锂离子电芯规格书

Specification
For
Lithium-ion Rechargeable Cell

Cell Type :**HDCNR18650-3000mAh-3.6V**

编制/Designed	审核/Checked	批准/Approved	日期/Effective Date

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Contents 目录

1 Preface 前言

This specification describes the type and dimensions, performance, technical characteristics, warning and caution of the lithium ion rechargeable cell. The specification only applies to 18650 cell supplied by Haidi Power 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。本标准适用于天科新能源有限责任公司生产的圆柱型 18650 锂离子电芯。

2 Definition 定义

2.1 Rated capacity and minimum capacity:

标称容量与最小容量：

Rated capacity: Cap=3000mAh, minimum capacity: Cap=2900mAh. Under 25±3℃, It means the capacity value of being discharged by 2-hours rate to end voltage 2.5 V, which is signed Cap, the unit is mAh.

标称容量 Cap=3000mAh，最小容量 Cap=2900mAh，指在 25±3℃环境下，以 2 小时率放电至终止电压 2.5V 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 0.02C.

指在 25±3℃环境下，以 0.5C 的电流恒流充电至单体电芯电压 4.2V 后，转为恒压 4.2V 充电，至充电电流降至 0.02C 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 2.5V with constant current of 0.5C.

指在 25±3℃环境下，以 0.5C 的电流恒流放电至单体电芯电压 2.5V。

3 Cell type and dimensions 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: **NRA LP HN**

动力型三元 18650-3000 mAh 圆柱锂离子二次电芯

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

HDCNR 18650-3000mAh-3.6V

\+ 条 形 码 -

HD NRA LP HN JJAE 024953

Figure 1

Cell bar code includes six parts(**Figure 1**): 电芯喷码包括六个部分的内容(见图 1)：（热缩膜颜色以具体实物为准）

Company Abbreviations + Battery type + Cell type + Cell batch code + Cell ordinal code

公司缩写 + 电池种类 +电池类型+ 电芯容量 + 电芯批号 + 电芯生产顺序码

For example 例如：HD + NRA+ LP +HN + JJAF + 024953

①Company Abbreviations 公司缩写：

The abbreviations of “HD” 海帝的缩写

Material Abbreviations 材料简称	Cell Shape 电池形状	battery size 电池尺寸

②Battery Type 电池种类：

F means $LiFePO_4$
F 代表磷酸铁锂电池
C means $LiCoO_2$
C 代表钴酸锂电池
M means $LiMnO_2$
M 代表锰酸锂电池
N means $LiNi_xCo_yMn_zO_2$
N 代表三元材料电池

R means cylinder type battery
R 代表圆柱型电池
P means square battery
P 代表方形电池
X means polymer battery
X 代表软包电池

A means 18650 battery
A 代表 18650 电池
B means21700 battery
B 代表 21700 电池
C means 26650 battery
C 代表 26650 电池
D means 32650 battery
D 代表 32650 电池
E means 32700 battery
E 代表 32700 电池

③battery type 电池类型：
EP stands for dynamic energy compatibility
EP 代表动力能量兼容型
LP stands for dynamic type
LP 代表动力型
HP represents the tool-start model
HP 代表工具启动型

④Cell Type 电芯型号：
HN means 18650-3000 mAh
HN 代表电池为 18650-3000mAh

⑤Cell batch code definition as following（Be constituting by the ingredients of date）：
电芯批号如下（由配料日期组成），显示如下：

J	J	AF

Manufacture Year
排产年份
For example:
J means 2019
J 代表 2019 年

Manufacture month
排产月份
J for September…...
J 代表 9 月….

Manufacture day
排产日期
For example:
AFmeansdate27th
AF 代表 27 日

⑥Cell ordinal code 生产顺序
024953 produces the 024953 th battery
024953 生产第 024953 只电池

⑦Combination rules 暗码规则
Code spray-code content is; Company name + battery capacity + batch number+ water code
暗码喷码内容为； 公司名称+电池容量+批次号+流水码
For example 例如：HD + HN+JJAF + 024953

