



Howell Energy Co., Ltd

深圳市鸿伟高能科技有限公司

Specification

Model: LiFePO4 12.8V 200Ah

P/N: HWE-4F200

Date 2017.12.22

Customer Approval

Comment: (Please return one copy with your approval signature)

Customer's Signature:

Prepared By	Checked By	Approved By
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1.Scope

This specification is applied to the LiFePO4 battery pack manufactured by Howell Energy Co., Ltd.

2.Specifications

No.	Item	General Parameter	Remark
1	Rated Capacity	200Ah	Standard discharge(0.2C) after standard charge(0.2C)
2	Nominal Voltage	12.8V	
3	Cycle Life	Higher than 80% of the Initial Capacity of the Cells	◆ Charge: CC@0.5C to 14.6V, then CV till current to 0.05C ◆ Rest: 30min. ◆ Discharge: 0.5C to 10.0V ◆ Temperature:20±5℃ ◆ Carry out 4000cycles
4	Discharge cut-off voltage	10.0V	
5	Charging cut-off voltage	14.6V	
6	Housing material	ABS+PC	
7	Standard Charge	50A	Charge time : Approx 6.5h
8	Max. Charge	100A	Charge time : Approx 2.5h
9	Standard Discharge	50A	
10	Max. Discharge	100A	Peak:200A(<5s)
11	Internal Impedance	≤20mΩ	Internal resistance measured atAC 1KHZafter 50% charge
12	Operation Temperature Range	Charge: 0~45℃ Discharge: -20~60℃	60±25%R.H.
13	Storage Temperature Range	Less than 1 year : 0~35℃ Less than 3 months : -20~45℃	60±25%R.H. at the shipment state
14	Weight	Approx: 22.0Kg	
15	Size	High: 220±3mm Width: 238±3mm Length: 522±3mm	Initial battery dimensions

3. Test Conditions, Methods and Electrical Performance

3-1 Test conditions

All tests shall be done under temperature: $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$, relative humidity: (RH) 25%~85%, air pressure: 86kPa~106kPa except special appointment.

3-2 Measuring apparatus

a) Voltage is measured by D.C. voltmeter which precision is higher than 0.5 grade and self resistance is higher than $1\text{k}\Omega/\text{V}$;

b) Current is measured by D.C. meter which precision is higher than 0.5 grade;

c) Temperature is measured by thermometer which has proper measuring range and division value is lower than 0.5°C ;

d) The timer used in measuring should be degressed in hour, minute and second, and should have degree of accuracy no more than $\pm 1\%$;

3-3 Standard charge

Charge the battery with DC stabilized power supply 14.6V, constant-current 0.2C(A) until current reach to 0.05C (A) .

3-4 Standard discharge

After charged by (3-3) , discharge the battery with constant current 0.2C(A) until the battery reach to over discharge protection or total voltage reach to 10.0V;

3-5 Battery capacity

Discharge battery by (3-4) , and write down discharge time (hour), then capacity (Ah)=0.2C (A) * discharge time (hour);

