Specification

MODEL: 26650-3.2-3600

Prepared By/Date: 03/20/2022
Checked By/Date:
Approved By/Date: 04/11/2022

Customer NO.
Customer Approval
Signature:
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Amendment Records

Revision	Description	Prepared by	Approved by	Date
A/00	First Publish			04/11/2022
A/01	Increase battery charge discharge restrictions			04/13/2022

Special Requirement

Customer should propose their special requirement and communicate with Soshine in advance. If there were some application or operation conditions are different from this specification, Soshine may change the design or product according to customer's special requirement.

No.	Special Requirement	Standard
1		
2		
3		
4		

1 Definition

1.1	Temperature of environment	Temperature of environment which battery stayed.
1.2	BMS	An effective battery management system that could record the parameters of battery during the service life. The parameters including but not limited to “Voltage”, “Current”, “Temperature and so on. This could make sure product application or operation conditions are conformity with our specification.
1.3	Cell Temperature	Temperature that was measured by temperature sensor on the surface of cells.
1.4	New Cells	It refers to the status within 7 days from the date of warehousing of the cells
1.5	Charge C-Rate	The ratio of the charging current to the battery capacity of the battery.
1.6	Cycle	The battery is charged and discharged once in accordance with the prescribed charging and discharging standards for one cycle. The cycle includes a short period of normal charging or a combination of regeneration charging and discharging processes, in the charging process sometimes only normal charging and no regeneration charging. Discharge may be formed by a combination of some partial discharges.
1.7	Production Date	The manufacture date of the battery. The date of the printed bar code on each associated battery.
1.8	Open-Circuit Voltage	The voltage of the battery is not connected to any load and circuit.
1.9	Recoverable Capacity	After the battery is stored, the maximum value of 3 measurements is selected according 4.5, 4.9 and 4.12, 4.6 to the capacity measured by the standard charge and discharge conditions.
1.10	Standard Charge	0.2C constant current, 3.65V constant voltage charge to 3.65V,continue charging till current decline to ≤0.01C.
1.11	Standard Discharge	0.2C constant current discharge to 2.0V.
1.12	Guarantee period	The general quality assurance period of products. Within one year from the date of manufacture of the product or as agreed by both parties.
1.13	Stage of Charge（SOC）	In the case of no load, the linear relationships of battery charging capacity are measured in Mill ampere hour or watt hour.
1.14	Temperature rise	The increase of cell temperature during charging process or discharge according to the specification.

2 Scope

This specification is applies to describe the related battery product in this specification and the battery/cell supplied by Soshine only, as well as product conditions of use and risk warnings.

3 Model：26650-3.2-3600

4 Cell Specification

No.	Items	Specifications		Remark
4.1	Type	LiFePO4		Lithium iron phosphate
4.2	Capacity	Nominal Capacity	3600mAh	0.2C Standard discharge & new battery status
		Minimum Capacity	3500mAh	
4.3	Voltage	Nominal Voltage	3.2V	Mean Operation Voltage
4.4		Operation Voltage	2.0~3.65V	
4.5		Absolute Charging Voltage	3.65V±0.03V	By standard charge method ,3.65V max for unit cells
4.6		Discharge Cut-off Voltage	2.0V(Min.)	For unit cell
4.7		Delivery voltage	3.2~3.3V	Within 10 days from factory
4.8	Standard charging method	0.2C constant current, 3.65V constant voltage charge to 3.65V, continue charging till current decline to ⩽0.01C		
4.9	Charge current	0.2C(Standard)	720mA	Standard charge, charge time about 6h(Ref)
4.10		0.5C	1800mA	Rapid Charge, charge time about: 3h(Ref)
4.11		1C(Maximum)	3600mA	For continuous charging mod. Ambient temperature 25°C
4.12	Discharge Current	0.2C(Standard)	720mA	constant current discharge to 2.0V,
4.13		1C(Maximum)	3600mA	For continuous discharge mod. Ambient temperature 25°C
4.14		5C(Maximum Pluse)	18000mA	The surface temperature of the cell ⩽60°C, and the maximum time is 3S
4.15	Impedance	Cell Internal	<15mΩ	Internal resistance measured at AC 1KH$_Z$ new cell after 50% charge new cell
4.16	Operation Temperature and relative humidity Range	Absolute Charge	0~45°C 60±25%R.H	Cell Surface Temperature Charge at a very low temperature such as blew 0°C, will be get a lower capacity and reduce cycle life of the battery. **Beyond the temperature range of charge and discharge, the battery must stop working**
4.17		Absolute Discharge	-20~60°C 60±25%R.H.	
4.18		Standard charging temperature	25±2°C	
4.19		Standard discharging temperature	25±2°C	
4.20	Storage temperature for a long time	-20~25°C 60±25%R.H.		**Do not storage exceed half year. Must charge once when storage for half year. Batteries with protection circuits must be charged once every 3 months**
4.21	Self-discharge Rate Per Month	≤3.5%		New cell after stored more than 3 months
4.22	Shipment Capacity	50% SOC (≥1800mAh)		
4.23	Weight	About 82g		

