Lithium-ion Battery Pack Specification
锂离子电池组规格书

Battery Model 产品型号	ZP21195	Specification 规格参数	36V 14.5Ah
Cell Model 电芯型号	N18650CL-29	Pack Mode 组合方式	10S5P
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Ben Feng Kai Zhou	Stu Lai	Jason Wu Robert Cao
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Shenzhen Ace Battery Co., Ltd.
2Floor, Office Building, BAK Industrial Park, Kuipeng Road, Dapeng New District, Shenzhen, 518119
Guangdong, China

Modified List 修订履历

Revision 版本	Date 日期	Mark 标记	Modified content 变更内容	Reviser By 修订者
00	2022-1-20		NEW RELEASE	Ben Feng
01	2022-7-23		Add Actual Discharge Current of the system 系统实际放电电流 ;Actual Charging Current of the system 系统实际充电电流 ;Actual load-profile of the system 系统实际 load-profile	Ben Feng
02	2022-08-17		Update Outline Drawing 更新产品外形尺寸图	Jintao Wu
03	2022-08-24		Update Minimum Capacity 更新最小电池包容量 Update Firmware to A04	Ben Feng Kai.zhou
04	2022-09-06		Update safety certification requirements 更新安规认证要求	zhaoyuan.wu
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06	2022-12-9		Update Discharge Over Current Protection Current (1) and Discharge Over Current Protection Current (2)	Ben.feng
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08	2023-2-16		Update DCDC & LED parameter	LI.LI
09	2023-2-17		Update product label	Yefang.wang

Content 目录

1. Scope 范围

This product specification has been prepared to specify the rechargeable Lithium-ion battery to be supplied to the customer by Shenzhen Ace Battery Co., Ltd.

