



天臣新能源（渭南）有限公司

TESSON NEW ENERGY (Weinan) CO.,LTD

Specification of Lithium-ion Rechargeable Cell

锂离子二次电池规格书

Cylindrical battery cell 圆柱型电池

TCR18650-3000mAh

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1. Application 适用范围

This specification specifies the technical parameters and test standards of TCR18650 - 3000mAh cylindrical lithium-ion battery supplied by Tesson New Energy (Weinan) Co., Ltd. This battery is suitable for devices or tools that discharge current is less than 8C under room temperature.

本规格书规定了天臣新能源（渭南）有限公司向客户提供的 TCR18650-3000mAh 圆柱型锂离子电池的技术参数及测试标准。本型号电池适用于在室温状态下持续放电电流小于 8C 放电的设备及工具。

2. Description 种类型号

2.1 Description: Rechargeable Cylindrical Lithium-ion Battery Cell

种类：圆柱型锂离子二次电池

2.2 Battery Cell Mode: TCR18650-3000mAh

型号：TCR18650-3000mAh

3. Reference standards 参考标准

This specification refers to UL1642、GB/T31485-2015、GB/T31486-2015 and other technical standards.

此规范参考 UL1642、GB/T31485-2015、GB/T31486-2015 等技术标准规范编制。

4. Cautions 注意事项

4.1 Please read this specification carefully before testing or using the battery to avoid the battery from failure, over-heat, electrolyte leakage, setting fire or explosion;

在测试或使用电池之前，请仔细阅读本规格书，以防止因操作不当引起电池功能失效、发热、漏液、起火甚至爆炸；

4.2 In charging or discharging, please apply professional testing equipment; no use of general constant current and constant voltage power which is not able to restrict current and voltage to avoid battery failure and dangers;

对电池进行充放电测试时，请使用锂离子电池专用测试设备，严禁使用普通恒流恒压源等不能精确限压、限流设备对电池进行充放电，以避免电池被过充过放而引起电池功能失效或发生危险；

4.3 Please do not put the battery with false direction of “+” “-” when charging or connecting with the equipment; otherwise the product will suffer from over-charging or over-discharging, and will cause battery failure or explosion;

对电池充放电或将电池装入设备时，注意不要将电池正负极反置，否则将会使电池发生过充或过放，导致电池严重失效甚至发生爆炸等危险；

4.4 Don't weld the battery directly, no opening of the battery;

不要直接对电池正负极两端进行锡焊焊接，严禁对电池进行分解；

4.5 In order to avoid short circuit, please don't put and store the battery with metal stuff in bag or pocket, for instance, necklaces, coins, barrettes, screws, no connecting directly the “+” and “-” together with metal or other conductive materials;

不要把电池同项链、发夹、硬币或螺丝等金属品一起放在兜中或包中，也不要将电池同上述物品一起储存，严禁用金属等导电材料直接连接电池正负极而使电池发生短路；

4.6 No knocking, throwing or trampling the battery, not to mention put the battery in washing machines or high compress vessels;

禁止敲击、抛掷或踩踏电池，更不要将电池放入洗衣机或高压容器内；

4.7 Please keep the battery far away from heat source, such as fire, heater; do not store or use the battery under strong sunshine or high ambient temperature above 60°C, otherwise the battery will set fire, be over heated or failure;

请勿将电池靠近热源，如火、加热器等，不要在烈日下或在温度超过 60℃ 的条件下使用或存放电池，否则可能会引起电池发热、起火、爆炸及功能失效等；

4.8 Please do not damp the battery or put it into water; please keep the battery dry and be of low temperature in storage;

不要将电池弄湿或将电池投入水中，暂不使用时，请放置在低温干燥的环境中；

4.9 During the period of using, testing or storage, if the battery has been found got hot, expiring abnormal odors, changed color, transformed or in other unusual states, please stop relative handling at once, isolate the battery and keep away from it;

使用、测试或存放电池时，如发现电池有变热、散发气味、变色、变形或其它反常时，请立即停止使用或测试，设法隔离电池并远离；

4.10 If the battery leaked and the electrolyte split into your eye, don't knead you eye, flush it with clean water at once, go to see a doctor in the case of seriousness; if electrolyte splattered on your skin or clothes, please flush it with clean water.

