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HENGTAI
恒泰科技

Huizhou HengTai Technology Co., LTD.

惠州市恒泰科技股份有限公司

Specification For Approval
客户承认书

Model 型号： HT46135-25E

Type 类型： Rechargeable Li-ion Cell

Prepared by RD	Approved by RD	Approved by QA	Approved by PE	Approved by PM
Customer Approval 客户回签				

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History of specification
规格书修订记录

Rev No 版本	Contents 内容	Draft 制定	Date 日期
A/0	First issue 新发行	陈希	2024/1/13

Contents 目录

1. Scope 适用范围

The specification shall be applied to Li-ion polymer rechargeable battery manufactured by HUIZHOU HENGTAI TECHNOLOGY CO., LTD.

本规格书适用于惠州市恒泰科技股份有限公司生产的聚合物锂离子可充电电池.

2. Model Name 产品型号：HT46135-25E

3. Standard Test Condition 标准测试条件

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

除非另有规定，产品规格书中所有测试状态都在以下条件下进行：

Temperature: 25±2℃ 温度:25±2℃

Humidity: 65±20% RH 湿度：65±20% RH

Barometric pressure:86KPa~106KPa 气压：86KPa~106KPa

3.2 Test should be conducted with new batteries within one month after shipment from our factory and the battery shall not be cycled more than five times before the test.

测试电池必须是本公司出厂时间不超过一个月的新电池，且电池未进行过五次以上充放电循环。

3.3 Standard charge 标准充电

At the test temperature 25±2℃，charging battery consist of charging at constant current rate of 0.5C until the battery voltage reach **3.65V** . Then battery be charged at constant voltage of **3.65V** while tapering the charge current ≤0.05C.

在 25℃±2℃ 温度条件下，电池用 0.5C 充电，当电池电压达到 **3.65V** 时改为恒压充电，直到充电电流小于或等于0.05C 时，停止充电。

4. Specification 主要技术参数

NO	Items	Criteria	Remarks	
4.1	Typical Capacity 典型容量	25.5Ah	Standard charge, 0.5C discharge to 2.5V	
	Rated Capacity(Cmin) 额定容量(最小容量)	25Ah		
4.2	Rated Energy 额定能量	80Wh		
4.3	Nominal Voltage 标称电压	3.2V		
4.4	Limited charging Voltage 充电截止电压	3.65V		
4.5	End of discharge Voltage 放电终止电压	2.5V	温度 T>0℃	
		2.0V	温度 T≤0℃	
4.6	Standard charging current 标准充电电流	0.5C		
	Fast charging current 快速充电电流	2C	15~55℃	
	Maximum continuous charging current 最大持续充电电流	0.1C	0~5℃	
		0.3C	5~15℃	
		1C	15~55℃	
4.7	Standard discharging current 标准放电电流	0.5C		
	Maximum continuous discharging current 最大持续放电电流	3C		
4.8	Standard Charge Time 标准充电时间	≤150min	0.5C	
4.9	Weight 重量	500 ±20g		
4.10	Charge Operating Temperature 充电工作温度	0~55℃		
	Discharge Operating Temperature 放电工作温度	-20~+60℃		
4.11	Storage of cell in shipment status 出货态电芯存储	-20℃～55℃	Less than 1 month 小于一个月	The cell should be charged and discharged every 3 months, when not in use for a long time. 电芯长期不使用时,应每隔3个月进行1次充放电
		-20℃～45℃	Less than 3 months小于三个月	
		-20℃～25℃	Less than 1 year 小于1年	

