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	版本 Version	R1.7


产品规格书

Product Specification

产品名称 Product Name	锂离子电池 Lithium-ion Cell				
产品型号 Model	18FC-5.12Wh				
编制 Made By	吴洪露	审核 Checked By	薛娟娟	批准 Approved By	李常

客户确认 Customer Approval	客户名称 Company Name	
	签名 Signature	
	日期 Date	
	公司印章 Company stamp	

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客户要求 Customer Inquiry

客户输出产品规格书以外的特殊要求信息需与精工电子沟通达成一致。例如客户有一些特别的技术要求或者应用条件不同于此文件所描述的，精工电子将根据客户的特别要求进行产品设计和生产。

Special requirements beyond the product specifications provided by customers need to be agreed upon through communication with Goldencell. For example, if the customer has some special technical requirements or application conditions that are different from those described in this document, Goldencell will design and produce products according to the customer's special requirements.

序号 No.	特殊要求 Special Request	标准 Standard
1		
2		
3		
4		
5		

客户代码/名称:


Customer's Company Name:

签字:

Singnature:

日期:


Date:

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1.适用范围 Application Scope

本产品规格书规定了山东精工电子科技股份有限公司（以下简称“精工电子”）生产的 18FC-5.12Wh 锂离子电池产品性能要求、试验方法、运输、贮存要求和注意事项等。

This file defines the performance requirements, test methods, transportation, storage and corresponding notice tips for rechargeable Lithium-ion battery 18FC-5.12Wh, produced by Shandong Goldencell Electronics Technology Co., Ltd.

(Hereinafter referred to as "Goldencell").

2.型号 Model

18FC-5.12Wh

3.规范性引用文件 Normative Reference

下列文件中的条款通过部分引用成为本标准的部分条款。凡是不注日期的引用文件，其最新版本适用本标准。

Provisions in the following documents are partly quoted as part of the standard. The latest version of undated reference documents is applicable to this standard.

GB/T 36276-2018 《电力储能用锂离子电池标准》 《Standard for lithium-ion batteries for power energy storage》

UL1642 《锂电池安全测试标准》 《Standard for safety-Lithium Battery》

CB IEC62133 《国际标准》 《International Standard》

Q/ 0400SJG 001—2022 《精工电子企业标准》 《Goldencell's standards》

4.测试条件 Test conditions

4.1 测试环境 Test environment

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：温度为 $25\pm 2^{\circ}\text{C}$ ，湿度为 $\leq 85\% \text{RH}$ ，大气压力为 $86\text{kPa}\sim 106\text{kPa}$ ；本规格书中所提常温或室温是指 $25\pm 2^{\circ}\text{C}$ 。

Unless specifically stated, the test shall be carried out in an environment of $25\pm 2^{\circ}\text{C}$, $\leq 85\% \text{RH}$ and $86\text{kPa}\sim 106\text{kPa}$ atmospheric pressure. The room temperature mentioned in this specification refers to $25\pm 2^{\circ}\text{C}$.

4.2 测试仪器要求 Requirements of the testing equipment

- (1) 电压、电流测量仪器精度等级： $\leq 0.5\text{mV}$ 和 $\leq 0.5\text{mA}$

The voltage and current measurement device accuracy grade: 0.5mV and 0.5mA or higher (better)

- (2) 交流阻抗仪测量频率： 1KHz

AC Impedance meter : 1KHz

- (3) 温度测试仪精度： $\leq 0.5^{\circ}\text{C}$


Temperature meter precision : 0.5°C or higher (better)