4 Characteristics 电池性能

4.1 Cell specification 电芯特性

ITEM 项目	SPECIFICATION 特性
Normal capacity 标称容量	3000 mAh@0.2C
Minimum capacity 最小容量	2900 mAh@0.2C
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. 5 ±0.05 V
Standard charging current 标准充电电流	0.5C(1500mA)
Standard discharge current 标准放电电流	3C(9000mA)
Max charge current 最大充电电流	1C (25±3℃) (not for cycle life)
Max discharge current 最大放电电流	3C (25±3℃) (not for cycle life)
Normal temperature cycle 常温循环	100%DOD 500 次@80% 80%DOD 700 次@80% 50%DOD 1000 次@80%
recommended charge and discharge cell environment temperature 充放电过程中推荐的环境温度	Charge: 0~45℃ Discharge: -10~60℃ 充电时：0~45℃ 放电时：-10~60℃
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衰减）	Charge: 60℃ Discharge: 70℃ 充电时：60℃ 放电时：70℃
Internal resistance 内阻	≤25mΩ(AC Impedance, 1000 Hz)
Cell dimensions(with PET film) 电芯尺寸(带有 PET 膜)	Height ： 65.2±0.2mm 高度：65.2±0.2 mm Diameter ： 18.3±0.2mm 直径：18.3±0.2mm
Weight 重量	≤48g

备注：电池在定容时需进行 3-5 次循环，其中有一次达到标准即符合要求。电池在测试时第一步需按标准放电后再进行后续测试。

4.2 Cell dimensions 电芯尺寸

Cell physical dimensions listed in Figure 2(unit: mm)电芯尺寸:

Height ： 65.1±0.2mm 高度 h：65.2±0.2mm

Diameter ： 18.55±0.2 mm 直径 d：18.55±0.2 mm

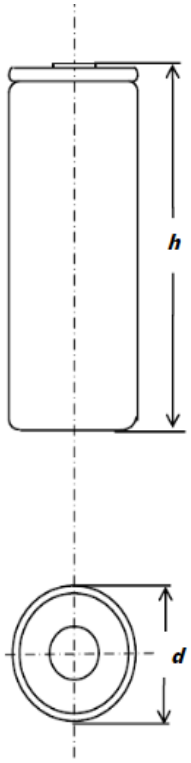

Figure 2

5 Technical requirements 技术要求

5.1 Cell storage conditions 电芯存储环境

Temperature 温度： 1 months 20～35℃ 3 months 25～45℃ 1years -10～25℃

Relative humidity 相对湿度：0～45%RH

5.2 Cell testing conditions 电芯测试条件

Unless otherwise specified, all tests stated according to following:

除非有特殊说明，所有测试的条件要求如下：

Temperature 温度： 25±3℃

Use standard charge and standard discharge method 使用标准充电与标准放电方式

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 0.5℃

5.4 Characteristics 电池性能

NO. 序号	Item 项目	Standard 标准	Test Method 测试方法
1	Discharge Characteristics (Room Temperature) 常温放电性能	Discharge capacity / Nominal capacity *100% A）0.5C ≥100% B）1C ≥98% C）3C ≥96% D) 5C ≥95% E) 7C ≥92% The charging and discharging curves must be smooth 放电容量/标称容量×100% A）0.5C ≥100% B）1C ≥98% C）3C ≥96% D）5C ≥95% E) 7C ≥92% 充放电曲线应平稳光滑	In 1 standard atmospheric pressure, ambient temperature of 25 ℃ + 3 ℃, relative humidity is 15% ~ 90%, 0.5 C standard battery charge (if no specific instructions, below are placed under the condition, is by the way), suspended 10 min, respectively by 0.5 C and 1 C, 3 C and 5 C and 7 C , discharge to the threshold voltage of 2.75V, cycle for three to five times, when there is a meet the requirements, which meet the standard requirements (thesamebelow). 在 1 标准大气压，环境温度 25℃±3℃，相对湿度为 15%～90%的条件下，电池 0.5C 标准充电后（以下若没有特别说明，均在此条件下放置，皆按此充电方式），搁置 10min，分别以 0.5C、1C、3C、5C、7C、进行放电至下限电压 2.75V，循环三至五次，当有一次达到要求，即达到标准要求（下同）。