本产品规格书仅适用于深圳安仕新能源科技有限公司提供给客户的可充电锂离子体电池。

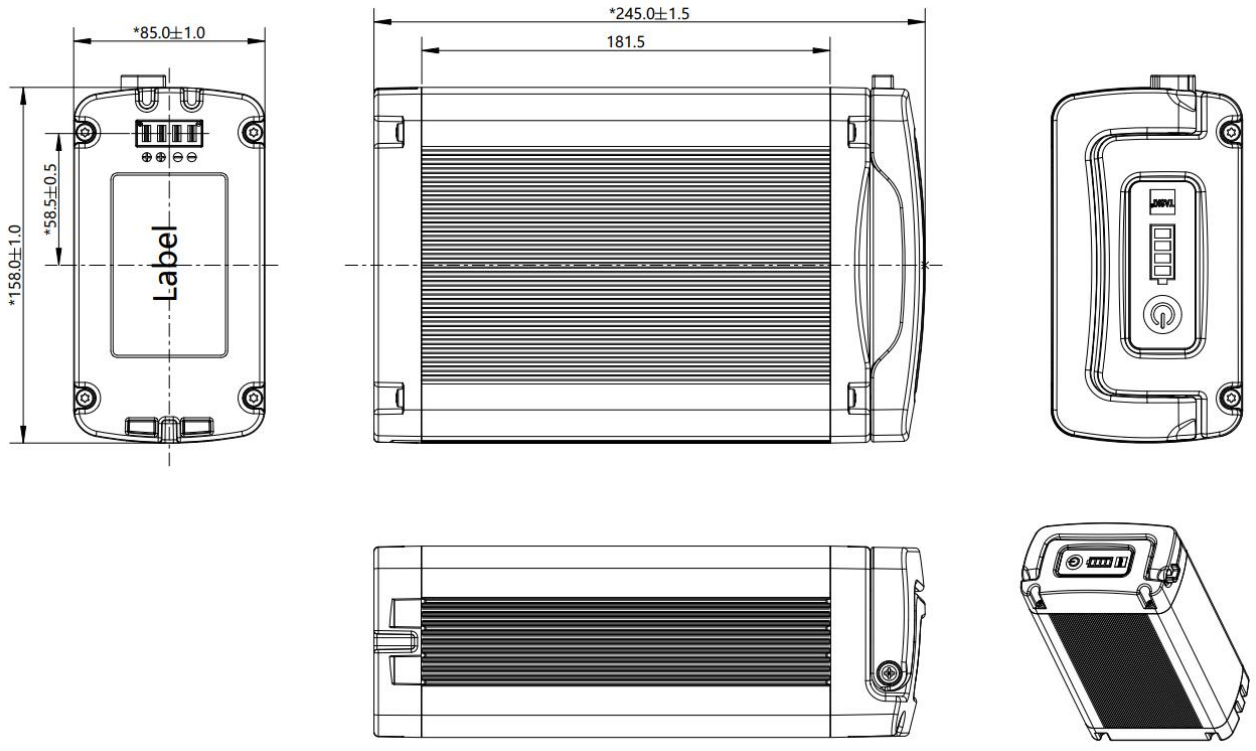
2. Nominal Specifications 主要参数

项目 Items	标准 Standard	备注 Comments
Nominal Voltage(V) 标称电压(V)	36V	
Fully Charge Voltage(FC) 满充电压(FC)	41.5V Defined in this DOC: FC = 41.5V	
Fully Discharge Voltage(FD) 满放电压 (FD)	25V Defined in this DOC: FD =25V	
Typical Capacity(Ah) 典型容量(Ah)	14.5Ah	At 0.2C discharge rate
Minimum Capacity (Ah) 最小容量(Ah)	13.8 Ah	
Weight (Kg) 重量	About 3.75	
Max Continuous Discharge Current 最大持续放电电流	25A	Peak 35A/5S
Charge Voltage 充电电压	41.5±0.1V	Charged by matching charger (recommended value)
Maximum Charge Current 最大充电电流	10A	
Standard Charge Method 标准充电方法	0.5C CC(constant current)charge to FC, then CV(constant voltage FC)charge till charge current decline to ≤0.02C. 0.5C CC（恒流）充电至 FC，再 CV（恒压 FC）充电直至充电电流≤0.02C	
Actual Discharge Current of the system 系统实际放电电流	20A Avg	
Actual Charging Current of the system 系统实际充电电流	10A	
Actual load-profile of the system 系统实际 load-profile	35A/5S	
Inner Resistance 内阻	≤80mΩ	Between positive and negative polar of discharge port
Operation Temperature Range ℃ 工作温度范围	Charge: 0℃～+45℃	Temperature Protection value is 0℃& 50℃ on cell surface
	Discharge: 0℃～+50℃	Temperature Protection value is -20℃ & 70℃ on cell surface
Storage Temperature Range ℃ 存储温度范围	-20℃～45℃ at half charged state	Recommended long-term storage temperature is 20~25℃
Operating Environment Humidity 使用环境湿度	RH: 65±20%	
Storage Environment Humidity 存储环境湿度	≤65%RH	

3. Mechanical specification 机械规格

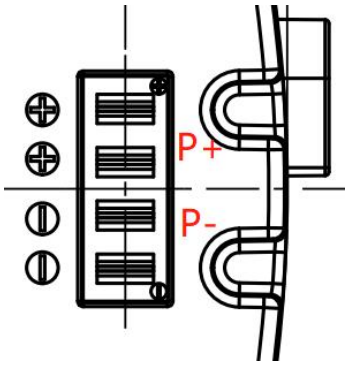
3.1 Outline Drawing 产品外形尺寸图

UNIT(单位)：mm					
L(长度)：	158±1	W(宽度)：	85±1	H(高度)：	245±1.5
Terminal (端子)：	4P terminal(4P 端子)				
Note（备注）：					