4.12	Permissible temperature on the surface of the cell 电芯表面允许温度	-20℃ ~ 80℃	

5. Cell Performance 电池性能

5.1 Electrical Tests：电性能测试

No.	Items	Test Method and Condition	Criteria	
5.1.1	Cell capacity 电池容量	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.5C with 2.5V cut-off voltage after the standard charge. Test temperature: 25°C±2°C 电池标准充电后，用0.5C放电至2.5V,记录放电容量	≥25Ah	
5.1.2	AC Impedance 交流内阻	Internal resistance measured at AC 1KHz after charge to shipment voltage. 用1KHz的交流内阻仪测试出货电压状态下的电池内阻	≤1.5mΩ	
5.1.3	Shipment Voltage 出厂电压	~30% state of charge ~30%充电SOC状态	3.25~3.35V	
5.1.4	RT Rated Discharge 室温倍率放电	After standard charging pretreatment at 25℃ ±2℃, the battery is discharge to a cut-off voltage of 2.5V with 0.5C, 1C, 2C, and 3C. 电池标准充电后，以0.5C, 1C, 2C和3C倍率放电至2.5V, 分别记录其放电容量。	0.5C	≥100%Cmin
			1C	≥97%Cmin
			2C	≥96%Cmin
			3C	≥95%Cmin
5.1.5	Temperature Dependence of Discharge Capacity 不同温度放电能力	After standard charging pretreatment at 25℃±2℃, the battery is placed under the temperature to be measured for 2~4h, and then discharged to end of discharge Voltage with 1.0C. After each temperature discharge test, the battery should be placed at room temperature for 2h before the next test. Discharge requirements are as follows: 25℃，-20℃，-10℃，0℃，45℃，60℃ 电池在 25℃±2℃标准充电前处理后，置于待测温度下 2~4h ，然后以1.0C放电至截止电压。做完每个温度放电实验后，电池都需要在室温下放置 2h 后再进行下一实验。 放电温度要求如下：	-20℃	≥65%
			-10℃	≥80%
			0℃	≥85%
			25℃	100%
			45℃	≥100%

		25℃，-20℃，-10℃，0℃，45℃，60℃	60℃	≥100%
5.1.6	Cycle life 循环性能	The battery is first charged at a constant current of 1C charge to 3.65V, terminal charge until the charging current drops to 0.05C, rest for 30 minutes, then 1C discharge to a cut-off voltage of 2.5V, 30min rest period, Repeat the above steps for 4000 cycles. Test temperature 25 ± 2 ℃ 电池先以1C恒流恒压充电至3.65V，截止电流0.05C后，搁置 30min，再以1C放电至2.5V，搁置 30 min，重复上述步骤进行4000次循环。 测试温度 25±2℃	Cap. Retention ≥80% 容量保持率≥80%	
5.1.7	Storage Characteristics 贮存特性 1	After standard charge and then stored at 25±2℃ for 28 days，measured the remaining capacity with 1/3C；And then recharged the cell with standard charge, measured the recovery capacity with 1/3C. 标准充电后在 25±2℃的环境中贮存 28 天后，测试 1/3C 的保持容量，重新用标准充电充满电后，测量1/3C的恢复容量。	Remaining Capacity ≥85% Cinitial 容量保持 ≥85% Cinitial Recovery capacity ≥90% Cinitial 容量恢复 ≥90% Cinitial	
5.1.8	Storage Characteristics 贮存特性 2	After standard charge and then stored at 55±2℃ for 7 days，measured the remaining capacity with 1/3C；And then recharged the cell with standard charge, measured the recovery capacity with 1/3C. 标准充电后在 55±2℃的环境中贮存 7 天后，测试 1/3C 的保持容量，重新用标准充电充满电后，测量1/3C的恢复容量。	Remaining Capacity ≥85% Cinitial 容量保持 ≥85% Cinitial Recovery capacity ≥90% Cinitial 容量恢复 ≥90% Cinitial	
5.1.9	Storage Characteristics 贮存特性 3	At RT, the standard rechargeable battery at a current of 1C discharge for 30 minutes; then store in an environment of 45 ± 2 ℃ for 28 days. After storage, let it stand at room temperature for 5 hours, and then recharged the cell with standard charge, measured the recovery capacity with 1/3C. 室温下，标准充电电池，先以1C电流放电30min；置于45±2℃的环境中贮存28天，存储结束后，室温静置5h，	Recovery capacity ≥90% Cinitial 容量恢复 ≥90% Cinitial	

