

# HeadWay

Customer: \_\_\_\_\_

Product name: Cylindrical lithium-ion Iron Phosphate batteryModel No.: HW 40152SSpecifications: 15000mAh/3.2VAdd.: Tai Hu Road, Changxing Eco.&Tech. Development Zone,  
Changxing County, Zhejiang Province, China

Designed	Approved	Inspected
Si Fanghong	Xu Aokui	Li Xingli

1<sup>st</sup>, May, 2003 Published20<sup>th</sup>, Oct, 2003 Completed

## 1. Range of application:

This specifications is applied to Headway lifepo4 batteries produced by Zhejiang Xinghai Energy Technology Co.,Ltd.

## 2. Product name and models:

2.1 Name: Headway cylindrical lifepo4 battery

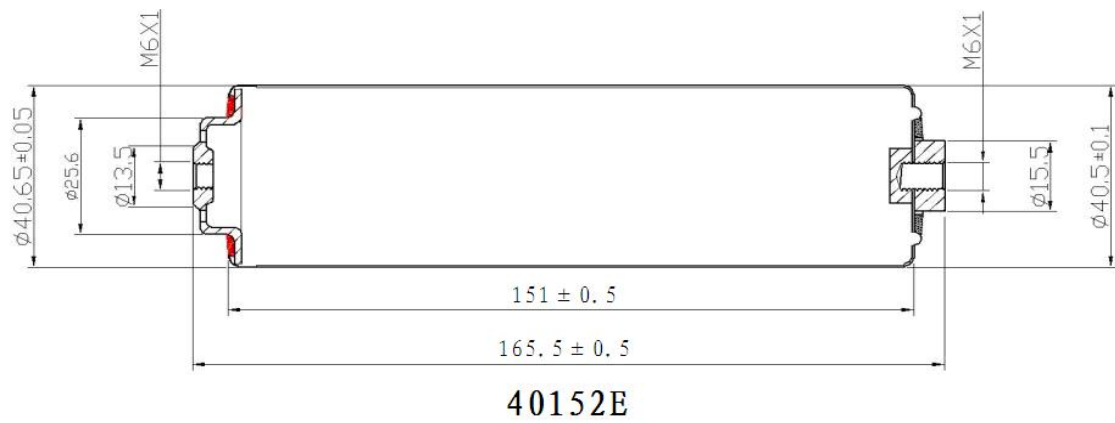
2.2 Model: HW 40152S

## 3. specifications:

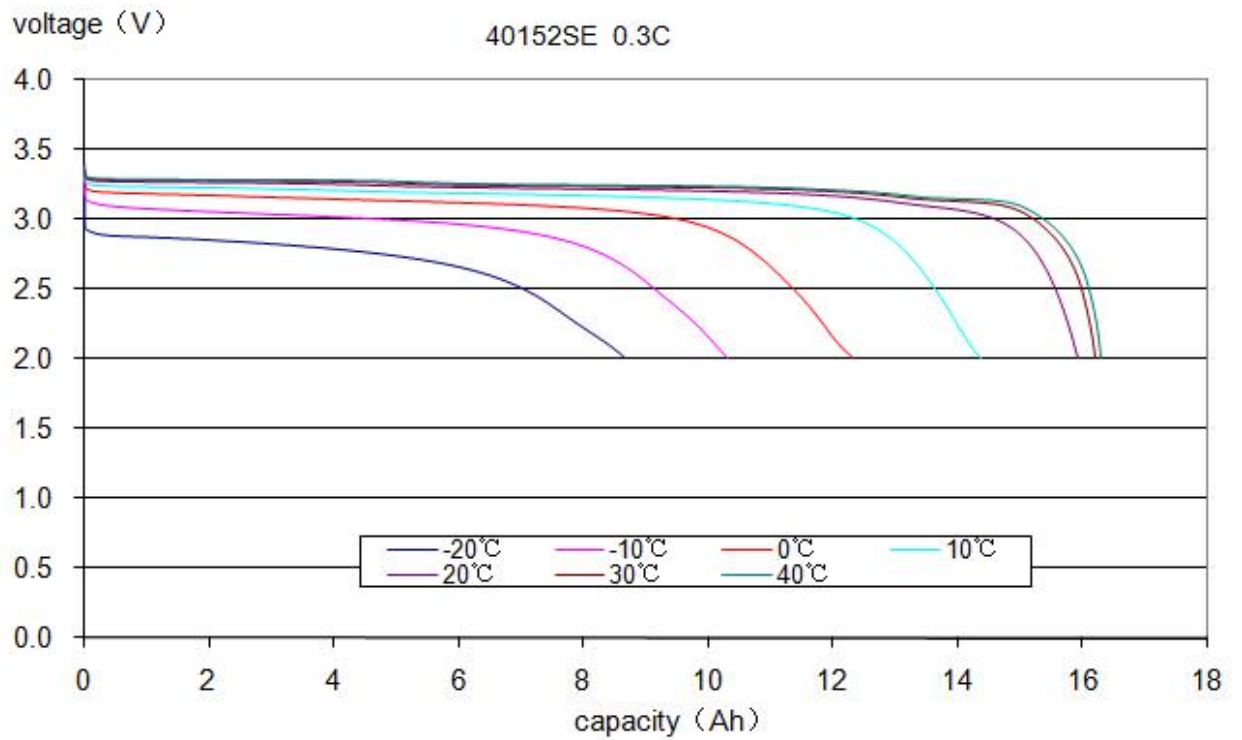
NO.	ITEM		Specifications
3-1	Nominal Capacity:		15000mAh
3-2	Rated voltage		3.2V
3-3	Energy density (Wh/kg)		100
3-4	Internal Resistance		$\leq 4m\ \Omega$
