



CUSTOMER NO: \_\_\_\_\_

# 产 品 规 格 书

圆柱锂离子电芯

## PRODUCT SPECIFICATION

Cylindrical Lithium-ion Cell

**MODEL/型号: 18650**

(INR18650-2200mAh)

Prepared By/Date 编制/日期	Checked By/Date 审核/日期	Approved By/Date 批准/日期
陈斌		

Customer Approval 客户确认	Signature/ 签字	Date/ 日期
	Company Name/公司名称	
	Company Stamp/公司印章	



## Contents 目录

Contents 目录.....	1
History of revision 修改履历.....	2
1 Preface 前言.....	3
2 Definition 定义.....	3
2.1 Rated capacity 标称容量.....	3
2.2 Standard charge method 标准充电方式.....	3
2.3 Standard discharge method 标准放电方式: .....	3
3 Cell type and dimenstions 电芯型号、尺寸、颜色.....	3
3.1 Description and model 电芯说明及型号.....	3
3.2 Cell bar code and explanation 电芯喷码及说明.....	4
3.3 Cell colour explanation 电芯套管颜色说明: .....	5
4 Cell specification 电芯特性.....	5
5 Technical characteristics 技术要求.....	6
5.1 Cell usage conditions 电芯使用环境.....	6
5.2 Cell testing conditions 电芯试验环境.....	6
5.3 Requirement of the testing equipment 测量仪表要求.....	6
5.4 Electronic performance 电性能.....	6
5.5 Environmental characteristics 环境适应性能.....	8
5.6 Safety characteristics 安全性能.....	8
6 Cautions in use 谨慎使用.....	10
7 Period of Warranty 保质期.....	11
8 Storage of the Batteries 电池的存放.....	11
9 Consultation 联系方式.....	11
10 Note 注释.....	11



History of revision 修改履历

Serial Number 序号	Dokument Numeber 文件编号	Revision 版本	Change Content 修改内容	PIC 修改人	Date 日期
1	SPEC-RTS-004	A00	初版制定	陈斌	2019-5-18

## 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 18650-2000mAh-3C cell supplied by Keheng New Energy Technology (Shenzhen) 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。本标准适用于科恒新能源科技(深圳)有限公司生产的圆柱型 18650-2200mAh 锂离子电芯。

## 2 Definition 定义

### 2.1 Rated capacity 标称容量:

Under  $25\pm 2.5^{\circ}\text{C}$ , It means the capacity value of being discharged by 2-hours rate to end voltage 2.75 V, which is signed Cap, the unit is mAh.

指在  $25\pm 2.5^{\circ}\text{C}$  环境下, 以 2 小时率放电至终止电压 2.75 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  $25\pm 2.5^{\circ}\text{C}$ , 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  $25\pm 2.5^{\circ}\text{C}$  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。

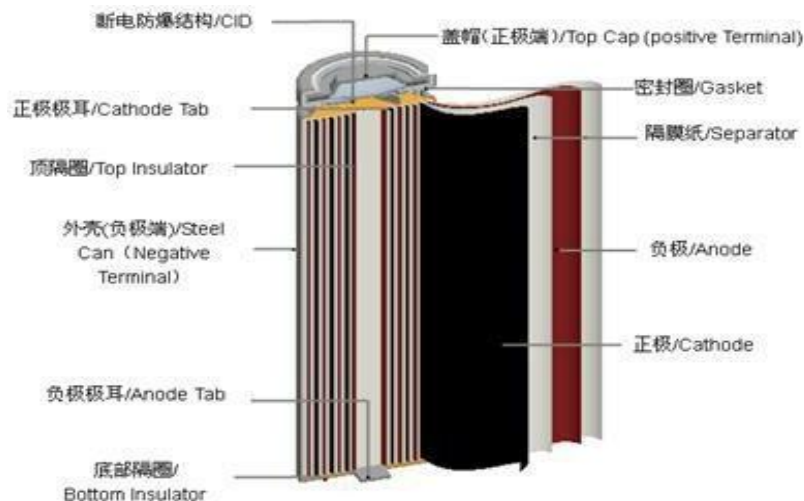
### 2.3 Standard discharge method 标准放电方式:

Under  $25\pm 2.5^{\circ}\text{C}$ , it can be discharged to the voltage of 2.75V with constant current of 0.5C.