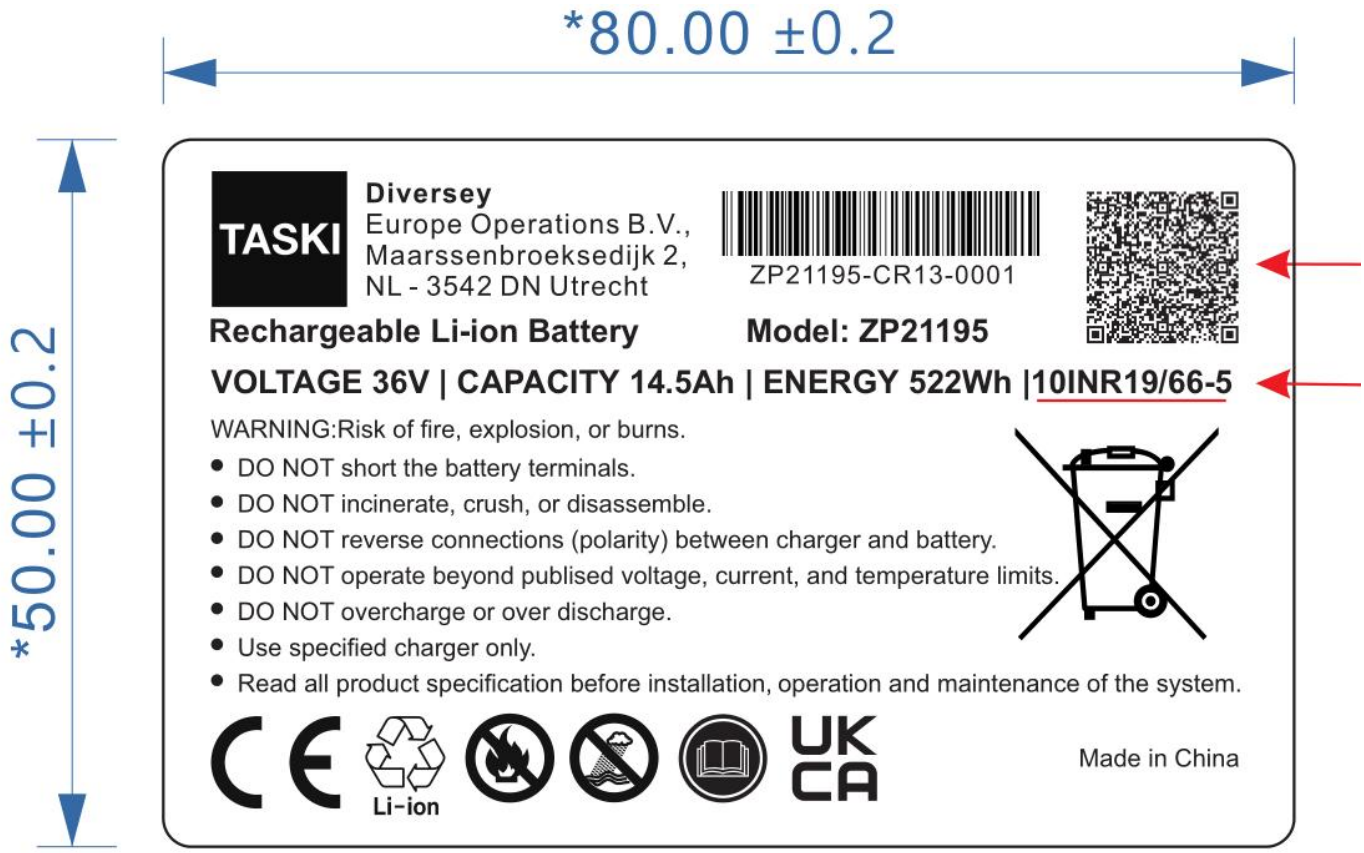
Note: Drawings are for reference only。

3.2 Output connector PIN definition 输出接口管脚定义



3.3 Battery Label 标签图

Specification Label 规格标签:



3.4 Mechanical property test 机械性能测试

3.4.1 Ingress Protection Rating 防护等级

IP54

3.4.2 Drop Criteria 跌落标准

UN38.3

3.4.3 Vibration Criteria 振动标准

UN38.3

3.5 Cycle Life test Specification 寿命测试标准

Charge 0.5C and discharge 1C >=1000cycle

4. BMS 保护板

4.1 Parameters BMS 参数

No.. 序号	Item 项目		Standard 标准
1	Voltages 电压	Single Cell Charge Balance ON Voltage 单节电池均衡电压开启电压	Cell≥ 3000 mV
2	Current 电流	Charge Balance Current For Single Cell 单节电池均衡电流	≤20mA
		Self-discharge Current (Active Mode) 自耗电（工作模式）	≤30mA
		Self-discharge Current (Sleep Mode) 自放电（休眠模式）	≤ 1mA
		Self-discharge Current (Shut down Mode) 自放电（关机模式）	≤50uA
		Max Charge/Discharge Current 最大充电/放电电流	10A/18A
3	Over Charge Protection 过充保护	Over Charge Protection Voltage (1) 一级过充保护电压	4.23 ± 0.05V
		Over Charge Protection Delay Time (1) 一级过充保护延迟时间	≤1S
		Over Charge Release Voltage (1) 一级过充恢复电压	4.1 ± 0.05V
		Over Charge Protection Voltage (2) 二级过充保护电压	4.3 ± 0.05V
		Over Charge Protection Delay Time (2) 二级过充保护延迟时间	≤2S
4	Over Discharge Protection 过放保护	Over Discharge Protection Voltage 过放保护电压	2.5 ± 0.05V
		Over Discharge Protection Delay 过放保护延迟	≤1S
		Over Discharge Release 过放恢复	Recover after Charge 2S and cell voltage>2.7V 电芯电压大于 2.7V 且充电 2S 后自动恢复
5	Discharge Over Current Protection 放电过流保护	Discharge Over Current Protection Current (1) 一次放电过流保护电流	35±3.5A
		Discharge Over Current Protection Delay (1) 一次放电过流保护延时	≤30S