2	Normal Storage 常温荷电保持能力	Residual capacity ≥ Nominal capacity *90% Recovery capacity ≥ Nominal capacity *95% Diminishing rate of 剩余容量≥标称容量*90% 恢复容量≥标称容量*95%	Tested the initial condition and initial capacity of battery. Store for 28 days after standard charged, tested the final condition of battery. Then discharge at 0.5C to the discharge cut-off voltage 2.75V, tested the residual capacity of battery. 0.5C /0.5 C tested the recovery capacity of battery. Charge/discharge cycle can be conducted for 3-5 times before meeting the Standards. 测量电池的初始状态和初始容量，电池标准充电后，开路放置 28 天，测量电池最终状态；以 0.5C 放电至 2.75V，测量电池的剩余容量； 以标准充放电方式（0.5C/0.5C）测量电池的恢复容量。循环三至五次，当有一次达到标准，即达到标准要求。
3	Cycle Life 循环寿命	Residual capacity ≥ Nominal capacity *80% 剩余容量≥标称容量*80%	1、Measured the initial condition and initial capacity of battery. Then conduct 1C/5C 500th cycle measured the final condition of battery. 1、测量电池的初始状态和初始容量，进行 1C/5C 循环，500 次后测量电池的最终状态。

4	Long Time Storage 贮存性能	Residual capacity ≥ Nominal capacity *95% 剩余容量≥标称容量*95%	Charged to the voltage of 4.2±0.02V ， Capacity after storage for 90dat 25±2°C after the standard charged and then discharge for 2h at 0.5C, measured with charge and discharge current 0.5C to cut-off voltage. Cycle three to five times, when one meets the standard, that is the standard requirements. 测量电池的初始容量，电池按照标准充电方式至4.2±0.02V 后，以 0.5C 电流放电 2h，在 25±2℃下存储 90d 后以 0.5C 电流充放电至截止电压，循环三至五次，当有一次达到标准，即达到标准要求。

5.5 Safety Performance 安全性能

NO. 序号	Item 项目	Standard 标准	Test Method 测试方法
1	Overcharge 过充性能	No fire, No explosion 不起火、不爆炸、	After fully charged according to the standard charge method, the cell is charged at 1C till the ending conditions: the cell voltage reaches 1.5 times of the cut-off voltage of standard charge or the 1C charge time reaches 60 min.The cell is observed for 1 h afterwards. 电池标准充电后，测量电池的初始状态，保证电池状态正常（下同）,以 1 C 电流充电至充电终止电压的 1.5 倍或充电时间达 1h 后停止充电,观察 1 小时。

2	Over Discharge 过放性能	No fire, No explosion, No leakage 不起火、不爆炸、不漏液	Standard charge. Discharge at 1C to 90 min and watch for 1h. 电池标准充电后，测量电池的初始容量，测量电池初始状态，以 1C 电流放电 90min，观察 1h。
3	Short Circuit at Room Temperature 常温短路性能	No fire, No explosion, Maximum temperature 不爆炸、不起火、最高温度	Standard charge. Keep the battery into a ventilation cabinet and short-circuit the positive and negative terminals directly (general resistance shall be less than or equal to 5mΩ). Stop the test when the time is 10 mintes . Observe the variation of the battery's appearance and temperature. 电池标准充电后，测量电池的初始状态，置于防爆玻璃罩中直接短路其正负极（线路总电阻不大于 5mΩ），当短路时间达到 10 分钟时试验结束。观察电池的温度及外观变化。
4	Crush 挤压安全性能	No fire, No explosion, Maximum temperature 不起火、不爆炸、最高温度	Standard charge. Use the half cylinder radius 75 mm (half the size of the cylinder are greater than the length of the squeezed battery), with (5±1mm/s speed in vertical direction extrusion batteries, battery plate until the voltage reaches 0 v or deformation after reaching 30% or extrusion of 200 kN stop pressing, observation of 1 h. 测量电池的初始状态，电池标准充电后，使用半径 75mm 的半圆柱体（半圆柱体的长度大于被挤压电池的尺寸），以(5±1)mm/s 的速度垂直于电池极板方向挤压电池，直到电压达到 0V 或变形量达到 30%或挤压力达 200kN 后停止挤压，观察 1h。

