUS HAZARDS.

电池存在潜在的危險，在操作和维护时必须采取适当的防护措施。

不正确地濫用测试实验，可能导致严重的人身伤害和财产损失。

必须使用正确的工具和防护装备操作电池。

电池的维护必须由具有电池专业知识并经过安全培训的人士执行。

不遵守上述警告可能造成多种灾难。

9.2 Types of Hazards

危险类型:

Customer acknowledges the following potential hazards in connection with the usage and handling of the Products:

客户知悉在电池使用和操作过程中存在以下潜在的危險:

9.2.1 Working with cell can expose the handler to chemical, shock and/or arcing hazards. Although a person's body might react to contact with direct current voltage differently than from contact with alternate current voltage, Customer shall take a conservative position and consider the risk of shock or electrocution to be the same for both alternate current and direct current exposures greater than 50 V.; 操作者在操作时可能会受到化学品、电击或者电弧的伤害。尽管人体对遭受直流电与交流电的反应不同，但是高于50V的直流电压与交流电对人体的伤害是同样严重的，因此客户必须在操作中采取保守的姿势以避免电流的伤害;

9.2.2 Cells expose its handler to chemical hazards associated with the electrolyte used in the cell.; 存在来自电池中的电解液的化学风险;

9.2.3 When selecting work practices and personal protective equipment, customer and its employees should consider potential exposure to these hazards and therefore prevent accidental short-circuit that can result in electrical arcing, explosion, and/or "thermal runaway" of the cells.

在操作电池和选择个人防护装备时，客户及其雇员必须考虑到以上潜在的风险，防止发生意外短路，造成电弧、爆炸或热失控。

HIGHSTAR	PRODUCT SPECIFICATION	DOC NO.:	NaCR46145-20ER	
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		ECN NO. :	Q/KAGG1492-2023	

Customer Inquiry
客户调查

Model: NaCR46145-20ER
型号: NaCR46145-20ER

The customer is requested to write down your information and contact HIGHSTAR in advance, if and when the customer needs applications or operating conditions other than those described in this document. HIGHSTAR could design and build such products according to your special request.
我司也可以根据客户的特殊要求而设计、制造符合要求的产品，如果贵公司有本规格书描述之外的性能要求，请您写在下面并回签给我司：

	Special Request 要求	Criteria 规格
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Company Name: _____ Signature: _____ Date: _____