3-5	Charge (CC-CV)		Charged with constant current to 3.65v and then charged with constant voltage to 0.1-0.2A
3-6	Charge (float)		$\leq 3.6V$
3-7	Max. charging current		3C
3-8	Standard. charging voltage		$3.65 \pm 0.05V$
3-9	Recommended charging current		0.5C
3-10	Max. continuous discharging current		5C
3-11	Max.pulse discharging current(30seconds)		10C (150A)
	Recommended discharging current		1C(15A)
3-12	Max. End-off discharged voltage		2.0V
3-13	Self discharge rate (monthly)		2-3%
3-14	Dimensions (mm)	Diameter	$40 \pm 1$
		Height	$165.5 \pm 0.5$
3-15	Weight (Approx.)		480g
3-16	Working temperature	Charging	0~45°C
		Discharging	-20~65°C
3-17	Storage temperature	In one month	-20~45°C
		In six months	-20~35°C

\*The battery shall be in the state of half –fully charged or with the voltage of 3.2~3.3V during storage and transportations.

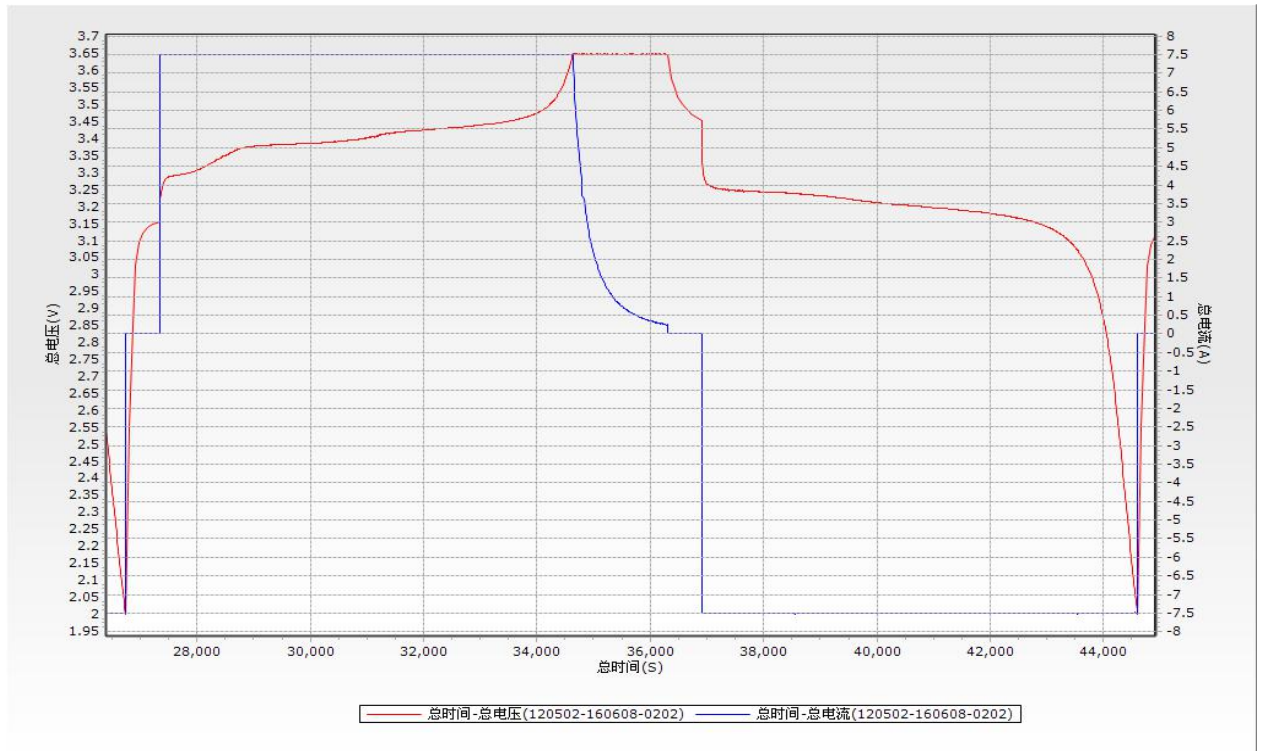
3-18 The dimensions drawing:



