盐城科尚锂电实业有限公司

Yancheng Keshang Lithium Battery Industry Co., Ltd

圆柱型锂离子电芯规格书

PRODUCT SPECIFICATION For Lithium-ion Rechargeable Cell

电芯型号：32700-6.0Ah 磷酸铁锂电芯(能量型)

Cell Type:32700-6.0Ah LiFePO$_4$Cell(energy type)

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1. 基本信息 General Information

1.1 适用范围 Scope

本规格书规定了盐城科尚锂电实业有限公司生产的圆柱型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，请与盐城科尚锂电实业有限公司联系相关事宜。

This specification describes the technical requirements of Cylindrical Lithium-ion Cell supplied by Yancheng Keshang Lithium Battery Industry Co., Ltd .If any other technical information is needed,please contact Yancheng Keshang Lithium Battery Industry Co., Ltd。

1.2 产品分类 Product Classification

圆柱型可充电锂离子电芯

Cylindrical Rechargeable Lithium-ion Cell

1.3 型号名称 Model Name

$LiFePO_4$-32700-6.0Ah

1.4 电芯特点 Benefits

- ●圆柱型钢壳 Cylindrical steel shell
- ● 高容量 High capacity
- ●出色的循环寿命 Excellent cycle life
- ●优秀的低温性能 Excellent low temperature performance
- ●平台电压持续时间长 Platform voltage long duration
- ● 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

1.5 主要应用 Main Application

- ● 电动交通工具 EV/PHEV
- ● 通信后备电源 UPS
- ● 大型储能柜 Large energy storage cabinet
- ● 工程商用车 Engineering commercial vehicle
- ● 乘用车 Passenger car

1.6 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.

1.7符号说明

●I_1:1h 率放电电流 (A), 其数值等于额定容量值。

Ii: Ih rate discharge current (A)is equal to the rated capacity value.

●I_3,3h 率放电电流 (A), 其数值等于额定容量值的1/3。

I_3.3h rate discharge current(A)with a value equal to 1/3 of the rated capacity value.

2. 标准规格 Nominal Specification

项目Item	条件Condition/Note	规格Specification	备注
2.1 标称容量 Nominal Capacity	1I_1 放电容量 1I_1 discharge capacity	6.0 Ah	标准充放电
2.2 交流内阻 AC Impedance	10%SOC在1000 Hz下测量10%SOC test at 1000 Hz	≤8.5mΩ	
2.3 标称电压 Nominal Voltage		3.2 V	
2.4 电芯尺寸 Cell Size	电芯直径 Cell Diameter	32.2±0.2 mm Max.32.4 mm	图形结构详细信息请参阅附图1。 For details, please prefer to Figure 1.
	电芯高度 Cell Height	70.5±0.3 mm Max.70.8mm	
2.5 电芯重量 Cell Weight	(光身电芯)	140±5g	
2.6 充电截止电压 End-of-charge Voltage	恒流充电 CC Mode	3.65 V	
2.7 充电截止电流 End-of-charge Current	恒压充电 CV Mode	0.30A	
2.8 充电方式 Charging Method	标准充电 Standard Charging	1lt at CC/CV	
	快速充电 Fast Charging	2I_1 at CC/CV	
2.9 放电截止电压 End-of-discharge Voltage	恒流放电 DC Mode	2.75V(45℃~60℃) 2.5V(20℃~45℃) 2.0V(-20℃~20℃)	
2.10 最大持续放电电流 Max continuous Discharging Current		18A	
2.11 最大瞬时放电电流 Max Pulse Discharging Current		30 A	5s

2.12循环性能 Cycle Life		$1I_1$/100%DOD	常温循环（20 ℃~30℃):≥2000 cycles	
2.13操作温度范围 Operating Temperature Range	充电温度 Charging Temperature		0~60 ℃	
	放电温度 Discharging Temperature		-20~60℃	
	储存温度 Storage Temperature	1年 1 yeai	-10~40℃	
2.14外观 Appearance		无破裂、划痕、变形、污渍、电解液泄漏等 Without break,scratch,distortion,contamination,leakage and so on		

3. 测试条件 Test Conditions

3.1 标准测试条件 Standard Test Conditions

若无特别要求，此规格书上的室温为25° ℃±2℃,产品测试条件为：温度25℃±5℃,湿度15~75% RH,大气压力86 kPa~106 kPa。

If no otherwise requirement,room temperature (RT)is 25 C±2 C,and all tests stated in this Specification are conducted at 25 °C±5 °C,15~90 %RH and atmospheric pressure of 86 kPa~106 kPa.