5	Hot Oven 热冲击安全性能	No fire, No explosion 不起火、不爆炸	Standard charge. Keep the battery connected with a thermocouple and put it into a gravity convection or circulating air oven. Temperature is raised at a rate of 5 ℃±2 ℃ per minute to a temperature of 130 ℃±2 ℃ and remained for 30 min at this temperature. observation of 1 h.Observe the variation of the battery's appearance. 测量电池的初始状态，电池标准充电后，放置于热箱中，并与热电偶相连，温度以（5 ℃±2 ℃）/min 的速率升至 130 ℃±2 ℃并保温 30 min，观察 1 小时，观察电池外观变化。

5.6 Environmental characteristics 环境适应性能

NO. 序号	Item 项目	Standard 标准	Test Method 测试方法
1	Thermal cycling Properties 温度循环性能	No leakage \ fire \ explosion 电池不漏液、不起火、不爆炸	Standard charge. Put battery into rapid temperature change box, starting from 25 ℃ with 60 min cooled to -40 ℃, and held to -40 ℃ environment after 90 min, with 60 min to 25 ℃, with another 90 min at 85 ℃ and 85 ℃ under the environment of 110 min, with another 70 min to 25 ℃.As a cycle, a total of 5 loop, observation of 1 h. 电池标准充电后，将电池放入快速温变箱中，从 25℃开始用 60min 降至-40℃，并在-40℃的环境下保持 90min 后，用 60min 升至 25℃，再用 90min 升至 85℃并在 85℃的环境下保持 110min，再用 70min 降至 25℃。以此为一个循环,共循环 5 次,观察 1h。
2	Seawater immersion 海水浸泡	No fire, No explosion 不起火、不爆炸	Standard charge. Battery in 2 h in 3.5% NaCl solution, the depth of the water completely after a battery, observation of 1 h. 电池标准充电后，将电池浸入 3. 5% NaCl 溶液中 2h，水深完全没过电池，观察 1h。

3	Drop 跌落性能	No leakage \ fire \ explosion 电池不漏液、不起火、不爆炸。	Standard charge. Make a battery positive and negative terminals from 1.2 m to the cement floor height in free fall, the observation of 1 h. 电池标准充电后，测量电池的初始状态，使电池正负端子从 1.2m 高度处自由跌落到水泥地板上，观察 1h。
4	Discharge Characteristics under Different Temperature 不同温度下的放电性能	Discharge capacity / Nominal capacity *100% A）25 ℃≥100% B）55 ℃≥98% C） 0 ℃≥80% D）-10 ℃≥70% No fire \ explosion 放电容量/标称容量×100% A）25 ℃≥100% B）55 ℃≥98% C） 0 ℃≥80% D）-10 ℃≥70% 电池不爆炸、不起火。	Tested the initial condition and initial capacity of battery. Standard charge. Put the battery into a 55℃±2℃ for 5h, discharge at 0.2C to the cut-off voltage 2.75V，then standard charge at room temperature. In turn put the battery into 25℃±2℃ to -10℃±2℃ for 2h、5h、10h、10h, discharge at 0.2C to the cut-off voltage, then test the final capacity of the battery, and then store it for 2h at room temperature. Observe the variation of the battery's appearance. 测量电池的初始容量和初始状态，电池标准充电后，在 55±2℃条件下恒温搁置 5h、以 0.2C 放电至 2.75V，然后在室温条件下标准充电,依此按照 25±2 ℃至-10±2 ℃的顺序在相应的恒温条件下搁置 2h、5h、10h、10h，以 0.2C 放电测量电池对应的终止容量，最后在室温状态下搁置 2h 测量电池的最终状态，观察电池外观变化。
5	Depression 低气压	No leakage \ fire \ explosion 电池不漏液、不起火、不爆炸	Standard charge. Put the battery in low pressure box, regulate pressure of 11.6 kPa in test chamber temperature to room temperature, let stand for 6 h, the observation of 1 h. 电池标准充电后，测量电池初始状态，将电池放入低气压箱中，调节试验箱中的气压为 11.6kPa，温度为室温，静置 6h，观察 1h。

Comments: the definitions of some nomenclatures of this specification
备注：以上标准中的一些术语的定义：

（1） Standard Charge: Charge with current 0.5C to limit charge voltage 4.2V under the condition of 25°C±3°C surrounding temperature, then change to charge with constant voltage till the current less than or equal to 0.02 C.