5 Battery/Cell performance test Criteria

5.1 Appearance inspection by visual

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

5.2 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.

5.3 Cell Electrical characteristics

No	Items	Test Method and Condition	Criteria	
5.31	Rated Capacity at 0.2C(Min.) 0.2C	After standard charge, the capacity shall be measured on 0.2C discharge till the voltage discharge to 2.0V,	≥3500mAh	⩾100%
	Rated Capacity at 0.5C(Min.) 0.5C	After standard charge, the capacity shall be measured on 0.5C discharge till the voltage discharge to 2.0V,	≥1750mAh	⩾98%
	Rated Capacity at 1C(Min.)	After standard charge, the capacity shall be measured on 1C discharge till the voltage discharge to 2.0V,	≥3500mAh	⩾96%
5.3.2	Cycle Life	Charging and discharging battery as blew conditions 0.2C standard charge to 3.65V end-off 0.2C standard discharge to 2.0V cut-off Continuous charge and discharge for 1000cycles ,the capacity will be measure after the1000th cycle	⩾80% of initial capacity	
5.3.3	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 1C at 20~25℃ as retention capacity	Retention capacity ⩾85%	
5.3.4	Temperature Dependence of discharge capacity	Cells shall be charged per 5.3.1 and discharged @0.2 C5A to 2.0 volts. Except to be discharged at temperatures per Table1. 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 1	

Table1

Discharge Temperature	-20°C	-10°C	0°C	23°C	60°C
Discharge Capacity (0.2 C5A)	40%	50%	80%	100%	95%

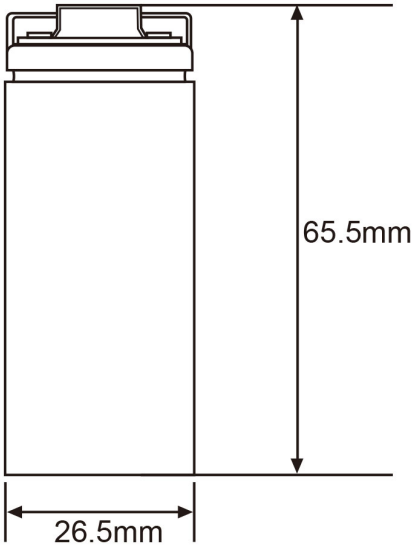
5.4 **Mechanical characteristics**

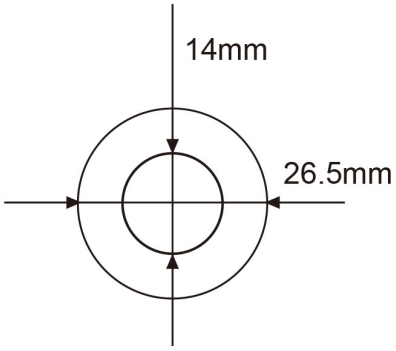
No	Items	Test Method and Condition	Criteria
5.4.1	Free fall test	The battery to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations.	No Fire
5.4.2	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

6 Safety performance

No	Items	Test Method and Condition	Criteria
6.1	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
6.2	Short test (20°C)	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100mΩ.Tests are to be conducted at room temperature 20~25°C.	No explosion, No fire The Temperature of the Battery surface not exceeded than150°C
6.3	Short test	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100mΩ.Tests are to be conducted at room temperature about 60-65°C.	No explosion, No fire The Temperature of the Battery surface not exceeded than150°C
6.4	Forced discharge test	A discharged cell is subjected to a reverse charge at 0.5C for 150 min.	No explosion, No fire
6.5	Over charge test	After standard charge, continue to charge with a constant voltage 10V per a cell, holding 8h.	No explosion, No fire