指在  $25\pm 2.5^{\circ}\text{C}$  环境下, 以 0.5C 的电流恒流放电至单体电芯电压 2.75V。

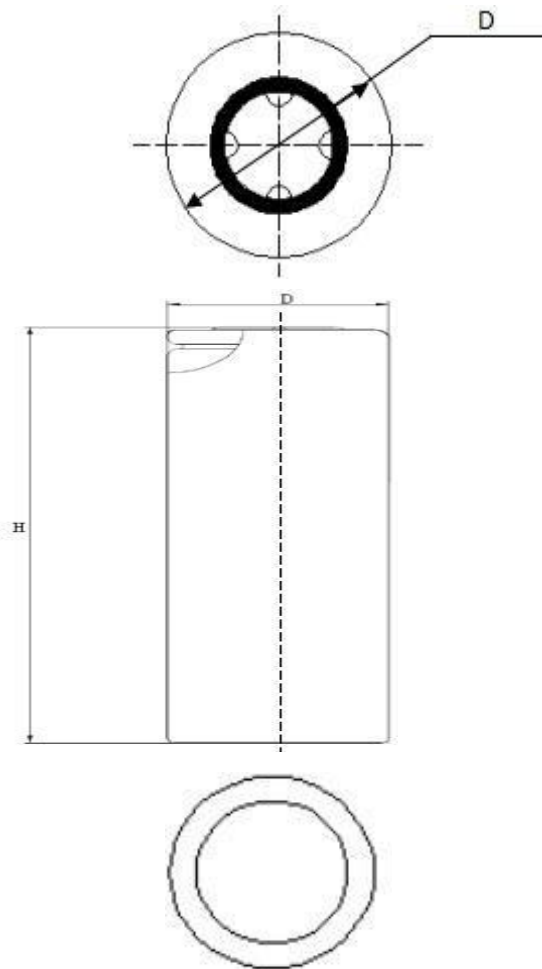
## 3 Cell type and dimenstions 电芯型号、尺寸、颜色

### 3.1 Description and model 电芯说明及型号



Profile of lithium-ion batteries Figure 1

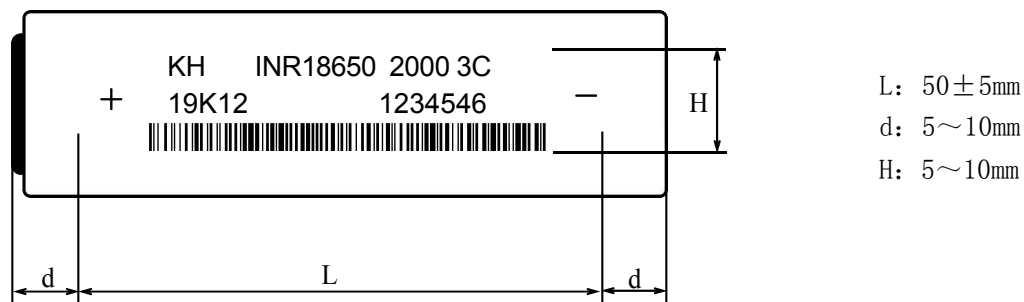
锂离子电池剖面图 图 1



Cell physical dimension listed Figure2(unit: mm)  
电芯尺寸示意图 图 2 (单位: mm)

NO	Items	Units: mm
1	diameter/直径(D)	18.3±0.2
2	Height/高度(H)	65.0±0.3

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



L: 50±5mm  
d: 5~10mm  
H: 5~10mm

规格: INR18650

额定电压: 3.6V

公司代码: KH

型号代码: 2200

追溯信息代码: 19 表示生产年; K 表示生产月; 12 表示生产日期;

流水号: 6 位 (123456)

### 3.3 Cell colour explanation 电芯套管颜色说明:

BLUE

蓝色

Colour is for reference only, the colour can be adjusted according to customer requirements.

