



## Product Specification

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# Specification for Cylindrical Lithium-ion Cell

**Model: INR18650-2600mAh**

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## Document revision CV

VER	Revised content	Revised page	Date
A/0	Publication	NO	NO
A/1	1. Article 3 Major Technical Parameters: Add the item of Max. Pulse discharge current; 2. Article 6 Safety performance: Add test method sources, update forced discharge, overcharge, free fall test methods, and delete the test item of seawater immersion; 3. Article 8 Transportation: Revised the transport conditions.	P4, P7, P8	2021.08.30



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## Abstract

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## 1. Scope of application

This specification specifies the technical requirements, test methods and precautions for the cylindrical lithium-ion cell manufactured by Shandong Tianhan New Energy Technology Co., LTD.

## 2. Model and description

2.1 Description: the cylindrical lithium-ion cell

2.2 Model: INR18650-2600mAh

## 3. Major Technical Parameters

NO	Item	Specifications		Note
3.1	Capacity	Nominal capacity	2600 mAh	0.2C
		Minimum Capacity	2550 mAh	0.2C
3.2	Alternating Internal Resistance	Max	25mΩ	AC 1 KHZ
3.3	Nominal Voltage		3.6 V	
3.4	Charging Voltage		4.20±0.05 V	
3.5	Standard Charge Conditions (Constant current charging and then constant voltage charging)	Current	0.5C (1300 mA)	
		Voltage	4.20V	25°C±2°C
		Cut-off Current	52±5mA	0.02C
3.6	Max Charging Current	0°C≤T≤5°C	0.1C (260 mA)	
		5°C≤T≤15°C	0.2C (520mA)	
		15°C≤T≤55°C	0.5C (1300 mA)	
3.7	Standard Discharge Conditions (Constant Current Discharge)	Current	0.5C (1300 mA)	25°C±2°C
		Cut-off Voltage	2.75±0.05V	
3.8	Max. Continuous Discharge Current	-20°C≤T≤5°C	0.5C (1300 mA)	
		5°C≤T≤45°C	3C (7800mA)	
		45°C≤T≤60°C	1C (2600 mA)	
3.9	Max. Pulse Discharge Current		13A(5s )	
3.10	Working Temperature	Charge	0~55°C	
		Discharge	-20~60°C	
3.11	Storage Temperature	1 month	-20~60°C	
		3 months	-20~40°C	
		12 months	-20~20°C	
3.12	Weight		≤48g	
3.13	Dimension	Height	65.2±0.3mm	Figure 1
		Diameter	18.3±0.2mm	
3.14	Appearance	No rupture, no scratch, no deformation, no stain, no electrolyte leakage, etc.		

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Figure 1: Schematic drawing of appearance and dimensions (unit: mm)



## 4. Test condition

### 4.1 Standard test condition

If there is no special requirement, the product test conditions in this specification book are temperature: 25°C±2°C, humidity: 65%±20% RH.