- (4) 游标卡尺精度： 0.01mm

Slide caliper: 0.01mm

- (5) 电子秤精度： 0.1g

Electronic scale: 0.1g


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5.尺寸 Dimension

	项目 Item	含套管尺寸 (mm) Dimension including casing (mm)
	h	65.20±0.30
d	≤18.60	

6.主要技术参数 Major Technical Parameters

序号 NO.	项目 Items	标准 Standard	备注 Note
1	标称容量 Nominal Capacity	1600 mAh	0.5C, 本型号 1C 电流值为 1600 mA 0.5C,current value of 1600mA at 1C
2	最小容量 Minimum Capacity	1550 mAh	0.5C
3	标称电压 Nominal Voltage	3.2 V	
4	交流内阻 AC Internal Resistance	≤25 mΩ	25±2℃交流 1KHz 测量 AC 1kHz measurement at 25 ± 2℃
5	最大充电电流 Max. Charging Current	1.6 A	25℃
6	快速持续放电电流 Fast Discharge Current	1.6 A	该电流为电池组合时建议的最大使用电流, 具体值应根据组合结构而定。最大使用电流设置以使用时温度不超过 60℃为基准。 This current is the maximum current recommended for the combination of cells, and the specific value should be determined according to the combination structure. The maximum operating current is set at a temperature not exceeding 60 °C.
7	最大持续放电电流 Max. Continuous Discharge Current	4.8 A	25℃, 不支持循环 25℃, not for cycle life
8	脉冲放电电流 Pulse Discharge Current	10 A, 5s	
9	循环性能 (25℃) Cycle Characteristic (25℃)	7000 次 (50%DOD) 7000 times (50%DOD)	1C 充电/1C 放电, 容量保持率≥80% The residual capacity is no less than 80% of rated capacity at 1C rate.
		4000 次 (80%DOD)	

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		4000 times (80%DOD)	
		3500 次 (100%DOD) 3500 times (100%DOD)	0.5C 充电/1C 放电, 容量保持率≥80% The residual capacity is no less than 80% of rated capacity at .0.5C/1C rate.
		2000 次 (100%DOD) 2000 times (100%DOD)	1C 充电/1C 放电, 容量保持率≥80% The residual capacity is no less than 80% of rated capacity at 1C rate.
10	工作温度 (含温升) Working Temperature (Including temperature rise)	充电 Charge	0~60℃
		放电 Discharge	-30℃~65℃
11	电池重量 Cell Weight	39.5g (约) Approx 39.5g	含套管 Including casing

7.电性能测试和使用方法 Electrical performance test methods

7.1 标准充电 Standard Charge

常温下, 电池以 0.5C 恒流恒压充电至 3.65V, 截止电流 0.01C。

Constant-current charge to 3.65 V at 0.5C, constant voltage charge to stop until 0.01C.

7.2 常温放电容量 Discharge capacity at normal temperature

充满电后, 搁置 10min; 0.5C 放电至 2.5V, 允许重复 5 次, 当连续 3 次实验结果的极差小于额定容量的 3%, 可提前结束实验, 取试验结果的最高值。

After full charge, the experiment can be put on hold for 10 minutes; 0.5C discharge to 2.5V allows five repetitions. When the range of three consecutive experiments is less than 3% of the rated capacity, the experiment can be completed ahead of time and the maximum value of the test results can be obtained.

7.3 不同温度放电性能 Discharge performance at different temperatures

正常电池标准充电后, 分别搁置在-20℃、-10℃、0℃、10℃、25℃恒温环境中至少 12h, 搁置在 60℃恒温环境中至少 5h, 用 0.5C 电流放电至相对应终止电压; 其中, 环境温度≥15℃, 终止电压为 2.5V, 环境温度<15℃, 终止电压为 2.0V。

After standard charging of normal batteries, it should be stored at least 12 hours in the constant temperature environment of -30℃, -20℃, -10℃, 0℃, 10℃ and 25℃, respectively, and at least 5 hours of 60℃. Then discharge with 0.5C current to the corresponding termination voltage at -20℃, -10℃, 0℃, 10℃, 25℃, and 60℃. When the ambient temperature is more than 15℃, the termination voltage is 2.5V, if less than 15℃, which is 2.0V.


放电率=不同温度下放电容量/25℃下放电容量*100%

capacity ratio = discharge capacity at different temperatures /25℃ discharge capacity *100%

不同温度下放电率 Discharge capacity retention rate at different temperatures: -20℃≥40%; -10℃≥60%; 0℃≥70%; 10℃≥80%; 25℃=100%; 60℃≥95%.

7.4 常温不同倍率放电性能 Discharge performance at different rates at room temperature

正常电池标准充电后, 在规定的环境温度下静置 10min, 分别采用 0.2C、0.5C、1C、2C、3C 的不同倍率恒流放

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电至 2.5V，①记录不同放电倍率电池容量；②同步记录不同放电倍率时的电池温升 ΔT 。

After standard charging of normal batteries, it should be placed for 10 minutes at the prescribed ambient temperature. Then discharged to 2.5V at different rates of 0.2C, 0.5C, 1C, 2C and 3C, respectively. The capacity of batteries with different discharge rates was recorded, and the temperature rise ΔT of batteries with different discharge rates was recorded synchronously.

