远东福斯特新能源有限公司
FAR EAST FIRST NEW ENERGY CO.,LTD

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Specification
For
Lithium-ion Rechargeable Cell

Cell Type: 18650-2500mAh

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Designed	**Checked**	**Approved**	
刘卫东			

Contents

1 Preface

This specification describes the type and dimensions, performance, technical characteristics, warning and caution of the lithium ion rechargeable cell. The specification only applies to 18650 cell supplied by Far East First New Energy Co., Ltd.

2 Definition

2.1 Rated capacity and minimum capacity:

Rated capacity: Cap=2500mAh, minimum capacity: Cap=2450mAh. Under 25±2 ℃, It means the capacity value of being discharged by 2-hours rate to end voltage 2.5 V, which is signed Cap, the unit is mAh.

2.2 Standard charge method:

Under 25±2 ℃, it can be charged to 4.20V with constant current of $0.5I_1(A)$, and then, charged continuously with constant voltage of 4.2V until the charged current is $0.02I_1(A)$.

2.3 Standard discharge method:

Under 25±2 ℃, it can be discharged to the voltage of 2.5V with constant current of $0.5I_1(A)$.

3 Cell type and Colour

3.1 Description and model

Description: Cylindrical Li-ion rechargeable cell
Model: 18650-2500mAh

3.2 Cell colour explanation

Purple

Color is for reference only，the colour can be adjusted according to customer requirements.

4 Characteristics

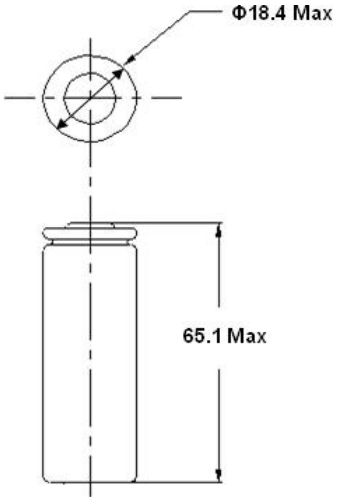
4.1 Cell specification

ITEM	SPECIFICATION	
Rated capacity	2500	mAh@0.5C
Minimum capacity	2450	mAh@0.5C
Normal voltage	3.60	V
Energy density	519	Wh / L
	188	Wh / Kg

Charging voltage	4.20	±0.05V
Discharge ending voltage	2.5	±0.05 V
Standard charging current	1250	mA
Standard discharge current	1250	mA
Max charge current	1C	45℃>T≥10℃
	0.5C	10℃>T≥0℃
	0.1C	0℃>T≥-10℃
Max discharge current	3C	55℃>T≥0℃
	2C	0℃>T≥-20℃
Max recommended charge and discharge cell body temperature	Charge: 0~45℃ Discharge: -20~60℃	
Maximum short term allowable charge and discharge cell body temperature. Charging and discharging at these conditions will shorten cell cycle life.	Charge: 60℃ Discharge: 75℃	
Internal resistance	≤35 mΩ(AC Impedance, 1000 Hz)	
Cell dimensions	Height ： 65.1mm Max Diameter ： 18.4mm Max	
Weight	≤ 48g	

4.2 Cell dimensions

Cell physical dimensions listed in Figure (unit: mm).



5 Technical requirements

5.1 Cell storage conditions

Temperature 3 months -20～45℃ more than 3 months -20～35℃ Relative humidity 0～45%RH

5.2 Cell testing conditions

Unless otherwise specified, all tests stated according to following:

