

江苏宁辉锂电池有限公司

锂离子电池规格书

Specification for Lithium-ion Rechargeable Cell

圆柱型磷酸铁锂电池

NH-32138-S 12500mAh/3.2V

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本产品属我公司开发的具有自主知识产权的高性能锂离子电池。为了使您的设备发挥出更好的性能，具有更长的使用寿命，请仔细阅读本使用说明，它提供了很重要的安装和操作指导。

This product is a high performance lithium ion battery developed by our company with independent intellectual property rights. In order to give your device better performance and longer service life, please read this instruction carefully, which provides important installation and operation instructions.

本说明适用于宁辉 NH-32138-S 圆柱型钢壳磷酸铁锂电池，该电池可应用于储能电源、纯电动汽车等领域。

This specification is applicable to NingHui NH-32138-S cylindrical steel shell lithium iron phosphate battery, which can be used in energy storage power supply, electric vehicles and other fields.

1、适用范围 Application

本标准描述了圆柱型锂离子电芯的外型尺寸、特性、技术要求及注意事项，本标准适用于江苏宁辉锂电池有限公司生产的圆柱型 NH-32138-S 锂离子电芯。

This standard describes the external dimensions, characteristics, technical requirements and matters needing attention of cylindrical lithium ion cells. This standard is applicable to cylindrical NH-32138-S lithium ion cells produced by JiangSu Ning Hui lithium battery CO., LTD.

2、电芯结构说明 Description of cell structure

2.1 电芯结构 Structure

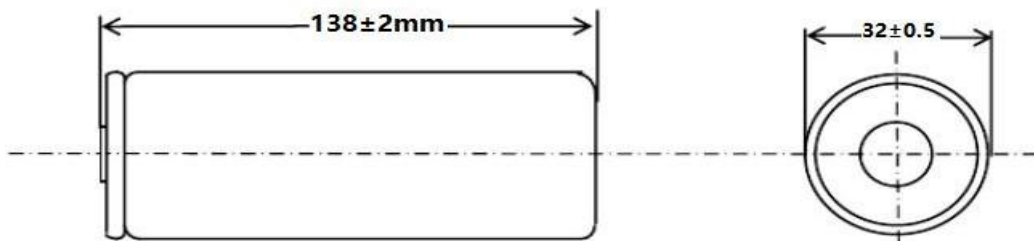
32138S 磷酸铁锂电池外壳使用 0.5mm 厚钢板一次冲压而成，具有很高的机械强度。正负极柱材料使用铁镍复合材料，正极盖板端面贴有绝缘面垫，外壳包覆有阻燃 PVC 套管，起到绝缘保护的作用。32#系列磷酸铁锂电池正极端设置有防爆阀，当电池发生意外时及时开启，起到泄压并防止爆炸的作用。

32138S lithium iron phosphate battery shell is made of 0.5mm thick steel plate in one punch, with high mechanical strength. The positive and negative pole column is made of iron-nickel composite material, the end face of the positive pole cover plate is covered with insulating surface pad, and the shell is covered with flame retardant PVC sleeve, playing the role of insulation protection. The lithium iron phosphate battery of 32# series is equipped with explosion-proof valve, which can be opened in time when the battery is in accident, to relieve pressure and prevent explosion.

2.2 电芯外观: Appearance



2.3 电芯尺寸示意图: Dimension



2.4 连接与组装 Connection and assembly

2.4.1 连接前确保电极干净，无油污、灰尘，否则可能导致接触不良，影响电池性能；

2.4.1 Make sure the electrode is clean and free from oil and dust before connection, otherwise it may cause poor contact and affect battery performance;

2.4.2 选择与电池型号相匹配的连接片进行电池测试、使用时的连接；

2.4.2 select the connector matching the battery model for battery test and connection during use;

2.4.3 确保电池电极与连接片连接紧固，否则可能会影响电池使用性能；

2.4.3 Ensure that the battery electrode is tightly connected with the connector piece; otherwise, the performance of the battery may be affected;