放电率=不同倍率下放电容量/0.5C 下放电容量*100%

capacity ratio = discharge capacity at different rate /0.5C discharge capacity *100%

不同倍率下放电率和温升 (ΔT : 温升) Discharge capacity retention rate and temperature rise at different rate (ΔT : temperature rise): 0.2C \geq 100%, $\Delta T \leq 5^\circ\text{C}$; 0.5C=100%, $\Delta T \leq 10^\circ\text{C}$; 1C \geq 95%, $\Delta T \leq 15^\circ\text{C}$; 2C \geq 90%, $\Delta T \leq 25^\circ\text{C}$; 3C \geq 85%, $\Delta T \leq 30^\circ\text{C}$.

7.5 常温荷电保持与容量恢复能力 Charge retention and capacity recovery capability

正常电池标准充电后，于常温环境中开路放置 28 天，然后按 0.5C 放电至 2.5V。再按充放电标准测试电池的恢复容量。

Normal batteries are charged according to the standard. They are placed in open circuit for 28 days at room temperature, and then discharged to 2.5V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards.

容量保持率=剩余容量/初始容量 \geq 90%；容量恢复率=恢复容量/初始容量 \geq 95%

Capacity Retention=storage capacity/ initial capacity \geq 90%；Capacity Recovery =recovery capacity/ initial capacity \geq 95%

7.6 高温荷电保持与容量恢复能力 Charge retention and capacity recovery capability at high temperature

正常电池标准充电后，于 $55 \pm 2^\circ\text{C}$ 环境中开路放置 7 天，存储期满后，在常温下搁置 5h，然后按 0.5C 放电至 2.5V。再按充放电标准测试电池的恢复容量。

After standard charging, normal batteries are placed open circuit for 7 days in the environment of $55 \pm 2^\circ\text{C}$. After the storage period expires, they are placed for 5 hours at room temperature, and then discharged to 2.5V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards.

容量保持率=剩余容量/初始容量 \geq 90%；容量恢复率=恢复容量/初始容量 \geq 95%

Retention Ratio=storage capacity/ initial capacity \geq 90%；Recovery ratio =recovery capacity/ initial capacity \geq 95%

7.7 循环寿命 Cycle characteristic


0.5C 充电/1C 放电循环：常温下，静置 5min，按 0.5C 充电，1C 放电至 2.5V，计为一个循环周期，每个周期之间间隔时间应不低于 10min，放电容量低于 80%额定容量时结束。

Stand for 5min, charge at 0.5C, and discharge at 1C to 2.5V, which is counted as one cycle. The interval between each cycle should not be less than 10 minutes, and the discharge capacity should end when it is less than 80% of the rated capacity.

1C 充电/1C 放电循环：静置 5min，按 1C 充电，1C 放电至 2.5V，计为一个循环周期，每个周期之间间隔时间应不低于 10min，放电容量低于 80%额定容量时结束。

Stand for 5min, charge at 1C, and discharge at 1C to 2.5V, which is counted as one cycle. The interval between each cycle should not be less than 10 minutes, and the discharge capacity should end when it is less than 80% of the rated capacity.

7.8 其他电池使用温度和倍率建议 Recommended usage temperature and rate for Cell

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放电模式使用温度和倍率建议 Suggestion for rate at different temperatures during discharge

电池温度/°C Cell temperature/°C		-40	-30	-20	-10	-5	0	10	25	35	45	50	55	60
最大放电倍率 Max discharging rate	100%SOC	0	0.2C	0.5C	1C	2C	2C	3C	3C	3C	1C	1C	0.5C	0.2C

充电模式使用温度和倍率建议 Suggestion for rate at different temperatures during charge


电池温度/°C Cell temperature/°C		0	5	10	15	20	25	35	45	50	55	60
最大充电倍率 Max charging rate	≥0%SOC	0.2C	0.2C	0.5C	0.5C	1C	1C	1C	1C	0.5C	0.2C	0

7.9 电池组合使用建议 Suggestions for Cell Packs

电池管理系统需满足以下最基本的检测和控制要求。

The BMS shall include the following monitoring and control features as a minimum requirement.

序号 NO.	项目 Items	参数 Parameters	保护动作 Actions
1	充电终止 Stop charging	≤3.65V	当电池的电压达到3.65V时终止充电。 Stop charging when cell voltage reaches 3.65V.
2	过充电保护 First overcharge protection	≤3.85V	当电池的电压达到3.85V时电池管理系统强制终止充电。 Force stop charging by BMS when cell voltage reaches 3.85V.
3	放电终止 Stop discharge	≥2.5V	当电池的电压达到2.5V时，终止放电。 When the voltage reaches 2.5V, the discharge should be terminated.
4	过放电保护 Over discharge protection	第一级过放保护≥2.3V 第二级过放保护≥2.0V First stage over-discharge protection ≥2.3V The second stage over-discharge protection ≥2.0V	当电池的电压达到2.3V时，电池管理系统强制终止放电；当电池电压低于2.0V，禁止充电。 When the voltage reaches 2.3V, BMS forcibly terminates discharge; When the voltage is below 2.0V, charging is prohibited.
5	短路保护 Short circuit protection	不允许短路 No short circuit allowed	发生短路时，由过流器断开电池。 When a short circuit occurs, the cell should be disconnected by the overcurrent protection device.
6	过流保护 Overcurrent protection	电流≤12.8A Current≤12.8A	电池管理系统控制充放电电流符合规格。 BMS controls the charge and discharge current to meet the specifications.
7	过热保护 Overheating protection	电池温度≤60°C Cell temperature≤60°C	当温度超过规定时，终止充电/放电。 Stop charging and discharging when temperature exceeds specification.