### 4.2 Charge method

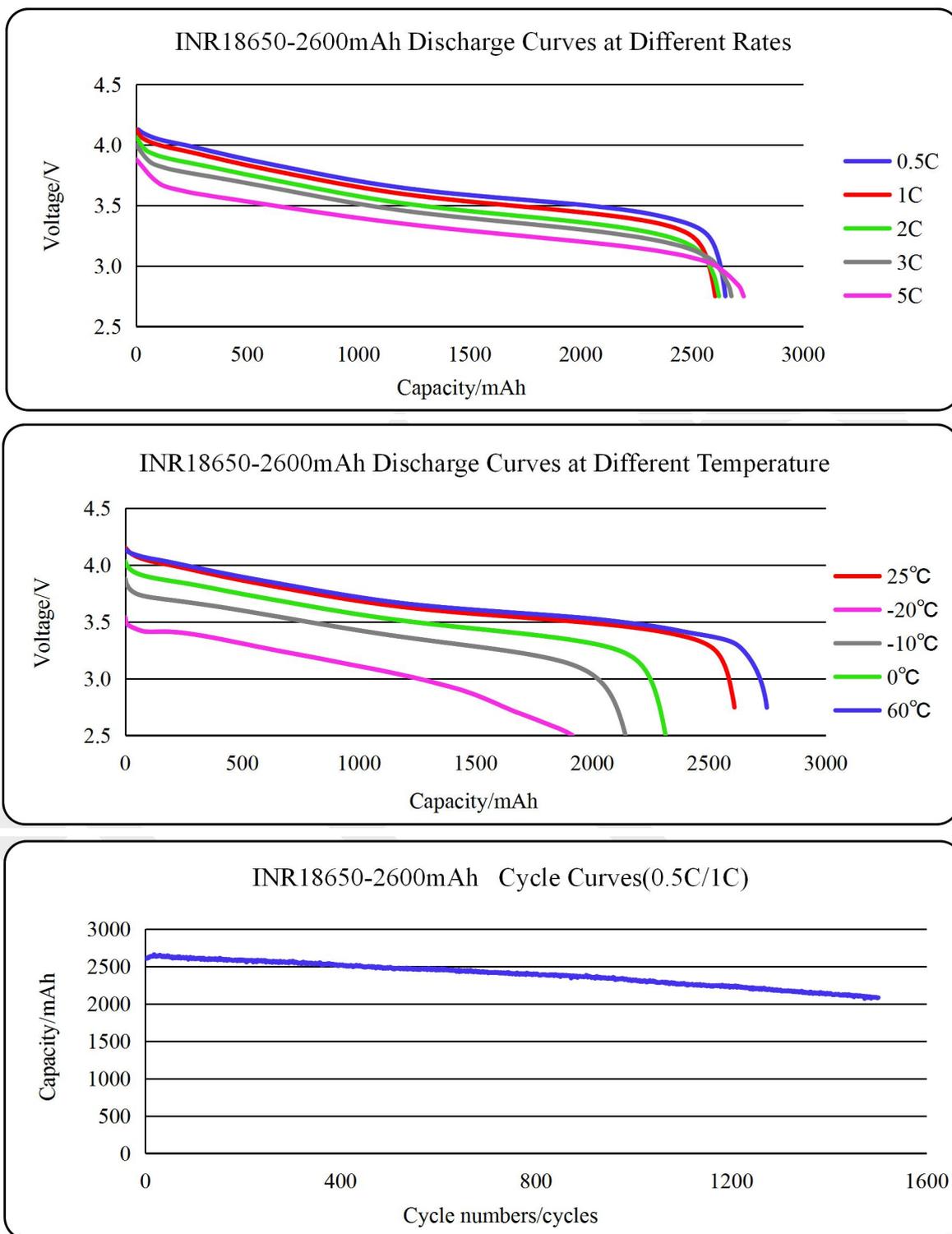
Standard charging means that under the condition that the ambient temperature is 25°C±2°C, charging is firstly done at a constant current of 0.5C to 4.20V, and then charging is stopped at a constant voltage of 4.20V until the current is less than 0.02C.