如电池漏液并不慎将电解液溅入眼睛，不要揉擦你的眼睛，立刻用干净的水进行冲洗，严重情况下请去医院就医，如皮肤或衣物溅上电解液，则需马上用清水冲洗干净。

5. Basic Specifications and Performance 基本规格及性能

Items 项 目		Specifications 规 格
Capacity 容量	Typical Capacity 标称容量	3000mAh@0.2C, 25℃
	Minimum Capacity 最低容量	2900mAh@0.2C, 25℃
Nominal Voltage 标称电压		3.7V
Internal Impedance 电池内阻		≤20mΩ (NO PTC)
Discharge Cut-off Voltage 放电终止电压		2.50V±0.05V
Charging Voltage 充电上限电压		4.20V±0.05V
Standard Charging 标准充电电流		0.5C
Quick Charging 快速充电电流		1.0C
Standard Discharging 标准放电电流		0.2C
Quick Discharging 快速放电电流		5C
Max Discharge Current 最大瞬间放电电流 (≤5s)		8C
Weight 电池重量		47±1.5g
Dimensions 电池尺寸		Diameter 直径(φ): 18.6 ⁺⁰ _{-0.3} mm
		Height 高度(H): 65.3±0.2mm
Operating Temperature (Ambient) 电池使用环境温度范围		Charge 充电温度: 0 ~ 45℃
		Discharge 放电温度: -20 ~ 60℃
Storage Temperature 贮存温度		Min 1month: 1 个月内: -5 ~ 35℃
		Min 6months: 6 个月内: 0 ~ 35℃

6. Test method 试验方法

6.1 Testing Condition 环境条件

Unless otherwise specified, the room temperature test should be conducted at below test condition: temperature $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$, relative humidity 15%~90%, atmospheric pressure 86~106kPa.

除另有规定，本标准所提到的室温试验应在温度为 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ，相对湿度为 15%~90%，大气压力为 86kPa~106kPa 的环境中进行。

6.2 Measurement Apparatus & Instrument Accuracy 测量仪器、仪表准确度

Measurement Apparatus, Instrument Accuracy shall meet the following requirements;

—Voltages Measuring Instrument: not less than 0.5 degree;

—Current Measuring Instrument: not less than 0.5 degree;

—Temperature Measuring Instrument: $\pm 0.5^{\circ}\text{C}$

—Time Measuring Instrument: $\pm 0.1\%$

—Dimension Measuring Instrument: $\pm 0.1\%$

—Weight Measuring Instrument: $\pm 0.1\%$

测量仪器，仪表准确度应满足以下要求；

—电压测量装置：不低于 0.5 级；

—电流测量装置：不低于 0.5 级；

—温度测量装置： $\pm 0.5^{\circ}\text{C}$

—时间测量装置： $\pm 0.1\%$

—尺寸测量装置： $\pm 0.1\%$

—质量测量装置： $\pm 0.1\%$

6.3 charge 充电

6.3.1 Standard Charge: The charger supplies $0.5I_1(\text{A})$ constant current until battery voltage reaches 4.2V at room temperature, then be charged at constant voltage of 4.2V while tapering the charge current to less than or equals to $0.03I_1(\text{A})$. Rest for 10 minutes.

标准充电：在室温下，先以 $0.5I_1(\text{A})$ 电流恒流充电至 4.2V，然后再转 4.2V 恒压充电，至充电电流降至 $0.03I_1(\text{A})$ 时停止充电，静置 10 分钟。

6.3.2 Quick Charge: The charger supplies $1I_1(\text{A})$ constant current until battery voltage reaches 4.2V at room temperature, then be charged at constant voltage of 4.2V while tapering the charge current to less than or equals to $0.03 I_1(\text{A})$. Rest for 10 minutes.

快速充电：在室温下，先以 $1I_1(\text{A})$ 电流恒流充电至 4.2V，然后再转 4.2V 恒压充电，至充电电流降至 $0.03I_1(\text{A})$ 时停止充电，静置 10 分钟。

6.4 discharge 放电

6.4.1 Standard Discharge: The discharge supplies $0.2I_1$ (A) current until the voltage down to 2.50V at room temperature.

标准放电：在室温下，电池以 $0.2I_1$ (A)电流放电，直到电压降低到 2.50V 停止。

6.4.2 Large rate continued discharge: The discharge supplies $5I_1$ (A) current until the voltage down to 2.50 V at room temperature.