3.2 标准充电 Standard Charging Method

“标准充电”即在标准测试条件下，电芯先以恒定电流11 充电至3.65V， 再以3.65V 的恒定电压充电至电流0.05 I,搁置1h。

“Standard Charging”means that in standard test conditions,charge the cell at a constant current of llt until the voltage reaches 3.65 V,then charge it at a constant voltage of 3.65 V until the current decreases 0.05 Ir and placed for 1 h.

3.3 标准放电 Standard Discharging Method

“标准放电”即在标准测试条件下，电芯以恒定电流1I 放电至2.0V。

“Standard Discharging”means that in standard test conditions,discharge the cell at a constant current of lli until the voltage reaches 2.0V.

4. 电性能 Electrochemical Performance

测试项目Test Item	测试方法Test Method	检验标准Criteria
4.1初始容量(Cm) Initial Capacity	电芯按3.2规定充电后，按3.3规定完全放电。 Cell shall be charged per 3.2 and discharged per 3.3 within 1h after full charge	初始容量≥6.0 Ah Cimi≥6.0 Ah

4.2循环 cycle	在标准测试条件下，电芯先以恒定电流1I充电至3.65 V,再以3．65V的恒定电压充电至电流小于0．05C,搁置30min,电芯以恒定电流1I放电至2.5 V,搁置30min 再进行下一次循环，连续2000次： Under standard test conditions,the cell is first charged to 3.65 V with a constant current of 1li,and then charged tc less than 0.05 Ii with a constant voltage of 3.65 V,and se aside for 30min.The cell is discharged to 2.5 V with a constant current of 1ll,set aside for 30min,and then carry out the next cycle for 2000 consecutive times	容量保持率≥80 % Capacity retention≥80 %
4.3工况循环 work condition cycle	1.电芯按3.2规定充电后，搁置30min,以1l放电23s后以1/3l放电8s后以1/3I,充电23s后以0.1I放电26s直到SOC20%,搁置30min 1/3I,discharge for 23 seconds,then 1/3I discharge for & seconds,then 1/3Ii charge for 23 seconds,then 0.1Iidischarge for 26 seconds,until soc 20%,set aside for 30min. 2.重复以上步骤直到测试放电容量值≤90%初始容量。 Repeat the above steps until the discharge capacity value ≤90%the initial capacity	总放电能量与电池初始能量比值>500 Total discharge energy / initial energy ≥500
4.4低温性能 Low Temperature Performance	电芯按3.2规定充电后，将电芯放入一定温度的低温箱中恒温4 h,然后按3.3规定放电。 Cell shall be charged per 3.2 and stored in a temperature-controlled environment for 4h.Then discharge according to 3.3.	放电容量 Discharge Capacity Discharge Capacity ≥70%Cmi(-20℃) ≥80%Cmi(-10℃) ≥90%Cini(0℃)
4.5常温存储 Room Temperature Storage Test	电芯按3.2规定充电后，在25℃±2 ℃下搁置28天再以0.5I,恒流放电至终止电压。 Cell shall be charged per 3.2,then stored at 25 ℃±2 ℃ foi 28 days.Finally discharged cell at 0.5 It to ending voltage	容量保持率≥90% Capacity retention≥90% 容量恢复率≥95% Capacity recovery ≥95%
4.6高温存储 High Temperature Storage Tes	电芯按3.2规定充电后，在55℃±2 ℃下搁置7天后室温搁置5h,再以3．3规定放电 Cell shall be charged per 3.2,then stored at 55 C±2 ℃ for 7 days.After standing for 5h,discharged cell per 3.3	容量保持率>90% Capacity retention≥90% 容量恢复率≥95% Capacity recovery ≥95%