3-6 Electrochemistry performance

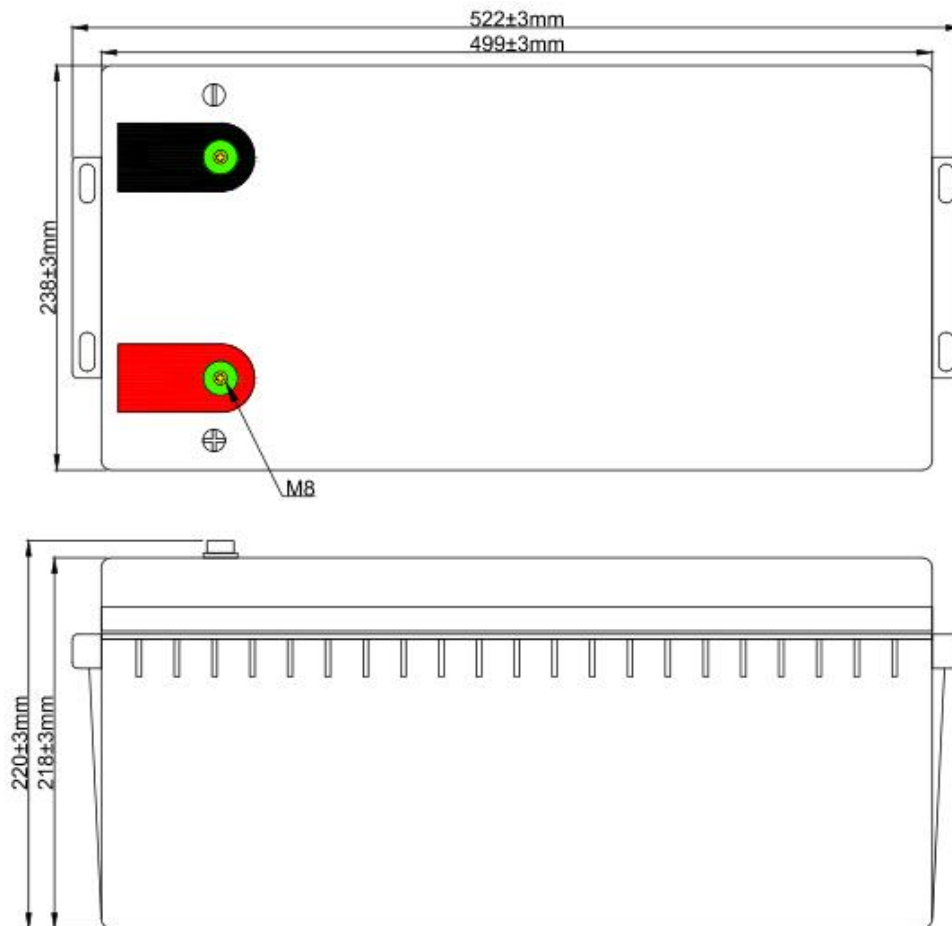
Items	Test Method	Technical requirements
25°C discharge capacity	Battery charge with standard methods, discharge at 0.2C (A) , write down discharge capacity	≥100% nominal capacity
55°C discharge capacity	Battery charge with standard methods, stored for 5h in 55°C±2°C, then discharge at 0.2C (A) to cut-off voltage, write down discharge capacity	≥95% nominal capacity
Charge retainability and recover capability	Battery charge with standard methods, stored for 28d in normal temperature 7d in 55°C,	capacity retention rate≥80% capacity retention rate≥90%
Multiplying power discharge capacity	Battery charge with standard methods, discharge at 1C, write down discharge capacity	≥90% nominal capacity
Cycle life	Under the condition of 20°C±5°C, charge the battery in 0.5C (A) ; discharge at 0.5C (A) to terminal condition, repeat like this.Test the capacity every 25 times in standard charge and discharge, stop testing when the capacity is lower than 80%.	≥4000 cycles

3-7 Safety performance (Cell)

Note: safety characteristics test no electronic protection circuit

Items	Test Method and Condition	Criteria
Thermal exposure test	Each fully charged cell, placed in a circulating air-convection oven. The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130 °C ± 2 °C. The cell remains at this temperature for 30 min before the test is discontinued.	No explosion, No fire
Short test	The fully charged battery is to be short-circuited by connecting the positive and negative terminals with resistance load not exceed 5mΩ. Tests are to be conducted at temperature 25±2°C.	No explosion, No fire The Temperature of the Battery surface not exceeded than 150°C
Over discharge test	After 1C charge, With 1C 90 minutes of constant current discharge and observed for 1 hour.	No explosion, No fire, No leakage
Over charge test	After 1C charge, continue to charge with a constant voltage 5.5V per a cell, holding 1h.	No explosion, No fire
Nail pierce	After standard charge, 5~8mm diameter nail transpierce cell with speed 20~30mm/s and observe 1h	No explosion, No fire
Free fall test	After 1C charge, then drop the battery three times from a height of 1.5 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations and observe 1h.	No explosion, No fire, No leakage
Crush test	After 1C charge, Half a cylinder with a radius of 75 mm to (5 + 1mm)/s velocity perpendicular to the cell pressure, when the battery voltage reaches 0 v or deformation of 30% or stop pressing after extrusion of 200 kn.	No explosion, No fire

4.Product Structural Characteristic



Outline diagram(For reference only, subject to the actual object)

