储 能 型 磷 酸 铁 锂 电 池 规 格 书

STORAGE LiFePO4 BATTERY SPECIFICATIONS

产品型号(Type)： HEQ-JC001 ES-H48100

Prepared 制定	Checked 审核	Approved 批准

1. 适用范围(Product Scope)

本规格书描述了由苏州合乾新能源科技有限公司生产的锂离子二次电池的技术要求、测量方法、运输、储存及注意事项。

This Specification describes the requirements of the lithium ion rechargeable battery supplied by Suzhou HeQian new energy Science and Technology Co.,Ltd

2. 电池组特性 (Battery Group Specifications)

Cell 电芯	Model 规格型号		LFP -100Ah
	Capacity 容量		100Ah
	Rated Voltage 标称电压		3.2 V
Module parameters 模组参数	Combination Method 组合方式		16 串 1 并 16S1P
	Rated Capacity 标称容量		100Ah
	Nominal Voltage 额定电压		51.2V
	Max. Charge Voltage 最大充电电压		57.6V
	Discharge cut-off voltage 放电截止电压		44.0V
	Charge Current 充电电流		0~80A
	Recommend Charge Current 推荐充电电流		50A
	Max continuous discharge current 最大持续放电电流		100A
	Output and Input 输出端与输入端		B+ / B-
	Weight 电池重量		45kg±2Kg
	Dimension 外形尺寸（L×W×H）		570*525*165±2mm
	Operating Temperature 适用温度	Charge 充电	2℃～45℃；
		Discharge 放电	-10℃～55℃；
	Single cell over-charge cut-off voltage 单只过压保护值		3.6V
	Charge Working voltage 过压释放值		3.35V

Management system 管理系统	Single cell under-discharge cut-off voltage 单只欠压保护值	2.75V
	Discharge working voltage 欠压释放值	3.05V
	Conditions of over-charge and under-discharge voltage recovery 过、欠压恢复条件	With the high-point voltage reaching the working voltage 极限电压达到释放值
	Over-charge cut-off current 充电过流保护值	90A@8S
	Over-discharge cut-off current 放电过流保护值	130A@8S
	Short-circuit protection 短路保护	Own this ability 具备此功能
	Condition for the recovery of over-current and short-circuit protection 过流\短路保护恢复条件	Cut the circuit to automatic recovery 断开负载自动恢复
	External parallel function of the system 系统外部并联功能	Own this ability 具备此功能

3. 技术要求 (Technical Requirements)

3.1 测试条件(除特别规定) Testing Conditions (unless otherwise specified)

温 度 Temperature: 25℃

相对湿度 Relative Humidity: 45%~75%

大气压 Atmospheric pressure: 86~106Kpa

3.2 充放电性能 (Electrical Characteristics)

NO	项目 ITEM	测试方法 Testing Instruction	要求 Requirements
1	Standard Charge 标准充电	Charging the cell initially with constant current at 0.5C and then with constant voltage at 3.65V till charge current declines to 0.05C 先用 0.5C 恒流充电至 3.65V，再恒压 3.65V 充电直至充电电流≤0.05C	
2	Rated Capacity 初始容量	Measure discharge capacity with discharge current 0.5C to 2.5V cut-off within 1 hour after standard charge. 标准充电方式充电静止 1 小时后，以 0.5C 电流放电至 2.5V 的容量	≥100Ah
3	Cycle Life RT	Measure the capacity after 4000 cycles of standard charge and discharge at 1C current to 2.75V cut-off 标准充电方式充电后，1C 放电至 2.75V，如此循环 4000 次后电池的剩余容量。	≥80% of Rated Capacity 初始容量的

	25℃循环寿命		80%
		Measure the capacity after 5000 cycles of standard charge and discharge at 1C current to 2.75V cut-off 标准充电方式充电后，1C 放电至 2.75V，如此循环 5000 次后电池的剩余容量。	≥ 70% of Rated Capacity 初始容量的 70%
4	Storage Characteristics 储存性能	Capacity after 30days storage at 25℃ from standard charge 标准充电方式充电后，25℃下储存 30 天后的容量	Retention capacity ≥90% 剩余容量≥ 90%
		Capacity after 7days storage at 60℃ from standard charge 标准充电方式充电后，60℃下储存 7 天后的容量	Recovery capacity ≥ 90% 剩余容量≥ 90%

