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		Date	Jan. 4, 2023
		DOC No:	WBY-YJY-CN2024010403-14-ZHJ
Address: Economic Development Zone of Hangbu town, Shucheng County, Lu'an, China			
Tel: +86-0564-8030526	Post Code: 231300	Web: www.lvwo-energy.com	

No.: WBY-YJY-CN2024010403-14-ZHJ

Product Development Agreement 12.8V60Ah Battery System Specification A0 Version

Prepared By	Checked By	Approved By
Zhang Hongjiang	Zhou Youbing	Li Pai

Customer Approved	Signature:
	Date:
	Company Name:(Company Stamp)

Specification

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1. Battery System Design Reference Technical Documents

GB 2894 Safety signs (neq ISO 3864:1984)

GB 16179 Guidelines for the use of safety signs

GB 8897.4-2008 Primary batteries Part 4 Safety requirements for lithium batteries

GB 21966-2008 Safety requirements for lithium primary batteries and batteries in transportation

GJB 4477-2002 General specifications for lithium-ion battery packs

2. Supply List

No.	Name	Unit	Quantity
1	12.8V60Ah Battery	pcs	1
2	Wire	set	Connected to MPPT interface
3	Certification	pcs	

3. Battery System Usage Requirements

1.External ambient temperature requirements for battery system operation: charge and discharge: charge-10°C~60°C, discharge-20°C~60°C;

2.Humidity requirements for the external environment of the battery system: 10%≤humidity≤90%RH;

3.Maintain the SOC above 20% when the battery system is in operation;

4.In the state of short-term non-use of the battery system, it is required to maintain more than 60% SOC and store it in a dry, clean and well-ventilated warehouse at 5°C~45°C;

5.In the process of battery packaging, it is required to be handled gently to prevent throwing, rolling, and impact;

6.The battery pack must not be placed upside down or horizontally during storage; it is strictly forbidden to expose the battery pack to the sun, rain or water for a long time;

7.Ensure the battery system is kept away from flammable and explosive materials and high temperature environments in operation or storage;

8.It is strictly forbidden to force operation in the state of short circuit, overcharge and high temperature alarm of the battery system;

9.It is strictly forbidden for customers to disassemble the battery system without permission.

4. Battery Parameters

4.1 Test Conditions

If there are no special requirements, the experiment should be carried out in the environment of temperature:25°C±2°C, relative humidity:15~90%RH, atmospheric pressure: 70kPa~106kPa.

4.2 Basic Performance

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Cell Parameters			
No.	Item	Index	Remarks
1	Battery type	Lithium iron phosphate power battery	
2	Rated voltage/capacity	3.2V/15Ah (IFR38121)	
3	Cell voltage range	2.5V-3.65V	
4	Cell weight	370g	
5	Dimension	Diameter:38.4mm; Hight:121.7mm	
6	Operating temperature	Charge 0°C-60°C; Discharge -20°C-60°C	
7	Charge retention capability	97% (25°C,30days)	
8	Cycle times	Over 4000 Times (0.2Ccycle, room temperature, capacity retention rate:80%)	
Battery System Parameters			
1	Rated voltage	12.8V	4 Series
2	Battery pack voltage range	10-14.6V	Single cell 2.5-3.65V
3	Rated capacity	60Ah	
4	Total energy	768Wh	
5	SOC Range	10%-100%	
6	Charge-discharge capacity efficiency	≥96%	
7	Standard charging current(A)	30	0.5C or lower recommended
8	Standard discharge current(A)	30	0.5C or lower recommended
9	Maximum continuous charge-discharge current(A)	60	
10	Total weight	7.7kg	Estimated
11	Ambient relative humidity	10%-90%	
12	Shell material	Plastic shell	
13	Battery pack composition	4S4P	
14	Battery system charging-discharging ambient temperature	Charge -10°C~60°C, Discharge -20°C~60°C	

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15	Product Dimension(mm)	196*166*171(L*W*H)	
16	Input/output method	M6 Stud	
17	Bluetooth	No	Customization

