保力新（内蒙古）电池有限公司 2024-07-01 受控文件

圆柱磷酸铁锂电芯规格书

Specification for
Lithium-ion Rechargeable Cell

电芯型号：LFP32700-6.0Ah(容量款)磷酸铁锂电芯

Cell Type：LFP32700-6.0Ah(Capacity) $LiFePO_4$ Cell

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1. 基本信息 General Information

1.1 适用范围 Scope

本规格书规定了由保力新能源科技股份有限公司生产的圆柱形锂离子电芯的技术要求，测试方法及注意事项，如需获取本规格书以外的技术要求，请与保力新能源科技股份有限公司联系相关事宜。

This specification describes the technical requirements of Cylindrical Lithium-ion Cell supplied by Blivex New Energy Technology CO., LTD. If any other technical information is needed, please contact Blivex New Energy Technology CO., LTD.

1.2 产品分类 Product Classification

圆柱形可充电锂离子电芯

Cylindrical Rechargeable Lithium-ion Cell

1.3 型号名称 Model Name

LFP32700-6.0Ah(容量款) 磷酸铁锂电芯

LFP32700-6.0Ah(Capacity) LiFePO4 Cell

1.4 电芯尺寸 Size

图A 电池图片和外形尺寸

（Figure A）Cell's appearance and dimension

1.5 电芯特点 Benefits

- 抗压镀镍钢外壳　Sturdy and pressure resistant steel envelope
- 高容量　High capacity
- 出色的循环寿命　Excellent cycling life
- 优秀的高低温性能　Excellent high and low temperature performance
- 电压输出稳定　Steady output voltage

- 自放电小　Low self-discharge
- 双重安全保护　Double safety protection
- 高抗振和抗冲击能力　With outstanding high level of vibrations and shocks

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1.6 主要应用 Main Application

动力领域 Power battery field

- 电动两轮车（电动两轮车共享、电动两轮车换电）　Electric two-wheel vehicle
- 电动三轮车　Electric tricycle
- 电动四轮车（A00级轿车）　Electric four-wheel vehicle
- 物流车　Logistics vehicle
- 特种车辆（电动叉车、高尔夫球车等）　Special vehicle

储能领域 Energy storage battery field

- 便携式储能电源　Portable energy storage power supply
- 家庭储能　Household energy storage
- 工商业储能　Industrial and commercial energy storage
- 通信后备电源　Communication backup power

1.7 电池组装 Battery Assembly

单个电芯根据具体应用组装成一定规格的电池组，由电池组与电子系统共同参与完成电池组的性能管理、热管理和安全管理。

Individual cells should be integrated in specific battery pack according to customers' demands. The battery pack together with electronic system provides performance, thermal and safety management.

2. 标准规格 Nominal Specification

项目 Item		规格 Specification	条件 Condition
2.1 标称容量 Norminal Capacity		6.0Ah	1C放电容量 1C discharge capacity
2.2 交流内阻 AC Impedance		≤8.5mΩ	在1000 Hz下测量 At AC 1000 Hz
2.3 标称电压 Nominal Voltage		3.2V	
2.4 电芯尺寸 Cell Size	电芯直径 Cell Diameter	32.2±0.3mm Max. 32.5mm	
	电芯高度 Cell Height	70.5±0.3mm Max. 70.8mm	
2.5 电芯重量 Cell Weight		135±5g	（光身电芯）
2.6 能量密度 Energy Density		142Wh/kg	

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2.7 充电限制电压 Limited Charge Voltage		3.65V	恒流充电 CC Mode
2.8 充电截止电流 Charge Cut-off Current		0.3A	恒压充电 CV Mode
2.9 充电方式 Charge Method	标准充电 Standard Charge	0.5C	At CC/CV
	快速充电 Quick Charge	1C	At CC/CV
2.10 放电终止电压 Discharge Cut-off Voltage		2.0 V	恒流放电 CC Mode
2.11 标准放电电流 Standard Discharge Current		1C（6A）	
2.12 最大持续放电电流 Max Continuous Discharge Current		3C（18A）	
2.13 最大脉冲放电电流 Max Pulse Discharge Current		5C（30A）	10s
2.14 循环性能 Cycling Life		1500 cycles	25°C 0.5C充/1C放 100% DOD
2.15 操作温度范围 Operating Temperature Range	最大允许充电温度 Max. Charge Temperature	0~60°C	
	最佳充电温度 Optimum Charge	15~40°C	
	最大允许放电温度 Max. Discharge Temperature	-30~60°C	
	最佳放电温度 Optimum Discharge	15~40°C	
	储存温度 Storage Temperature	-20~45°C	≤0.5年 ≤Half a year
		-10~25°C	≤1年 ≤One year
2.16 外观 Appearance		无破裂、划痕、变形、污渍、电解液泄露等 Without break, scratch, distortion, contamination, leakage and so on	