标准充电：在环境温度 25℃±3℃的条件下，以 0.5C 充电，当电池端电压达到充电限制电压 4.2V 时，改为恒压充电，直到充电电流小于或等于 0.02C 后停止充电

（2） Initial State: The initial appearance, open-circuit voltage and internal resistance of battery.
初始状态：电池的初始外观、开路电压、交流内阻。

（3） Final State: The final appearance, open-circuit voltage and internal resistance of battery.
最终状态：电池的最终外观、开路电压、交流内阻。

（4） Residual Capacity: After a specific testing program, the first discharge capacity of battery.
剩余容量：电池经过特定的检测程序后的首次放电容量。

（5） Recovery capacity: After a specific testing program, and through the repeatedly charging and discharging to the recovery state, then the discharge capacity of battery.
恢复容量：电池经过特定的检测程序后，通过反复充放电使状态恢复后的放电容量。

（6） 0.5 C /1 C (0.5 C /0.5 C, 0.5 C /0.2 C）：Charge at 0.5C to limit charge voltage4.2V, then change to charge with constant voltage until the current less than or equal to 0.01 C, rest for 5 min, then discharge at 1C(0.5 C, 0.2C) to 2.75V cut-off.
0.5C/1C（0.5C/0.5C、0.5C/0.2C）：以 0.5C 充电，当电池端电压达到充电限制电压 4.2V 时，转为恒压充电，直到充电电流小于或等于 0.02C 停止充电，充电完成后，搁置 5min，再以 1C（0.5 C、0.2C）恒流放电至终止电压 2.75V。

6 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！

7 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：

Add:Haidi Power Technology Co.,Ltd.guangjin road, taierzhuang economic development zone, taierzhuang district, zaozhuang city, shandong province

厂址：山东省枣庄市台儿庄区台儿庄经济开发区广进路，天科新能源有限责任公司

Tel ：**+86 - 0632-4423889** 电话 ： **+86 - 0632-4423889**

8 Version change record 修改记录

Serial Number 序列号	Change item 修改项目	Change Content 修改内容	修改人 PIC	修改日期 Date
A/1	无	初版发行	张薪	2019-10-9
A/2	喷码	喷码内容由HDCF改为HDCNR	张薪	2020-02-22

HANDLING INSTRUCTIONS

FOR

LITHIUM ION RECHARGEABLE CELL

锂离子可充电电芯使用说明

1 CAUTION AND PRECAUTION 提醒与预防

1.1 Charging 充电

a) Charging voltage must be set 4.2V/cell. Concerning charge voltage tolerance of charger, charging voltage must be set below4.3V/cell. Even if the charge could be out of order, charge voltage of charger should not be above 4.3V/cell to avoid over- charging. Cell life will be shorten by charging voltage above 4.3V.
电芯充电电压设定为4.2V，考虑到充电器的控制偏差，必须保证电芯充电电压低于4.3V，即使在异常情况下，充电电压不可超过4.V以避免过充电。充电电压高于4.3V会导致电芯循环寿命缩短

b) Charger should start charging at temperature range 0 ~ +45°C.
电芯充电温度范围为0 ~ +45°C。

c) Charge the cell at a constant current of 0.5C until4.2V is attained. Charge rates greater than 2C are NOT recommended. (C: Rated Capacity of cell)
以0.5C的电流恒流充电至4.2V，超过2C的电流建议不要使用（C：标称容量）。

d) Maintain charge voltage at 3.65V for 2.0 hours (recommended for maximum capacity).
恒压4.2V充电2小时（最大容量）。

e) Cell must be charged with constant current-constant voltage method. Do not use the continuous charging method..
必须使用恒压恒流方式对电芯进行充电，不可使用持续充电方式。

f) Do not continue to charge cell over specified time.
不要超过标准时间持续充电

g) No reverse charging
不可反向充电

h) In case of cell voltage is below 2.75V, cell should be charged with pre-charge that current is below 0.26A (0.1C). Then cell voltage reach over2.75V, standard charge starts. And if cell voltage never reaches to 2.75Vin specified period (timer), charger will stop charging.
当电芯电压低于2.75V时，必须使用低于0.26A（0.1C）电流对电芯进行预充电，直到电芯电压高于2.75V再进行标准方式充电。如果电芯电压在限定时间内无法充至2.75V，充电器需停止充电。

i) By timer, current detection and open circuit voltage detection, charger detects full charge. When charger detect cell

is full charged, charger stop charging.
充电器必须能够通过计时，电流检测，开路电压检测监控电芯充电状态，如检测到电芯充满电，充电器需停止充电。