5. BMS Parameters

No.	Item		Standard
1	Voltages	Charge Voltage	CC/CV 14.6V
		Single cell Charge Voltage	3.65V
2	Current	Self-discharge current	$\leq 100\mu\text{A}$
		Max continuous charge current	$\leq 100\text{A}$
		Max Continue discharge currentt	$\leq 100\text{A}$
3	Over charge protection	Over charge protection voltage	$3.75\pm 0.05\text{V}$
		Over charge protection delay time	0.5-1.5S
		Over charge release voltage	$3.55\pm 0.05\text{V}$
4	Over discharge protection	Over discharge protection voltage	$2.2\pm 0.1\text{V}$
		Over discharge protection delay	$2\pm 0.5\text{S}$
		Over discharge release voltage	$2.70\pm 0.10\text{V}$
5	Over current protection	Over current protection voltage	---
		Over current protection current	$330\pm 50\text{A}$
		Over current protection delay	300ms-800ms
		Over current release voltage	Charge battery
6	Balance	Balance voltage of cell	$3.55\pm 0.05\text{V}$
		Balance current of cell	$35\pm 5\text{mA}$
7	short circuit protection	Condition	Outside short circuit
		Short circuit protection delay time	200-500us
		Release condition	Cut off Loading, release automatically
8	Inner resistance	Protection circuit (MOSFET)	$\leq 10\text{m}\Omega$
9	Temperature	Working temperature range	$-40\text{--}+85^\circ\text{C}$
		Storage temperature range	$-40\text{--}+125^\circ\text{C}$

6. Product storage and transportation

6-1 Storage

If the battery pack need to be stored for a long time, charge the battery for 50% electric quantity (after discharge, charge by charger for 2~3h every 3 months).

Battery pack and the charger should be stored in clean, dry and ventilating place, and should not be together with corrosive material, keep the battery away from fire and heat source.

6-2 Transportation

Battery pack and charger should be transported after packaging, and should avoid severe vibrating, impacting , extrusion, and direct light and rain. They can be transported with automobile, train, ship and plane, etc.

6-3 Maintainance

- a) The battery pack should be stored in 40%~60% state-of-charge.
- b) If the battery won't be used for a long period, charge it every 3 months, and each time 1~2h
- c) In the process of maintainance, don't assemble and disassemble the battery without permission, other wise, the performance of battery will descend.
- d) Don't disassemble the battery without permission.

7. Warnings in using the battery

- * Do not immerse the battery into water or seawater.
- * Do not use , leave or charge battery near a heat source such as fire or heater. If the battery leaks or smells, move it away from open fire. The battery should be used after fully charged in the first use.
- * Do not inversely connect positive and negative polar.
- * do not put the battery in fire or heat the battery.
- * Do not short-circuit the battery with wires or other metals.
- * Do not pierce the shell with nails or other sharp objects. Do not hammer or tread the pack.
- * Do not disassemble the pack and battery in any way.
- * Do not put the battery pack in microwave oven or pressure vessels.
- * If the battery pack smells, fevers, is out of shape, color changes or any other abnormal phenomena which the battery can't be used, if the battery is being charged or used, please take it out of the charger or electrical equipments.
- * Do not use the battery in extremely thermal environment, such as direct light or cars in hot

day. Other wise, the battery will overheats and the performance and life of battery will be influenced.

* If the battery leaks and the electrolyte get into the eye, do not rub eye. Instead, rinse eye with clean water, and seek medical attention immediately.

*Temperature will influence discharge capacity, if the temperature exceeds standard environment temperature (25±5℃) , discharge capacity will reduce.

8. Especially attention

* If the battery pack smells or sounds unusual in the process of charging, stop charging immediately.

*If the battery pack smells or sounds unusual in the process of discharging, stop discharging immediately.

* If the above problems appear, please contact Howell Energy, do not disassemble without permission.

9. Product responsibility

* Howell Energy won't responsible for any accident caused by violating the specification.

* Howell Energy won't further notice if the specification changes for the reason of improving the quality of products or upgrade technical parameters. If you want to know latest product information, contact us to ask for it.

History of Revisions

Edition	Description	Prepared by	Approved by	Date
A	For the first time to issue	Joshua	Robert	2017.12.22