2.4.4 禁止用金属直接连接电池正负极短路；

2.4.4 Do not use metal to directly connect the positive and negative electrodes of the battery to short-circuit;

2.4.5 严禁颠倒正负极连接使用电池；

2.4.5 it is strictly prohibited to invert the positive and negative poles to connect the battery;

* 公司提供不同规格、材质的连接片、支架

* We provides connectors and holder of different specifications and materials

3、电化学性能定义 Definition of electrochemical performance

3.1 标称容量：Nominal capacity

标称容量 $\text{Cap}=12500\text{mAh}$ ，指在 $25 \pm 2.5^\circ\text{C}$ 环境，以 2 小时内放电至终止电压 2.0 V 时的容量。

The nominal capacity $\text{Cap} = 12500 \text{ mAh}$ refers to the capacity when discharged at a rate of 2 hours at a temperature of $25 \pm 2.5^\circ\text{C}$ to a final voltage of 2.0 V.

3.2 标准充电方式: Standard charging method

指在 $25 \pm 2.5^\circ\text{C}$ 环境下, 以 1C 电流大小恒流充电至单体电芯电压 3.65 V 后, 转为恒压 3.65V 充电, 至充电电流小于 0.01C 时, 停止充电。

It refers to charging at a constant current of 1C current to a voltage of 3.65 V at $25 \pm 2.5^\circ\text{C}$, and then charging to a constant voltage of 3.65V. When the charging current is less than 0.01C, the charging is stopped.

3.3 标准放电方式: Standard discharge method

指在 $25 \pm 2.5^\circ\text{C}$ 环境下, 以 1C 的电流恒流放电至单体电芯电压 2.0V。

Refers to a constant current discharge of 1C at $25 \pm 2.5^\circ\text{C}$ to a single cell voltage of 2.0V.

4、技术要求 (除非有特殊说明, 否则所有测试要求为: 温度在 $25 \pm 2.5^\circ\text{C}$ 条件下, 样品为新电池, 充放电制度为标准充电和标准放电)