1.2 Discharging 放电

a) Discharge current must be below 7C (18200mA) /cell.
电芯放电电流需小于7C（18200mA）。

b) Discharge end voltage must be over 2.75V.
电芯放电终止电压需高于2.75V。

c) Do not over-discharge cell below 2.75V/cell.
电芯不可过放电至电压低于2.75V。

d) Discharge temperature range should be -10 °C ~ +60°C(0.5C discharge).
电芯放电温度范围为-10 °C ~ +60°C（0.5C放电）。

1.3 Environmental using conditions 电芯长期使用环境条件

When the cell is charged.：0°C ~ +45°C
电芯充电：0°C ~ +45°C
When the cell is discharged.：-10°C ~ +60°C
电芯放电：-10°C ~ +60°C

Charge or discharge out of recommended range might cause the generating heat or serious damage of cell. And also, it might cause the deterioration of cell's characteristics and cycle life.
在超出限定温度范围进行充电或放电，会引发电芯产热或严重的损伤，也会造成循环寿命缩短及性能衰降。

1.4 Storage 储存

Any storage, cell should be in low humidity, no corrosive gas atmosphere area. And there is no press and condensation on the cell. Best temperature range20~30°C.
电芯应在干燥无腐蚀性气体的环境下储存，不要让电芯承受任何压力，且不能有冷凝液体附着在电芯表面，最佳储存温度为20~30°C

1.5 Precautions on Handling Lithium Ion Cells 电芯使用方式

a) When the cells are connected in series, use same rank cells, use same lot number cells and use same charging date cells. These date show label for carton on the master carton. Further, the cell's voltage and impedance have to be checked and matched as uses of cells. HAIDI recommend match cells keep voltage within 10mV difference and impedance within 5mΩ difference at least.
电芯进行串并使用时，需使用相同档位，相同批次及相同充电状态电芯，可以从内外箱标签上获得此信息。电芯使用前需检测电压内阻并按照其用途进行组配，海帝建议至少保证组配使用电芯电压差10mV以

内，内阻差5mΩ以内。

b) Inspect voltage and internal impedance before using.
使用前需检测电芯电压及内阻。

c) When cells are re-shipped to assembling factory, make enough attention the packing to avoid stress by shipping. HAIDI recommends the same package shipped from HAIDIwhen re-shipping. Even if after open package, when re-shipping, use the same parts and materials from HAIDI for re-packing.
电芯中转至组装工厂过程要特别注意禁止运输过程造成外力损伤，转运过程海帝建议使用相同的运输包装，即使过程中存在打开包装的情况。

d) Do not use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.
不要使用由于运输损伤，跌落，短路或其它原因造成破损或漏液电芯。

e) Do not use or leave the cell under the blazing sun (or in heated car by sunshine). The cell may generate heat, , it might cause the deterioration of cell's characteristics or cycle life.
不要使用或将电芯放在太阳光直射的地方（或阳光直接照射的车内）。这种情况会使得电芯产热，可能使得电芯性能衰降及循环寿命缩短。

f) Do not use cell nearby the place where generates static electricity (more than 100V).
不要在静电区域（高于100V）附近使用电芯。

g) Please read the manual before using the cell and please reread if necessary.
请在使用电芯前阅读使用手册，必要情况需要阅读理解。

h) Please read the manual of specified charger about charging method.
请阅读使用手册明白规定充电器的充电方式。

i) When the cell has rust, bad smell or something abnormal at first-time-using, do not use the equipment and go to bring the cell to the place which it was bought.
电芯第一次使用如发现生锈，有异味或异常之处，不要进行使用，将其带至购买处进行处理。

j) In case younger children use the cell, their parents teach how to use cells according to the manual with care.
儿童在使用电芯时，需有父母陪伴并指导其按照使用手册要求操作。

k) Keep the cell out of the reach of younger children. And also, pay attention to cell be taken out it from the charger or equipment by little children.
电芯要放置在儿童无法触及的地方，同时要注意儿童自行将电芯从充电器或使用产品中取出。

l) If the skin or cloth is smeared with liquid from the cell, wash with fresh water. It may cause the skin inflammation, see a doctor immediately.
如果电芯流出液体接触到皮肤或衣服，立即使用清水清洗。可能会引起皮肤炎症，请立即就医。