3.电性能 Electrical Performance

测试项目 Test Item	测试方法 Test Method	检验标准 Criteria

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3.1 标准充电 Standard Charge Method	在温度25°C±5°C，湿度15~90%RH，大气压力82kPa~106kPa的环境条件下，电芯先以恒定电流0.5C充电至3.65V，再以3.65V的恒定电压充电至电流小于0.05C，搁置1h。 All tests stated in this Specification are conducted at 25°C±5°C, 15~90%RH and atmospheric pressure of 82kPa~106kPa. Charge the cell at a constant current of 0.5C until the voltage reaches 3.65V, then charge it at a constant voltage of 3.65V until the current decreases less than 0.05C and placed for 1h.	
3.2 标准放电 Standard Discharge Method	在温度25°C±5°C，湿度15~90%RH，大气压力82kPa~106kPa的环境条件下，电芯以恒定电流1C放电至2.0V。 All tests stated in this Specification are conducted at 25°C±5°C, 15~90%RH and atmospheric pressure of 82kPa~106kPa. Discharge the cell at a constant current of 1C until the voltage reaches 2.0V.	
3.3 交流内阻 AC Impedance	电芯以0.5C充满电后在1000Hz下测量。 Cell should be measured at 1000 Hz after Charging the cell fully at a current of 0.5C.	≤8.5mΩ
3.4 初始容量（Cini） Initial Capacity	电芯以0.5C充满电后，以1C恒流放电至2.0V结束。 Cell should be charged fully at a current of 0.5C and discharged at a constant current of 1C until the voltage reaches 2.0V.	初始容量≥6.0Ah Cini≥6.0Ah
3.5 循环寿命 Cycling Life	在25°C±2°C，电芯按0.5C CC/CV充电到3.65V，截止电流0.05C；搁置30min，然后以1C恒流放电至2.0V结束，搁置30min，再进行下一次循环，连续1500次。 At 25°C±2°C, Cell should be charged at CC/CV mode (CC:0.5C, CV: 3.65V, Charge Cut-off current: 0.05C) . After stored for 30min, cell should be discharged at CC mode (1C, Discharge Cut-off Voltage: 2.0V).After stored for 30min, tests should be continued for 1500 times.	容量保持率≥80% Capacity retention≥80%
3.6 倍率放电性 Discharge Rate Performance	电芯以0.5C充满电后，室温下以1C恒流放电至2.0V结束。 Cell should be charged fully at a current of 0.5C and discharged at a constant current of 1C until the voltage reaches 2.0V at RT.	放电容量≥100%标称容量 Discharge Capacity ≥100% Nominal Capacity
	电芯以0.5C充满电后，室温下以2C恒流放电至2.0V结束。 Cell should be charged fully at a current of 0.5C and discharged at a constant current of 2C until the voltage reaches 2.0V at RT.	放电容量≥99%标称容量 Discharge Capacity ≥99% Nominal Capacity
	电芯以0.5C充满电后，室温下以3C恒流放电至2.0V结束。 Cell should be charged fully at a current of 0.5C and discharged at a constant current of 3C until the voltage reaches 2.0V at RT.	放电容量≥98%标称容量 Discharge Capacity ≥98% Nominal Capacity