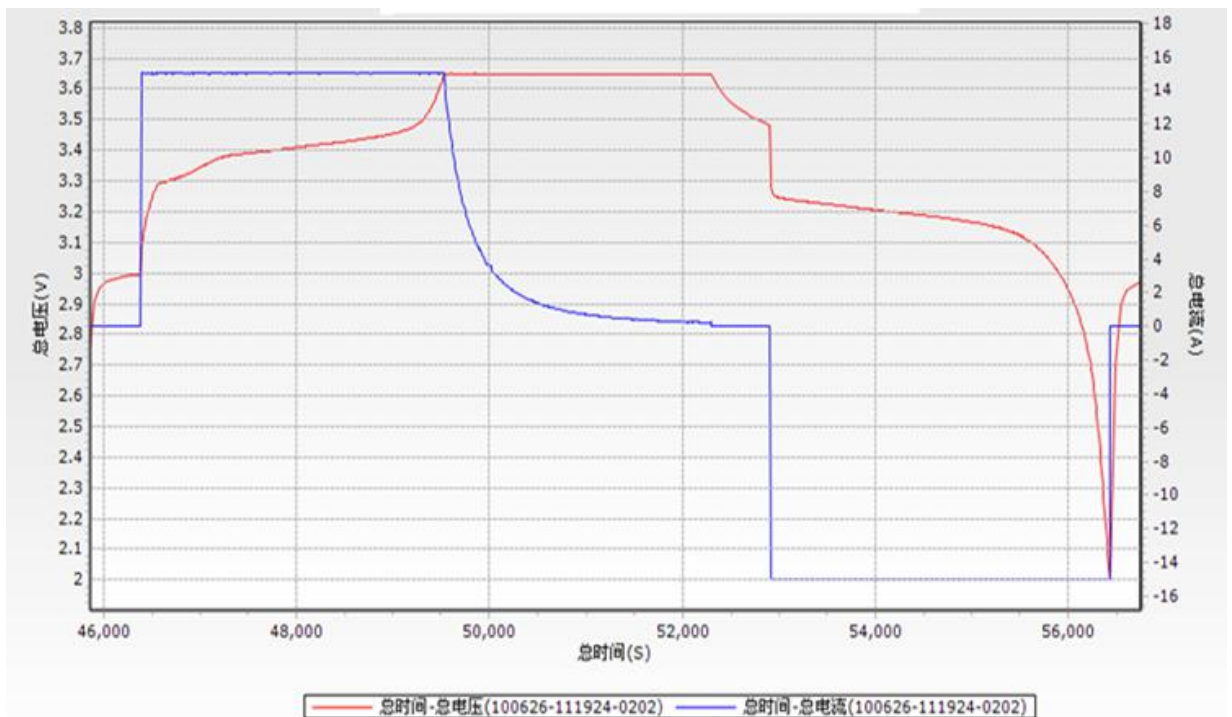
**40152S discharging curves at different temperature:**



