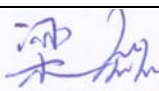
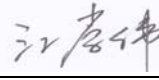
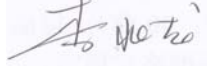


# SHANDONG HIPOWER ENERGY GROUP

## Lithium-Ion Battery SPECIFICATION



Name	LiFePO <sub>4</sub> Battery
Number	HP-DT-P-007
Type	HP-IFP220/57/335
Specification	3.2V/200.0Ah
Prepared	 2018.1.18
Checked	 08.1.18
Approved	 08.1.18.

Address: HiPower Industrial Park, NO.1 Tianan Rd, Hi-Tech Development District,

Zaozhuang, Shandong, CHINA



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## 1. Summarization

This Specification describes the requirements of the LiFePO4 rechargeable battery supplied by SHANDONG HIPOWER Energy Group, The product mentioned in the specification accord with Q/SHB002-2007 (based on GB/T18333.1-2001).


## 2 Description

2.1 Name: LiFePO4 Battery

2.2 Type: : HP-IFP220/57/335

## 3. Parameters

No.	Item	unit	Parameters	Remark
1	Nominal Capacity	Ah	200.0	Capacity according to standard discharge, After standard charge
2	Nominal Voltage	V	3.2	Average Voltage according to standard discharge, After standard charge
3	Charge Type	/	CC/CV	/
4	Charge Cut-off Voltage	V	3.85	/
5	Discharge Cut-off Voltage	V	2.0	/

 <b>Shan Dong Hipower Energy Group</b>		<b>Type: HP-IFP220/57/335</b>		
<b>LiFeP04 Battery Specification</b>		<b>Version: 08/08</b>		

6	Charge current		A	66.6	constant current
	Discharge current		A	66.6	constant current
8	Max. instantaneous discharge current		A	600	<15S
	Weight		g	7200±10	/
10	Inner Resistance		mΩ	<2	/
	Dimension (H×W×L)		mm	220×57×335	/
12	Working Temperature	Charging	℃	0~45	/
		Discharging	℃	-20~60	/
13	Storage Temperature	1 month	℃	-20~60	/
		3 months	℃	-20~45	/
		6 months	℃	-20~25	/
	Atmospheric pressure		KPa	86~106	/
Relative Humidity		RH	25%~85%	/	

#### 4. TECHNICAL REQUIREMENTS

##### 4.1 Testing Conditions

(1) Standard charge: Under temperature 20±5 °C, charge with 1I<sub>3</sub> constant current till it reaches ( to) charge cut off voltage(3.85V), then starts to Charge with constant voltage, Till charge current<0.01C.

**LiFeP04 Battery Specification**

(2) Standard discharge: Under temperature  $20\pm 5\text{ }^{\circ}\text{C}$ , discharge with  $1I_3$  constant current till(to) discharge cut-off voltage(2.0V).

(3) Standard testing environment:

Temperature:  $15\text{--}35\text{ }^{\circ}\text{C}$ ;

Relative Humidity: 25%~85%RH;

Atmospheric pressure: 86kPa~106kPa.

#### 4.2 Electrical Performance:

:

No.	Item	Testing Instructions	Requirement
1	Nominal Capacity	Temperature $20\pm 5\text{ }^{\circ}\text{C}$ , Measure discharge capacity to 2.0V cut-off within 1h after standard charge. (One time for the first 5times ,meeting the requirements can do )	200.0Ah
2	high-current discharge performance	Temperature $20\pm 5\text{ }^{\circ}\text{C}$ , discharge with 0.5C constant current to discharge cut-off voltage within 1hrs after standard charge.	Discharge time $\geq 120$ min. The battery shall not be metamorphose, rupture.
3	Low-temperature discharge performance	Keep the battery in the case at $-20\pm 2\text{ }^{\circ}\text{C}$ for 20hrs after standard charge. Measure the discharge time with constant discharge current $1I_3$ to cut-off voltage. Then, Temperature $20\pm 5\text{ }^{\circ}\text{C}$ , lay the battery for 2hrs, observe the appearance of the battery.	Discharge time $\geq 126$ min The battery shall not be metamorphose, rupture.