3.7 低温性能 Low Temperature Performance	电芯以0.5C充满电后，将电芯放入一定温度的低温箱中恒温4h，然后以1C电流放电至终止电压。 Cell should be charged fully at a current of 0.5C and stored in a temperature-controlled environment for 4h. Then discharged cell at a constant current of 1C to ending voltage.	放电容量≥50%标称容量 Discharge Capacity ≥ 50% Nominal Capacity （-20°C）
3.8 储存特性 Storage Characteristics	测试电芯在25°C±5°C的初始容量并记录，电芯以0.5C充满电后，在25°C±5°C，湿度15~90%RH的环境下储存3个月、6个月、12个月、24个月后，以1C电流放电至终止电压，循环5次并记录电芯的放电容量。将5周循环的最大放电容量与初始容量的比值作为储存容量恢复率。 Test the cell initial capacity at 25°C±5°C and record, then charge the cells fully at a current of 0.5C, then storage for 3, 6,12,24 months respectively at 25°C±5°C and 15~90%RH, then discharged cell at a constant current of 1C to ending voltage. The maximum discharge capacity of 5 cycles is taken as discharge capacity. Discharge Capacity / Initial Capacity = recovery rate of storage capacity.	储存3个月≥95% 储存6个月≥93% 储存12个月≥91.5% 储存24个月≥88% After 3 months storage≥95% After 6 months storage ≥93% After 12 months storage≥91.5% After 24 months storage≥88%
3.9 常温存储 Room Temperature Storage Test	电芯以0.5C充满电后，在25°C±2°C下搁置28天，再以1C电流放电至终止电压。 Cell should be charged fully at a current of 0.5C, then stored at 25°C±2°C for 28 days. Finally discharged cell at a constant current of 1C to ending voltage.	容量保持率≥94% Capacity retention≥94% 容量恢复率≥95% Capacity recovery≥95%
3.10 高温存储 High Temperature Storage Test	电芯以0.5C充满电后，在55°C±2°C下搁置7天后，室温搁置5h，再以1C电流放电至终止电压。 Cell should be charged fully at a current of 0.5C, then stored at 55°C±2°C for 7 days. After standing for 5h，discharged cell at a constant current of 1C to ending voltage.	容量保持率≥93% Capacity retention≥93% 容量恢复率≥94% Capacity recovery≥94%

4.环境特性 Environmental Characteristics

测试项目 Test Item	测试方法 Test Method	检验标准 Criteria
4.1 温度性能 Temperature Performance	电芯以0.5C充满电后，再以1C电流放电至终止电压。电芯必须先在不同的试验温度中放置4个小时后放电，百分比按放电容量比最小容量计算。 Cell should be charged fully at a current of 0.5C and discharged cell at a constant current of 1C to ending voltage. Cells should be stored for 4 hours at the test temperature prior to discharging, The percentage should be calculated using discharge capacity compared to the minimum capacity.	不泄漏、无外观不良 No leakage,No Appearance defect -20°C/25°C≥50% 0°C/25°C≥80% 25°C/25°C≥100% 60°C/25°C≥98%

4.2 恒温恒湿性 Constant Temperature and Humidity Performance	电芯以1C充满电后，将电芯放入45°C±2°C（90~95%RH）的恒温恒湿箱中搁置48h后取出，在室温下搁置2h，观察1h。 Cell should be charged fully at a current of 1C, and stored in 45°C±2°C (90~95% RH) for 48h. Then be placed in RT for 2h and checked for 1h.	电芯无变形、无锈蚀、不冒烟、不爆炸 No distortion, no rust, no fume and no explosion.
4.3 温度冲击性能 Thermal Shock Performance	电芯以1C充满电后，放入温度箱中，60min内降至-40°C，保持90min后，在60min内升至25°C，再在90min内升至85°C，保持110min，然后在70min内降至25°C。重复上述步骤5次，观察1h。 Cell should be charged fully at a current of 1C, and put into an oven. Temperature inside the oven will drop to -40°C in 60min and remain for 90min. Then it will rise to 25°C in 60min and keep rising to 85°C in 90min, following by remaining for 110min. And it will drop to 25°C in 70min. Repeat this process for 5 times, then check it for 1h.	电芯不爆炸、不起火、不漏液 No explosion, no fire, no leakage.
4.4 低气压测试 Low-pressure Test	电芯以1C充满电后，放入低气压箱中，调节气压为11.6kPa，温度为室温，静置6h后，观察1h。 Cell should be charged fully at a current of 1C, then stored it for 6h at an absolute pressure of 11.6kPa (RT). Check it for 1h.	电芯不爆炸、不起火、不漏液 No explosion, no fire, no leakage.
4.5 跌落测试 Drop Test	电芯以1C充满电后，正负端子向下从1.5m高度自由跌落到水泥地面上，观察1h。 Cell should be charged fully at a current of 1C, then dropped from a height of 1.5m onto the concrete ground. Positive and negative terminals of cells shall be towards the ground. Check it for 1h.	电芯不爆炸、不起火 No explosion, no fire.
4.6 振动测试 Vibration Test	电芯以1C充满电后，将电芯紧固到振动试验台上，沿X，Y，Z三个方向各振动90±5min，振幅0.76mm，振动频率为10Hz～55Hz；振动速率为1Hz/min；测试结束后搁置1h，目检电芯外观和测试前后的重量变化。 Cell should be charged fully at a current of 1C, then cell is to be subjected to simple harmonic motion with amplitude of 0.76mm total maximum excursion. The frequency is to be varied at the rate of 1Hz per minute between 10 and 55 Hz. The cell should be vibrated for 90±5 minutes per axis of XYZ axes. The samples should be observed for 1 hours after the test, and also check the weight loss of cells before and after the test.	电芯不爆炸、不起火 No explosion, no fire.