		再用标准充电充满电后，测量1/3C的恢复容量。	

5.2 Electrical Safety Test of Cells 电池电安全测试

No.	Items	Test Method and Condition	Criteria
5.2.1	External short-circuit at room temperature 常温外部短路	After it is fully charged as standard charge at RT，then connect the ends of both positive and negative electrodes of the cell with conducting wire, and make sure that the total external resistance is ≤5 mΩ, Short circuit lasts for 10min. After the test is completed, observe the battery appearance at the test ambient temperature for 1 h. 电池标准充电后，放置室温环境中，用导线连接电池正负极端，并确保全部外部电阻≤5mΩ，短接持续10min，测试结束后观察1h，检查电池外观。	No fire 不起火 No explosion 不爆炸
5.2.2	Over charging Test 过充电测试	After being discharged as standard discharge, the battery shall be charged to the test voltage specified at constant current using 1C . The change of the cell temperature during the test shall be monitored, and the test shall be terminated in either of the following cases. a) the charging voltage reaches 1.1 times the termination voltage; b) the charging SOC reaches 115% 将电池按标准放电后，使用1C电流充电，试验过程中检测电池温度变化，当出现以下两种情形之一时，试验终止： a）电压为充电截止电压的1.1倍 b）电池容量达到115%SOC	No fire 不起火 No explosion 不爆炸
5.2.3	Forced-Discharge 强制放电	Conduct reverse charging to the cell at 1C current for 90min after it is fully discharged as standard discharge. 电池按标准放电后，用1C电流进行反向充电，充电时间持续90min。	No fire 不起火 No explosion 不爆炸

5.3 Cell Environmental Safety Testing 电池环境安全测试

5.3.1	Low air pressure 低气压	Place the cell into a vacuum chamber with the temperature being 20° ±5℃ after it is fully charged as standard charge, and then vacuumize the chamber to	No fire 不起火

		reduce its air pressure to 11.6kPa (simulating altitude: 15240m), and maintain for 6h. 将电池按标准充电方式充满电后，置于20±5℃的真空箱内压强降低至11.6kPa（模拟海拔15240m），并保持6h	No explosion 不爆炸 No leak 不漏液
5.3.2	Temperature circulation 温度循环	Place the cell in to a temperature-regulated box after it is fully charged as standard charge, and perform the following steps : a)The temperature inside the box should cool to -40℃ within 60 minutes; b) Insulation for 90 minutes in a -40 ℃ environment c) Raise the temperature of the battery to 25 ℃ within 60 minutes; d) Raise the temperature of the battery to 85℃ within 90 minutes; e) Insulation for 110 minutes in a 85 ℃ environment f) Cool down the battery to 25 ℃ within 70 minutes g) Repeat Steps a)~f) for 5 times; After 1 hour of test completed, check the appearance of the battery 将充满电的电池放置在温度为20±5℃的可控温的箱体中进行如下步骤： a） 将试验箱60min内降温至-40±2℃； b） -40±2℃环境，保持90min； c）60min内升温至25℃; d) 90min内升温至85℃; e) 85±2℃环境，保持110min； f) 70min内降温至25℃ g)循环以上步骤a)至f) 5次 测试结束1h后，检查电池外观	No fire 不起火 No explosion 不爆炸 No leak 不漏液
5.3.3	Vibration 振动	Fasten the cell on the vibration test bench after it is fully charged as standard charge, and perform the sinusoidal vibration test according to the parameters in Table . Vibrate the up and down direction, total 3h for test.	No fire 不起火 No explosion 不爆炸 No leak 不漏液

