Product Specification

Lithium-ion Power Cell of LP71173207-272Ah

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1. Scope

The product specification describes the requirement of the Prismatic Lithium Ion Power Cell to be supplied to the customer by Lishen Power Battery System Co., Ltd. If there be any additional information required by the customer, customer are advised to contact Lishen Power Battery System Co., Ltd.

2. General Specifications

2.1 Abbreviation Definitions

C_1—— the rated capacity (in ampere-hours) of the cell for a one-hour discharge.

I_1 —— a current corresponding to the manufacturer's rated capacity (in ampere-hours) for a one-hour discharge. which is equal to, in numeral, the C_1

In the below specification I_1(A) = 272A.

SOC —— the state of charge.

DOD —— the depth of discharge.

The NEW BATTERY — — the battery since the date of the product is made, the state of temperature within 30 days

INDOOR TEMPERATURE——25℃±2℃

2.2 Specification

	Item	Specification
1	Cell Type	Lithium -ion power cell
2	Cell Model	LP71173207-272Ah
3	Nominal Capacity☆	272Ah(The NEW BATTERY)
4	Nominal Voltage☆	3.2V
5	AC-impedance(1000Hz)☆	0.12±0.05mΩ
6	Weight	5302±100g
7	Maximum Charge Current at Room Temperature	1.0I_1（Continuous） 2I_1 (60s)
	Charging Voltage	3.65V
8	Maximum Discharge Current at Room Temperature	1.0I_1（Continuous） 2I_1 (60s)
	Discharge End Voltage	2.5V（＞0℃）、2.0V(≤0℃)
9	Max Operating Temperature Range	
	Charge	0℃ ~ 65℃
	Discharge	-35℃ ~ 65℃
10	Optimal Operating Temperature Range	
	Charge	15℃ ~ 35℃
	Discharge	15℃ ~ 35℃
11	Storage Temperature	
	1 month	-30℃~ 45℃

	6 months	-20℃ ~ 35°C
*Cells should be stored at 20%SOC-40%SOC or the voltage is between 3.275V and 3.305V.		

3. Appearance and Dimension

Appearance and Dimension refer to the attached drawing 1.

4. Characteristics

4.1 Test Condition

Cells should be tested within a month after the product is made and the charge-discharge times of the test cells should be less than 5.Unless noted otherwise, all tests are to be conducted at standard temperature which is(25±2)℃ and standard humidity which is (65±2)%. The room temperature mentioned in this specification means (25±2)℃.

4.2 Test Equipment

a) Voltmeter Inner impedance>1000Ω per volt.

b) Slide caliper The slide caliper should have a scale of 0.02mm.

c)Impedance meter The impedance meter should be operated at AC 1kHz.

d) Electronic Scale The electronic scale should have a minimum scale of 0.001g.

4.3 Test Process and Specification

4.3.1 The room or high temperature charge method(Slow charging):

Cells are charged with Constant Current and Constant Voltage (CC/CV) method at the environment temperature of (25±2)℃ or (45±2)℃.The constant current is 0.5 I_1 （A ） and the constant voltage is 3.65V, Charge shall be terminated when the charge current has tapered to 0.05 I_1（A ）, then store cells for 1h.

4.3.2 The room or high temperature Charge method(Fast charging):

Cells are charged with Constant Current and Constant Voltage (CC/CV) method at the environment temperature of (25±2)℃ or (45±2)℃.The constant current is 1.0 I_1 （A ） and the constant voltage is 3.65V, Charge shall be terminated when the charge current has tapered to 0.05 I_1（A ）, then store cells for 1h.

4.3.3 Test Item and Specification

Test Item and Specification Should refer to table 2.

