SUNNIVA POWER CORPORATION	PRODUCT SPECIFICATION	Version:	A/0
		DATE:	2019-07-17
		DOC No:	

1 Scope

This specification is applied to describe the related Battery product in this Specification and the Battery/cell supplied by manufacturer only.

2 Model： 32650 3.2V 6Ah

3 Cell Specification

No.	Items	Specifications		Remark
1	Nominal Capacity	6Ah		0.2C Standard discharge 0.2C
2	Minimum Capacity	5.8Ah		
3	Nominal Voltage	3.2V		Mean Operation Voltage
4	Delivery voltage	3.0-3.3V		Within 10 days from Factory
5	Charge Voltage	3.65V±0.05V		By standard charge method
6	Standard charging method	0.2C constant current,3.65V constant voltage charge to 3.65V,continue charging till current decline to ⩽0.01C		0.2C 3.65V⩽0.01C ,6.5h
7	Charge current	0.2C	1.2A	Standard charge, charge time about 6.5h(Ref)
		0.5C	3A	Rapid Charge, charge time about: 2.5h(Ref)
8	Standard discharging method	0.2C constant current discharge to 2.0V,		1.0C 2.0V
9	Cell Internal Impedance	⩽25mΩ		Internal resistance measured at AC 1KHz after 50% charge

3 Cell Specification

No.	Items	Specifications		Remark
10	Maximum charge current	0.5C	3A	For continuous charging mod 连续充电模式
11	Maximum discharge current	3C	18A	For continuous discharge mode
11	Operation Temperature and relative humidity Range	Charge	0~45℃ 60±25%R.H.	Charge at a very low temperature such as blew 0℃,will be get a lower capacity and reduce cycle life of the battery
		Discharge	-20~60℃ 60±25%R.H.	
13	Storage temperature for a long time	-20~25℃ 60±25%R.H.		Do not storage exceed half year. Must charge once when storage for half year. must charge the battery which with protect circuit when storage for three months.
14	Temperature Dependence of discharge capacity	Cells shall be charged per 3.3.1 and discharged @0.2 C_5A to 3.0 volts. Except to be discharged at temperatures per Table 3. Cells shall be stored for 3 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of a cell at each temperature shall be compared to the capacity achieved at 23 ºC and the percentage shall be calculated. .		Each cell shall meet or exceed the requirements of Table 3

Table 3

Discharge Temperature	-10℃	0℃	23℃	60℃
Discharge Capacity（0.2 C_5A）	70%	80%	100%	95%

4 Battery/Cell performance test Criteria

Appearance inspection by visual

There shall be no such defect as rust, leakage, which may adversely affect commercial value of battery.

Environmental test condition

Unless otherwise specified, all test stated in this product specification are conduct at below test condition

Temperature: 20℃~25℃

Relative Humidity:60%±25% R.H.

Cell Electrical characteristics

No	Items	Test Method and Condition	Criteria	
1	Rated Capacity at 0.2C(Min.)	After standard charge, the capacity shall be measured on 0.2C discharge till the voltage discharge to2.0V,	≥5.8Ah	⩾100%
	Rated Capacity at 1C(Min.)	After standard charge, the capacity shall be measured on 1C discharge till the voltage discharge to2.0V,	⩾97%	
2	Cycle Life	Charging and discharging battery as blew conditions 0.2C standard charge to3.65V end-off 0.2C standard discharge to 2.0V cut-off Continuous charge and discharge for 2000cycles ,the capacity will be measure after the 2000th cycle	⩾80% of initial capacity	
	Capacity retention	The battery to be charge in accordance with standard charge condition at 20~25 ℃,then storage the battery at an ambient temperature 20~25℃ for 28 days. Measure the capacity after 30 days with 0.2C at 20~25℃ as retention capacity	Retention capacity ⩾90%	