Temperature 25±5℃

Use standard charge and standard discharge method

5.3 Requirement of the testing equipment

Voltage meter: The precision is≥0.5

Temperature meter: The precision is±0.5℃

5.4 Characteristics

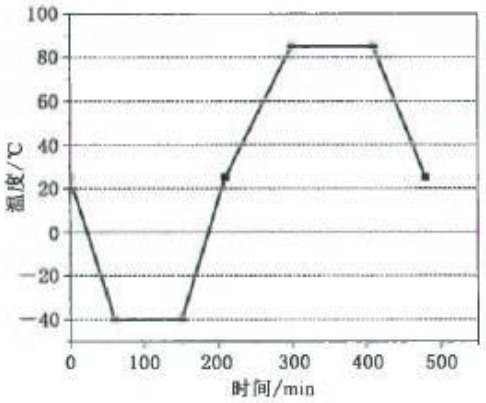
NO.	Item	Standard	Test Method
1	Discharge Characteristics (Room Temperature)	Discharge capacity / Initial capacity *100% A）$0.5C_1A$≥100% B）$1C_1A$ ≥95% C）$2C_1A$≥90% D）$3C_1A$≥90%	Under the room temperature, after $0.5I_1(A)$ standard charged, rest for 15min and then discharge at $0.5I_1(A)$, $1I_1(A)$, $2I_1(A)$ and $3I_1(A)$ to the discharge cut-off voltage 2.5V respectively. Discharge capacity of different rate accord with testing standard.
2	Charge Characteristics (Room Temperature)	Discharge capacity / Initial capacity *100% $2C_1A$ ≥80%	Under the room temperature, Then discharge at $1I_1(A)$ to the discharge cut-off voltage 2.5V, After 15 min to charge at $2I_1(A)$ to the charge cut-off voltage 4.2V, Then discharge at $1I_1(A)$ to the discharge cut-off voltage 2.75V,
3	Cycle Life	The 500th discharge capacity ≥Initial capacity *80%	Measured the initial capacity of battery. Then conduct $0.5I_1(A)/1I_1(A)$ cycle measured the final condition of battery.

4	Normal Storage	Residual capacity ≥Initial capacity *85％ Recovery capacity ≥Initial capacity *90％	Tested the initial condition and initial capacity of battery. Store for 28 days after standard charged, tested the final condition of battery. Then discharge at $1I_1(A)$ to the discharge cut-off voltage 2.5V, tested the residual capacity of battery. Then conduct $0.5I_1(A)$/ $1I_1(A)$ cycle for 3 times to tested the recovery capacity of battery.
5	High Temperature Storage	Residual capacity ≥Initial capacity *85％ Recovery capacity ≥Initial capacity *90％	Standard charge. Tested the initial condition of battery. Put the battery into a 55℃±2 ℃ for 7d, Then discharge at $1I_1(A)$ to the discharge cut-off voltage 2.5V, tested the residual capacity of battery. Then conduct $0.5C_1A$/ $1C_1A$ cycle for 3 times to tested the recovery capacity of battery.
6	Long Time Storage （45℃）	Recovery capacity ≥Initial capacity *90％	Standard charge. Then discharge at $1I_1(A)$ to 30 min . Tested the initial condition of battery. Store for 28 days at 45±2℃ temperature, measured the final condition of battery. Then conduct $0.5I_1(A)$/ $1I_1(A)$ cycle for 3 times to record the discharge capacity.
7	High And Low Temperature Discharge Characteristics	Discharge capacity / Initial capacity *100％ A）55 ℃ ≥100％ B）-20 ℃ ≥70％	Tested the initial condition and initial capacity of battery. Standard charge. Put the battery into a 55℃±2 ℃ for 5h, discharge at $1I_1(A)$ to the cut-off voltage 2.5V, then standard charge at room temperature. In turn put the battery into -20℃±2 ℃ for 24h, discharge at $1I_1(A)$ to 2.50V, then test the final capacity of the battery.

5.5 Safety Performance

NO.	Item	Standard	Test Method
1	Overcharge	No explosion、No fire	Standard charge. Charge at 1I_1(A) to 10V.
2	Over Discharge	No explosion、No fire、No leakage	Standard charge. Discharge at 1I_1(A) to 90 minutes .
3	Short Circuit	No explosion、No fire	Standard charge. Keep the battery into a explosion-proof tank and short-circuit the positive and negative terminals directly (general resistance shall be less than 5mΩ). Short circuit time 10 minutes.
4	Drop	No explosion、No fire、No leakage	Standard charge. Then let it fall off from a height of 1.5m(the lowest height) to the cement floor.
5	Crush	No explosion、No fire	Standard charge. perpendicular to the battery. The speed at 5 ±1mm/s. Untill the voltage is 0V or deformation is 30% or the pressure of 200kN.
6	Hot Oven	No explosion、No fire	Standard charge. Keep the battery connected with a thermocouple and put it into a gravity convection or circulating air oven. Temperature is raised at a rate of 5 ℃ ±2 ℃ per minute to a temperature of 130 ℃±2 ℃ and remained for 30min at this temperature. Observe the variation of the battery's appearance.