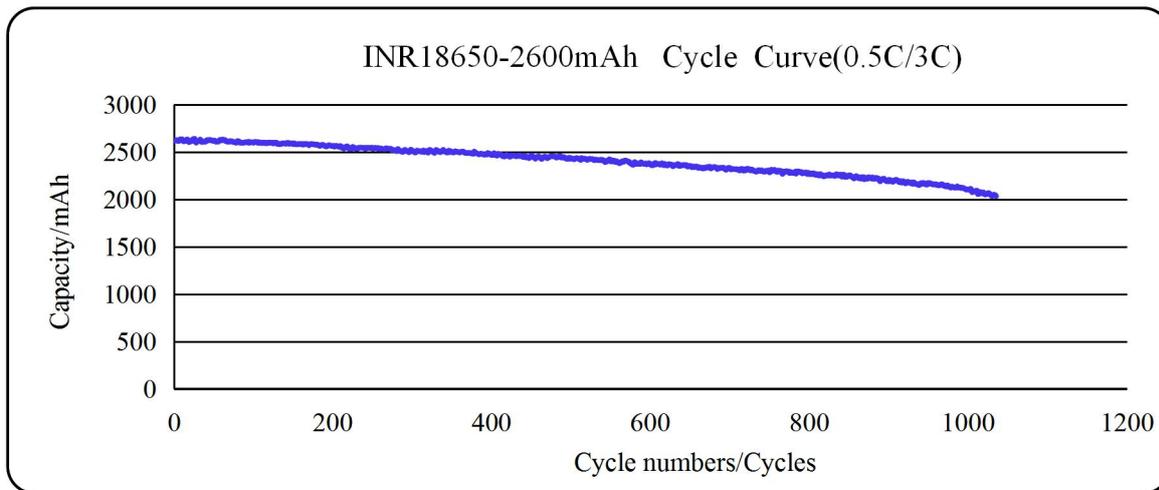
## 5. Electrical Characteristics

NO	Test item	Test method	Standard
5.1	Capacity	The cells is charged according to 4.2 method and discharged to 2.75V with 0.2C current, and record the discharge capacity.	≥2550mAh
5.2	Discharge performance at different rate	After the cells is charged according to 4.2 method, the cells is discharged to 2.75V with the current of 0.5C, 1C, 2C, 3C and 5C, and the percentage of discharge capacity is measured. (0.5C/0.5C, 1C/0.5C, 2C/0.5C, 3C/0.5C, 5C/ 0.5C)	0.5C=100% 1C≥95% 2C≥90% 3C≥88% 5C≥85%

5.3	Discharge performance at different temperatures	After the cells is charged according to the 4.2 method, the cells is stored at -20 °C , -10 °C and 0 °C for 12h, and discharged to 2.5V at 0.5C current . Stored at 25 °C and 60 °C for 5h and and discharged to 2.75V at 0.5C current;Measure the percentage of discharge capacity. ( -20°C/25°C 、 -10°C/25°C、 0°C/25°C、 25°C/25°C、 60°C/25°C )	25°C=100% -20°C≥60% -10°C≥70% 0°C≥80% 60°C≥95%
5.4	Charge retention and capacity recovery ability at normal temperature	The initial capacity of the cells is measured. After charging according to 4.2 method, the cells is stored at room temperature for 28 days, and then discharged at 0.5C current to 2.75V to measure the capacity.After charging in accordance with 4.2, discharge to 2.75V with 0.5C current and measure the recovery capacity.	Storage capacity ≥92% Recovery capacity ≥95%
5.5	Charge retention and capacity recovery ability at high temperature	The initial capacity of the cells was measured. After charging according to the 4.2 method, the cells was stored at 60 °C ± 2 °C for 7 days, and then set aside at room temperature for 5 hours. Then, the cells was discharged to 2.75V with a current of 0.5C, and the capacity was measured.After charging in accordance with 4.2 method, discharge with 0.5C current to 2.75V, and measure the recovery capacity.	Storage capacity ≥92% Recovery capacity ≥95%
5.6	Storage performance	After the cells is charged according to the 4.2 method, after discharging with 1C current for 30min, the cells is stored at 45°C ± 2 °C for 28 days, and then stored at room temperature for 5 hours. After charging according to the 4.2 method, the cells is discharged with 0.5C current to 2.75V, and the discharge capacity is measured.	Recovery capacity >90%
5.7	Cycle life	Stand for 10min after charging according to 4.2 method; Discharge with 1C current to 2.75V, complete a cycle, and stand for 10min;Repeat the steps above. When the discharge capacity is less than 70% of the initial capacity, the life is terminated. Stand for 10min after charging according to 4.2 method; Discharge with 3C current to 2.75V, complete a cycle, and stand for 10min;Repeat the steps above. When the discharge capacity is less than 70% of the initial capacity, the life is terminated.	0.5C charge /1C discharge cycle ≥1000 cycles 0.5C charge /3C discharge cycle ≥600 cycles