1.6 Cell position in equipment and charger. 电芯在使用设备及充电器上的部位

To avoid degradation of cell performance by heat, a cell should set the place apart from heat generating electronic parts inside equipment and charger.
避免电芯由于受热造成性能下降，电芯使用时要求远离使用设备及充电器上的发热部件。

1.7 Precautions on Battery Pack Design. 电池包设计预防措施

a) Battery pack Shape, Mechanism and Material 电池包外形，构造及材料

- Do not make the shape and mechanism which easy connect to other equipment and charger.
  电池包外形与构造设计不可与其他设备及充电器通用。
- Do not make the terminal shape which easy cause short circuit by metal object such as necklaces, hairpins, etc. And further, have over current protection function to prevent outer short circuit.
  终端外形应能够避免如项链、发夹等金属物引起短路，而且要对外部短路引起的过流情况具有保护及防止功能。
- Do not make the terminal shape and mechanism which connect reverse to equipment.
  终端外形及构造设计能够避免电池包与使用设备正负极反接。
- Do not make the shape and mechanism which static electricity and water easy go through the battery pack inside.
  终端外形与构造设计能够有效阻止静电及水进入电池包内部。
- Make the shape and mechanism which can inspect protection circuit function before the battery pack makes completely.
  终端外形及构造设计能够在电池包完成组装前检测电路保护功能。
- Fix cells with mold case by rib, tape, glue etc., but do not make damage cells (especially sealing part) by rib or sharp part of mold case. In case of the battery pack is struck by hard shock or vibration, the battery pack has possibility to cause leakage, smoke, explosion.
  内部电芯要使用骨架，胶带，胶水等材料进行定位，以避免电池包受到冲击及振动引发漏液，冒烟和爆炸的可能。但骨架及模具尖锐部分不能对电芯造成损伤（尤其是封口部分）。
- Weld mold case by glue. Not weld mold case by ultra sonic welding.
  熔接模具要使用胶水进行密封，非熔接模具使用超声焊接进行密封。

b) Protection Circuit insure safety of battery 保护线路保证电池包安全

- Overcharge protection should work below 3.7V/cell by charge. Then charge current shall be shut down.
  过充保护能够确保电芯充电电压低于3.7V，若电芯电压高于3.7V则停止充电。
- At the voltage range 2.75V/cell, over-discharge protection should work. Then discharge current shall be shut down and consumption current is below 1μA.
  过放保护能够在电芯电压达到2.75V时停止放电且漏电流需小于1μA。

c) Electric circuit 电路

- To avoid to discharge during storage, design the low consumption current electronic circuit(e.g. Protection circuit, fuel gauge, etc) inside battery pack.
  电池包电路设计低漏电流（例如保护电路，电量监控等）以避免电芯储存过程被放电

d) Cell connection 电芯连接

・ Do not solder onto a cell in order to avoid a damage on the cell. Weld spot welding lead plate onto cell, and solder lead wire or lead plate.
不可使用锡焊以避免对电芯造成损伤，电池包组装使用点焊方式在电芯上连接导线及线路板

2 PRECAUTIONS AND SAFETY INSTRUCTIONS 安全守则

The cell includes the flammable objects such as the organic solvent. If the handling is missed there will be possibility that the cell rupture flames or hot, or it will cause the damage to the cell and/or personal injury. Please observe the following prohibitive matters. And also, add the protection device the equipment for fear that the trouble would affect the cell by the abnormality of equipment. Please read and observe the standard cell precautions below before using utilization.
电芯含有有机溶剂等易燃物质，如使用不当可能引起电芯产热或起火，造成电芯的损害或人身的伤害。请注意使用禁止事项，同时应增加保护装置以避免使用设备异常造成电芯事故。在使用锂离子可充电电芯以前，请仔细阅读以下的安全守则。

2.1 Don’t use or expose the cell to extreme heat, flame, disposed in fire or water or get it wet. Don’t modify or disassemble the cell. It will be dangerous, and may cause ignition, heating, leakage or explosion.
不要使用或放置电芯于极热，有火星的环境。不要将其投入火中，水中或使其吸湿。不要修理或拆解电芯，存在引发电芯起火、过热、漏液或爆炸的危险。