Number	Item	Test profile	Specification
1	Appearance and Dimension	1.Eyeballing` 2.Test cells' dimension with slide caliper	No Deep Scratch, No Transformation, No leakage ,
2	Weight	Electronic Scale	5302±100g
3	Open Circuit Voltage☆	Measure the open circuit voltage within 1h after charging cells per 4.3.2.	OCV≥3.35V
4	Nominal discharge capacity ☆	Discharge cells at a 1.0 I_1(A) current to 2.5V within 1h after charging cells per 4.3.2. Record the capacity. The cycle can repeat 5 times, when the capacity difference of 3 times continuously are less than 3%, the test can be terminated. Tack the average of last 3 discharge capacity.	1.0 I_1 Capacity ≥272Ah （The NEW BATTERY）
5	Maximum charge current at Room Temperature	Continuous: Charge cells per 4.3.2. Discharge cells to 2.5V at a 1.0 I_1 (A) current. And record the capacity. Charge cells to 3.65V at a n I_1 (A) current, and then charge cells at constant voltage (3.65V) until the current has tapered to 0.05 I_1 (A). ("n" is an integer) 50%SOC: Charge cells per 4.3.2. Discharge cells 30min at a 1.0 I_1 (A) current. Charge cells to 3.65V in a n I_1 (A) current. ("n" is an integer)	1.0 I_1 (A)(Continuous); 2.0 I_1 (A)(60s,50%SOC);
6	Maximum discharge current at Room Temperature	Continuous: Discharge cells at a 1.0 I_1 (A) current to 2.5V after charge cells per 4.3.2. And record the capacity. Charge cells per 4.3.2. Discharge cells in a n I_1 (A) current to 2.5V. ("n" is an integer). 50%SOC: Discharge cells at a 1.0 I_1 (A) current for 30min after charging cells per 4.3.2. Discharge cells to 2.5 V at a n I_1 (A) current. ("n" is an integer)	1.0 I_1 (A)(Continuous); 2.0 I_1 (A)(60s,50%SOC);
7	Cycle Life at Room Temperature☆	Charge cells per 4.3.2. Discharge cells to 2.5V at a constant current of 1.0 I_1 (A). Discharge capacity shall be measured after 3500 cycles. Cells should be clamping during cycling.	3500th Discharge Capacity ≥80% Nominal Capacity (200th Discharge Capacity ≥97% Nominal Capacity or 500th Discharge Capacity ≥93% Nominal Capacity or 1000th Discharge Capacity ≥90% Nominal Capacity）
8	Cycle Life at High Temperature☆	Charge cells per 4.3.2. Discharge cells to 2.5V at a constant current of 1.0 I_1 (A). Discharge capacity shall be measured after 2000 cycles. Cells should be clamping during cycling.	2000th Discharge Capacity ≥80% Nominal Capacity (200th Discharge Capacity ≥93% Nominal Capacity or 500th Discharge Capacity ≥88% Nominal Capacity ）
9	Charge Retention☆	After charging per 4.3.2, store the testing cells for 30 days	Capacity Retention ≥96.5%