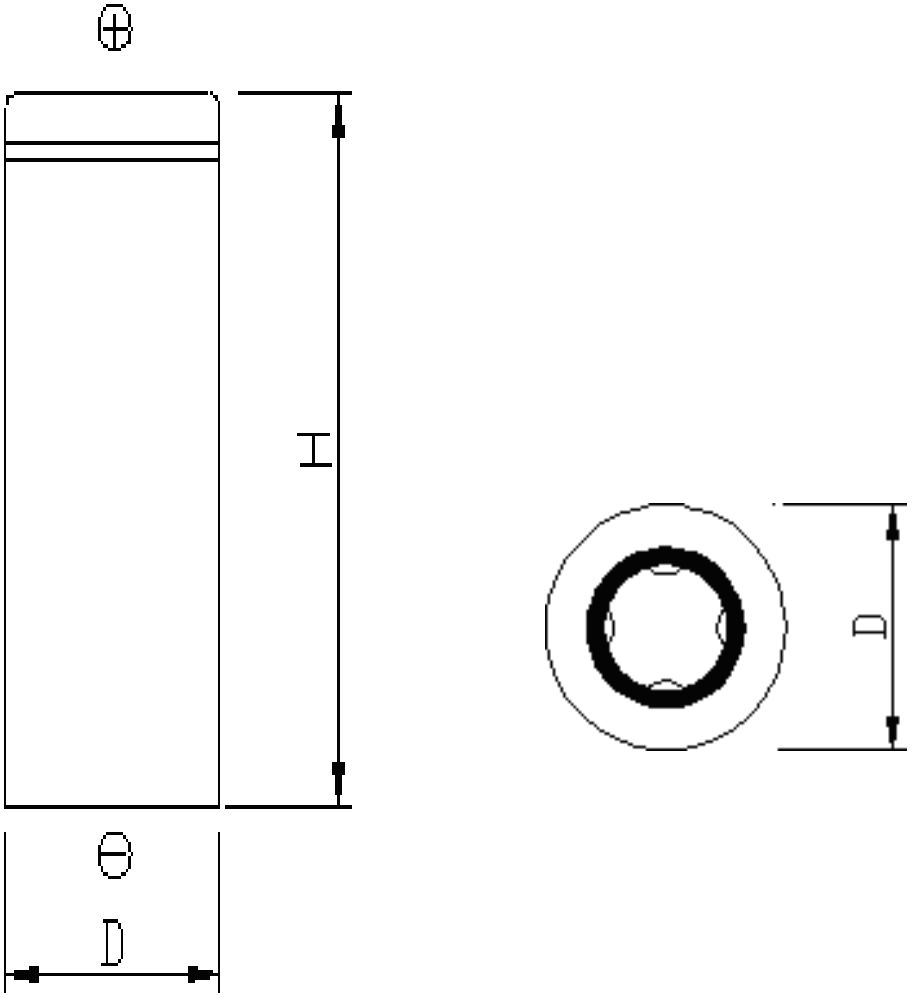
4.4 Mechanical characteristics

No	Items	Test Method and Condition	Criteria
1	Free fall test	The battery to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1,0 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations.	No Fire, No explosion,
2	Vibration test	After standard charging, 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 and 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No explosion, No leakage, No fire
3	Crush test	Fully charged the battery in accordance with standard charge condition, the battery is to be crushed between two flat plates. Continuous to applied force on battery of 13kN(17.2Mpa),stopped until a pressure reading of 17.2Mpa is reached on the hydraulic ram	No fire，No explosion,
4	Shock test	The fully charged battery is secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the cell or battery. The battery is subjected to a total of three shocks of equal magnitude. The shocks are applied in each of three mutually perpendicular directions. At least one of them shall be perpendicular to a flat face. For each shock the cell or battery is accelerated in such a manner that during the initial 3 milliseconds the minimum average acceleration is 75 gn. The peak acceleration shall be between 115 gn and 175 gn. Cells or batteries are tested in an ambient temperature of 20~25℃	No explosion, No leakage, No fire