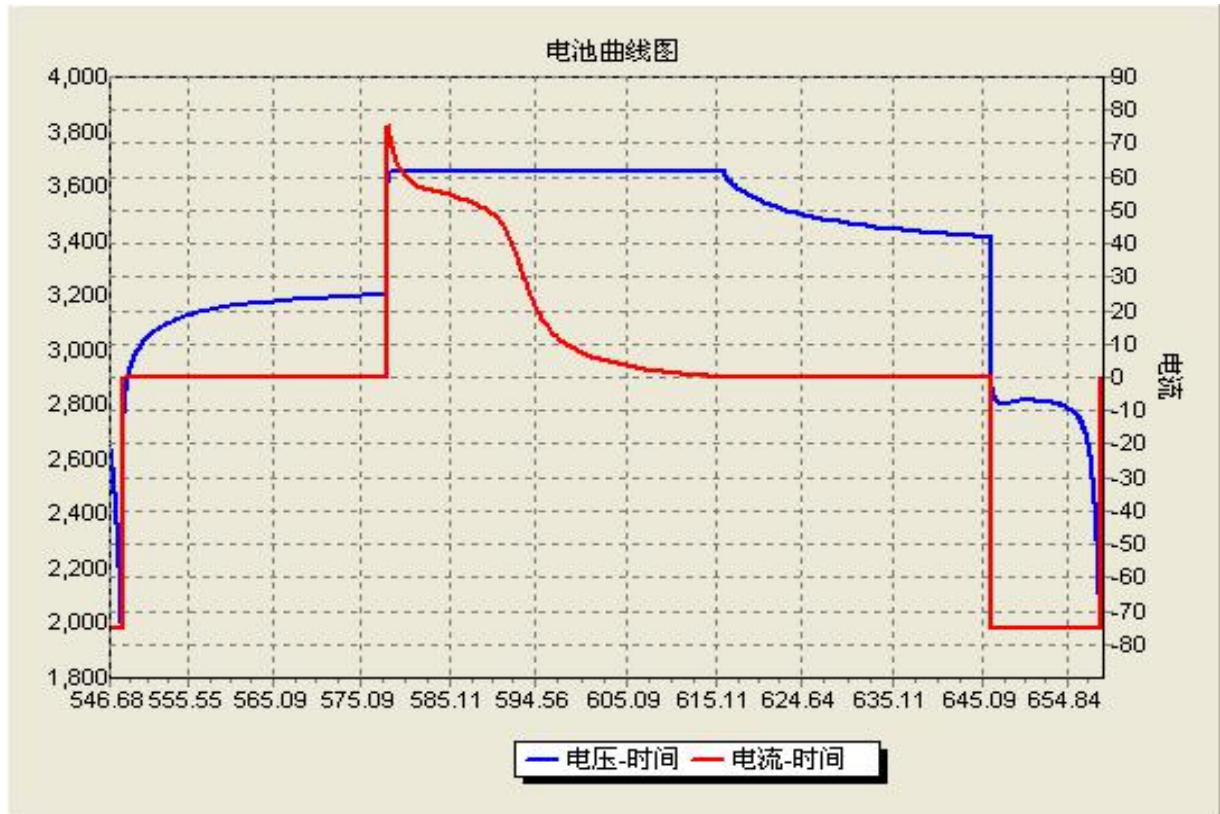
**40152S discharging and charging curves at 0.5C:**



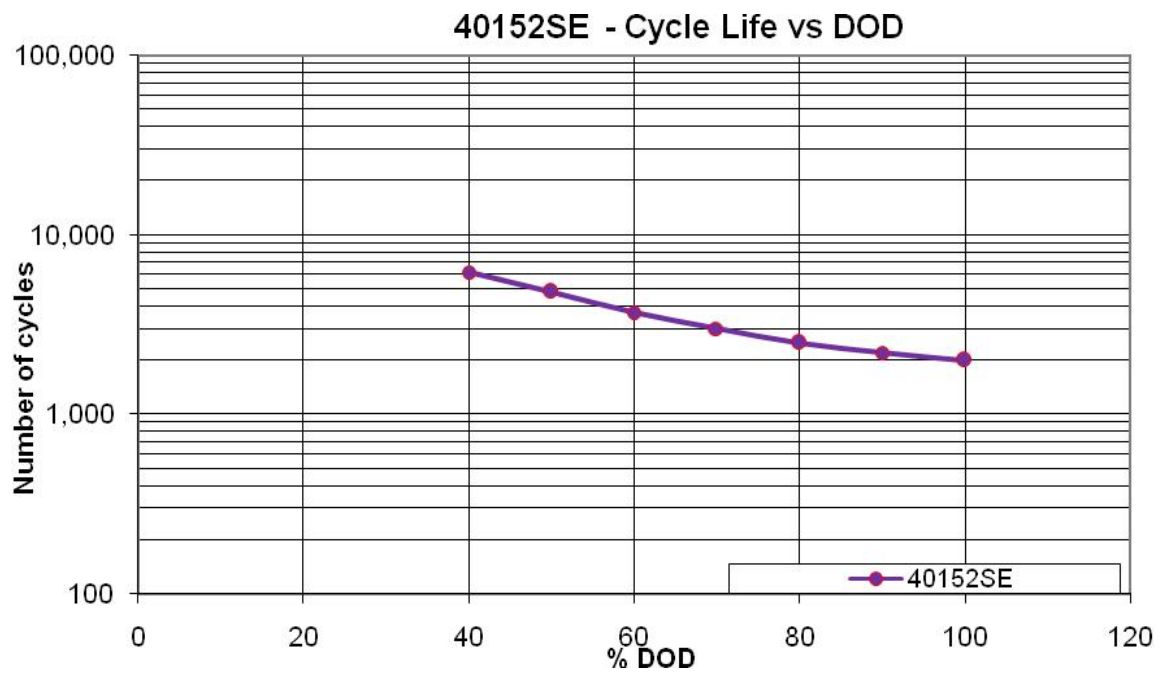
40152S discharging and charging curves at discharging rate of 1C:



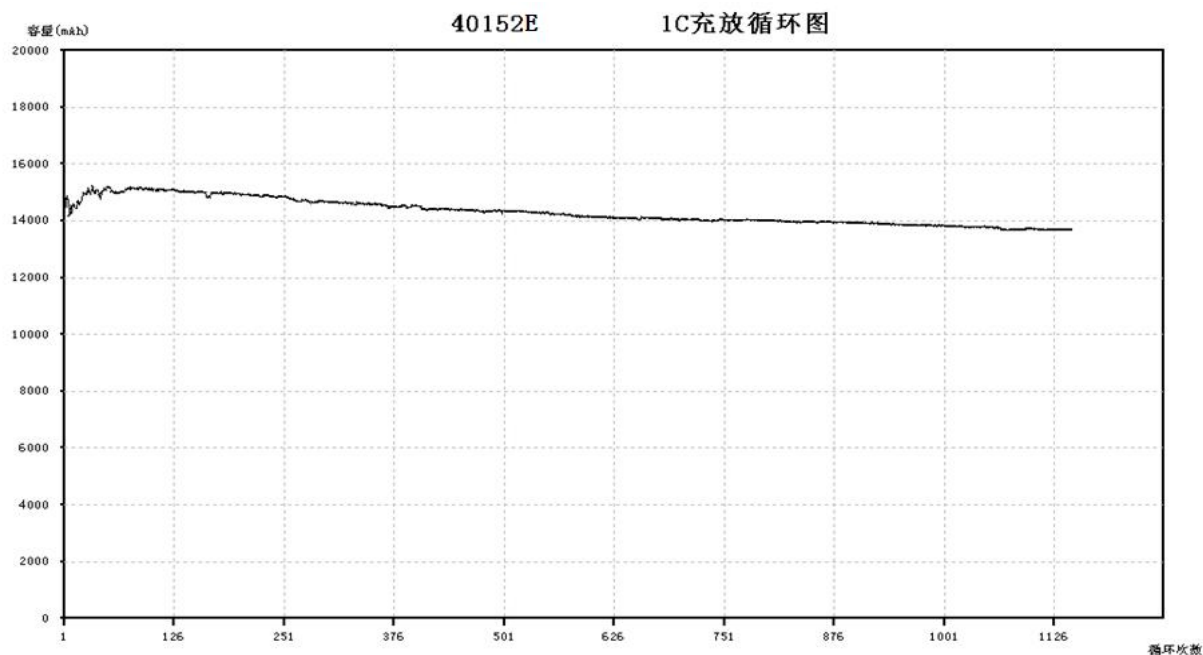
40152S discharging and charging curves at discharging rate of 5C:



40152S cycle life vs DOD:



40152S cycle life at 1C:



### 4. Test conditions

4.1 The experiments and survey should be on the nominal temperature of  $20 \pm 5^\circ\text{C}$ , and the nominal humidity should be  $65 \pm 20\%$ .

Standard charging: first charged by constant current of 0.5C, then by constant voltage up to 3.65V, and when the current falls down to 300mA, then stop the charging.

Standard discharging: discharging at constant current of 7500mA until the voltage falls down to 2.0V.