颜色仅供参考，可依据客户要求进行调整。

### 4 Cell specification 电芯特性

ITEM 项目	SPECIFICATION 特性
Normal capacity 标称容量	2200 mAh@0.5C
Minimum capacity 最小容量	2150mAh@0.5C
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	2.75 ± V
Standard charging current 标准充电电流	0.5C(1100 mA)
Standard discharge current 标准放电电流	0.5C(1100 mA)
Max charge current 最大充电电流	0.5C(1.1A)(T≥10°C)
Max discharge current 最大放电电流	1C(2.2A)(T≥0°C)
Max instantaneous discharge current 最大瞬间电流	3C(6.6A) (20~ 45°C)
Max recommended charge and discharge cell body temperature 充放电过程中电芯表面的最大推荐温度	Charge:0~ 45°C      Discharge:-20~ 60°C 充电时: 0~45°C      放电时: -20~60°C
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: 60°C      Discharge: 75°C 充电时: 60°C      放电时: 75°C
Internal resistance 内阻	≤50mΩ      (AC Impedance, 1000 Hz,50%SOC)
Weight 重量	≤ 48g

## 5 Technical characteristics 技术要求

### 5.1 Cell usage conditions 电芯使用环境

Temperature of charge 充电温度: 0~45℃

Temperature of discharge 放电温度: -20~60℃

### 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±2.5℃

### 5.3 Requirement of the testing equipment 测量仪表要求

Voltage meter: The voltage tester internal resistance is  $\geq 10\text{ K}\Omega/V$

电压仪表要求: 测量电压的仪表内阻不小于  $10\text{K}\Omega/V$

Temperature meter: The precision is  $\leq 0.5^\circ\text{C}$

温度仪表要求: 测量温度的仪表精度不低于  $0.5^\circ\text{C}$

### 5.4 Electronic performance 电性能

NO. 序号	ITEM 项目	Standard 标准	TESTING METHOD 测试方法
1	Discharge rate capability(Room temperature) 倍率放电性能	Discharge capacity / Nominal capacity*100% 放电容量/标称容量*100% ①0.2C <sub>5</sub> A≥100% ②0.5C <sub>5</sub> A≥98% ③1.0C <sub>5</sub> A≥92% ④3.0C <sub>5</sub> A≥88% The charging and discharge curves must be smooth 充放电曲线应平稳光滑	At standard atmospheric pressure ambient temperature 25±2℃, relative humidity 45-80% (The following if no specific instructions are all in these conditions ,according to this charging ways) ,after 0.5C <sub>5</sub> A standard charged ,rest for 15 min and then discharge at 0.2C <sub>5</sub> A、0.5C <sub>5</sub> A、1.0C <sub>5</sub> A、3.0C <sub>5</sub> A to discharge cut-off voltage 2.75V respectively.Charge/discharge cycle can be conducted for 3 times before meeting the standards(the same bellow) 在 1 标准大气压下, 环境温度 25±2℃, 相对湿度为 45-80%的条件下, 电池 0.5C <sub>5</sub> A 标准充电后 (以下若没有特殊说明, 均在此条件下放置, 皆按此充电方式) 搁置 15min, 分别以 0.2C <sub>5</sub> A、0.5C <sub>5</sub> A、1.0C <sub>5</sub> A、3.0C <sub>5</sub> A 进行放电至下限电压 2.75V, 循环三次, 当有一次达到标准, 即达到标准要求 (下同)
2	Cycle life 循环寿命	Residual capacity $\geq 80\%$ *Nominal capacity 容量 $\geq 80\%$ *标称容量	Measure the initial condition and initial capacity of battery.Then conduct 0.5C <sub>5</sub> A/10.0C <sub>5</sub> A 300 <sup>th</sup> (rest 30min) cycle measured the final condition of battery. 测量电池的初始状态和初始容量, 进行 0.5C <sub>5</sub> A/0.5C <sub>5</sub> A (搁置 30min) 循环, 500 次后测量电池的最终状态。
3	High-Low temperature	Discharge capacity/Nominal capacity*100% 放电容量/标称容量*100%	Tested the initial condition and initial capacity of battery .Standard charge.Put