4.3 Environmental Features

(Charged according to the standard until fully charged, do the following test after 0.5 hours)

Ambient temperature	Discharge current	Battery capacity requirements
25°C	1.0I1A	The measured discharge capacity of the battery pack is not less than 100% of the nominal capacity, and the appearance is not deformed or exploded.
0°C	1.0I1A	The measured discharge capacity of the battery pack is not less than 90% of the nominal capacity, and the appearance is not deformed or exploded.
-10°C	1.0I1A	The measured discharge capacity of the battery pack is not less than 75% of the nominal capacity, and the appearance is not deformed or exploded.
55°C	1.0I1A	The measured discharge capacity of the battery pack is not less than 95% of the nominal capacity, and the appearance is not deformed or exploded.

4.4 Safety Features

Item	Specifications	Remarks
Insulation resistance	$\geq 10\text{M}\Omega$	Use an insulation resistance tester with a DC 500V test voltage to test the positive and negative terminals of the battery against the metal shell of the battery pack. The insulation resistance value is $\geq 10\text{M}\Omega$.
Dielectric strength	No breakdown or arcing	The positive and negative terminals of the battery pack should be able to withstand an AC voltage of 500V (leakage current $\leq 10\text{mA}$) at 50Hz or a DC voltage of 710V for 1min without breakdown or arcing.
Drop resistance	No leaks, smoke, fire or explosion	Immerse the fully charged battery pack in 3.5% NaCl solution, the water depth should completely cover the battery pack, keep it for 2 hours, take it out, and place it in an environment with a temperature of 15°C~35°C, a relative humidity of 25%~85%, and an atmospheric pressure of 86kPa~106kPa for 4 hours.
Drop resistance	There is no obvious damage, leakage, shell cracking, fire or explosion, and the battery pack and each camera position do not move when shaking up and	When the battery pack is fully charged, select any of the six angles and let it fall freely from the set highest point height (0.8m-1.8m) onto the concrete floor once.

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Constant humidity	There should be no obvious deformation, rust, smoke or explosion, and its capacity should not be less than 90% of the measured reference capacity.	After the battery pack is fully charged, place it in a constant temperature and humidity chamber at 60°C±2°C and relative humidity of 90% to 95% for 12 hours with BMS, then take it out and place it at an ambient temperature of 25°C±2°C for 2 hours, visually inspect its appearance, and then discharge it at a current of 1.0I1A to the termination voltage.
Vibration Test	No explosion, no fire, no deformation, no parts falling off, no abnormal voltage, no sharp change in discharge current	After the battery pack is fully charged, it is fixed on the vibration table in the direction of the large plane. The battery pack is subjected to an amplitude of 5mm, a maximum stroke of 10mm, and a vibration frequency of 10Hz~55Hz. The vibration test is carried out in the x, y, and z directions of the battery pack respectively. The test time of the frequency sweep cycle in each direction between 10Hz~55Hz is 90min±5min. After the test, it is left for 1h.