Figure 2: Main discharge curve (for reference only)





## 6. Safety performance

The following tests shall be carried out under forced exhaust conditions and explosion-proof measures. Before the test, all batteries shall be charged according to 4.2 method, and the following tests shall be carried out after 24h of use:

NO	Test item	Test method	Standard	NO
6.1	Forced discharge	The battery to be discharged with standard discharging Condition(discharged to 2.75V with 0.5C current), Inverse charge current =1C; time $\geq 90$ mins.	No explosion, no fire	IEC62133
6.2	Overcharge	The battery to be discharged with standard discharging Condition(discharged to 2.75V with 0.5C current), then charge at constant current of 3C to 10V.(or charge at 3C for 90mins)	No explosion, no fire	UL1642
6.3	Short circuit	The cells positive and negative electrode short circuit, with the external circuit the total resistance is $80 \pm 20 \text{ m}\Omega$ . When the cells voltage drops to 0.1V, the test is over.	No explosion, no fire	UL1642
6.4	Thermal abuse	Put the cells into the electric blast drying oven for heating, and the temperature rose to $130 \pm 2^\circ\text{C}$ at a rate of $5^\circ\text{C}/\text{min}$ , and kept for 30 minutes.	No explosion, no fire	UL1642
6.5	Extrusion test	The cells is squeezed between two planes with a pressure force of $13\text{KN} \pm 1\text{KN}$ . Discharge pressure when the extrusion pressure reaches the maximum or the cells voltage drops sharply to 1/3 of the cells voltage.	No explosion, no fire	UL1642
6.6	Heavy impact	The cells was placed on a flat surface and a rod with a diameter of 15.8mm was placed in the center of the cells, with a weight of 9.1kg falling on the sample from a height of $610 \pm 25\text{mm}$ .	No explosion, no fire	UL1642

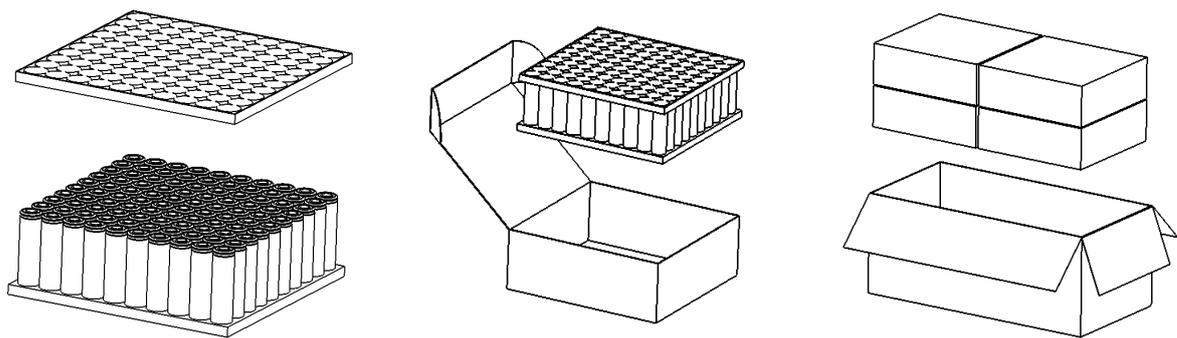
6.7	Low atmospheric pressure	The cells was placed in a low-pressure box, and the air pressure in the test box was adjusted to 11.6kPa. The temperature was room temperature, and the cells was allowed to stand for 6H.	No explosion, No fire, No leakage	UL1642
6.8	Free fall	The cells dropped freely from a height of 1.5m onto the concrete floor or metal floor. The positive and negative end faces of the cells fell once each, and the cylinder fell twice, for a total of four times. After the experiment, the cells was placed for 24h, and then the appearance was observed.	No explosion, no fire	IEC62133
6.9	Vibration	The cells vibrates with a sinusoidal vibration amplitude of 0.8mm, the vibration frequency range is 10Hz~55Hz, and the frequency change rate is 1Hz/min.Vibration along X, Y, Z three directions, each direction vibration $90 \pm 5$ min.	No explosion, No fire, No leakage	UL1642
6.10	Temperature cycle	The cells was used at $75 \pm 2^\circ \text{C}$ for 6h;The temperature was set at $-40 \pm 2^\circ \text{C}$ for 6h, and the maximum interval between the two extremes was 30min.After 10 cycles, the cells shall be tested after being put aside for 24h.	No explosion, No fire, No leakage	UN38.3