	<p>discharge performance 高低温放电性能</p>	<p>①55℃ ≥100% ②25℃ ≥100% ③0℃ ≥80% ④-10℃ ≥60%</p>	<p>the battery into 55±2℃ for 2h , discharge at 0.2C<sub>5</sub>A to the cut-off voltage 2.75V ,Then standard charge at room temperature .In turn put the battery into -10/0±2℃ for 4h ,discharge at 0.2C<sub>5</sub>A 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 2h，以 0.2C<sub>5</sub>A 放电至 2.75V，然后再室温条件下标准充电后，在-10/0±2℃恒温条件下搁置 4h，以 0.2C<sub>5</sub>A 放电至 2.75V，测试电池的最终容量。在室温条件下搁置 2h，观察电池的外观变化。</p>
4	<p>Normal Storage 常温荷电保持能力</p>	<p>Retention capacity ≥ 85%*Nominal capacity 剩余容量 ≥85%*标称容量  Recover capacity ≥ 90%*Nominal capacity 恢复容量 ≥90%*标称容量</p>	<p>Tested the initial condition and initial capacity of battery.Store at 25±2℃ for 28 days after standard charged, tested the final condition of battery.Then discharge at 0.5C<sub>5</sub>A to the discharge cut-off voltage 2.75 V,tested the residual capacity of battery.0.5C<sub>5</sub>A / 0.5C<sub>5</sub>A tested the recovery capacity of battery.Charge/discharge cycle can be conducted for 3 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，在25±2℃开路放置28天，测量电池最终状态；以0.5C<sub>5</sub>A 放电至2.75V，测量电池的剩余容量；0.5C<sub>5</sub>A /0.5C<sub>5</sub>A 测量电池恢复容量。可循环三次，当有一次达到标准，即达到标准要求。</p>
5	<p>High temperature Storage test 高温储存</p>	<p>Retention capacity ≥ 85%*Nominal capacity 剩余容量 ≥85%*标称容量  Recover capacity ≥ 90%*Nominal capacity 恢复容量 ≥90%*标称容量</p>	<p>Tested the initial condition and initial capacity of battery.Store at 55±2℃ for 7 days after standard charged, tested the final condition of battery.Then discharge at 0.5C<sub>5</sub>A to the discharge cut-off voltage 2.75 V,tested the residual capacity of battery.0.5C<sub>5</sub>A / 0.5C<sub>5</sub>A tested the recovery capacity of battery.Charge/discharge cycle can be conducted for 3 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，在55±2℃开路放置7天，测量电池最终状态；以0.5C<sub>5</sub>A 放电至2.75V，测量电池的剩余容量；0.5C<sub>5</sub>A /0.5C<sub>5</sub>A 测量电池恢复容量。可循环三次，当有一次达到标准，即达到标准要求</p>





6	Storage performance 存储性能	The discharge time of 0.2C <sub>5</sub> A: Storage 6 months of battery ≥4h 0.2C <sub>5</sub> A 放电时间: 贮存 6 个月的电池 ≥4h	after 0.5C <sub>5</sub> A standard charged, measured the initial condition and initial capacity of battery. Store 6 months at room temperature, measure the final condition of battery Then conduct 0.5C <sub>5</sub> A / 0.2C <sub>5</sub> A cycle 3 times to record the discharge time of battery. 电池 0.5C <sub>5</sub> A 标准充电后, 测量电池储存前的初始状态, 室温 6 个月后, 测量电池的最终状态, 然后以 0.5C <sub>5</sub> A / 0.2C <sub>5</sub> A 循环 3 次记录电池放电时间。
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**5.5 Environmental characteristics 环境适应性能**