大倍率持续放电：在室温下，电池以 $5I_1$ (A)电流放电，直到电压降低到 2.50V 停止。

6.5 Internal Impedance measurement 内阻测量

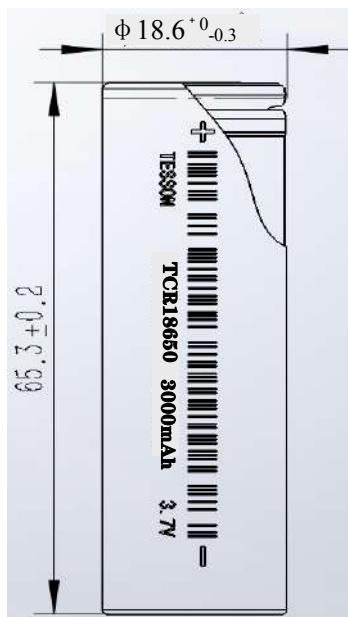
The internal impedance is measured by AC impedance method and the frequency of equipment is 1kHz.

采用交流阻抗法测试，设备频率 1KHZ。

7. Appearance 外观

The battery should be clean and dry, no technical damages, electrolyte leakage, rustiness, and what's more, the battery must have product identification on the surface.

外表清洁，无机械损伤、漏液、锈蚀；另表面有必须的产品标识。



8. Performances 电池性能测试

8.1 Electrical Properties 电性能

Items 项目	Inspecting Method 测试方法	Standard 标准	
Nominal capacity 额定容量	Charge according to 6.3.1, then measure discharge capacity during discharge process according to 6.4.1. 在室温下, 单体电池按照 6.3.1 方法充电后, 按照 6.4.1 方法放电, 计量放电容量 (以 mAh 计)。	≥ 2900	
Initial capacity 初始容量	Charge according to 6.3.1, The discharge supplies $1I_1(A)$ current until the voltage down to 2.50V at room temperature, the cycle should be 5 times. When the capacity gap of three times in succession are less than 3% nominal capacity, the test terminates. Calculate the average of last three experimental results. 单体电池按照 6.3.1 方法充电后, 在室温下, 电池以 $1I_1(A)$ 电流放电, 直到电压降低到 2.50V 停止, 持续 5 次循环, 当连续 3 次容量极差小于额定容量的 3%, 可以提前结束测试, 取最后 3 次试验结果的平均值 (以 mAh 计)。	capacity gap for three times <3% 3 次极差 <3%	
Initial resistance 初始内阻	The internal impedance is measured by AC impedance method and the frequency 直接使用交流阻抗法测试来料电池的内阻。	$\leq 20m\Omega$	
Discharge Rate 常温倍率放电	Charge according to 6.3.1 under room temperature, rest for 10 minutes. Then the battery discharge with vary current to the end, measuring the discharge capacity percentage. 单体电池按照 6.3.1 方法充电后, 室温下, 静置 10min, 电池以不同的电流放电至终止电压, 计量其放电容量百分比 (不同放电电流容量/初始容量)。	3C	93%
		5C	92%
		8C	85%
Quick Charge 常温倍率充电	discharge with $1I_1(A)$ till the cut-off voltage 2.50V at room temperature, then rest for 1 hour, Charge with $2I_1(A)$ for 30min while the cut-off voltage is 4.2V, and rest for 1H, then discharge with $1I_1(A)$ till the cut-off voltage 2.50V, calculate the capacity restoration. 室温下, 电池以 $1I_1(A)$ 电流放电至终止电压 2.50V, 静置 1H, 电池以 $2I_1(A)$ 电流恒流充电 30min, 上限保护电压 4.2V 静置 1H, 再以 $1I_1(A)$ 电流放电至终止电压 2.50V, 计量其放电容量。	$\geq 70\%$ initial capacity $\geq 70\%$ 初始容量	