		Discharge Over Current Protection Current (2) 二次放电过流保护电流	45±4A
		Discharge Over Current Protection Delay (2) 二次放电过流保护延时	≤1S
		Discharge Over Current Release 放电过流恢复	Automatic recovery after 60S 60S 后 放电过流自动恢复
6	Charge Over Current Protection 充电过流保护	Charge Over Current Protection Current 一次充电过流保护电流	13±1.3A
		Charge Over Current Protection Delay 一次充电过流保护延时	≤2S
		Discharge Over Current Release Delay 充电过流恢复	Recover after 60S 30S 自动恢复
7	Charge Over Temperature Protection 充电过温保护	Charge Over Temperature Protection 充电过温保护	50±3℃
		Charge Over Temperature Protection Delay 充电过温保护延时	≤2S
		Charge Over Temperature Release 充电过温恢复	45±3℃
		Charge Under Temperature Protection 充电低温保护	0±3℃
		Charge Under Temperature Protection Delay 充电低温保护延时	≤2S
		Charge Under Temperature Release 充电低温恢复	5±3℃
8	Discharge Over Temperature Protection 放电过温保护	Discharge Over Temperature Protection 放电过温保护	70±3℃
		Discharge Over Temperature Protection Delay 放电过温保护延时	≤4S
		Discharge Over Temperature Release 放电过温恢复	65±3℃
		Discharge Under Temperature Protection 放电低温保护	-20±3℃
		Discharge Under Temperature Protection Delay 放电低温保护延时	≤2S
		Discharge Under Temperature Release 放电低温恢复	-15±3℃
9	FET Temperature Protection FET 过温保护	FET Over Temperature Protection 场效应管高温保护	110°C
		FET Over Temperature Protection Delay 场效应管高温保护延时	≤2S
		FET Over Temperature Release 场效应管高温保护回复	90°C

10	Multiple continuous overcurrent protection 多次连续过流保护	Multiple consecutive overcurrent protection conditions 多次连续过流保护条件	When the short circuit or overcurrent protection is triggered 10 times, the battery pack cannot continue to discharge 连续 10 次触发短路或者过流保护的时候，电池包不能继续放电
		Multiple consecutive overcurrent recovery conditions 多次连续过流恢复条件	Recovery after charge 接入充电器后恢复
11	Firmware Version 固件版本	A06	

*Note: Please customer do not short the battery pack directly.

4.2 Firmware 软件

Firmware version，checksum and file name 软件版本，检验字和文件名

Firmware version	A06
checksum	0x52BFE2E3
file name	ZP21195-BAT-MCUG-P-RevA06-026(52BFE2E3)-221223.hex
MCU	GD32E230C8T6

5. Standard Test Conditions 标准测试条件

5.1 Environmental Conditions 环境要求

Unless otherwise specified, all tests stated in this specification are conducted at temperature 25±2℃and humidity 15~90%.

除非特殊说明，否则所有测试都在温度 25±2℃，湿度 15~90%的环境中测试。

5.2 Measuring Equipment 测量设备

A) Voltage is measured by D.C. voltmeter which precision is higher than 0.5 grade and self resistance is higher than 1kΩ/V;

测量电压用的直流电压表精度不低于 0.5 级，电压表内阻不低于 1kΩ/V;

B) Current is measured by D.C. meter which precision is higher than 0.5 grade;

测量电流用的直流电表精度不低于 0.5 级;

C) Temperature is measured by thermometer which has proper measuring range and division value is lower than 0.5℃;

测量温度用的温度计应具有适当的量程，其分度值不应大于 0.5℃;

D) The timer used in measuring should be decreed in hour, minute and second, and should have degree of accuracy no more than ±1%;

测量时间用的计时器应按时、分、秒分度，至少应具有±1%的准确度。

5.3 Test conditions 测试环境

The battery to be tested should be new cells and within one month after shipment from our factory and the battery shall not be cycled over five times before the testing. All the tests in this specification shall be conducted in an ambient temperature of 25℃ ±2℃ under a humidity of 15~90%, unless otherwise specified.