NO. 序号	ITEM 项目	Standard 标准	TESTING METHOD 测试方法
1	Temperature cycle test 温度循环	No leakage, fire, explosion 电池不漏液、不起火、不爆炸	Standard charge. Put the battery into 20±5°C chamber: ①raising the chamber temperature to 75±2°C for 6h ; ②reducing the chamber temperature to -40±2°C for 6h; ③charge the temperature within 30 minutes; ④repeating the sequence for 10 cycles; 将电池充满电后, 放置在温度为 20±5°C 的温控箱中进行如下操作: ①将温控箱温度升为 75±2°C, 并保持 6h; ②将温控箱温度降为 -40±2°C, 并保持 6h; ③温度转换时间不大于 30min; ④重复步骤①-③, 共循环 10 次;
2	Drop 跌落	No leakage, fire, explosion 电池不漏液、不起火、不爆炸	After standard charge ,cells dropped from a height of 1.5m to the cement floor 将充满电后电芯从 1.5m 的高度上跌落到水泥地面上 (从头部、尾部、侧面)
3	Vibration 振动	No leakage, fire, explosion 电池不漏液、不起火、不爆炸	After standard charge ,cells are fixed on vibration table and subjected to vibration cycling at the rate of 1 Hz per minute between 10 Hz to 55 Hz. The excursion of the vibration is 1.52mm. The test has to be carried out for 90 minutes at x,y,z axes individually 将充满电的电池以振幅 0.76mm (双振幅为 1.52mm) 的正弦振动, 振动频率范围为 10-55Hz, 频率变化速率为 1Hz/m; 沿 x,y,z 三个方向振动, 每个方向振动 90±5min

**5.6 Safety characteristics 安全性能**

NO.	ITEM	Standard	TESTING METHOD
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序号	项目	标准	测试方法
1	Over discharge 过放电	No leakage,fire,explosion 电池不漏液、不起火、不爆炸	A discharged cells are subjected to a reverse charge at 1C for 90 min. 将电芯放完电，再用 1C 反接充电 90 分钟
2	Overcharge 过充电	No fire,explosion 电池不起火、不爆炸	After standard charge,After standard charge, continue to charge with a constant current 3C/10Vper a cell,holding 1h. 将充满电的电芯以 3C/10V 的恒定电流充电，保持 1 小时
3	Short-circuit 短路	No fire,explosion 电池不起火、不爆炸	After standard charge,Cells are stored in temperature of $20 \pm 5^{\circ}\text{C}$ and $55 \pm 5^{\circ}\text{C}$ , Then short-circuited by connecting the positive and negative terminals with a total external resistance of $80 \pm 20\text{m}\Omega$ ,remain for 24h or the case temperature declines by 20% of the maximum temperature rise. 将充满电电芯分别放在温度 $20 \pm 5^{\circ}\text{C}$ 和 $50 \pm 5^{\circ}\text{C}$ 下，每个电芯的正负极通过一个 $80 \pm 20\text{m}\Omega$ 的外部电阻连接，保持 24h 或壳体温度下降到最高温度的 20%
4	Heating 加热	No fire,explosion 电池不起火、不爆炸	After standard charge,Cells are heated in a circulation air oven at a rate of $5 \pm 2^{\circ}\text{C}$ per minute to $130 \pm 2^{\circ}\text{C}$ , and remain for 30minutes. 将充满电的电芯放在电热鼓风干燥箱中，温度以 $5 \pm 2^{\circ}\text{C}$ 的速率升至 $130 \pm 2^{\circ}\text{C}$ ，并保持 30min。
5	Crush 挤压	No fire,explosion 电池不起火、不爆炸	After standard charge,Placed the cell in two iron plane moulds , with the most strongly $13 \pm 1\text{KN}$ pressure for the moment compression.Once the maximum force has been applied,or an abrupt voltage drop of one-third of the original voltage has been obtained,or 10% of deformation has occurred compared to the initial dimension,the force is released 将充满电的电芯放置在两贴纸平板中，用 $13 \pm 1\text{KN}$ 的压力进行压缩，一旦压力大到最大值，或电压下降至初始电压的 1/3，或形变量达到 10%，停止挤压
6	Impact 重物冲击	No fire,explosion 电池不起火、不爆炸	After standard charge,placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it.A $15.8 \pm 0.2\text{mm}$ diameter bar is to be placed across the center of the sample. A $9.1 \pm 0.1\text{kg}$