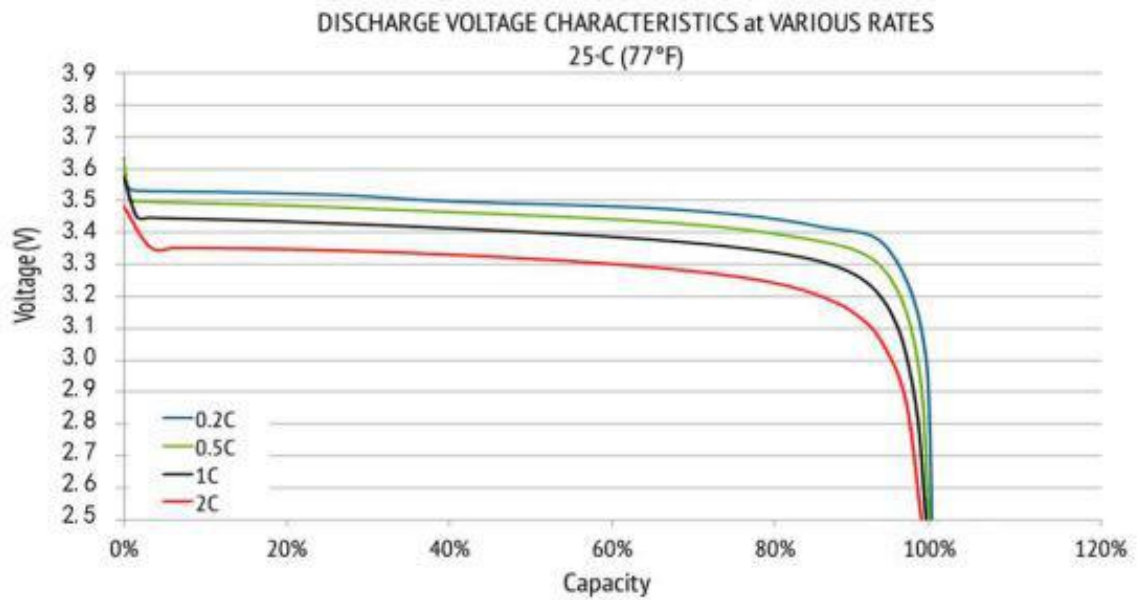
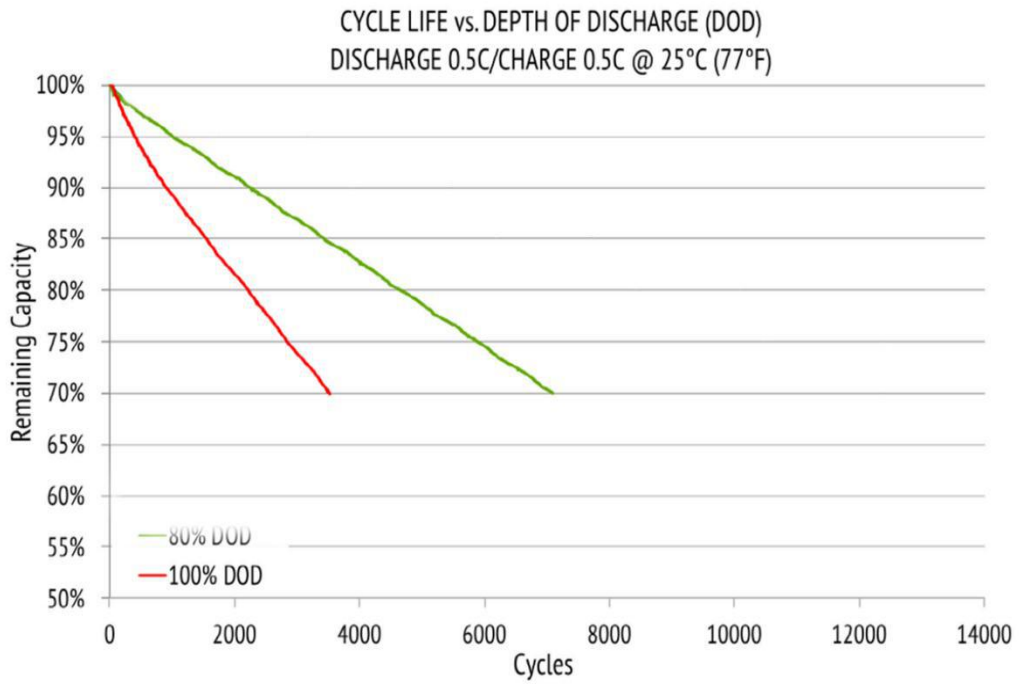
Technical requirements (unless otherwise specified, all test requirements are: at $25 \pm 2.5^\circ\text{C}$, the sample is a new battery, the charge and discharge system is standard and standard discharge)

4.1 电化学性能 Electrochemical performance

项目Item	规格Specification
标称容量 Nominal capacity	12.5Ah @ 0.5C
标称电压 Nominal voltage	3.2V
充电截止电压 Charging cut-off voltage	3.65 ± 0.05 V
放电截止电压 Discharge cut-off voltage	2.0 ± 0.05 V
充电电流 Charging current	标准充电: 1C Standard charge: 1C 最大充电 2C 当 $T \geq 10^\circ\text{C}$

	<p>Maximum charging 2C ; T \geq 10°C 最大充电 1C 当 10°C \geq T \geq 0°C Maximum charging 1C ; 10°C \geq T \geq 0°C 最大充电 0.1C 当 0°C \geq T \geq -10°C Maximum charging 0.1C ; 0°C \geq T \geq -10°C</p>	
<p>放电电流 Discharge current</p>	<p>标准放电 : 1C Standard discharge current: 1C 最大持续放电: 2C Max discharge current: 2C</p>	
<p>充放电过程中电芯表面 建议温度 Recommended cell surface temperature during charge and discharge</p>	<p>充电时: 0~45°C Charging 放电时: -20~60°C Discharging</p>	
<p>充放电过程中电芯表面的短 时间最大温度 (在这些情况下 充放电将会导致电池循环寿 命很快衰减) The maximum temperature of the cell surface in a short period of time during charging and discharging (in these cases, charging and discharging will cause the battery cycle life to decline rapidly)</p>	<p>充电时: 60°C Charging 放电时: 75°C Discharging</p>	
<p>倍率放电性能 Discharge rate performance</p>	<p><u>0.2C 放电容量</u> 0.2C Discharge capacity 0.5C 放电容量 0.5C Discharge capacity</p>	<p>\geq100%</p>
	<p><u>1C 放电容量</u> 1C Discharge capacity 2C 放电容量 2C Discharge capacity</p>	<p>\geq98%</p>