2.2 Don’t short-circuit cell positive(+) and negative(-) terminals. Keep away from metal or other conductive materials. Jumbling the cells of direct contact with positive(+) and negative(-) terminals or other conductive materials may cause short-circuit. Don’t reverse the positive (+) and negative (-) terminals for any reason.
不要将电芯混乱摆放，同时远离金属或导电材料，以避免正（+）负（-）极短路，不要颠倒电芯正（+）负（-）极使用

2.3 Don’t use the unspecified charger and breach charging requirement. Cell charged with unspecified condition maybe lead cell to be overcharged or abnormal chemical reaction. It causes the generating heat, smoke,rupture .
不要使用非规定充电设备和违反充电要求。非规定条件充电会引发电芯过充电或异常化学反应，发生产热，冒烟，破裂情况

2.4 Don’t overcharge, over-discharge, drive nail into the cell, strike it by hammer or tread it.
不要过充、过放、针刺、锤击或践踏电芯。

2.5 Don’t give cell impact or drop, and not use the cell with conspicuous damage or deformation.
不要撞击或投掷电芯，不要使用受到明显的损害或变形的电芯

2.6 Don’t connect cell to the plug socket or car-cigarette-plug. Don’t use lithium-ion cell in mixture of different batch or use cell for other equipment.
不要将电芯与插座直接连接，不同批次锂离子电芯不可混合使用，或将电芯用于其它设备。

2.7 Do not use or leave the cell under the blazing sun (or in heated car by sunshine), and keep cell away from little

children in order to avoid troubles by Swallowing. In case of swallowing the cell, see a doctor immediately.
不要将电芯放置在太阳光直射的地方（或阳光直接照射的车内），电芯要远离儿童放置以避免儿童吞咽事故，如发生吞咽情况，请立即就医。

2.8 If the cell gives off an odor, generates heat, becomes discolored, or in any way appears abnormal during use, recharging or storage, immediately remove (Don't touch a abnormal cell directly) it from the device or cell charger and stop using it.
电芯在使用、充电或储存过程中，出现释放气味、过度产热或变色等异常情况，立即将电芯从使用设备或充电器取出（不要直接接触异常电芯）并停止使用。

2.10 Do not continue to charge cell over specified time. If the cell is not finished charging over regulated time, let it stop charging. There is possibility that the cell might generate heat, smoke, rupture or flame.
电芯不要持续充电超过限定时间。如电芯在限定时间内仍无法完成充电，要停止充电，继续充电有可能发生电芯产热，冒烟，破裂或起火。

2.11 Do not get cell into a microwave or a high pressure container. It causes the generating heat, smoke, rapture or flame because of a sudden heat or damage of sealing condition of cell.
不要将电芯至于微波或高压容器内，突然高温或密封状态破坏会引起电芯产热，冒烟，破裂或起火。

2.12 Don't solder the cell directly. Excessive heating may cause deformation of the cell components such as the gasket, which may lead to the cell swelling, leakage, or ignition.
不要直接锡焊焊接电芯，过热会导致绝缘垫圈等电芯部件变形，引发电芯变形、漏液或者起火。

2.13 Do not touch a leaked cell directly or put a leaked cell nearby fire.
要直接接触漏液电芯或将漏液电芯放置在火源旁。

2.14 Don't use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.
不要使用由于运输碰撞、跌落、短路或其它原因造成损伤以及有电解液泄露的异常电芯。

3 **CONSULTATION** 技术咨询

3.1 If there are problems in this specification, HAIDI can consider to change specification after discussion, please contact us as following:
如果这个规格有问题，天科可以在讨论后考虑变更规格，请联系我们如下

Add:Haidi Power Technology Co.,Ltd.guangjin road, taierzhuang economic development zone, taierzhuang district, zaozhuang city, shandong province
地址：山东省枣庄市台儿庄区台儿庄经济开发区广进路，天科新能源有限责任公司
网址：

3.2 For the sake of safety assurance, please discuss the equipment design, its system and protection circuit of Lithium-ion cell with HAIDI in advance. And consult about the high rate current, rapid charge and special application in the same way.
为了安全起见，如有设备设计，锂离子电芯系统保护电路或高电流，快速充电和其它方面的特殊应用,请

先咨询天科公司相关事宜。