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8	低温保护 Low temperature protection	充电：温度 $\geq 0^{\circ}\text{C}$ ； 放电：温度 $\geq -20^{\circ}\text{C}$ Charging: $T \geq 0^{\circ}\text{C}$ ； Discharge: $T \geq -20^{\circ}\text{C}$	当温度低于规定时，终止充电/放电。 Stop charging and discharging when temperature exceeds specification.
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备注：以上No. 2、4为警示条款，提请客户注意：当电池达到上述任何一项条款描述的指标和参数状态时，意味着电池已超出本规格书规定的使用条件，客户需依“保护动作”及本规格书的其他相关规定对电池采取保护措施，同时，精工电子声明对上述使用状态的电池质量不承担任何保证责任，并免除因此而导致的客户及第三方的任何损失赔偿。

Note: the above No. 2、4 are the warning clauses, draw the attention of customers: when the battery reaches any of the terms described in the above, it means that the battery has been used beyond the specification. The customer shall take protective measures on the battery in accordance with the protection action and other relevant provisions of this specification. At the same time, Goldencell shall not take any responsibility for the quality of the above mentioned cells, and exempts customers and third parties from any loss compensation caused thereby.

8.安全性能 Safety Characteristics


序号 NO.	项目 Items	测试方法 Test Method	标准 Standard
1	过充 Overcharge	正常电池以 1C 恒流充电至充电终止电压的 1.5 倍或充电时间达 1h 后停止充电并观察 1h 电池的外观变化。 Normal batteries are charged at 1C constant current until the charging termination voltage is 1.5 times or after charging time reaches 1h, then stop charging and the appearance changes of the batteries are observed for 1h.	不起火，不爆炸 No explosion, No fire.
2	过放 Over Discharge	正常电池标准充电后，电池以 1C 恒流放电 90 min，观察 1h 电池的外观变化。 After the standard charging of the normal batteries, use 1C constant current discharge for 90min, and observe the appearance changes of the batteries for 1h.	不起火，不爆炸 No explosion, No fire.
3	外部短路 External Short-circuit	正常电池标准充电后，直接短路正、负极 10min，外部线路电阻应小于 $5\text{m}\Omega$ ，当电池温度下降到比峰值温度低约 10°C 时结束试验，观察 1h 电池的外观变化。 After standard charging of normal batteries, direct short circuit positive and negative poles for 10 minutes, external line resistance should be less than $5\text{ m}\Omega$. End the test when the battery temperature drops to about 10°C below the peak temperature and the appearance changes of batteries are observed for 1 hour.	不起火，不爆炸 No explosion, No fire.
4	热滥用 Thermal Abuse	测量正常电池的初始状态，电池标准充电后，放置于烘箱中，温度以 $(5\pm 2^{\circ}\text{C})/\text{min}$ 的速率升至 $130\pm 2^{\circ}\text{C}$ 并保温 30min，然后观察 1h 电池的外观变化。 The initial state of the normal battery was measured. After standard charging, the battery was placed in the oven. The temperature was increased to $130\pm 2^{\circ}\text{C}$ at a rate of $(5\pm 2^{\circ}\text{C})/\text{min}$ and kept for 30 minutes. Then the appearance of the battery was observed for one hour.	不起火，不爆炸 No explosion, No fire.