5. 环境特性 Environment Characteristic

测试项目Test Item	测试方法Test Method	检验标准Criteria
5.1恒温恒湿性能 Constant Temperature and Humidity Test	电芯按3.2规定充电后，将电芯放入45℃±2℃(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 shall be charged per 3.2,and stored in 45℃±2℃(90~95%RH)for 48 h.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
5.2 温度循环性能 Thermal Shock Test	电芯按3.2规定充电后，放入温度箱中，60 min内降至-40 °℃,保持90 min后，在60 min内升至25℃,再在90 min内升至85℃,保持110 min,然后在70min内降至25℃。重复上述步骤5次，观察1h: Cell shall be charged per 3.2,and put into an oven Temperature inside the oven will drop to -40 ℃ in 60 min and remain for 90 min.Then it will rise to 25 ℃ in 60 min and keep rising to 85 ℃ in 90 min,following by remaining for 110 min.And it will drop to 25 ℃ in 70 min Repeat this process for 5 times,then check it for 1h	电芯不爆炸、不起火No explosion,no fire
5.3低气压测试 Low-pressure Test	电芯按3.2规定充电后，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 shall be charged per 3.2,then stored it for 6h at an absolute pressure of 11.6 kPa(RT).Check it for 1h	电芯不爆炸、不起火、不漏液 No explosion,no fire,no leakage
5.4跌落测试 Drop Test	1、电芯按3.2规定充电后，正极朝下垂直从1.5m高度自由跌落到水泥地面上，观察1h: Cell shall be charged per 3.2,the positive pole termina vertically dropped from 1.5 m to the cement ground ,check it for 1h. 2、电芯按3.2规定充电后，水平放置从1.5m高度自庄跌落到水泥地面上，观察1h. Cell shall be charged per 3.2,horizontally dropped from 1.5 m to the concrete ground,check it for 1h	电芯不爆炸、不起火 No explosion,no fire
5.5浸泡测试 Soaking Test	电芯按3.2规定充电后，完全浸入3.5 wt%NaCl溶液中2 h,观察1h . Cell shall be charged per 3.2,then completely soaking into NaCl solution(3.5 wt %)for 2h.Check it for 1h	电芯不爆炸、不起火 No explosion,no fire

6. 安全特性 Safety Characteristic

测试项目Test Item	测试方法Test Method	检验标准Criteria
6.1短路 External Short-Circuiting Test	电芯按3.2规定充电后，将正、负极经外部短路10 min外部线路电阻应小于5mΩ;静置1h。 Cell shall be charged per 3.2,then short-circuited by connecting the positive and negative terminals with a resistance of<5 mΩ for 10 min.Check it for 1h	电芯不爆炸、不起火 No explosion,no fire
6.2过充电 Over-charge Tes	电芯按3.2规定充电后，以1C电流充电至5.5V或充电达1h后停止充电，观察1h Cell shall be charged per 3.2,then charged at 1C to ending voltage of 5.5 V or charged at 1C for 1h.Check it for Ih	电芯不爆炸、不起火 No explosion,no fire
6.3过放电 Over-discharge Test	电芯按3.2规定充电后，以1I_1电流放电90min,观察1h。 cell shall be charged per 3.2,then discharged at 1C for 90 min.Check it for 1h.	电芯不爆炸、不起火 No explosion,no fire,no leakage

6.4挤压测试 Crush Test	电芯按3.2规定充电后，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100kN后停止挤压保持10min,观察1h。 Cell shall be charged per 3.2,then crush the cell perpendicularly to the cell plate at a rate of (5±1)mm/s with a semi-cylinder(radius of 75 mm).When met any of the following criteria,stopping crushing and check it for 1h. 1.Voltage reaches 0V; 2.Deformation reaches 30% 3.Pressure reaches 100 kN.	电芯不爆炸、不起火 No explosion,no fire
6.5针刺测试 Acupuncture Test	电芯按3.2规定充电后，用05mm~08mm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 shall be charged per 3.2,then acupuncture the cel perpendicularly to the cell plate at a rate of (25±5)mm/s with a Φ5 mm~08 mm 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.
6.6热冲击测试(130 ℃) Heating Tes	电芯按3.2规定充电后，放置入温度箱，以5℃/min的速率由室温升至130℃±2℃,并保持30min后停止加热，观察1h。 Cell shall be charged per 3.2,then heated in an oven Temperature will rise to 130 C±2 ℃ at a rate of 5 C/mir and remain for 30 min.Check it for 1h	电芯不起火，不爆炸。 No explosion,no fire

7. 存储与运输 Storage and Transportation

7.1 由于电芯的特性，需要对电芯进行合适的包装来保护。

Based on the character of cell,proper environment for transportation of pack need to be created to protect the battery.