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5.安全特性 Safety Characteristics

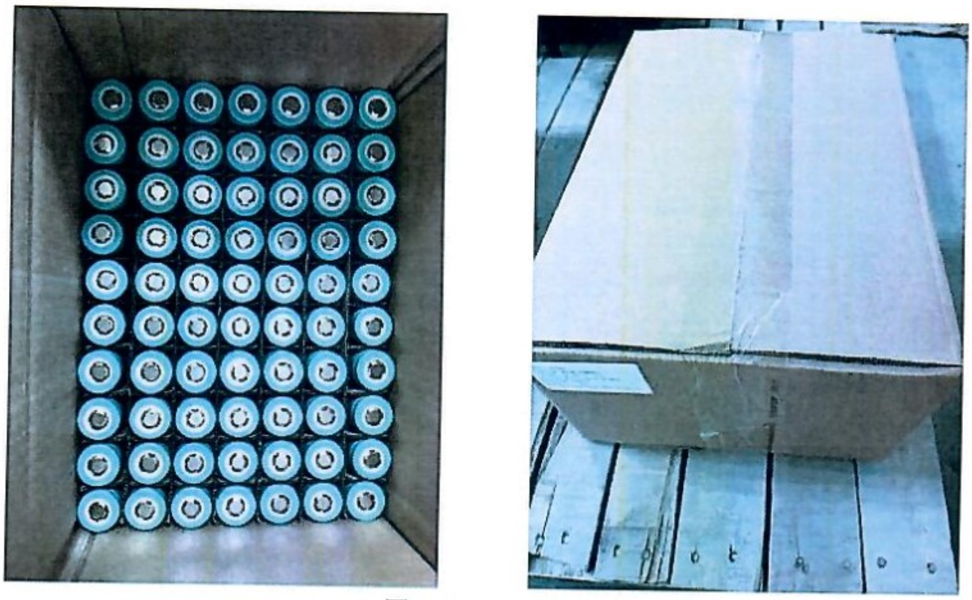
测试项目 Test Item	测试方法 Test Method	检验标准 Criteria
5.1 外短路 External Short Circuit Test	电芯以1C充满电后，将正、负极经外部短路10min，外部线路电阻应小于5mΩ；静置1h。 Cell should be charged fully at a current of 1C, then short-circuited by connecting the positive and negative terminals with a resistance of <5mΩ for 10min. Check it for 1h.	电芯不爆炸、不起火 No explosion, no fire.
5.2 过充电 Over-charge Test	电芯以1充满电后，以1C电流充电至5.5V或充电达1h后停止充电，观察1h。 Cell should be charged fully at a current of 1C, then charged at a constant current of 1C to ending voltage of 5.5V or charged at a constant current of 1C for 1h. Check it for 1h.	电芯不爆炸、不起火 No explosion, no fire.
5.3 过放电 Over-discharge Test	电芯以1C充满电后，以1C电流放电90min，观察1h。 Cell should be charged fully at a current of 1C, then discharged at a constant current of 1C for 90min. Check it for 1h.	电芯不爆炸、不起火、不漏液 No explosion, no fire, no leakage.
5.4 挤压测试 Crush Test	电芯以1C充满电后，以半径为75mm半圆柱体垂直电芯极板方向，以(5±1) mm/s速度挤压，当电压为0V或变形量达到30%或挤压力达到200kN后停止挤压，观察1h。 Cell should be charged fully at a current of 1C, then crush the cell perpendicularly to the cell plate at a rate of (5±1) mm/s with a semi-cylinder (radius of 75mm). When met any of the following criteria, stopping crushing and check it for 1h:Voltage reaches 0V;Deformation reaches 30%;Pressure reaches 200kN.	电芯不爆炸、不起火 No explosion, no fire.
5.5 热冲击测（130 °C）Heating Test	电芯以1C充满电后，放置入温度箱，以5°C/min的速率由室温升至130°C±2°C，并保持30min后停止加热，观察1h。 Cell should be charged fully at a current of 1C, then heated in an oven. Temperature will rise to 130°C±2°C at a rate of 5°C/min and remain for 30min. Check it for 1h.	电芯不起火，不爆炸。 No explosion, no fire.
5.6 针刺测试 Acupuncture Test	电芯以1C充满电后，用ϕ5mm~ϕ8mm的耐高温钢针，以(25±5)mm/s的速度，从垂直于蓄电池极板的方向贯穿，贯穿位置宜靠近所刺面的几何中心，钢针停留在蓄电池中，观察1h。 Cell should be charged fully at a current of 1C, then acupuncture the cell perpendicularly to the cell plate at a rate of (25±5)mm/s with a ϕ5mm~ϕ8mm steel needle and remain it inside. The acupuncturing location shall be near the geometric center of plane. Check it for 1h.	电芯不爆炸、不起火 No explosion, no fire.