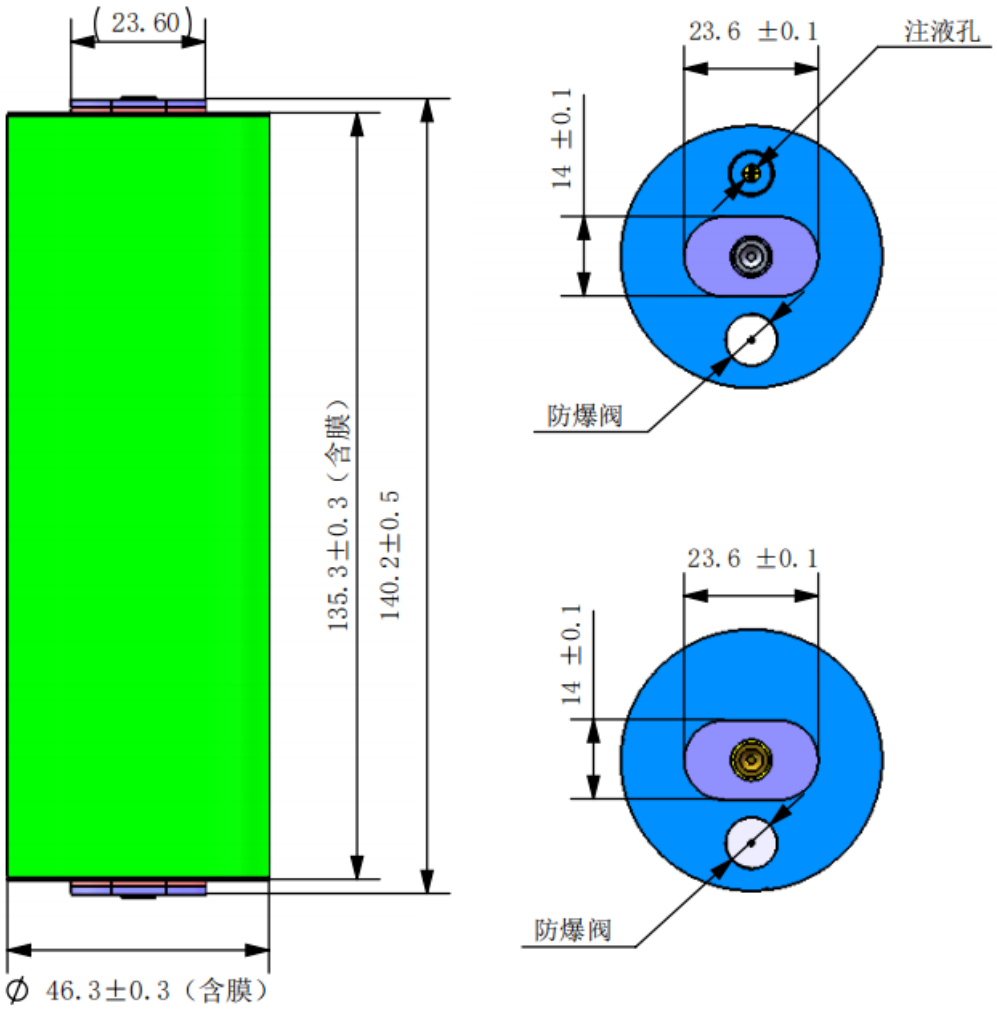
		<table><tr><td colspan="2">Frequency</td><td>Vibration parameter</td><td>Logarithm seep cycle (7Hz-200Hz-7Hz)</td><td>Axial direction</td><td>Number of vibration cycles</td></tr><tr><td>From</td><td>To</td><td></td><td></td><td></td><td></td></tr><tr><td>f_1=7Hz</td><td>f_2</td><td>a_1=1g_n</td><td rowspan="3">15min</td><td>X</td><td>12</td></tr><tr><td>f_2</td><td>f_3</td><td>S=0.8mm</td><td>Y</td><td>12</td></tr><tr><td>f_3</td><td>f_4=200Hz</td><td>a_2=8g_n</td><td>Z</td><td>12</td></tr><tr><td colspan="4">Back to f_1=7Hz</td><td>Total</td><td>36</td></tr><tr><td colspan="6">f_1, f_4——lower and upper limit of frequency; f_2, f_3——crossover frequency (f_2≈17.62Hz, f_3≈49.84Hz); a_1, a_2——acceleration amplitude; S——displacement amplitude.</td></tr><tr><td colspan="6">Note: The vibraion parameter is the maximum absolute value of displacement and acceleration, for example: the corresponding peak-peak displacement value for displacement value of 0.8mm is 1.6mm.</td></tr></table> 将充满电的电池紧固在振动试验台上，按表中参数进行正弦振动测试。 上下面单方向振动，总测试时间每共计3h。	
5.3.4	Acceleration shock 加速度冲击	Fasten the cell on the shock table to perform semi-sinusoidal shock test after it is fully charged as standard charge, with the minimum average acceleration speed at 75gn, the peak acceleration speed at 150gn±25gn, and the pulse duration at 6ms±1ms within the first 3ms. Perform the acceleration shock tests in each direction of the cell for three times. 将充满电的电池固定在冲击台上，进行半正弦脉冲冲击试验，在最初的3ms内，最小平均加速度为75gn，峰值加速度为150gn±25gn，脉冲持续时间为6ms±1ms。电池每个方向进行三次加速度冲击试验。	No fire 不起火 No explosion 不爆炸 No leak 不漏液
5.3.5	Free drop 跌落	Drop the cell freely from 1m heights to a concrete slab after it is fully charged as standard charge。 将电池按标准充电方式充满电后，按1m的跌落高度自由落体跌落在混凝土板上。	No fire 不起火 No explosion 不爆炸
5.3.6	Crush 挤压	Place the cell between two planes after the cell is fully charged as standard charge, and extrude it in a direction perpendicular to polar plate, with an extrusion force of 13.0kN±0.2kN applied between the two planes. The crush test shall be stopped once the pressure reaches its maximum value. And, external short-circuit shall not occur to the cell during the test. 将电池按标准充电方式充满电后，将电池置于两个平面内，垂直于极板方向进行挤压，两平板间施加13.0kN±0.78kN的挤压力，挤压电池的速度为0.1mm/s.一旦压力达到最大值或电池的电压下降三分之一，即可停止挤压试验。试验过程中电池应防止发生外部短路。	No fire 不起火 No explosion 不爆炸