Low temperature discharge 低温放电	Charge according to 6.3.1, lay the battery aside for 24 hours in the ambient temperature of $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$, then discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V and calculate the discharge capacity. 电池按照 6.3.1 充电后, 将电池置放在 $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 环境下 24H, 电池在 $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 下, 以 $1I_1(\text{A})$ 电流放电至终止电压 2.50V, 计量其放电容量。	$\geq 70\%$ initial capacity $\geq 70\%$ 初始容量
High temperature discharge 高温放电	Charge according to 6.3.1, lay the battery aside for 5H in the ambient temperature of $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$, then discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V and calculate the discharge capacity. 电池按照 6.3.1 充电后, 将电池置放在 $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 下 5H, 电池在 $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 下, 以 $1I_1(\text{A})$ 电流放电至终止电压 2.50V, 计量其放电容量。	$\geq 95\%$ initial capacity $\geq 95\%$ 初始容量
Room temperature Capacity Retention & Capacity Recovery 室温荷电保持与容量恢复	Charge according to 6.3.1, store the battery for 28 days in the room temperature, then discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V, calculate the remain capacity. Charge according to 6.3.1 again, then discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V, calculate the capacity restoration. 电池按照 6.3.1 充电后, 在室温下储存 28 天, 然后按照以 $1I_1(\text{A})$ 电流放电至终止电压 2.50V, 计为荷电保持容量; 再按照 6.3.1 充电后, 在室温下, 电池以 $1I_1(\text{A})$ 电流放电至终止电压 2.50V, 计为恢复容量。	Capacity retention $\geq 90\%$ initial capacity Capacity restoration $\geq 90\%$ initial capacity 荷电容量保持率 $\geq 90\%$ 初始容量 恢复容量 $\geq 90\%$ 初始容量
High temperature Capacity Holding & Capacity Recovery 高温荷电保持与容量恢复	Charge according to 6.3.1, store the battery for 7 days in the ambient temperature of $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$, then rest for 5 hours at room temperature, discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V calculate the remain capacity. Charge according to 6.3.1 again, then discharge with $1I_1(\text{A})$ till the cut-off voltage 2.50V, calculate the capacity restoration. 电池按照 6.3.1 充电后, 电池在 $55^{\circ}\text{C} \pm 2^{\circ}\text{C}$ 下储存 7 天, 然后再在常温下搁置 5 小时后, 以 $1I_1(\text{A})$ 电流放电终止电压 2.50V, 计量荷电保持容量, 再按照 6.3.1 充电后, 在室温下, 电池以 $1I_1(\text{A})$ 电流放电终止电压 2.50V, 计算恢复容量。	Capacity retention $\geq 85\%$ initial capacity capacity restoration $\geq 85\%$ initial capacity 荷电容量保持率 $\geq 85\%$ 初始容量 恢复容量 $\geq 90\%$ 初始容量

Vibration 耐振动性	Charge according to 6.3.1, then fix the charged battery on the vibrating table. The conditions of vibration test: ---discharge current: $1/3I_1(A)$; ---vibration direction: perpendicular to the surface of the vibrating table; ---vibration frequency: 10Hz~55Hz; ---maximum acceleration: $30m/S^2$; ---sweep cycle: 10 times ---vibration time: 3 hours 电池按照 6.3.1 充电后, 将电池紧固在振动试验台上, 按照下述条件进行线性振动试验: 一放电电流 $1/3I_1(A)$; 一振动方向: 上下单振动; 一振动频率: 10Hz~55Hz; 一最大加速度: $30m/S^2$; 一扫描循环 10 次; 一振动时间 3H, 振动试验过程中观察有无异常现象。	Current without sharp change, voltage without exception, the appearance of battery should not leakage, break or explosion 电流无锐变、电压无异常, 壳体无变形, 结构完好, 无漏液, 不起火、不爆炸
High temperature half electricity storage 高温半电储存	Charge according to 6.3.1, then discharge with $1I_1(A)$ for 30min, store the battery for 28 days in the ambient temperature of $45^{\circ}C \pm 2^{\circ}C$, then rest for 5 hours at room temperature, Charge according to 6.3.1, then discharge with $1I_1(A)$ till the cut-off voltage 2.50V, calculate the capacity restoration. 电池按照 6.3.1 充电后, 电池以 $1I_1(A)$ 电流放电 30min 后, 将电池置放在 $45^{\circ}C \pm 2^{\circ}C$ 下储存 28 天, 然后再在常温下搁置 5 小时后, 再按照 6.3.1 充电后, 以 $1I_1(A)$ 电流放电终止电压 2.50V, 计量放电容量。	restoration $\geq 90\%$ initial capacity 恢复容量 $> 90\%$ 初始容量
Cycle Life 循环寿命	1. Charge it with the current of $0.5I_1(A)$, then store it for 10min; 2. Discharge with $5I_1(A)$ till the cut-off voltage 2.75V, then store it for 30min; The test is to be conducted as per the 1~2 cycles. The cycle should be 300 times. the discharge capacity is over than 70% initial capacity after 300 cycles. 1.按照 $0.5I_1(A)$ 电流充满电 (截止电流 0.03C) 后搁置 10min; 2.电池以 $5I_1(A)$ 电流放电终止电压 2.75V, 记录放电容量, 搁置 30min; 按照上述条件循环 300 次, 要求放电容量高于首次放电容量的 70%即可。	$0.5C/5C$ 300 周 $\geq 70\%$