3.3 环境性能 (Environmental Characteristic)

NO	项目 ITEM	测试方法 Testing Instruction	要求 Requirements
1	Temperature testing 高低温测试	Measure capacity with constant discharge current 0.5C to 2.5V cut-off at each temperature after standard charge at 25℃, Percentage as an index of the capacity compared with 100% at 25℃ 25℃下标准充电方式充电后，在指定温度下 0.5C 放电至 2.5V 的容量，并以 25℃时放电容量为基准计算百分率	70% at 0℃ 100% at 25℃ 96% at 60℃
2	Constant temperature /humidity 恒定湿热性能	Keep the battery at 40℃ and 90%RH for 96hrs 将电池放入温度为 40℃，相对湿度为 90%的条件下搁置 96 小时	Recovery capacity ≥ 85% 恢复容量≥85%

3.4 机械性能 (Mechanical characteristics)

NO	项目 (ITEM)	测试方法(Testing Instruction)	要求 (Requirements)
1	Vibration 振动	After standard charge, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz~ 55Hz, the excursion of the vibration is 1.6mm.The cell shall be vibrated for 30 minutes per axis of XYZ axes. 将标准充电后的电芯固定在振动台上，沿 X、Y、Z 三个方向各振动 30 分钟，振幅 1.6 mm，振动频率为 10Hz~55Hz，每分钟变化为 1Hz。	The battery shall not rupture, smoke, catch fire, vent or leak and the voltage not be lower than 2.5V

2	IFPacting Testing 碰撞	After vibration , the battery will be IFPacted 1000±10 times(60±20 times per minute) with the acceleration of 100 m/s² and pulse lasting time 16ms. 将振动后的电池以峰值加速度为 100 m/s²的脉冲撞击 1000±10 次(平均每分钟 60±20 次)，脉冲持续时间为 16ms	电池应无破裂、冒烟、着火、泄漏或漏液，并且电压不低于 2.5V
3	Free fall 自由跌落	After IFPacting, the battery will be dropped free five times in three mutually perpendicular directions from the height of 1.0m onto a hard board with the thickness of 20mm 碰撞实验结束后，将电池由高度为 1m 的位置自由跌落到置于水泥地面上的 20mm 厚的硬木板上，从 X、Y、Z 正负方向（六个方向）每个方向自由跌落 1 次	

3.5 安全性能 (Safe Characteristic)

NO	项目 ITEM	测试方法 Testing Instruction	要求 Requirements
1	Short Circuit 短路	After standard charge，the battery located in a fume hood is to be short-circuited by connecting the positive and negative terminals with an external load of less than 50 mΩ till the battery case temperature has returned to near ambient temperature. 将标准充电后的电池置于通风橱中，短路其正负极（线路总电阻不大于 50m ），实验过程中监视电池温度变化，当电池温度下降到接近初始室温时，结束实验	The battery shall not rupture, smoke, catch fire, vent or leak. 电池应无破裂、冒烟、着火、泄漏或漏液
2	Abnormal Changing Test 过充	After discharge to 2.5V cut-off with discharge current 1C, Charge with 0.5C (A) current to the battery voltage of 5.475 V or charge time of 2 h(one of the conditions is preferred to stop the test). 将电池 0.5C 放电至 2.5V 后，以 0.5C(A)电流充电，到电池电压达到 5.475V 或充电时间达 到 2h（其中一个条件优先达到即停止试验）。	
3	Over discharge testing 过放	After standard charge, Discharge with 1C(A) current at (25±2) ℃90 min to finish the test. 以标准方式充电后，在（25±2）℃下以 1C(A)电流放电，放电 90min，结束试验。	
4	Puncture 穿刺	After standard charge，the battery located in a fume hood is to be punctured with a nail (diameter≥1mm) until it is completely discharged and the battery case temperature has returned to near ambient temperature 将标准充电后的电池置于通风橱中，用直径不小于 1mm 的针将电池从正面刺穿，直至电池完全放电，温度下降到环境温度	