5. Product Dimensions Diagram



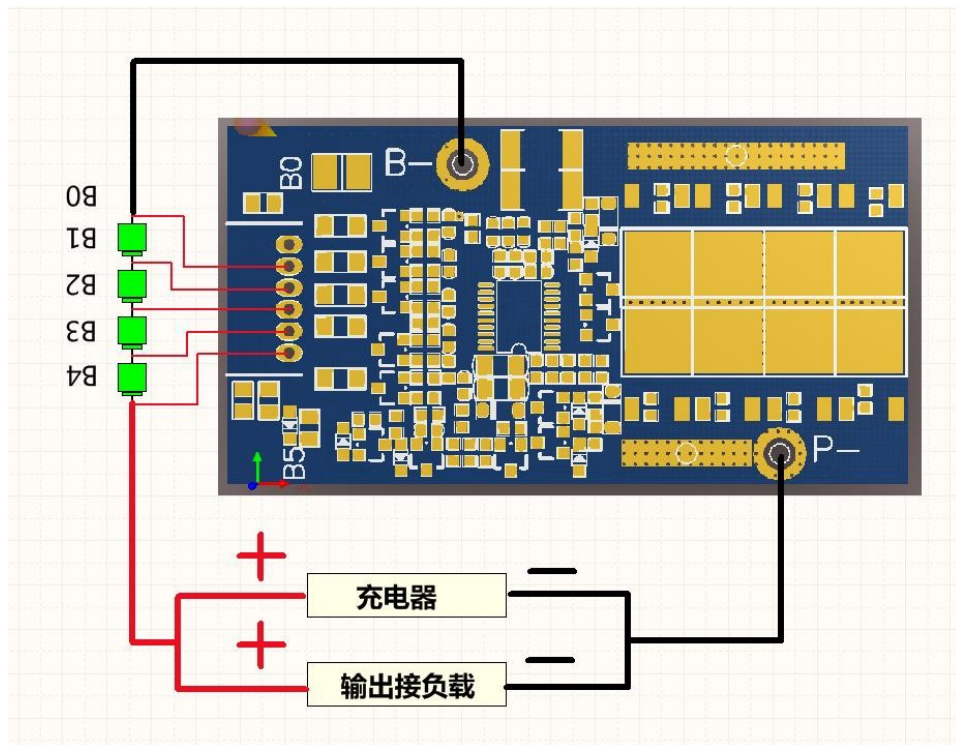
6. Warning Label and Nameplate

None.

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7. Protection Board Specifications

7.1 Protection Board and Wiring Diagram



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7.2 Function Parameters

Function	Test items	Parameter	Accuracy	Unit
Charging voltage	Rated charging voltage	14.4	±0.25	(V)
Continuous current	Maximum charging current	30	/	(A)
	Maximum discharge current	60	/	(A)
Charging protection	Overcharge protection voltage	3750	±25	(V)
	Overcharge protection delay	1000	±500	(mS)
	Overcharge protection recovery voltage	3550	±50	(mV)
	Overcharge protection recovery condition	Each battery voltage is lower than the overcharge protection recovery voltage		
	Charge overcurrent protection	35	±5	(A)
	Charge overcurrent protection delay	1000	±500	(mS)
	Charge overcurrent release condition	Disconnected charger		
Discharge protection	Overdischarge protection voltage	2200	±80	(V)
	Overdischarge protection delay	1000	±500	(mS)
	Overdischarge protection recovery voltage	2700	±100	(V)
	Overdischarge protection recovery condition	Disconnect load or plug in a charger		
	Discharge overcurrent protection	70	±5	(A)
	Discharge overcurrent protection delay	200	±100	(mS)
	Short circuit protection	On		(A)
	Short circuit protection delay	100-800	\	(uS)
	Overcurrent/short circuit protection delay recovery condition	Disconnect load or plug in a charger		
Temperature protection	Charge high temperature protection	55	±5	(°C)
	Charge high temperature protection recovery	45	±5	(°C)
	Charge low temperature protection	-7	\	(°C)
	Charge low temperature protection recovery	0	\	(°C)
	Discharge high temperature protection	75	±5	(°C)
	Discharge high temperature protection recovery	55	±10	(°C)
	Discharge low temperature protection	\	\	(°C)
	Discharge low temperature protection recovery	\	\	(°C)
Balance	Balanced start voltage	3500	±50	(mV)
	Balanced current	40	±10	(mV)
Self-consumption	Single-cell self-consumption	22.1	≤50	(uA)
Internal resistance	Charge/discharge circuit internal resistance	6.3	≤30	(mΩ)
Finished Product dimension	L*W*H	63*33*8		(mm)

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8. Charger

1. Special charger for lithium iron phosphate battery
2. Maximum input voltage $\leq 14.6(\text{CC/CV})$
3. Maximum continuous output current $\leq 30\text{A}$

Note: To prevent overcharging due to failure of the charger or protection board, the charger end is cut off first when charging is completed.