5.3.7	Thermal abuse 热冲击	Place the cell into a test chamber after it is fully charged as standard charge. Increase the temperature of test chamber at a rate of (5±2) ℃ /min, and maintain the chamber in constant temperature for 30min after the temperature reaches 130℃ ±2℃ 将电池按标准充电方式充满电后，将电池放入试验箱中。试验箱以5±2℃/min的温升速率进行升温，当箱内温度达到130℃±2℃后恒温，并持续30min。	No fire 不起火 No explosion 不爆炸

6. Drawing 产品图纸

Fig.1 Dimensional Drawing of HT46135-25E产品规格图纸

Unit: mm



7. Handling Instructions 电池使用指南

Read and observe the following warnings and precautions to ensure correct and safe use of Li-ion batteries.

认真阅读下面的注意事项，确保正确使用锂离子电池。惠州市恒泰科技股份有限公司对违反下述注意事项而产生的任何问题不予负责。

Danger! 危险!

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire. 不仔细阅读下述事项可能导致电池泄露、爆炸或起火。

— Do not immerse the battery in water or allow it to get wet.
— 勿将电池投入水中或将其弄湿；
— Do not use or store the battery near sources of heat such as a fire or heater.
— 勿在热源（如火或加热器）附近使用或贮存电池；
— Do not use any battery charger not specified. Incorrect charging method and charging equipment, the battery will be damaged, which may cause firing, or other problems
— 请勿使用非指定充电器，错误的充电方法和充电设备，可能损坏电池，导致起火或其它安全问题.
— Do not reverse the positive (+) and negative (-) terminals.
— 勿将正负极接反；
— Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
— 勿将电池直接连接到墙上插座或车载点烟式插座上；
— Do not put the battery into a fire or apply direct heat to it.
— 勿将电池投入火中或给电池加热；
— Do not short-circuit the battery by connecting wires or other metal objects to the positive (+) and negative (-) terminals.
— 禁止用导线或其它金属物体将电池正负极短路；
— Do not carry or put the battery together with necklaces, hairpins or other metal objects.
— 禁止将电池和项链，发夹和其它金属物品放置在一起。
— — Do not strike, throw or subject the battery near a fire or in extremely hot conditions.
— 禁止将电芯投放到较热的容器里。

Warning! 警告!

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.
不仔细阅读下述事项可能导致电池泄露、爆炸或起火。

— Do not place the battery in a microwave oven or pressurized container.
— 禁止将电池置入微波炉或压力容器中；
— Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different capacity, type or brand.
— 禁止与一次电池（如干电池）或不同容量、型号、品种电池组合使用；
— Do not use the battery if it emits odor, heat, deformation, discoloration, or any other abnormal phenomenon; If the battery is in use or charging, it should be immediately removed from the appliance or charger and stopped from use;
— 如果电池发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电池正在使用或充 电，应立即从用电器中或充电器上取出并停止使用；
— Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
— 禁止用钉子或其它尖锐物体刺穿电池壳体，禁止锤击或脚踏电池；
— Do not directly solder the battery terminals. 禁止直接焊接电池端子。
— Do not attempt to disassemble or modify the battery in any way. 禁止以任何方式分解电池。

—Do not recharge discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.

—如果电池发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电池正在使用或充电，应立即从用电器中或充电器上取出并停止使用；

- Keep the batteries out of the reach of children. If a child somehow swallows a battery, seek medical attention immediately.
- 电池应放在小孩接触不到的地方，如果小孩不小心吞咽电池 应立即寻求医疗救助；
- If the battery leaks or emits an odor, immediately remove it from the proximity of any exposed flame. The leaking electrolyte can ignite and cause a fire or explosion.
- 如果电池泄漏或发出异味，应立即将其从接近明火处移开；泄漏的电解液可能引起火灾或爆炸；
- If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.
- 如果电池漏液后电解液进入眼睛，不要擦，应用水冲洗，立即寻求医疗救助。如不及时处理，眼睛将会受到伤害。

Caution! 注意!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

不要使用处于极热环境中的电池，如阳光直射或热天的车内。否则，电池会过热，可能着火（点燃）；同时这样也会影响电池的性能、缩短电池的使用寿命。

Do not use the battery in other than the conditions specified. otherwise, the battery might cause heat generation, damage, or deterioration of its performance.