常温 (25℃) 循环寿命 Cycle life(25℃)	第 3000 次循环的放电容量 <u>The discharge capacity of the 3000th cycle</u> 初始放电容量 Initial discharge capacity	≥80%
高低温放电性能 (0.5C 充电/0.5C 放电) High and low temperature discharge performance (0.5c charge / 0.5c discharge)	-10℃放电容量 <u>-10℃ discharge capacity</u> 25℃放电容量 25℃ discharge capacity	≥60%
	0℃放电容量 <u>0℃ discharge capacity</u> 25℃放电容量 25℃ discharge capacity	≥85%
	60℃放电容量 <u>60℃ discharge capacity</u> 25℃放电容量 25℃ discharge capacity	≥97%
存储性能 (60%荷电状态) Storage performance (60% soc)	存储 28 天后残余容量 <u>Remaining capacity after 28 days of storage</u> 初始放电容量 Initial discharge capacity	≥97%
	存储 28 天后恢复容量 <u>Restore capacity after 28 days of storage</u> 初始放电容量 Initial discharge capacity	≥99%
湿度范围 Humidity range	0~90%RH(不冷凝)	
内阻 Internal resistance	≤4mΩ (交流内阻, 1000HZ)	
电芯尺寸 Size	最大高度 H: 140 mm 最大直径 Φ: 32.5mm	
重量 Weight	280±5 g	



4.2. Testings

4.2.1 Appearance

The surface should be clean, no mechanical damage, adherent point should be no rust, and there should be necessary marks on the cells.

4.2.2 Characterisitcs

Item	Test program	Standard
Open-circuit voltage	After standard charging ,then measure the open-circuit voltage in one hour.	$\geq 3.3V$
Nominal capacity	Discharging by constant current of 0.5C in one hour until the voltage falls down to 2.0V	Capacity $\geq 12.5Ah$
Cycle life	At the temperature of $25\pm 5^{\circ}C$, charged by constant current of 0.5C until the voltage comes up to 3.65V, then charged by constant voltage of 3.65v until the current falls down to $\leq 200mA$, then kept aside for 0.5-1hour, then discharged of 0.5C until the voltage falls down to 2.0V, then kept aside for another 0.5-1hour, then stepped into the next cycle. If the capacity falls down $\leq 7000mAh$ for two continuous cycles, then it is considered as dead	≥ 3000 times
Reserve ability of the capacity	After standard charging and stored at $25 \pm 5^{\circ}C$ for 28days, then discharging at 0.5C to the voltage of 2.0V, the reserved capacity is $\geq 90\%$ nominal capacity.	Capacity $\geq 11.25Ah$
High Temperature performances	After standard charging and stored at $60 \pm 2^{\circ}C$ for 4 hours, then discharging at 0.5C to voltage of 2.0V, the reserved capacity is $\geq 90\%$ nominal capacity.	Capacity $\geq 11.25Ah$
Low temperature performances	After standard charging and storage at $-10 \pm 2^{\circ}C$ for 4 hours, then discharging at 0.5C to the voltage of 2.0V, the reserved capacity $\geq 60\%$ nominal capacity.	Capacity $\geq 7.5Ah$
Extrusion	Put the battery into the two planes of the extrusion equipment, boost pressure to 13KN, keep the pressure for 1 min. the vertical axis should parallels to the horizontal plane of the extrusion equipment, be vertical to the direction of extrusion, each battery only accept one test.	The battery must be no fire and no explosion.
Thermal shock	After putting the battery into the incubator, the temperature should be increased continuously at the rate of $5^{\circ}C \pm 2^{\circ}C/min$ to $130^{\circ}C$ and kept for 30 min, then take out the battery, resume to the room temperature.	The battery must be no fire, no explosion.
Overcharged	The test is made at temperature of $20^{\circ}C \pm 5^{\circ}C$. The battery should be discharged at I_5A until the voltage is 2.0V, put the battery into ventilation cabinet, connecting the anode and cathode to the DC power supply. Change the output current of power supply to $15I_5A$, The voltage should not be lower than 10V, charging for 7 h or and	The battery must be no fire and no explosion