7 Cell initial Dimensions





NO	Items	Units: mm
1	Cell Diameter	D 26.5±0.2
2	Cell Height	H 65.5±0. 2
3	Diameter	d 14±0.2

8 Considerations for different charging methods

8.1 Other Charge Model

Cell surface Temperature	Standard Charge	Fast Charge	Fierce charge
＜0°C	Prohibited	Prohibited	Prohibited
0~10°C	0.3C	0.5C	Prohibited
10~20°C	0.5C	1C	Prohibited
20~45°C	1C	2C, Cell's SOC ≤50% AND charge time less than 5mins	Prohibited
＞45°C	Prohibited		

8.2. Pules Charge Model

Regenerative pulse charging refers to the charging of the electric cell during the process of product use. The regenerative pulse charging must meet the charging state and cell temperature condition described in this specification. The magnitude and duration

of the pulse current must strictly observe all the charging states and cell temperature conditions listed in the table below.

Violation of regenerative pulse charging conditions may result in permanent damage to the cell and there by releases product quality responsibility. Maximum regenerative pulse charging voltage 3.65V.

Regenerative pulse charging current and duration

SOC	Cell Surface Temperature				
	≤0℃	0~10°C	10~20°C	20~45°C	＞45°C
＞95%	Prohibited	Prohibited	Prohibited	0.5C,＜10S	Prohibited
80%~95%	Prohibited	Prohibited	1C,＜10S	1C,＜10S	Prohibited
50%~80%	Prohibited	1C,＜10S	2C,＜10S	2C,＜10S	Prohibited
＜50%	Prohibited	2C,＜10S	2C,＜10S	3C,＜10S	Prohibited

After each regenerative pulse charging, the battery needs to have a period of storage, which should be equal to or longer than the duration of the regeneration pulse. During storage, the battery can be discharged, or it can be a no working condition, but in the storage period, the battery will not be allowed to reproduce pulse charging again.

9 Considerations for different charging methods

Battery life is limited. Customers should set up an effective tracking system to detect and record the internal resistance of the battery. The measurement methods and calculation methods of internal resistance require customers and Soshine to discuss and agree with both parties. When the battery internal resistance is more than 250% of the initial resistance, they should stop using the battery. Any violation of the requirements will be exempt from Soshine's quality guarantee responsibility which based on product sales contract and this specification.

10 Application Condition

Customers should use the battery according to the following correct conditions of use，Customer should apply BMS to monitor, manage and protect each battery.

10.1.1. Customer shall provide BMS detailed design, system characteristic, framework, system data information to Soshine, based on these data system, could evaluation, and build the battery management files.

10.1.2. Without authorization, the customer shall not modify or change the design and framework of the battery management system, to make sure not to affect the performance of the battery.

10.1.3. The customer shall keep the monitoring data of the complete battery operation as a reference for product quality responsibility.

The Soshine does not undertake the product quality assurance responsibility without the inspection data of the complete battery system.

10.1.4. The battery management system needs to meet the following basic requirements:

No.	Parameter	Specification	Protection Action
10.1.4.1	Stop Charging	3.65V	Stop charging when the voltage reaches 3.65V
10.1.4.2	First-Stage Overcharge Protection	≥3.8V	Stop charging when the voltage reaches 3.8V
10.1.4.3	Second-Stage Overcharge	＞4.0V	When the cell voltage reaches 4.0V, locking the battery management system until the technician solves the problem
10.1.4.4	Stop Discharge	2.0V (Min.)	Stop discharging when the cell voltage reaches 2.0V, Minimize the current
10.1.4.5	First-Stage Over-discharge	1.8V(Min.)	Stop discharging when the cell voltage reaches 1.8V, Minimize the current
10.1.4.6	Second-Stage Over-discharge Protection	1.6V(Min.)	When the cell voltage reaches 1.6V, locking the battery management system until the technician solves the problem
10.1.4.7	Short-circuit Protection	Short-circuit is Forbidden	When a short circuit occurs, the battery is disconnected from the over current
10.1.4.8	Over current Protection	According to 4.9,4.10,4.11,4.12,4.13 and 4.14	the battery management system controls the discharge current to meet the specifications
10.1.4.9	Overheat Protection	According to4.16 and 4.17	The charge/discharge is terminated when the temperature exceeds the specification of this specification
10.1.4.10	Charging Time Protection	Within 8 hours	Stop charging when charging time is over 8 hours