			weight is to be dropped from a height of 61cm on the sample. 将充满电的电芯放在平面上，将一直径Φ7.9mm 的棒放在样品中心，让重量 9.1kg 的重物从 610mm 的高度落到实验电芯
7	Low-pressure 低气压	No leakage, fire, explosion 电池不漏液、不起火、不爆炸	After standard charge, Put cell into the low pressure box, adjust the air pressure in the test chamber is 11.6 KPa, temperature to room temperature, let stand for 6 h. 标准充电后，将电芯放入低气压箱中，调节试验箱中气压为 11.6KPa，温度为室温，静置 6h
8	Seawater soak 海水浸泡	No leakage, fire, explosion 电池不漏液、不起火、不爆炸	After standard charge, cells immersed in 3.5% NaCl solution (mass fraction, simulation under the normal temperature water composition) simulation under the normal temperature water composition in 2 h, The cell completely submerged in water. 将充满电的电芯浸入 3.5%NaCl 溶液（质量分数模拟常温下的海水成分）中 2h；水深应完全没过电芯

## 6 Cautions in use 谨慎使用

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)

### ➤ Handling (电池操作)

- Do not expose to, dispose of the battery in fire. (不要靠近和放置电池于火中)
- 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)
- Avoid shorting the battery (避免电池短路)
- Avoid excessive physical shock or vibration. (避免电池过多的物理撞击和震动)
- Do not disassemble or deform the battery. (不要解剖和使电池变形)
- Do not immerse in water. (不要把电池浸泡在水中)
- 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)
- Keep out of the reach of children. (放置电池于儿童不易接触的地方)

### ➤ charge and discharge (充电和放电)

- Battery must be charged in appropriate charger only. (电池必须用适当的充电器充电)
- Never use a modified or damaged charger. (不要使用改装或损坏的充电器)
- Do not leave battery in charger over 24 hours. (不要把电池放置于充电器超过 24h)

### ➤ 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)

### ➤ disposal (电池处理)

- Regulations vary for different countries. Dispose of in accordance with local regulations. (电池处理要符合当地的规定)

## 7 Period of Warranty 保质期

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

电池的保质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 Storage of the Batteries 电池的存放

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 Consultation 联系方式

If there are problems in this specification, KH Battery can consider to change specification after discussion, please contact us as following:

如果对此规格书有疑问，经讨论协商后，科恒考虑修改该规格书，请按以下方式联系我们：

Keheng New Energy Technology (Shenzhen) Co.Ltd

Head Office:Lang kou Industrial Park, Longhua District, Shenzhen city

Factory Add:No.58 yihu west road, high-tech industrial development zone, lujiang county, hefei city, anhui province, China

科恒新能源科技（深圳）有限公司

深圳地址：广东省深圳市龙华区金地大科技园D8栋8楼

工厂地址：安徽省合肥市庐江县高新技术开发区移湖西路 58 号

Tel. No.: +86 0755-21044322

Website: [www.keheng-battery.com](http://www.keheng-battery.com)

## 10 Notes 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。