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5	跌落 Drop	<p>正常电池标准充电后，测量电池的初始状态，将试验电池从1.5m 高度处自由跌落到平整的水泥地面上，每个方向各1次。</p> <p>After standard charging of normal batteries, the initial state of the batteries was measured, and the test batteries were freely dropped from 1.5m height to flat cement ground, once in each direction.</p>	不起火，不爆炸 No explosion, No fire.
6	重物冲击 Heavy Impact	<p>将一直径为 15.8mm 的钢棒置于满电的电池中部；将重量为10Kg 的铁锤从 1.0m 高处自由落体到电池上部。</p> <p>A diameter of 15.8 mm steel rod is placed in the middle of the fully charged cell, then the weight of 10kg hammer from 1.0m height free falls to the cell upper.</p>	不起火，不爆炸 No explosion, No fire.
7	挤压测试 Extrusion Test	<p>正常电池标准充电后，在垂直于电池极板或电池纵心轴方向施压，挤压头面积不小于 20cm²，逐渐增加压力至 13kN 或变形量达到 30%。</p> <p>After standard charging of normal batteries, pressure is applied perpendicular to the electrode plate or the longitudinal axis of batteries. The area of extrusion head is not less than 20 cm², and the pressure gradually increases to 13 kN or the deformation reaches 30%.</p>	不起火，不爆炸 No explosion, No fire.
8	针刺 Prick test	<p>正常电池标准充电后，用 $\phi 3\text{mm} \sim \phi 5\text{mm}$ 的耐高温钢针，以 10mm/s\sim40mm/s 的速度，从垂直于电池极板或电池纵心轴的方向贯穿（钢针停留在电池中时间大于 5min）。</p> <p>After standard charging of normal batteries, use $\phi 3 \sim 5\text{mm}$ high temperature resistant steel needle, to 10 mm/s \sim 40 mm/s of speed, from the perpendicular to the direction of the cell plate. (The steel needle stays in battery for more than 5 minutes).</p>	不起火，不爆炸 No explosion, No fire.

9.环境适应性性能 Environmental Adaptability

序号 NO.	项目 Items	测试方法 Test Method	标准 Standard
1	热循环 Thermal Cycle	<p>电池标准充电后，依次开路放置在 75\pm2$^{\circ}$C 的条件下 48h, -20$^{\circ}$C 条件下 6h, 室温条件下 24h, 观察电池外观变化。</p> <p>Store the cell for 48 hours at 75\pm2$^{\circ}$C after standard charge, then store the cell at -20$^{\circ}$C for 6 hours, and at room temperature for 24 hours. Observe the batteries.</p>	不漏液、不冒烟、不起火、不爆炸 No leakage, No smoke, No fire, No explosion.
2	恒定湿热 Static Humidity	<p>电池标准充电后，置于温度为 40$^{\circ}$C\pm5$^{\circ}$C，相对湿度为 95% 的恒温恒湿箱中，48h 后取出电池搁置 2h。观察电池外观变化。然后以 0.5C 放电至 2.5V，测量电池最终容量。</p> <p>Put the cell at 40$^{\circ}$C\pm5$^{\circ}$C and 95%RH chamber for 48h, then get it out and store it for 2h at room temperature. Observe the appearance and discharge at 0.5C to 2.5V, then test the final capacity.</p>	搁置后容量>90%*标称容量、电池外观无明显变形、无腐蚀、不冒烟、不爆炸 Discharge capacity after storage is more than 90% of rated capacity. No obvious outside damage, No corrosion, No smoke, No explosion

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3	振动 Vibration	振动频率/Hz vibration frequency/Hz	位移幅值（单振幅） Displacement breadth (single swing)	剩余容量 $\geq 90\%$ *标称容量、电压衰减 $\leq 0.5\%$ 、电池外观无明显损伤、不漏液、不冒烟、不爆炸 Residual Capacity $\geq 90\%$ Rated Capacity Voltage Decrease Rate $\leq 0.5\%$ No obvious outside damage, No leakage, No smoke, No explosion.
		A 10~30	0.38mm	
		B 30~55	0.19mm	
正常电池标准充电后安装在振动台面上,按上表振动频率和对应的振幅调整好试验设备 X、Y、Z 每个方向从 10~55Hz 循环扫频振动 30min 扫频速率为 1oct/min, 扫频结束后测电池最终状态, 观察电池外观变化。 Standard charge. Equip it to the vibration platform, prepare the test equipment according to above vibration frequency and relevant swing, doing frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min, Observe the final state after scanning.				

10. 储存 Storage

项目 Items	环境 Conditions	存储时间 Permissible time
储存 Storage Temperature	45°C~55°C, 不凝露环境下 45°C~55°C, non-condensing	<1 个月 < 1 month
	25°C~45°C, 不凝露环境下 25°C~45°C, non-condensing	<3 个月 < 3 months
	-20°C~25°C, 不凝露环境下 -20°C~25°C, non-condensing	<12 个月 < 12 months

建议电池存储 SOC 应保持在 20~50% 范围内。电池置于无腐蚀性气体的环境中, 电池不能承受任何压力, 存储电池的地面不能出现返潮现象。应每 3 个月对电池进行一次充放电循环。


It is recommended that the battery storage SOC be in the range of 20 to 50%. The battery is stored in an environment free of corrosive gases and cannot withstand any pressure. The ground where batteries are stored should not show any signs of moisture phenomenon. The battery should be charged and discharged once every three months.