4	High-temperature discharge performance	Keep the battery in the case at $55\pm 2$ °C for 5hrs after standard charge. Measure the discharge time with constant discharge current $1I_3$ to cut-off voltage. Then, Temperature $20\pm 5$ °C, lay the battery for 2hrs, Observe the appearance of the battery.	Discharge time $\geq 171$ min. The battery shall not be metamorphose, rupture.
5	Charge Retention	Temperature $20\pm 5$ °C after standard charge, keep the battery open circuit for 28 days. Then, Measure the discharge time with constant discharge current $1I_3$ to cut-off voltage.	Discharge time $\geq 144$ min
6	Cycle Life	Temperature $20\pm 2$ °C, Charge with constant charge current $1I_3$ to charge cut-off voltage, Then charge with constant voltage to the current $\leq 0.01C$ , Then, stop charge. 10 min later, discharge with discharge current $0.5C$ to 100% of the capacity DOD. 10 min later, repeat the cycle, till the capacity of lasting 24times $\leq 80\%$ of the Nominal Capacity, Then consider the life of battery end.	Cycle Life $\geq 1000$ times

#### 4.3 Misuse testing :

No	Item	Testing instruction	Requirement
1	Falling off testing	After standard charge , drop the battery from the height of 1.5m to the hardwood floor 20mm thin , 2 times one direction , 6 times altogether. During the testing ,make note of the changes of voltage and the temperature .	No explosion, no leakage, no fire.



2	Extrusion testing	<p>After standard charge ,lay the battery at <math>20\pm 5^{\circ}\text{C}</math> for 1 hour .</p> <p>a) Extrusion direction: press in he vertical direction of the battery polar board.</p> <p>b) Extrusion area: <math>\geq 20\text{cm}^2</math></p> <p>Extrusion extent: till the rupture of the battery rind and till to be short-circuited inside(voltage be 0V).</p>	No explosion、no fire (distortion and leakage allowed) 。
3	Puncture testing	<p>After standard charge ,put the battery at <math>20\pm 5^{\circ}\text{C}</math> for 1 hr .Then puncture the battery in the direction of electrode board with the high temperature-proof steel pin with 3mm diameter .(the pin staying in the battery ) . The test must be conducted in the protective condition .During the test ,make note of the changes of the voltage and the temperature .</p>	No explosion、no fire (distortion and leakage allowed) 。
4	Calefaction testing	<p>Put the battery in the case at constant temperature of <math>70\pm 2^{\circ}\text{C}</math> for 120min and observe the appearance of the battery .</p> <p>Meanwhile, make note of the changes of the battery voltage.</p>	No explosion、no fire (distortion and leakage allowed)

#### 4.4 Safety Performance:

NO	Item	Testing Instructions	Requirement
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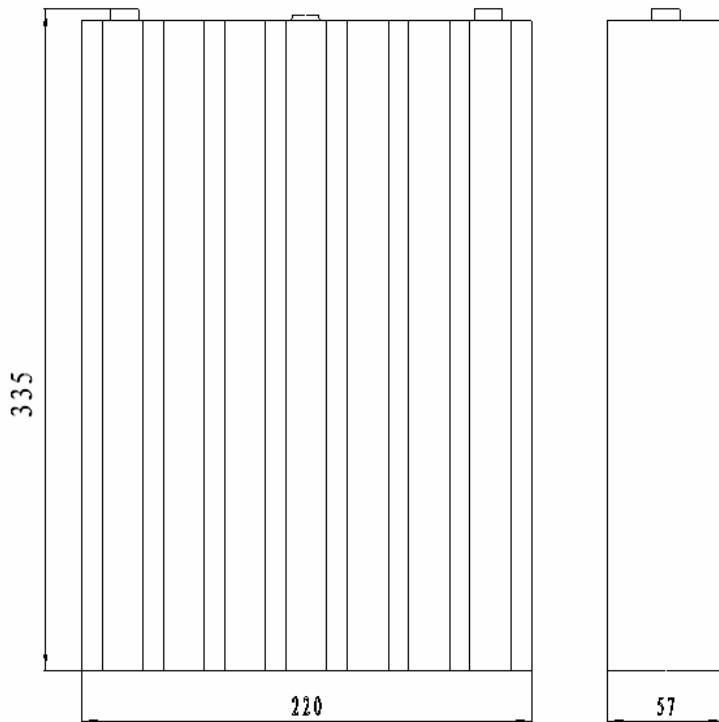
1	Short Circuit performance	<p>After charging the battery standardly put it under the temperature of <math>20 \pm 5^{\circ}\text{C}</math> for 1 hrs and then short-circuit the battery for 10 min ,connecting the positive and negative terminals of it (The resistance of the circuitry <math>\leq 5 \text{ m}\Omega</math>).</p> <p>Notice the change of the temperature, battery current and the voltage during the experiment.</p>	No fire ,no explosion
2	Over charge Performance	<p>After charging the battery standardly, put it under the temperature of <math>20 \pm 5^{\circ}\text{C}</math> for 1 hrs</p> <p>The battery with thermocouple is to be put into the fume cupboard .Charge it with constant current 0.3C to 4.1 voltage.</p> <p>Observe the appearance of the battery.</p> <p>Notice the change of the temperature, battery current and the</p>	No fire ,no explosion