4 电池组保护功能要求 (Battery Required Protection Functions)

To insure the safety, charger and the protection circuit shall be satisfied the items below. As safety device, please use in combination with the temperature fuse. The standard charge method is CC/CV (constant current/constant voltage)

为确保安全,充电器和保护电路应符合以下要求。同时请使用装有热熔保险丝的安全装置。标准充电方法为 CC/CV(恒流/恒压)

4.1 参数(product Specification)

名 称 (NAME)	项 目(ITEM)	值 (value)	精度（Precision）	单 位(unit)
过充电压 (Over voltage)	过充检测电压 Ocv	3600	±25	mV
	过充恢复电压 Vcl	3350	±50	mV
	延迟 Delay Time	1	±0.5	S
过放电压 (Under Voltage)	过放检测电压 Vcu	2750	±80	mV
	过放恢复放电 Vcl	3050	±100	mV
	延迟 Delay Time	100	±50	mS
充电过流 (Charge Over Current)	充电电流 OC	90	±5	A
	过流延迟 OC Delay Time	8000	±100	mS
工作电流 (Current)	持续放电电流（Continuous Output Discharging Current）	≤100	±5	A
过放电流 (Over Current)	过放保护电流 OC	130	±5	A
	过流延迟 OC Delay Time	8000	±5	mS
静态电流 (Current Consumption)	工作状态 Normal Mode	≤30		uA
	休眠状态 Sleep Mode	≤8		W
短路 (Short Circuit)	短路电流 SC	320		A
	延迟 Delay Time	≤500		uS
	恢复条件 Recovery Condition	断开负载 Manual regulation		

5 电池使用时警告事项及注意事项

WARNINGS AND CAUTIONS IN HANDLING THE Lithium-ion BATTERY

To prevent a possibility of the battery from leaking, heating or explosion please observe the following precautions:

为防止电池可能发生泄漏,发热、爆炸,请注意以下预防措施:

WARNINGS!

1. Do not immerse the battery in water or seawater, and keep the battery in a cool dry surrounding if it stands by.
   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
2. Do not use or leave the battery near a heat source as fire or heater
   禁止将电池在热高温源旁,如火、加热器等使用和留置
3. When recharging, use the battery charger specifically for that purpose
   充电时请选用锂离子电池专用充电器
4. Do not reverse the positive (+) and negative (-) terminals
   严禁颠倒正负极使用电池
5. Do not connect the battery to an electrical outlet
   严禁将电池直接接入电源插座
6. Do not discard the battery in fire or heat it
   禁止将电池丢于火或加热器中
7. Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminal with metal objects such as wire.
   禁止用金属直接连接电池正负极短路
8. Do not transport or store the battery together with metal objects such as necklaces, hairpins etc.
   禁止将电池与金属,如发夹、项链等一起运输或贮存
9. Do not strike or throw the battery
   禁止敲击或抛掷、踩踏电池等
10. Do not directly solder the battery and pierce the battery with a nail or other sharp object.
    禁止直接焊接电池和用钉子或其它利器刺穿电池
11. Before connecting 24V and 48V in parallel, turn off the battery switch.
    在 24V 和 48V 锂电池系统的并联操作之前，您需要关闭电池开关。

CAUTIONS!

1. Do not use or leave the battery at very high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerated and its service life will be decreased.
   禁止在高温下（炙热的阳光下或很热的汽车中）使用或放置电池,否则可能会引起电池过热、起火或功能失效、寿命减短
2. Do not use it in a location where static electricity is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
   禁止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

3. If the battery leaks, and the electrolyte get into the eyes. Do not rub eyes, instead, rinse the eyes with clean running water, and immediately seek medical attention. Otherwise, it may injure eyes or cause a loss of sight.
   如果电池发生泄露,电解液进入眼睛,请不要揉擦,应用清水冲洗眼睛,并立即送医院治疗,否则会伤害眼睛
4. If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using it.
   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,立即将电池从装置或充电器中移离并停用
5. In case the battery terminals are dirty, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection with the instrument.
   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
6. Be aware discarded batteries may cause fire, tape the battery terminals to insulate them
   废弃之电池应用绝缘纸包住电极,以防起火、爆炸