9. Conditions of Usage

9.1 Package

9.1.1 Method: ☐ Neutral carton (domestic) ☐ UN carton (export) ☐ Wooden pallet (bulk container export).

9.1.2 Each battery pack should have an outer packaging, and should be accompanied by a product manual and certificate of conformity. Packaged products should be placed in dry, dust-proof and moisture-proof packaging boxes. The product name, model, voltage, capacity, quantity, gross weight/net weight, LOGO, battery serial number, etc. should be marked on the outside of the dangerous goods packaging box. The neutral packaging box does not contain the above content. There should be necessary signs such as "handle with care", "afraid of moisture", "upward", "afraid of fire", etc.

9.1.3 Materials accompanying the goods: shipping inspection report, product manual, host computer software, communication protocol (electronic file), etc.

9.1.4 Anti-vibration and anti-pressure measures: The two sides (upper and lower) of the battery module need to be filled with anti-vibration materials.

9.1.5 Waterproof, anti-scattering and handling: battery modules are put into nylon bags, tightened with packing tape and placed on pallets.

9.2 Transportation

The battery pack should be packed into boxes for transportation. During transportation, it should be protected from severe vibration, impact or extrusion, and from exposure to sunlight and rain. It can be transported by cars, trains, ships, airplanes and other means of transportation.

9.3 Storage

9.3.1 The battery pack is usually stored at 20% to 40% of the state of charge in a clean, dry, ventilated and rainproof room with an ambient temperature of -5°C to 35°C and a relative humidity of no more than 75%. It should be placed flat and elevated, not less than 100MM from the ground;

9.3.2 The battery cannot be stored together with active chemicals or dust-generating items;

9.3.3 The battery cannot be subjected to any mechanical shock or heavy pressure;

9.3.4 The battery should be kept away from direct sunlight, away from fire, and not less than 2M from heat sources;

9.3.5 From the date of manufacture, the battery should be recharged at $0.2\sim 0.5\text{C}$ current for $30\sim 60\text{min}$ every 3 months of storage, and the temperature range should be $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$.

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10. Letter of User Responsibility

Users must use the battery in accordance with the instructions on the battery label or this battery specification sheet of Anhui Lvwo Recycling Energy Technology Co., Ltd. If the power system overheats or even catches fire or explodes due to improper use by the user, the company will not bear any responsibility for the damage caused.

11. Dangerous Matters

Please read the following carefully, otherwise it may cause battery leakage, explosion or fire.

- (1) Do not put the battery into water or get it wet;
- (2) Do not use or store the battery near a heat source (such as a fire or heater);
- (3) Do not connect the positive and negative poles in reverse;
- (4) Do not connect the battery directly to a wall socket or a car cigarette lighter socket;
- (5) Do not put the battery into fire or heat the battery;
- (6) Do not short-circuit the positive and negative poles of the battery with wires or other metal objects, and do not transport or store the battery together with necklaces, hairpins or other metal objects;
- (7) Do not hit, throw or subject the battery to mechanical vibration;
- (8) Do not pierce the battery shell with nails or other sharp objects, and do not hammer or step on the battery;
- (9) Do not disassemble the battery in any way;
- (10) Do not charge the battery in the presence of fire or extreme heat.

12. Warnings and Precautions

- ◆ It is strictly forbidden to disassemble or repair the battery system without professional personnel.
- ◆ The battery system must be charged with a charger specially designed for it.
- ◆ It is strictly forbidden to immerse the power system in water or salt water. When not in use, please store the battery in a cool and dry environment.
- ◆ If the power system emits an odor, heats up, changes color or deforms, or becomes abnormal in any way during charging or discharging, stop the operation immediately and find a professional to handle it.
- ◆ When the battery catches fire, use dry sand or nitrogen fire extinguisher to put out the fire.
- ◆ It is strictly forbidden to put the battery system into fire or heat source.
- ◆ Please remove metal jewelry or other metal objects when installing or using the battery, and be careful when handling the battery, especially when placing it in a metal container.