11. 注意事项 Notice in Using Cell


滥用电池可能会导致电池损伤或人身伤害等意外。在使用前, 请仔细阅读以下安全守则及预防措施:

Abuse of cell may cause accidents such as damage to cores or personal injury. So please read the following safety codes and precautions carefully before used:

- 严禁将电池浸入海水或水中, 保存不用时, 应放置于阴凉干燥的环境中。Do not immerse the cell in water or seawater, and keep the cell in a cool dry surrounding if it stands by.
- 严禁将电池在高温下使用或放置, 如火、加热器等, 否则可能会引起电池过热、起火或功能失效、寿命减短。Do not use or leave the cell at high temperature as fire or heater. Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- 禁止电池被太阳直射。Batteries must not be exposed to direct sunlight.

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- 严禁颠倒正负极使用电池。Do not reverse the position and negative terminals.
- 严禁将电池正负端直接插入电源插座。Do not connect the cell electrodes to an electrical outlet.
- 严禁短路电池，它会导致电池严重损坏。Do not short circuit. Otherwise it will cause serious damage of the cell.
- 严禁将电池与金属，如发夹、项链等一起运输或贮存。Do not transport or store the cell together with metal objects such as hairpins, necklaces, etc.
- 严禁敲击、抛掷、踩踏、坠落、冲击，机械震动、碰撞及压力冲击电池等，否则电池内部可能短路，产生高温和火灾。Do not strike, trample, throw, fall and shock the cell. Protect cells from mechanical shock, impact and pressure. Internal electrical circuit may short circuit to generate high temperature and fire hazards.
- 严禁电池直接焊接壳身和用钉子或其它利器刺穿电池。It is strictly prohibited to directly weld the steel shell of the battery, and to pierce the battery with nails or other sharp tools.
- 严禁在强静电和强磁场的地方使用，否则易破坏电池安全保护装置,带来不安全的隐患。Do not use the cell in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- 当电池电压低于 2.0V 时，禁止进行充电。When cell voltage is lower than 2.0V, cell is prohibited from charging.
- 充电时请选用符合本文件充放电要求的锂离子电池专用充电装置。Use the cell charger specifically that meets the charging and discharging requirements of this document when recharging.
- 如果电池发生泄露，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。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.
- 禁止任何人或动物吞食电池的任何部件或电池所含物质。It is forbidden for any person or animal to swallow any part of the cell or the substance contained in the cell.
- 如果电池发出异味、发热、变色、变形或使用、贮存、充电过程中出现任何异常，立即停止充电或停止使用，并将其从装置中移出或隔离。If the cell gives off strange odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately stop charging, using, and remove it from the device.
- 如果电极弄脏，使用前应用干布抹净，否则可能会导致接触不良功能失效。In case the cell terminals are dirty, clean the terminals with a dry cloth before use. Otherwise poor performance may occur due to the poor connection with the instrument
- 严禁解剖电池，否则电池不再被保护，电池可能会出现漏液，发热，冒烟，起火，爆炸等安全隐患。Do not dissect the battery. Otherwise, the battery is no longer protected, and the cell may have potential safety hazards, such as liquid leakage, heat generation, smoke, fire, explosion, etc.
- 废弃的电池应用绝缘纸包住电极。Tape the discarded cell terminals to insulate them.
- 寿命终结的锂电池或没有使用价值的锂离子电池要依照当地的法律进行相应的回收和处理。请务必将废旧的电子产品、电池以及包装材料送交到专门的回收点。End-of-life lithium batteries should be recycled and disposed of in accordance with local laws. Be sure to send your used electronics, batteries, and packaging materials to a dedicated collection point.