7.2 运输过程中需保证电芯带电量为30%~50% SOC, 以确保不受短路和液体的损伤。

During transportation,30%~50%SOC must be kept to ensure that short circuit,appearance of liquid in the battery or immersion of battery in liquid never occur.

7.3 电芯需在-10℃-40 ℃的干燥、清洁、通风的环境下存储。

Cell should be kept at-10°C-40°C in warehouse where it's dry,clean and well-ventilated.

7.4装卸电池时需注意避免跌落、翻转和堆积。

During loading of battery,attention must be paid against dropping,turning over and serious stacking.

8. 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℃。

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℃

●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，请勿揉捏，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。电池电压需高于放电截止电压，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 discharge 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.

9. 技术咨询 Consultation

如有疑问，请按以下方式咨询：

As to obscurity,contact us as followings:

盐城科尚锂电实业有限公司

Yancheng Keshang Lithium Battery Industry Co., Ltd

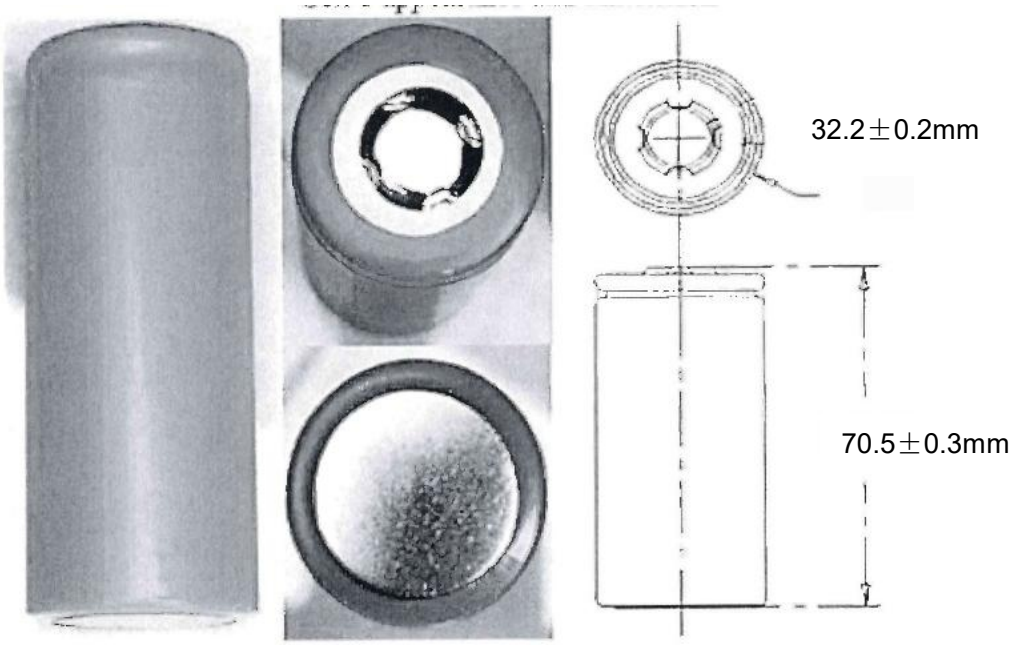
地址：江苏省盐城市大丰区西康南路61号

Address：61 Xikang South Road, Dafeng District, Yancheng City, Jiangsu Province

附件 Annex

电池图片和外形尺寸

Cell's appearance and dimension



6.0Ah 磷酸铁锂电池1C 循环曲线图

Circular curve of 6.0 Ah-$LiFePO_4$cell