			voltage during the experiment	
3	Over discharge performance	After standard charge and under the temperature of $20 \pm 5^{\circ}\text{C}$ , discharge the battery (if there is BMS, please disconnect the BMS first) with the current of 1I3 till the voltage of the battery is 0v . Notice the change of the temperature, battery current and the voltage during the experiment .	No explosion , no leakage , no fire .	

**5.Sketch map of product :**

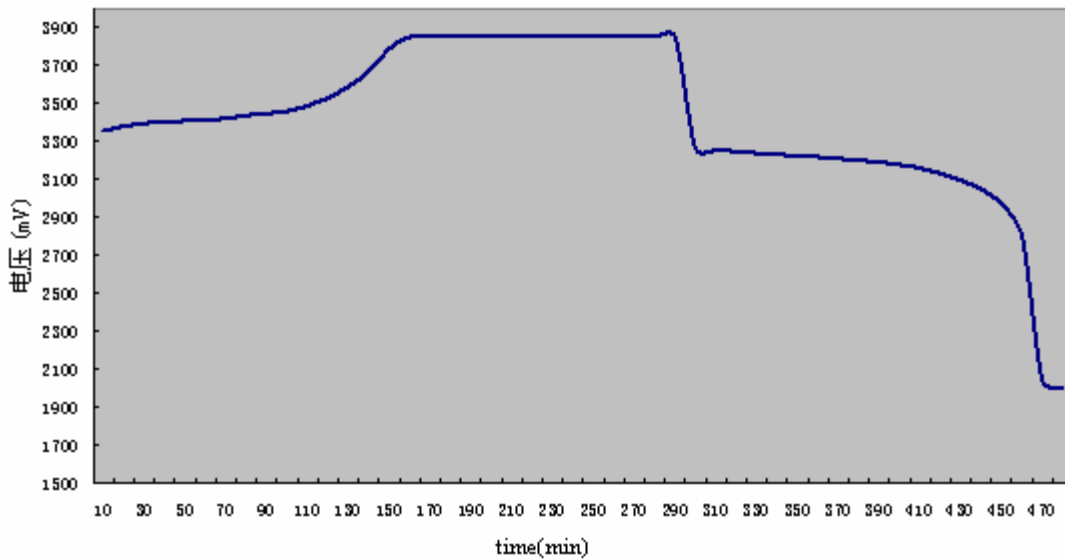




## 6. Typical curves :

### 6.1 Typical charge/discharge curve graph:

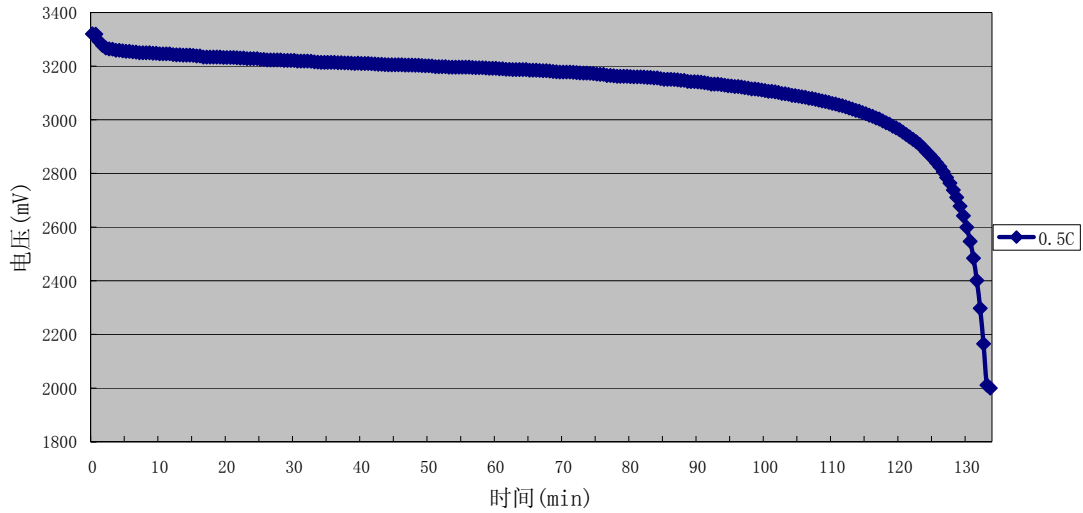