6.包装、出货与储存 Packaging Transportation and Storage

6.1 包装 Packaging

每箱装入140pcs电芯，箱体外部张贴成品电芯标识卡，如图B所示。

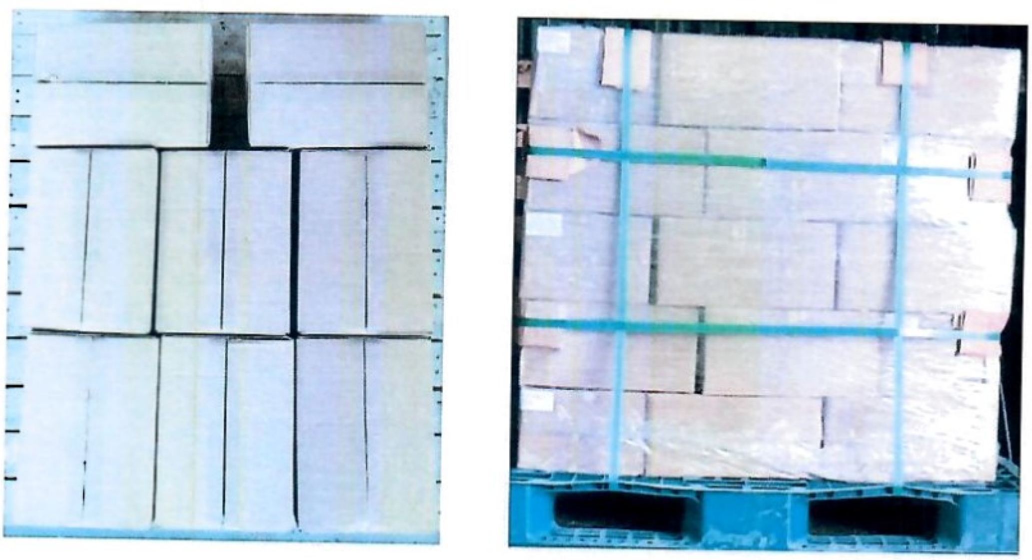
Each box is loaded with 140pcs batteries, and the finished battery identity card is posted on the outside of the box, as show in Figure A.



图B（Figure B）

卡板每层8个箱子，码垛高度不超过6层。如图C所示。

The cardboard has 8 boxes per layer, stacking≤6 layers, as show in Figure C.



图C（Figure C）

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6.2 出货 Shipment

单体电芯按5%～30%SOC或客户要求出货，电芯出货后充电前的剩余容量取决于储存时间和条件。
The cell should be shipped in 5%～30% SOC or in accordance with customers' requirement. The remaining capacity of the cell after shipment and before charging depends on the storage time and conditions.