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12.免责声明 Disclaimer

质保不包括正常损耗，以及维护、搬运、储存不当造成的问题和未遵守本产品规格书规定的使用和安装，包括但不限于以下情况：

Quality assurance does not include normal wear and tear, as well as problems caused by improper maintenance, handling and storage. Failure to follow the use and installation specified in this product specification, including but not limited to the following:

- 运输或储存过程中的损坏。Damage during transportation or storage.
- 对于电路，电池组以及充电器搭配使用所产生的问题。Problems arising from the combination of circuit, batteries and chargers.
- 不正确的电池安装或维护。Incorrect battery installation or maintenance.
- 在不适当的环境下使用电池或电池组。Use cell or cell pack in inappropriate environments.
- 除本规格书规定外，不适当的或不正确的充放电方式使用。Used improper or incorrect charging and discharging methods which is not included in this specification.
- 不遵守操作注意事项，包括客户未能正确处理、操作、安装、测试和维护电池，或未遵守本规范中提供的说明、注意事项、警告、注释以及其他合理说明或建议。Failure to comply with operational precautions, including failure to properly operate, install, test, and maintain the battery, or failure to comply with the instructions, precautions, warnings, notes, and other reasonable instructions or recommendations provided in this Specification.
- 出货后客户在电池组装过程中产生的不良电池。Bad cells generated in the process of assembling by the customer after shipment.
- 在不可抗力的情况下，如雷电、风暴、洪水、火灾、地震等。In case of force majeure, such as lightning, storm, flood, fire, earthquake, etc.
- 电池避免在本规格书禁止的温度条件下充电，否则，精工电子不承担质量保证责任。Prevent charging the Products at a temperature which is not allowed under the specification hereunder, thereby releasing Goldencell from any liability in connection therewith.
- 存储超过 3 个月不做充放电维护，对电池造成的容量损失或其他损失，精工电子将不承担责任。If the storage exceeds 3 months without charge and discharge maintenance, Goldencell will not be responsible for any capacity loss or other losses caused to the cell.
- 客户及第三方应避免电池到达过充、过放状态。电池截止电压、充电电流、放电电流超过本规格书要求时，电池内部可能会遭到永久性的损坏，此时精工电子的产品质量保证责任失效。Prevent draining any product down to over charge and discharge state. A product may be permanently damaged internally when the cut-off voltage, charging current, and discharge current of the battery exceed the requirements of this specification, and which shall be strictly prohibited, failing what Goldencell warranties under the contract shall cease to apply, thereby releasing the Goldencell from any liability in connection therewith.
- 电池应严格按照本规格书当中的内容使用电池，客户并确保电池的使用者按本规格书的内容使用电池，否则发生的电池参数不符、电池质量问题、电池故障及任何损失，精工电子均不承担责任。The customer shall use the battery in strict accordance with the battery usage requirements in this specification. Goldencell shall not be responsible for

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the failure and loss caused by the violation of the battery usage requirements.

- 自出货之日起，电池的保质期限依合同而定。在此期限内，如果非精工电子的制程原因，而是客户的误用造成的电池质量问题，我司不承诺免费更换。The Warranty period of cell is made according to business contract. However, even though the problem occurs within this period, Goldencell won't replace a new cell for free as long as the problem is not due to the failure of Goldencell manufacturing process or is due to customers' abuse or misuse.

13.风险警告 Risk Warning

13.1 警示声明 Warning statement

- 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！
The cell is potentially dangerous, and appropriate protective measures must be taken during operation and maintenance.
- 必须使用正确的工具和防护装备操作电池。
The correct tools and protective equipment must be used to operate the battery.
- 电池的维护必须由具有电池专业知识并经安全培训的人士执行。
The maintenance of batteries must be carried out by personnel with professional knowledge of batteries and safety training.
不遵守上述警告可能造成多种灾难，我司概不负责。
Due to the possibility of multiple disasters caused by non-compliance with the above warnings, our company is not responsible for any related consequences.

13.2 危险类型 Hazard type

客户知悉在电池使用和操作过程中存在以下潜在的危險。


Client acknowledges the following potential hazards in connection with the usage and handling of the Products.

- 存在受到电击或者电弧伤害的风险。
Working with battery can expose the handler to shock and/or arcing hazards.
- 存在受到电解液或者其他化学品危害的风险。
Working with battery can expose the handler to chemical or electrolytical hazards in the cell.
- 为防止发生意外短路，造成电弧、爆炸或者热失控，需选择合适的操作方法及防护装备。
When selecting work practices and personal protective equipment, Client and its employees shall 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.

14.其他约定 Other agreements

- 如果由于产品需求单位或者使用者不按照本规格书的规定进行使用，精工电子不再承担产品质量保证责任及由此引起的损失赔偿等一切相关责任。因前述行为，对精工电子的声誉造成负面影响的，精工电子保留追究产品需求单位法律责任的权利。在不影响产品使用的情况下，产品如有升级，不再另行通知。买方在订购精工电子产品前，需要与精工电子提前确认产品的最新状态。

If the product demand unit or user fails to comply with the provisions of this file when the battery is used, such as product quality assurance responsibility and loss compensation, Goldencell will no longer be liable. If the behavior described earlier has a negative impact on Goldencell's reputation, Goldencell reserves the right to hold the requirement unit unauthorized,禁止翻印、传播。Without authorization, any pirate or circulation is prohibited.