测试电池必须是本公司出厂时间不超过一个月，且电池未进行过五次以上充放电循环除非另有规定。本规格书中各项试验应在标准大气条件下进行：温度：25℃±2℃，相对湿度：15~90%

6. Characteristics 特性

6.1 Standard charge 标准充电

The battery shall be charged at a constant current of 0.5C to FC (Fully charge voltage) and then at constant voltage of FC charge the battery till the charge current is less than 0.02C, cut off.

电池应以0.5C的恒定电流充到FC(满充电压)，然后以FC的恒定电压充电，直至截止电流小于0.05C。

6.2 Standard discharge 标准放电

Discharge the battery at 0.5C to FD (Fully discharge voltage), stop.

以0.5C放电到FD(满放电压)，停止。

7. Appearance 外观

There shall be no such defects as scratch, discoloration, leakage which may adversely affect commercial value of the Battery.

电池表面无划痕、脏污、电解液泄漏等影响电池价值的外观缺失。

8. Compliance Requirement 安规认证要求

UN38.3

CE

UKCA

9. Delivery Condition 出货状态

Air Delivery Capacity: 20%-30%

航空运容量 20-30%

Sea or Land Delivery Capacity: 60%-80%

海陆运容量 60%-80%

10. Period of Warranty 保质期

The period of warranty is one year from the date of shipment. ACE guarantees to give a replacement in case of battery 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。如果证明电池的缺陷是在我们公司制造过程中造成的而不是客户滥用或错误使用造成，本公司负责退换电池。

11. Others 其他

Any matters that this specification does not cover should be conferred between the customer and ACE.

未尽事宜由供需双方协商而定。

12. Appendix 附页

Proper Use and Handling of Lithium-ion Battery

锂离子电池使用说明及注意事项

1. General 一般规范

This document has been prepared to describe the appropriate cautions and prohibitions, which the customer should take or employ when the customer uses and handles the Lithium-ion battery to be manufactured and supplied by Shenzhen Ace Battery Co., Ltd. in order to obtain optimum performance and safety.

本内容为安仕新能源生产的锂离子电池在使用过程中的一些指导和警告，请消费者仔细阅读并遵守，以便于获得最佳的使用性能和最可靠的安全性。

2. The customer is requested to contact ACE in advance, if the customer needs other applications or operating conditions is beyond those described in this document, as we need to do additional check or tests to verify the battery performance and safety under such conditions.

客户若需要将电池用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电池，应事先联系安仕，因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性。

3. ACE will not take responsibility for any accident when the battery is used under other conditions than those described in this Document.

对于在超出文件规定以外的条件下使用电池而造成的任何意外事故，安仕概不负责。

4. If necessary, ACE will inform, in a written form, the customer of improvement(s) regarding proper use and handing of the battery.

如有必要，安仕会以书面形式告之客户有关正确操作使用电池的改进措施。

5. Charging 充电

5.1. Charging Current 充电电流

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to battery electrical, mechanical and safety performance and could lead to heat generation or leakage.

充电电流不得超过本标准书中规定的最大充电电流。使用高于推荐值电流充电将可能引起电池的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。

5.2 Charging Voltage 充电电压

Charging shall be done by voltage less than that specified in the Product Specification (FC/PACK). Charging beyond FC, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the battery electrical, mechanical safety performance and could lead to heat generation or leakage.

充电电压不得超过本标准书中规定的满充电压（FC/PACK）。FC/电池组为充电电压最高极限，充电器的设计应满足此条件；电池组电压高于满充电压值时，将可能引起电池组的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

5.3 Charging Temperature 充电温度

The battery shall be charged within 0℃~45℃ range in the Product Specification.

电池必须在 0℃~45℃的环境温度范围内进行充电。

5.4 Prohibition of Reverse Charging 禁止反向充电

Reverse charging is prohibited. The battery shall be connected correctly. The polarity has to be confirmed before wiring, In case of the battery is connected improperly, the battery cannot be charged. Simultaneously, the reverse charging may cause damaging to the battery which may lead to degradation of battery performance and damage the battery safety, and could cause heat generation or leakage.

正确连接电池的正负极，严禁反向充电。若电池正负极接反，将无法对电池进行充电。同时，反向充电会降低电池的充放电性能、安全性，并会导致发热、泄漏。

5.5 Please use approved charger or charger supplied from supplier. If charger used improperly, it may damage the battery. For any un-approved charger which caused the battery problem, ACE will not take any responsibility.