8.2 Safety Performance 安全性能

Item 项目	Testing Method 测试方法	Standard 要求
Over Discharge 过放电	Charge according to 6.3.1; Discharge 90 min with the constant current $1I_1(A)$; Observe 1 hour. 单体电池按照 6.3.1 充电，电池以 $1I_1(A)$ 电流放电 90min，观察 1H。	No explosion, no fire, no leakage 不爆炸，不起火，不漏液
Over charge 过充电	Charge according to 6.3.1; Charge with the constant current $3I_1(A)$ to the end voltage 10V or charge 1 hours with the constant current $3I_1(A)$; Observe 1 hour. 单体电池按照 6.3.1 充电，电池以 $3I_1(A)$ 电流恒流至电压达到 10V 或充电时间达 1H 后停止充电，观察 1H。	No explosion, no fire. 不爆炸，不起火
Short Circuit 短路	Charge according to 6.3.1; Use a total external resistance of less than $5m\Omega$ to a short circuit condition for 10min; Observe 1 hour. 电池按 6.3.1 充电，将单体电池正、负极经外部短路 10min,外部线路电阻应小于 $5m\Omega$ ，观察 1H。	No explosion, no fire. 不爆炸，不起火
Free Fall Testing 跌落	Charge according to 6.3.1; Fall the battery cell freely from a height of 1.5m to the cement floor. It shall be fallen for 2 times on each direction of positive, negative and side; Observe 1 hour. 单体电池按 6.3.1 充电，单体电池正负端子向下从 1.5m 高度处自由跌落到水泥地面上，观察 1H。	No explosion, no fire, no leakage 不爆炸，不起火，不漏液
Heat shock 加热	Charge according to 6.3.1; The cell is placed in a thermal chamber. Temperature is raised to $130\pm 2^{\circ}C$ at the rate of $5^{\circ}C/min$ and held for 30 minutes, then cooled to room temperature; Observe 1 hour. 单体电池按 6.3.1 充电，将单体电池放入温度箱：对于锂离子电池，温度箱按照 $5^{\circ}C/min$ 的速率由室温升至 $130\pm 2^{\circ}C$ ，并保持此温度 30min 后停止加热，观察 1H。	No explosion, no fire. 不爆炸，不起火
Crush 挤压	Charge according to 6.3.1; A battery is crushed between two flat surfaces. The applied force is $13kN\pm 0.2kN$ by hydrocylinder, Once the maximum pressure has been obtained or voltage decrease to 1/3 of nominal voltage sharply, then release pressure; Observe 1 hour; 单体电池按照 6.3.1 充电，放在两个平面间承受挤压，两板间施加压力 $13kN\pm 0.2kN$ 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，卸压；观察 1H。	No explosion, no fire. 不爆炸，不起火

Salt spray 海水浸泡	Charge according to 6.3.1; The battery shall be immersed in 3.5% sodium chloride solution under the surface for 2 hours. 单体电池按照 6.3.1 充电，将单体电池浸入 3.5% NaCl 溶液中（模拟常温下海水成分）2H，水深应该全部没过单体电池。	No explosion, no fire. 不爆炸，不起火
Altitude Simulation 低气压	Charge according to 6.3.1; Test cells shall be stored 6 hours at a pressure of 11.6kPa and room temperature; Observe 1 hour. 单体电池按照 6.3.1 充电，电池放入低压箱中，调节试验箱中气压为 11.6kPa，温度为室温，静置 6H；观察 1H。	No explosion, no fire, no leakage 不爆炸，不起火，不漏液
Temperature Cycle 温度循环	Charge according to 6.3.1; The cell is placed in a thermal chamber. Temperature is adjusted according to the following table 1 and figure 1. The cycle shall be 5 times; Observe 1 hour. 单体电池按照 6.3.1 充电，单体电池放入温度箱中，温度箱温度按照下表 1 和图 1 进行调节，循环 5 次；观察 1H。	No explosion, no fire, no leakage 不爆炸，不起火，不漏液