NOTES: As for above No. 10.1.4.2, 10.1.4.3, 10.1.4.5, 10.1.4.6 are warning clauses, the customer please note: when the battery reaches any of these describe indicators and parameters, it means that the battery has already beyond the conditions of use, the customer should be in accordance with the "protection" and other relevant provisions this specification of battery protection measures, at the same time, Soshine statement on the using state of the battery does not undertake any guarantee responsibility for the quality.

10.1.5. The battery may be permanently damaged when the battery voltage is less than 1.5V, and the product quality assurance of Soshine will be invalid. According to 4.6 this specification, the internal energy consumption of the system should be reduced to minimum when the discharge cut-off voltage is below 2.0V, and the storage time is prolonged before recharging. The customer needs to train the user to recharge the battery in the shortest time to prevent the battery from over-discharge state.

10.1.6. If the battery is expected to be stored for more than 30 days, the SOC should be adjusted to about 50%. If the battery is expected to be stored for more than 90 days, the SOC should be adjusted to about 50% and the battery to be charged and discharged at least once in the whole SOC range (single core 2.0~3.65V) for every 90 days .

10.1.7 The battery should avoid charging (including standard charging, quick charging, emergency charging) in the low-temperature conditions which is prohibited in this specification, otherwise, unexpected capacity reduction may occur. The battery management system should be controlled according to the minimum charge and regenerative charging temperature. It is forbidden to charge when temperature is lower than the temperature conditions specified in this specification. Otherwise, Soshine shall not be liable for quality assurance.

10.1.8. Soshine advises customer should use protection system with balance function.

10.1.9. In the design of the electric box, the heat diffusion of the cells should be fully considered. Soshine shall not be responsible for the quality assurance due to the overheating of the battery or battery caused by the design of the electric box.

10.1.10. The waterproof and dustproof problem should be fully considered in the electrical box design, and the electric box must meet the waterproof and dust-proof grade stipulated by the relevant national standards. Soshine is not responsible for quality assurance due to the damage caused by the waterproof and dustproof problem (such as corrosion, rust, etc.)

11 Storage and cycling performance

No.	Parameter	Specification	Conditions
11.1	Recoverable Capacity(Short time)	≥3492mAh	New Cell is charge to 50% SOC, then stored at 25°C for 28 days Test capacity according to the standard charge and discharge conditions listed in Sections 4.5, 4.9 and 4.12, 4.6 of this specification.
11.2	Recoverable Capacity(Long time)	≥3420mAh	New Cell is charge to 50% SOC, then stored at 25°C for 180 days. Test capacity according to the standard charge and discharge conditions listed in Sections 4.5, 4.9 and 4.12, 4.6 of this specification.
11.3	Absolute Storage Temperature	-20°C ~60°C	
12.4	Capacity After	≥2880mAh(1000 times cycle)	New Cell, cycled according to the standard charge/discharge

12 CAUTIONS IN USE

To ensure proper use of the battery please read the manual carefully before using it.

.Handling

- Do not expose to, dispose of the battery in fire.
- Do not put the battery in a charger or equipment with wrong terminals connected.
- Avoid shorting the battery
- Avoid excessive physical shock or vibration
- Do not disassemble or deform the battery.
- Do not immerse in water.
- Do not use the battery mixed with other different make, type, or model batteries.
- Keep out of the reach of children.
- Don’t transport and store the cell together with metal objects such as necklaces, hairpins.
- Don’t pierce the cell with a nail or other sharp object

Charge and discharge

- Battery must be charged in appropriate charger only
- Never use a modified or damaged charger.
- Do not leave battery in charger over 24 hours.

Storage：Store the battery in a cool, dry and well-ventilated area.

Disposal

- **If the cell beyond the useful-life, please fully discharged, sticks the cell with insulating tape, then put the cell to the specialized recycle bin**
- Regulations vary for different countries. Dispose of in accordance with local regulations.

13 Period of Warranty

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

14 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.

15 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 the battery.

16 Note

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