使用合格或者厂家配套充电器，因使用不合格充电器而导致的电池问题，安仕不负责任何问题。

6. Discharging 放电

6.1 Discharging Current 放电电流

The battery shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.

放电电流不得超过本标准书规定的最大放电电流，大电流放电会导致电池容量剧减并导致过热。

6.2 Discharging Temperature 放电温度

The battery shall be discharged within -20℃~60℃range specified in the Product Specification.

电池必须在-20℃~60℃的环境温度范围内进行放电。

6.3 Over-discharging 过放电

1） It should be noted that the battery would be possible to be at a over-discharged state by its self-discharge characteristics in case the battery is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain between 40%-60%.

应该注意的是，如果电池长时间不使用，电池可能会因其自身放电特性而处于超负荷状态。为了防止过度放电，电池应定期充电以维持在 40% – 60%之间。

2）Over-discharging may causes loss of battery performance, characteristics, or battery functions.

过放电会导致电池性能，电池功能的丧失。

3）The charger shall have the function to prevent the battery to be further discharged beyond a cut-off voyage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures. If the battery is over discharged, please use the following steps:
Firstly, charge the battery with a very low current (0.01C) for 15-30 minutes, i.e.-charging, before rapid charging starts. When the voltage is above FD then start normal charge. The charger can be determined with the use of an appropriate timer for pre-charging. In case the voltage does not rise to FD within the pre-charging time, then the charger shall have functions to stop further charging and show the pack is at abnormal state.

充电器应有装置来防止电池放电至低于本标准书规定的截止电压。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（0.01C）预充电 15~30 分钟，以使电池电压达 FD 以上，再进行快速充电。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，（个别）电池的电压仍未升到 FD 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。

7. Storage 贮存

1> The storage temperature of the battery are as below:

电池储存温度请按照如下方法储存：

- -20℃~45℃ within 3 months
  -20℃~45℃保存不超过 3 个月
- -10℃~25℃ within 6 months
  -10℃~25℃保存不超过 6 个月
- The battery should be stored at half charged state in a dry, clean, no corrosive gas place with good ventilation, If the cell has to be stored for a long time (Over 3 months), the environmental condition should be -10~25℃, low humidity, no corrosive gas atmosphere. The voltage for a long time storage shall be 40%-60% range. For every three months, cycle the battery 1~3 times to keep the battery performance, and stored again at half charged

电池应以半带电状态储存在干燥、干净、没有腐蚀性气体、有良好的通风的地方。如果电池必须存储很长时间(超过 3 个月)，环境条件应：-10~25℃，低湿度和不含腐蚀性气体。长时间存储的电压应为 40-60%。每三个月，循环一次电池 1 ~ 3 次以保持电池的性能，并以半充电的方式再次储存。

8. Others 其它

8.1 Prevention of short circuit within a battery pack 防止电池内短路

Enough insulation layers between wiring and the battery shall be used to maintain extra safety protection.
使用足够的绝缘材料对线路进行保护

8.2 Prohibition of disassemble 严禁拆卸电池

1) The disassembling may generate internal short circuit in the battery, which may cause firing, or other problems.
拆卸电池可能会导致内部短路，进而引起着火及其它问题。

2) The battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.
电池理论上不存在流动的电解液，但万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位，应立即用清水冲洗电解液并就医。

3) Never incinerate nor dispose the battery in fire. These may cause firing of the battery, which is very dangerous and is prohibited.
在任何情况下，不得燃烧电池或将电池投入火中，否则会引起电池燃烧，这是非常危险的，应绝对禁止。

4) The battery shall never be soaked with liquids such as water, seawater drinks such as soft drinks, juices coffee or others.
不得将电池浸泡液体，如淡水、海水、饮料(果汁、咖啡)等。

5) The battery replacement shall be done only by either battery supplier or device supplier and never be done by the user.
更换电池应由电池供应商或设备供应商完成，用户不得自行更换。

6) Prohibition of use of damaged battery
禁止使用已损坏的电池。

The batteries might be damaged during shipping by shock. If any abnormal features of the batteries are found such as damages in a plastic envelop of the batteries, deformation of the battery package, smelling of electrolyte, electrolyte leakage and others, the battery shall never be used any more.
电池在运输过程中可能因撞击等原因而损坏，若发现电池有任何异常特征，如电池塑料封边损坏，外壳破损，

闻到电解液气体，电解液泄漏等，该电池不得使用。

The batteries with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.

有电解液泄漏或散发电解液气味的电池应远离火源以避免着火。