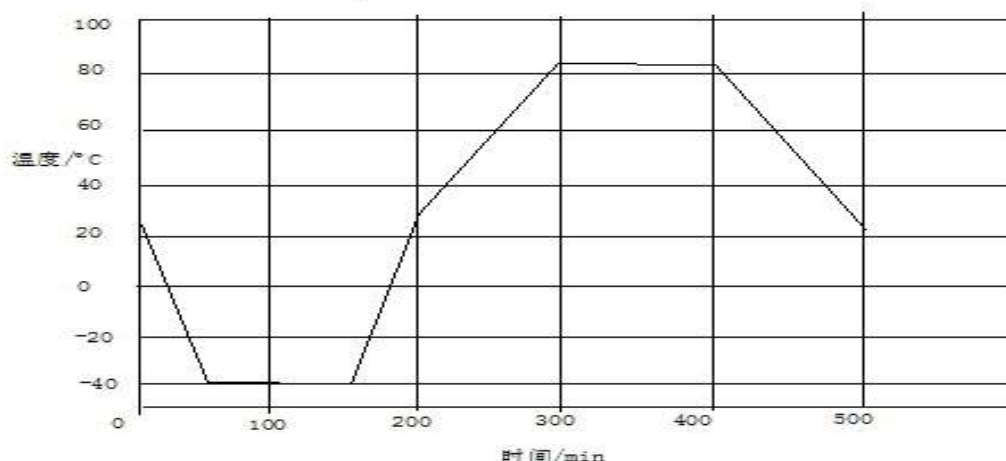
Table 1 The temperature and time of a cycle

表 1 温度循环实验一个循环的温度和时间

Temperature 温度 °C	time increment 时间增量 min	cumulative time 累计时间 min	Temperature change rate 温度变化率 °C/min
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7

Fig.1 The graph of temperature cycling test

图 1 温度循环试验示意图



9. Package 包装

Battery in the package must be under half-charged state. On the surface of the package, there should be with product name, type, rated voltage, number, gross, leaving factory time and corresponding internal resistant and capacity

电池在包装时需处于半充满状态,包装箱外应标明产品名称、型号、标称电压、数量、毛重、出厂日期及相应等级的内阻、容量。

10. Shipment 运输

The battery should be packed in cartons for shipment. The violent vibration, impaction or squeezing should be avoided in the transport process; neither exposed in the sunlight nor rain. The transport vehicles may be automobile, train, ship, airplane, etc.

电池应包装成箱进行运输,在运输过程中应防止剧烈振动、冲击或挤压、防止日晒雨淋,可使用汽车、火车、轮船、飞机等交通工具运输。

11. Storage 贮存

The battery should be store in a clean, dry, ventilated room with a temperature required in 5.14 and 75% RH. Keep away from corrosive material, fire and heat source. In addition, the battery should be store in half-charging state, in order to avoid over-discharge caused by self-discharge, and this will lead to irreversible capacity loss.

电池应存放在 5.14 所规定的环境温度及相对湿度不大于 75%的清洁、干燥、通风的室内,避免与腐蚀性物质接触、应远离火源和热源。另外必须使电池处于半充满状态贮存,以防止电池因自放电而产生过放电,发生不可逆容量损失。

12. The quality guarantee period is 12 months from the time leaving factory.

保质期是从出厂开始 12 个月。

13. We are irresponsible for any accident caused by handling not according to this specification.

本公司对没有按本规格书规定操作而导致的意外不负责任。

14. We have the right to modify this specification, the revised new specification will be sent to the clients and inform the modified content

本公司拥有对本规格书进行修改的权利，修订后的新规格书将会及时发给用户并告知修改的内容。

15. Details not be involved in this specification through the discussion between the manufacturer and the clients.

本规格书未尽事宜由供求双方共同协商解决。