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legally responsible. Without affecting the use of the product, any product upgrades will not be notified separately. Before ordering Goldencell products, the customer needs to confirm the latest status of the products in advance with Goldencell.

- 精工电子保留对产品的规格及性能参数修改的权利，内容如有变动，不再另行通知。本规格书为中英双语，如中英文约定存在冲突时，以中文版本为准，本文件的最终解释权归本公司所有。

Goldencell reserves the right to revise the specifications and performance parameters of the product. The content is subject to change without prior notice. This specification is bilingual in both Chinese and English. In case of any conflict between the two language agreements, the Chinese version shall prevail. The final interpretation right of this information belongs to Goldencell.

- 客户应对合作内容高度保密，未经精工电子许可，不得向第三方透露规格书的任何内容，否则，将依照相关法律追究责任。

The customer is obliged to keep the content of this specification confidential, and the customer shall not disclose it to any third party without authorization. Otherwise, Goldencell will be held responsible in accordance with the law.

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变更履历表 Amendment Records

版本 Revision	日期 Date	变更前内容 Pre-change Content	变更后内容 Post change Content	变更原因 Reasons for Change
R1.1	2020.01.08	深圳分公司地址：深圳市南山区粤兴二道武汉大学深圳产学研大楼 B905 Branch office (Shenzhen) Add: B905, Wuhan University Research Bldg., No. 2 Yue xing Rd., Hi- tech Industrial Park, Nanshan District, Shenzhen, China	深圳分公司地址：广东省深圳市南山区粤兴四道深圳北航大厦 1 号楼 8006 室 Branch office (Shenzhen) Add: Room 8006, Building 1, Shenzhen Beihang Building, Yuexing 4th Road, Nanshan District, Shenzhen, Guangdong, China	地址变更 Address change
R1.2	2020.03.26	/	新增客户确认，新增履历表 Add the content of customer approval and amendment records	内容完善 Perfect the content
R1.3	2020.10.15	/	Φ4=18.50±0.15mm Add the dimension of Φ4=18.50±0.15mm	完善尺寸标注 Perfect the dimension
R1.4	2021.03.15	/	Branch Office (Europe) Pihatörmä 1 A, 02240 Espoo, Finland	新增地址 Add new address
R1.4	2021.03.15	HTCFR18650-1600mAh-3.2V	JGCFR18650-1600mAh-3.2V	型号命名变更 Naming change of model
R1.5	2022.04.27	山东省枣庄市高新区锂电产业园复元五路 Fuyuan 5 Rd. Lithium Battery Industrial Park, Hi-tech District, Zaozhuang City, Shandong Province, China	山东省枣庄市高新区光明路 X6699 号 X6699 Guangming Road, high tech Zone, Zaozhuang City, Shandong Province China	公司地址变更 Address change
R1.5	2022.04.27	≤40 mΩ	≤25 mΩ	内阻变更 Change the internal resistance
R1.6	2022.09.28	山东精工电子科技股份有限公司 Shandong Goldencell Electronics Technology Co.,Ltd	山东精工电子科技股份有限公司 Shandong Goldencell Electronics Technology Co.,Ltd	公司名称变更 Change of the company name
R1.7	2023.12.06	JGCFR18650-1600mAh-3.2V	18FC-5.12Wh	产品型号名称变更 Change of the Model
R1.7	2023.12.06	/	“美国公司/ Branch Office (USA) 地址 /Add:4695 Chabot Drive, Suite 200, Pleasanton, CA 94588, USA 电话/ Tel: +1 (925) 558-2758 Email: usa_branch@goldencell.biz”	加美国公司地址和联系方式 Add addresses and contact information for Branch Office (USA)
R1.7	2023.12.06	/	循环性能 (25℃) : 0.5C/1C, 3500 次 (100%DOD) Cycle Characteristic (25℃): 0.5C/1C, 3500 times (100%DOD)	增加循环性能要求 Increase Cycle Characteristic
R1.7	2023.12.06	充电 0℃~55℃ Charge 0℃~55℃ 放电 -20℃~60℃ Discharge -20℃~60℃	充电 0℃~60℃ Charge 0℃~60℃ 放电 -30℃~65℃ Discharge -30℃~65℃	工作温度变更 Change of the Working Temperature
R1.7	2023.12.06			更改规格书模板 Change Template