4.2 The testing facilities:

Voltmeter: Impedance  $> 1000 \Omega$ /piece;

Ammeter Total resistance  $< 0.01 \Omega$ ;

Vernier Caliper: Precision: 0.02mm;

### 5. Testings

#### 5.1 Appearance

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

#### 5.2 Characteristics

Item	Test program	Standard
5.2.1 Open-circuit voltage	After standard charging ,then measure the open-circuit voltage in one hour.	$\geq 3.3\text{V}$
5.2.2 Nominal capacity	Discharging by constant current of 0.5C in one hour until the voltage falls down to 2.0V	Capacity $\geq 15\text{Ah}$
5.2.3 Cycle life	At the temperature of $25 \pm 5^\circ\text{C}$ , charged by constant	$\geq 2000$ times

	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 $\leq 300\text{mA}$ , 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 $\leq 12000\text{mAh}$ for two continuous cycles, then it is considered as dead	
5.2.4 Reserve ability of the capacity	After standard charging and stored at $25 \pm 5^\circ\text{C}$ for 28days, then discharging at 0.5C to the voltage of 2.0V, the reserved capacity is $\geq 90\%$ nominal capacity.	Capacity $\geq 13.5\text{Ah}$
5.2.5 High Temperature performances	After standard charging and stored at $60 \pm 2^\circ\text{C}$ for 4 hours, then discharging at 0.5C to voltage of 2.0V, the reserved capacity is $\geq 90\%$ nominal capacity.	Capacity $\geq 13.5\text{Ah}$
5.2.6 Low temperature performances	After standard charging and storage at $-10 \pm 2^\circ\text{C}$ for 4 hours, then discharging at 0.5C to the voltage of 2.0V, the reserved capacity $\geq 60\%$ nominal capacity.	Capacity $\geq 9\text{Ah}$
5.2.7 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 <b>horizontal plane</b> 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.
5.2.8 Thermal shock	After putting the battery into the incubator, the temperature should be increased continuously at the rate of $5^\circ\text{C} \pm 2^\circ\text{C}/\text{min}$ to $130^\circ\text{C}$ and kept for 30 min, then take out the battery, resume to the room temperature.	The battery must be no fire, no explosion.
5.2.9 Overcharged	The test is made at temperature of $20^\circ\text{C} \pm 5^\circ\text{C}$ . The battery should be discharged at $I_5\text{A}$ 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 $15I_5\text{A}$ , The voltage should not be lower than 10V, charging for 7 h or and the voltage stays the same, until the current falls down to 0.	The battery must be no fire and no explosion
5.2.10 Forced discharge	The test is made at temperature of $20^\circ\text{C} \pm 5^\circ\text{C}$ . Discharged at $I_5\text{A}$ until the voltage falls down to 2.0V, then reverse charged at $5I_5\text{A}$ current for 90 min.	The battery must be no fire and no explosion.
5.2.11 Short circuit	After standard charging fully, put a battery which is connected with thermocouple (The essential resistance of the circuit should be less than $50\text{m}\Omega$ ), short circuit for the anode and cathode, monitoring the temperature of the battery, when the battery temperature falls with a range of $10^\circ\text{C}$ , then stop the testing.	The battery must be no fire and no explosion.
5.2.12 Acupuncture	The test is required to operating at the temperature of	The battery must

	<p>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.</p>	<p>be no fire and no explosion.</p>
5.2.13 Heavy Impact	<p>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.</p>	<p>The battery must be no fire and no explosion.</p>
5.2.14 Vibration	<p>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 30minutes, and the speed is 1oct/min.</p>	<p>There is no damage of the appearance and no smoking, no penetration, no explode, and the voltage is no less than 3.2V</p>
5.2.15 Collision	<p>After vibration testings, fix the battery from X,Y,Z three <b>perpendicularity and colliding pulsely at 100m/s<sup>2</sup></b> , and 40~80times per min, and each pulse collisions keeps 16ms and 1000±10 times.</p>	<p>There is no damage of the appearance and no smoking, no penetration, no explode, and the voltage is no less than 3.2V</p>
5.2.16 Free fall drop	<p>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 voltage is 2V, then make they charging and discharging cycles no less than 3cycles.</p>	<p>No fire, no explode, and the discharging time is no less than 51minutes</p>
5.2.17 Storage Characteristics	<p>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</p>	<p>Remaining capacity ≥ 13.5Ah</p>



**6. Matters need attention.**

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

**7.Shelf life**

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

**8.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.