## 7. Packaging

7.1 Cells packing: 100 cells per box, 4 boxes per box, 400 cells in total, Outer box size : 455\*232\*172 mm .

7.2 The cells packing case shall be marked with the product name, model, nominal voltage, quantity, gross weight, date of manufacture and the corresponding grade of internal resistance and capacity.

Figure 3: cells packaging structure diagram



## 8. Transportation

Shipping lithium batteries in the transportation process shall not be subject to severe mechanical impact, exposure, rain, not upside down; Handling process should be handled gently, strictly prevent throwing, rolling and heavy pressure.

## 9. Quality guarantee

In 12 months from the date of shipment, any quality problem that is confirmed to be caused by process and not by misuse shall be resolved by the manufacturer. Beyond this deadline, the cells quality problem caused by misuse by customers is not the reason of production process. Tianhan company does not promise to replace the cells for free.

**9.1** Tianhan shall not assume any responsibility for the problems caused by violation of the safety rules.

**9.2** Tianhan shall not take any responsibility for the problems caused by the combination of the circuit, cells pack and charger.

**9.3** Defective batteries produced by customers in the cells assembly process after shipment shall not be included in the scope of quality assurance.

## 10. Cells use warning and Precautions

To prevent possible leakage, heating and explosion of the cells, please pay attention to the following precautions:

→ Before using the new cells or using the cells for the first time after long-term storage, please use a special charger to fully charge the cells before using;

→ Do not disassemble, open, crush, bend, deform, Pierce or break;

→ Do not modify, do not insert external objects into batteries, do not immerse or expose in water or other liquids, and stay away from fires, explosives and other hazards;

→ Do not short-circuit the cells and do not allow metal or other conductors to contact the cells terminal;

→ Do not drop the host or cells, if the host or cells dropped accidentally, users suspect that the cells is damaged, should find the service center for inspection;

→ Changing cell shall be completed by the cells supplier or equipment supplier, and the user cannot replace the cells by himself.

→ The cells can be replaced with a cells that has been certified as standard. Uncertified batteries may cause fire, explosion, or other hazards;

→ Avoid cells storage for a long time, because safety issues may arise when batteries that have been left unused for a long time are recharged

→ If the cells leaks, do not allow the cells to come into contact with the skin or eyes. If contact occurs, flush the contact area with plenty of water or seek medical attention.

→ Children using batteries should be monitored and seek medical attention if they are swallowed.

→ Under no circumstances shall the cell be removed; Removing the cell can cause an internal short circuit that can cause fire and other problems;

→ Under no circumstances shall the cells be burned or put in the fire, otherwise it will cause the cells to burn;

→ Do not remove the sleeve of the cells;

→ Do not mix our batteries with other brands of batteries or different types of batteries.

→ Do not mix old and new batteries, which may cause overdischarge;

→ Dispose of discarded batteries according to local regulations.

## 11. Disclaimer

Shandong Tianhan New Energy Technology Co., Ltd. shall not be responsible for any accident caused by

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failure to operate in accordance with the provisions of this manual. Improper use of the product, improper circuit connection, or the use of input power supply, load function parameters inconsistent with the performance parameters specified in the product manual and other phenomena are improper use. The Company shall not be liable for damage (personal safety) to the product, load and peripheral connectors caused by improper use.

Shandong Tianhan New Energy Technology Co., Ltd. reserves the right to change the contents of this manual. The company reserves the right of final interpretation of the materials.