禁止在超出规定条件下使用电池，否则可能导致过热，损坏，恶化电池电性能。

Prolonged standing or storage, PACK must be stored after removal from the host (disconnect the electrical properties of contacts); PACK need to conduct a test at least once in half of year. If necessary, the PACK needs to supplement electricity. PACK shall be kept for at least 40% capacity after a path to storage.

长时间搁置或储存，电池必须从主机上拆卸下储存（断开电子器件的接触）；电池至少在半年需要进行测试一次，如有必要，电池需要补充电力，保持至少 40%的容量。

If the PACK cannot removed from the host , the PACK need to be set to the lowest power consumption mode before the storage, and arrangements the PACK supplementary charge regularly and performance testing according the Consumption rate (recommendation: supplementary charge to approximately 50% every three months), adjustment depending on the system actual storage conditions and power consumption. With Smart-Gauge products, it is strongly recommended to set Shipping Mode of the PACK after storage.

如果电池无法从主机上拆卸，电池需要被设置为最低功耗模式存储，并安排定期补充电和性能测试，根据自耗电率（建议：每 3 个月补充电至 50%左右），根据系统的实际存储条件和耗电调整。带有智能电量计的产品，强烈建议储存设置为电池出货模式。

The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voltage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows: The cell battery pack shall start with a low current (0.05C) for 15 - 30 minutes, i.e. pre-charging, before rapid charging starts. The rapid charging shall be started after the （ individual） cell voltage has been reached above 2V within 15 - 30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 2V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

充电器应有装置来防止电池放电至低于本规格书规定的截止电压。此外，充电器还应有装置以防止

重复充电，步骤如下：电池在快速充电之前，应先以一小电流（0.05C）预充电 15~30 分钟，以使电池的电压达到 2.0V 以上，再进行标准充电。可用一记时器来实现该预充电步骤。如果在预充电规定时间内，电池的电压仍未升到 2.0V 以上，充电器应能够停止下一步快速充电，并显示该电芯/电池正处于非正常状态。

In cases where children use the battery, instruct them on the contents of the user's guide and keep an eye on them to ensure that the battery is being used correctly.

当小孩使用电池时，需要按用户说明书的内容教他们，并密切注意他们确保正确使用电池。

If the battery leaks and electrolyte gets your skin or clothing, immediately rinse the affected area with clean running water. If left as is, skin inflammation can occur.

如果电池漏液，电解液弄到皮肤或衣服上，立即用流动的水清洗受影响区域，否则可能导致皮肤发炎

For directions on battery installation and removal, read the instruction manual that accompanies the equipment in which the battery will be used.

阅读用电池的装置说明书，正确进行电池的安装与拆卸。

If the terminals of the battery are dirty, wipe them clean with dry cloth before use. Otherwise, solid electrical contact may not be charged with the equipment, and this can cause power outages or charging to fail.

如果电池的端子变脏，使用前用干布擦干净。否则电池会接触不良，从而引起能量损耗或无法充电。

8. Period of Warranty 保质期

The period of warranty is one year after the manufacture date. HENGTAI guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customers' abuse and misuse.

电池保质期为从生产日期算起后一年。本公司承诺如果在一年中由于电池本身的质量问题，本公司将负责进行调换，如果是由于用户误用而产生的问题，不予调换。

9. Note

Note (1)：声明一

The customer is requested to contact HUIZHOU HENGTAI TECHNOLOGY CO., LTD.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本规格书规定以外的设备，或在本规格书规定以外的使用条件下使用电芯，应事先联系惠州市恒泰科技股份有限公司，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。

Note (2)：声明二

HUIZHOU HENGTAI TECHNOLOGY CO., LTD. will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

对于在超出本规格书规定以外的条件下使用电芯而造成的任何意外事故，惠州市恒泰科技股份有限公司概不负责。

Note (3)：声明三

HUIZHOU HENGTAI TECHNOLOGY CO., LTD. will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

如有必要，惠州市恒泰科技股份有限公司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。