battery charge&discharge testing curve



### 6.2 Discharge curve at different rate:



磷酸铁锂电池0.5C倍率放电曲线图

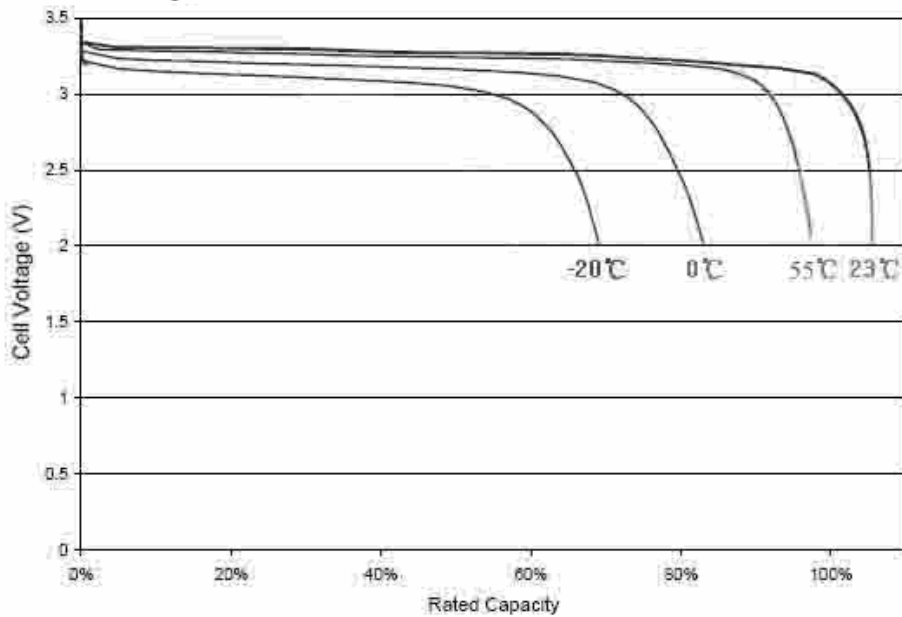


This curve shows the discharge capacity at high drain rate . The Max discharge current allowed is 3C, which is the instantaneous current within 15s .

6.3 High/Low-temperature testing typical curve:

Discharge Temperature Characteristics

Charge:C/3 to 3.85V (CC-CV)  
Discharge:C/3 as indicated



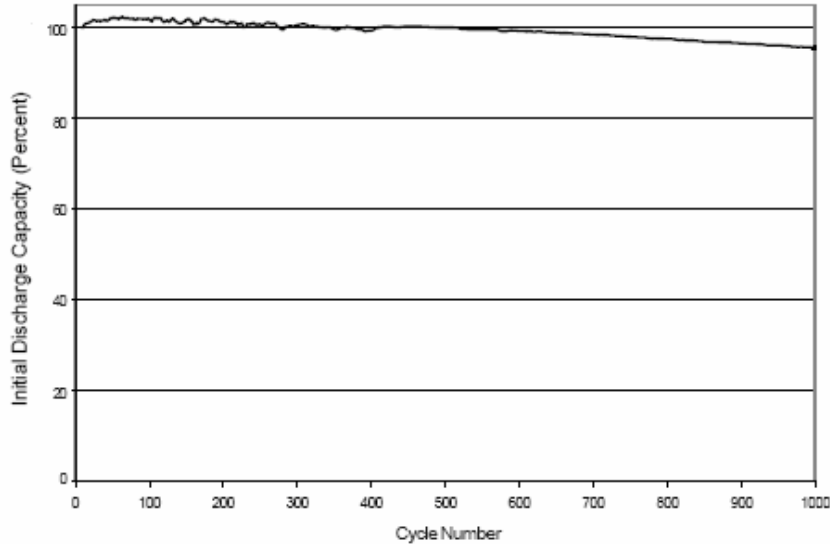
6. Cycle life curve:



### Cycle Life Characteristics

Charge: 0.3C to 3.85V (CC-CV)

Discharge: 0.5C to 2.00V (100% Depth of Discharge)



## 7. Storage

The place of preserving the battery must accord with the following requirements:

Indoor, The temperature of environment is between  $-5^{\circ}\text{C} \sim 35^{\circ}\text{C}$ , The relative humidity is  $\leq 75\%$ , The place must be clean dry and ventilative;

Avoid contacting to the corrosives;

Keep far away from fire and heat;

Keep the battery 50%~60% charge state;

Avoid being over-charged, the battery should be charged once per 3~6 months when preserved.

## 8. Battery maintenance

(1) Be sure to charge the new battery fully before using for the first time. The battery will reach its max capacity after 3-5 times of full charging and discharging.



(2) The battery should be used in the ventilative and dry environment. Avoid being near to fire .

(3) The best working temperature range for the battery is 15°C-40°C .Beyond that , there will be effect on the battery's normal working .

(4) Don't short circuit the battery by connecting the cathode and anode, in case of any danger.

(5) Don't wash the outer shell of the battery with impregnant .In case of fire, please use Carbon Chlorin to put out fire instead of CO2.

(6) If the battery goes wrong, please deliver that to the factory service centre or relevant organization for proper disposal .

(9)Don't dismantle the battery at will and never open the electrolyte-injecting hole .

#### 9. Notice when using the battery :

In case of leakage, heat, fire, performance decrease etc , please use the battery according to the following regulations .Our company won't take any responsibility for any mis-operation not according to this specification .

(1) Handle with care, do not shake.

(2)Don't immerge the battery in the water or other liquid , in case of damp .Especially on rainy days , take care to prevent the water from going into the controller and motor ,in case of short- circuit .

(3)Avoid being short-circuited , connecting the anode and cathode .

(4) Please charge the battery with the Special charger provided by Shan Dong Hipower.



(5) Don't dismantle the battery, as that may cause inner short-circuit and then decomposition of the inner material, fire and even explosion accordingly. In addition, dismantling the battery may cause the leakage of the electrolyte, which will do bad to the human body. If the electrolyte is spattered onto skin, eye and other part of the body, please wash with clean water immediately and go to the doctor at once.

(6) Don't dispose the battery with fire, in case of any danger.

(7) If the battery is damaged, distorted or there is leakage of the electrolyte or the taste of electrolyte and some similar abnormal phenomena, don't use the battery any more. Please deliver that to the factory service centre or relevant organization for proper disposal. In addition, battery with electrolyte leakage should be far away from fire, in case of explosion.

(8) battery replacement

The battery provider should be responsible for replacing and installing the battery. The consumer shouldn't replace that at will.

(9) dismantle without permission

The consumer shouldn't dismantle the battery at will. Or our company won't take any responsibility.

10. Notice during the transportation :

(1) The battery is suitable for being transported by truck, train, plane. During transportation, please avoid solarization, drench and serious shake.

(2) The battery pack must be packed with insulated material and marked with logo



of fragibility in case of any damage caused by bumping in transit.

(3) Don't upside down the battery. A sticker indicating 'Don't upside down' is needed. Also can't be put at will .

(4) Handle with care in transit. Can't throw or impact the battery.

(5) Don't place any heavy objects on battery pack.

(6) Don't mix-transport with flammable or explosive consignment, or metal objects with sharp end.

(7) Outer packing should be marked 'Away from moisture, water, and fire'.

11. Other

Any issues not included , suppliers and customers can negotiate .