4.4 **Safety performance**

No	Items	Test Method and Condition	Criteria
1	Thermal exposure test	Each fully charged cell, stabilized at room temperature, is 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 10 min before the test is discontinued.	No explosion, No fire
2	Short test (20℃)	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100m Ω .Tests are to be conducted at room temperature 20~25℃.	No explosion, No fire The Temperature of the Battery surface not exceeded than 150℃
3	Short test (60℃)	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100m Ω .Tests are to be conducted at room temperature about 60-65℃	No explosion, No fire The Temperature of the Battery surface not exceeded than 150℃
4	Forced discharge test	A discharged cell is subjected to a reverse charge at 1C for 90 min.	No explosion, No fire
5	Over charge test	After standard charge, continue to charge with a constant voltage 10V per a cell, holding 8h.	No explosion, No fire,

5 Cell initial Dimensions



NO	Items	Units: mm
1	diameter	Max 32.5mm
2	Height	Max 70.9mm

6 Battery specifications

No.	Items	Specifications	Remark
1	Capacity for assembled cell discharging by 0.2C	⩾59Ah	Standard discharging method
2	Battery Voltage	48.75-49.5V	Delivery Voltage, Within 10 days from Factory
3	Standard charge condition	Charge with 0.2C constant current and 54.75V constant voltage, charge to54.75V,continue charging till current decline to ⩽0.01C	Charge volage 54.75V±0.05V Charge current: 0.2C
4	continuous charge current per pack	Extended constant current charging current	⩽30A
5	Standard discharging method	0.2C constant current discharge to 37.5V	0.2C 37.5V
6	Maximum continuous discharge current per pack	Extended working current	50A
6	Internal Impedance	Assemblage Impedance⩽150mΩ	Measure the Red and black wire of the connector after assembling.

7 Battery Pack Dimensions

Dimension：385mm*444.5mm*155mm

8 Handling of Cells

Prohibition short circuit

Never make short circuit cell. It generates very high current which causes heating of the cells and may cause electrolyte leakage, gassing or explosion these are very dangerous.

The LIR tabs may be easily short-circuited by putting them on conductive surface.

Such outer short circuit may lead to heat generation and damage of the cell.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

8.2.Mechanical shock

Falling, hitting, bending, etc. may cause degradation of LIR characteristics.

9 Notice for Designing Battery Pack

Pack toughness

Battery pack should have sufficient strength and the LIR cell inside should be protected from mechanical shocks.

Cell fixing

The LIR cell should be fixed to the battery pack by its large surface area. No cell movement in the battery pack should be allowed.

Inside design

No sharp edge components should be insides the pack containing the LIR cell.

Tab connection

Ultrasonic welding or spot welding is recommended for LIR tab connection method.

Battery pack should be designed that shear force are not applied to the LIR tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

1) The solder iron should be temperature controlled and ESD safe;
2) Soldering temperature should not exceed 350°C;
3) Soldering time should not be longer than 3s;
4) Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
5) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

For mishaps

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

1) Isolate PCM (Protection Circuit Module) from leaked electrolyte as perfectly as possible.
2) Avoid narrow spacing between bare circuit patterns with different voltage.(Including around connector)

LIR battery should not have liquid from electrolyte, but in case If leaked electrolyte touch bare circuit patterns, higher potential terminal material may dissolve and precipitate at the lower potential terminal, and may cause short circuit. The design of the PCM must have this covered.

10 Notice for Assembling Battery Pack

Shocks, high temperature, or contacts of sharp edge components should not be allowed in battery pack assembling process.

11 Others

Cell connection

1) Direct soldering of wire leads or devices to the cell is strictly prohibited.
2) Lead tabs with pre-soldered wiring shall be spot welded to the cells.

Direct soldering may cause damage of components, such as separator and insulator, by heat generation.

Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack shall be structured with no short circuit within the battery pack, which may cause generation of smoke or firing.

Prohibition of disassembly

1) Never disassemble the cells

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

2) Electrolyte is harmful

LIR battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very dangerous and is prohibited.

Prohibition of cells immersion into liquid such as water

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

Battery cells replacement

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

Prohibition of use of damaged cells

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more.

The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

12 Period of Warranty

The period of warranty is three years from the date of shipment. We guarantee to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

13 Storage of the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity.

We recommend that batteries be charged about once per half a year to prevent over discharge.

14 Other

The Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change

15 Note

Any other items which are not covered in this specification shall be agreed by both parties.