6.3 储存 Storage

电芯需在-20°C-45°C、湿度不大于95%的干燥、清洁、通风的环境下存储。
Cell should be kept at -20°C-45°C, not more than 95% humidity in warehouse where it's dry, clean and well-ventilated.
如果要长时间贮存，电池应在温度范围0°C～35°C、相对湿度在0%~75%和无腐蚀性气体环境中储存。超过三个月时，应对电池进行一次完全充放电循环，再将电池充电约3.0-3.2V的条件下储存。
If the battery is stored for a long time, the battery should be conducted a cycle of charge and discharge, and the voltage should be about 3.0-3.2V and the battery is to be stored at temperature range of 0°C~35°C and RH0%~75%，low moisture and corrosive gases environment.

7.安全守则 Precautions and Safety Instructions

为避免电芯泄露，过热和爆炸，请注意以下事项：
In order to prevent the battery leakage, getting hot and explosion, please pay attention to preventing measures as following:

Warning!

- 请勿将电池投入水中。非使用时，电池需在干燥阴凉处存放。
  Never throw the battery into water. Store it under dry, shady circumstance when not use.
- 请勿颠倒正负极使用。
  Never misidentify the positive and negative terminals.
- 请勿直接用金属接通正负极，避免短路。
  Never connect the positive and negative terminals of battery with metal to prevent short-circuiting.
- 请勿将电池与金属一起储存或运输。
  Never ship or store the battery together with metal.
- 请勿敲击、投掷或踩踏电池。
  Never knock, throw or trample the battery.
- 请勿用钉子或其它利器破坏电池。
  Never cut through the battery with nail or other edge tool.

Tips!

- 请勿在过高的温度下使用或储存电池，否则会引起电池过热，致使寿命减短和性能降低，甚至起火。长时间储存的温度范围建议是10~45°C。
  Never use or store the battery under the over-high temperature. Otherwise it will lead to battery over-heating, which might lose some function and reduce life, even getting fire. The proposed temperature for long-term storage is 10~45°C.
- 请勿将电池投入火中或其它热源中，避免起火、爆炸和环境污染。废电池需回收至供应商处，移交回收

站处理。

Never throw the battery into fire or heating machine to avoid fire, explosion and environment pollution; scrap battery should be returned to the supplier and handled by the recycle station.

- 请勿将电池置于强静电场或强磁场中，否则会破坏保护设备。
  Never use the battery under strong static electronic and magnetic field, otherwise it will destroy the protecting device.
- 若电解液泄露并进入眼睛，请勿揉搓，经水洗后尽快就医。
  Never knead eyes if leakage electrolyte gets into eyes. Wash eyes by water and seek medical advice ASAP.
- 若电池在使用、储存、充电过程中发出异味，过热，形变或其他非常规情况，请停止使用并移除设备。
  If battery emit peculiar smell, over-heating, distortion or appear any unconventionality during using, storage or charging process, please stop using and take it out of the device.
- 请勿在充电中直接插拔电池，并使用规定充电设备进行充电。
  Never cut the battery in socket directly, please use the stated charger when charging.
- 使用前请检查电池电压和相关连接器；若有异常请勿使用。
  Check the voltage of battery and relevant connectors before using. Do not use until everything turns out to be normal.
- 在充电前请检查相关设备绝缘性、物理状态和老化情况。电池电压需高于截止电压，如有异常，需标记并勿更改现状，然后通知我们售后服务部门，待我们工作人员到场维修。
  Prior to charging, fully check the insulativity, physical condition and ageing status. The pack voltage must not be less than the cut-off voltage, if not, it needs to be labeled. The user should contact our Customer Service Department. It can't be charged until repaired by our staff.
- 电池需在30%～50%SOC下储存，若半年未使用，需重新充电。
  The battery should be stored in 30%～50%SOC. It needs to be charged once again if out of use for as long as half a year.
- 若电极端子污染，需用干净、干燥的棉布擦拭，否则会导致接触和操作不良。
  Clean the dirty electrode with a clean dry cloth if any contamination appears, otherwise poor contact or operation failure may occur.

8.技术咨询 Consultation

如有疑问，请按以下方式咨询：

As to obscurity, contact us as followings:

保力新能源科技股份有限公司

Blivex New Energy Technology CO., LTD.

地址：广东省深圳市南山区兴海大道3040号前海世茂大厦4602室；

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