	the voltage stays the same, until the current falls down to 0.	
Forced discharge	The test is made at temperature of 20°C±5°C. Discharged at I ₅ A until the voltage falls down to 2.0V, then reverse charged at 5I ₅ A current for 90 min.	The battery must be no fire and no explosion.
Short circuit	After standard charging fully, put a battery which is connected with thermocouple (The essential resistance of the circuit should be less than 50mΩ), short circuit for the anode and cathode, monitoring the temperature of the battery, when the battery temperature falls with a range of 10°C, then stop the testing.	The battery must be no fire and no explosion.
Acupuncture	The test is required to operating at the temperature of 20°C±5°C. Standard charged to the voltage of 3.65V, Put the battery in which is connected with thermocouple into the ventilation cabinet, pricked with a diameter-3mm stainless steel pricker throughout the centre of the of the battery at most surface in 20mm/s~40mm/s speed, and keep 1min.	The battery must be no fire and no explosion.
Heavy Impact	Put the battery on the floor, put a Φ 15.8mm Steel column into center of the battery, the vertical axis of the Steel column should be parallel to the floor, then let the 9.1kg's heavy object fall on to the steel column from a height of 610mm.	The battery must be no fire and no explosion.
Vibration	After standard charging fully, put the battery on the vibration table of vibrating frequency of 10Hz-30Hz, and continuously vibrated from X,Y,Z three directions with 10Hz-50Hz for 30 minutes, and the speed is 1oct/min.	There is no damage of the appearance and no smoking, no penetration, no explode, and the voltage is no less than 3.2V
Collision	After vibration testings, fix the battery from X,Y,Z three perpendicularity and colliding pulsely at 100m/s² , and 40~80times per min, and each pulse collisions keeps 16ms and 1000±10 times.	There is no damage of the appearance and no smoking, no penetration, no explode, and the voltage is no less than 3.2V
Free fall drop	After standard charging fully, let the battery fall from a height of 1m from X,Y,Z six directions accordingly to the hard wood with thickness of 18-20mm on the cement floor, each for each direction, and then discharged at 1C until the	No fire, no explode, and the discharging time is no less than

	voltage is 2V, then make they charging and discharging cycles no less than 3cycles.	51minutes
Storage Characteristics	Battery shall be charged continuously at a constant current of 0.5C until the voltage is up to 3.65v, then charged at the constant voltage of 3.65v until the capacity falls down to 0.02c; and stored under the condition of normal temperature of 20°C±5°C for 30days; After 30-days' storage, discharge the battery continuously at the constant current of 0.5C to the end-off voltage of 2.0V	Remaining capacity ≥ 11.25Ah

5. Matters need attention.

- 5.1 Don't put the battery near the origin of heat, such as fire, heater etc.
- 5.2 Please use the matched charger to charge the battery.
- 5.3 Don't convert the anode and cathode.
- 5.4 There are safety features in the battery, in order to keep safe, do not dissect or change the structure of the battery.
- 5.5 It is forbidden to connect the anode and cathode directly with metal.
- 5.6 It is forbidden to pound, throw , trample the batteries.
- 5.7 It is forbidden to put the battery into the water, or in the moisture place.
- 5.8 If the battery are stored without being used for 6 months,we recommend the batteries fully charged before using them.

6.Shelf life

- 6.1 The shelf life is 24 months since the production time.
- 6.2 Our company is not responsible for quality inferiority or accidents caused by abuse operating or using which are not compliant with the specifications and instrutions.

7.Transportation

During the transportation, preventing the strenuous vibration, impact, exposed to the sun and rain, and keep the battery on a state of half-charged.