<table>
<tr><td>7</td><td>Seawater Immersion</td><td>No explosion、No fire</td><td>Standard charge. Keep the battery to 3.5% NaCl solution 2 hours.</td></tr>
<tr><td>8</td><td>Low Pressure</td><td>No explosion、No fire、
No leakage</td><td>Standard charge. Keep the battery to the altitude chamber of 11.6Kpa 6 hours.</td></tr>
<tr><td>9</td><td>Heat Cycle Properties</td><td>No explosion、No fire、
No leakage</td><td>Standard charge. Put the battery into a temperature controlled tank, then according to the parameter to test, A total of five times.

1）：Temperature and time in one cycle
<table>
<tr><th>温度
℃</th><th>时间增量
min</th><th>累计时间
min</th><th>温度变化率
℃/min</th></tr>
<tr><td>25</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>-40</td><td>60</td><td>60</td><td>13/12</td></tr>
<tr><td>-40</td><td>90</td><td>150</td><td>0</td></tr>
<tr><td>25</td><td>60</td><td>210</td><td>13/12</td></tr>
<tr><td>85</td><td>90</td><td>300</td><td>2/3</td></tr>
<tr><td>85</td><td>110</td><td>410</td><td>0</td></tr>
<tr><td>25</td><td>70</td><td>480</td><td>6/7</td></tr>
</table>
2）diagram：
 
</td></tr>
</table>

Comments: the definitions of some nomenclatures of this specification

（1） Initial State: The initial appearance, open-circuit voltage and internal resistance of battery.

（2） Final State: The final appearance, open-circuit voltage and internal resistance of battery.

（3） Residual Capacity: After a specific testing program, the first discharge capacity of battery.

（4） Recovery capacity: After a specific testing program, and through the repeatedly charging and discharging to the recovery state, then the discharge capacity of battery.

（5） 0.5 C_1A /1 C_1A：Charge at 0.5 I_1 (A) to limit charge voltage 4.20V, then change to charge with constant voltage until the current less than or equal to 0.02 I_1 (A), rest for 5 min, then discharge at 1 I_1 (A) to 2.5V cut-off.

（6） I1：1 hour discharge current； C1 ： 1 hour rated capacity；

（7） Initial Capacity: Standard charge method and standard discharge method at the room temperature,the discharge capacity is initial capacity.

6 Warning and cautions in handling the lithium-ion cell

To prevent the possibility of the cell from leaking, heating, explosion, please observe the following precautions:

- Don’t immerse the cell in water.
- Don’t use and leave the cell near a heat source such as fire or heater.
- When charging, use a cell charger specifically for that purpose.
- Don’t reverse the positive and negative terminals.
- Don’t connect the cell to an electrical outlet directly.
- Don’t discard the cell in fire or heater.
- Don’t connect the positive and negative terminal directly with metal objects.
- Don’t transport and store the cell together with metal objects such as necklaces, hairpins.
- Don’t strike, throw or trample the cell.
- Don’t directly solder the cell.
- Don’t pierce the cell with a nail or other sharp object.
- When disposing of secondary cells, keep cells of different electrochemical systems separate from each other.

Caution

- Don’t use or leave the cell at very high temperature conditions (for example, strong direct sunlight or a vehicle in extremely hot conditions).
- If the cell leaks and the electrolyte get into your eyes, don’t wipe eyes, instead, thoroughly rinse the eyes with clean running water for at least 15 minutes, and immediately seek medical attention. Otherwise, eyes injury can result.
- If the cell gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during usage, recharging or storage, immediately remove it from the device or cell charger and stop using it.
- In case the cell terminals get dirty, clean the terminals with a dry cloth before use.

7 The restriction of the use of hazardous substances

This model of lithium-ion cell is in accordance with our company"s request of "environmental substances control standard".

8 Contact information

If you have any questions regarding the cell, please contact the following address:

Headquarter： Firstbattery industrial park.No.39, Yichun Economic Development Zone Jiangxi Province. (336000)

Tel ：0795-3666188 Fax：0795-3666118

9 Version change record

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A/00	无	V0	刘卫东	2017-08-21