		at the environment temperature of (25±2) ℃ , then discharge the cells to 2.5V at a 1.0 I_1 (A) current. Record the discharge capacity. Charge cells per 4.3.2. Discharge the cells to 2.5V at a 1.0 I_1 (A)current. Record the recovery capacity. After charging per 4.3.2, store the testing cells at (45±2)℃ for 30 days, then discharge the cells to 2.5V at a 1.0 I_1 (A) current. Record the discharge capacity. Charge cells per 4.3.2. Discharge the cells to 2.5V at a 1.0 I_1 (A)current. Record the recovery capacity.	（25℃） Capacity Recovery ≥95% （45℃）
10	Characteristics at high temperature	Cells shall be charged per 4.3.2 and store for 5h at （55±2）℃, then discharge to 2.5V at 1.0 I_1 (A) and measure the capacity.	Residual capacity≥97% of Nominal capacity
11	Characteristics at low temperature	Cells shall be charged per 4.3.2 and store for 24h at （-20±2）℃, then discharge to 2.0V at 1/3 I_1 (A) and measure the capacity。	Residual capacity≥70% of Nominal capacity
12	Short-circuit Test★	Cells, charged per 4.3.2, with thermocouples， shall be short circuited 10 minutes in fuming cupboard by connecting the positive and negative terminals through the external wires. And the resistance of external wires will be less than 5mΩ. Observe 1h.	No Explosion, No Fire
13	Overcharge Test★	After charged per 4.3.2, test cells (with thermocouple) shall be overcharged with a sort of method below: 1st Method: Charge test cells at 1 I_1 (A), and stop test when the voltage reached 1.5 times of end voltage. Observe 1h. 2nd Method: Charge test cells at 1 I_1 (A), then stop the test when the charge time reached 1h. Observe 1h.	No Explosion, No Fire
14	Over Discharge test★	Cell shall be charged per 4.3.2. Discharge cells at a 1 I_1 (A) current for and stop the test when the discharge time reached 90 min. Observe 1h.	No Explosion, No Fire, No leakage
15	Thermal Test★	Cell shall be charged per 4.3.2. Put cells (with thermocouple) into the oven, then close the door of it The oven temperature shall be raised at a rate of 5℃±2℃/min to a temperature of （130±2）℃, the cells shall remain at this temperature for 30min. Then, stop the test and observe 1h.	No Explosion, No Fire
16	Crush Test★	After charged per 4.3.2, crush the cells vertically at the speed of (5±1) mm/s until cells'deformation reach to 30% or the voltage tapered to 0V, or the press reach to 200kN. Observe 1h.	No Explosion, No Fire

17	Drop Test★	Charge cells per 4.3.2. Then drop cells from a height of 1.5m to the concrete ground. Cells shall be dropped with the terminals down.	No Explosion, No Fire, No leakage

5.Caution

5.1 Charge

a) NO over-charge，the charge voltage should not be over 3.65V.

b) NO reverse charging

c) The charge temperature range is 0℃~ 65℃. The charge must be stopped when any part of the cell reach to 65℃.

d) Optimal charge temperature range is 15℃ ~ 35℃。Do not charge for a long time in the temperature less than 15℃.

5.2 Discharge

a) No short circuit

b) The end of discharge voltage must be over 2.0V.

c) The discharge temperature range is -35℃~ 65℃. The discharge must be stopped when any part of the cell reach to 65℃.

d) Optimal discharge temperature range is 15 ℃~ 35℃. Do not discharge for a long time in the temperature more than 35℃

5.3 Put cells away from children.

5.4 Storage and Usage

a) For any short time storage (in one month), cell should be in a clean and dry area（humidity ≤65% RH） and at -30℃ ~+45℃ at 20~40%SOC .

b) For any long time storage (in 6 month), cell should be in a clean and dry area（humidity ≤65% RH） and at -20℃ ~+35℃ at 20~40%SOC.

c）During the course of storage or usage, keep the cells upright .

6. Warning

6.1 Avoid overheat in any circumstances.Don’t modify or disassemble the battery. It will be dangerous, and may cause ignition, heating, leakage or explosion.

6.2 Don’t put cells in overheat circumstances or disposed in fire ,don’t put cells under the sunshine.

6.3 Don’t short-circuit positive(+) and negative(-) terminals. Keep away from metal or other conductive materials. Jumbling the batteries of direct contact with positive(+) and negative(-) terminals or other conductive materials may cause short-circuit and may even cause fire and

explosion.

6.4 Don't reverse the positive (+) and negative (-) terminals.

6.5 Don't put cells in water or other conductive liquids or let cells absorb amoisture.

6.6 Don't impact cells excessively.

6.7 Don't solder the battery directly. Excessive heating may cause deformation of the battery components such as the gasket, which may lead to the battery swelling,leakage, explosion,or ignition.

6.8 Don't use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.

6.9 Don't contact cans directly or with other conductive materails during the using process.

6.10 Keep away form static circumstances during storage and using.

6.11 Don't use cells together with other one-shot batteries and secondary batteries. Don't use cells together with different packages, types and brands.

6.12 Stop using and process the cells accordingly when the following circumstances happened：getting hot sharply, smelling, changing colors, deformation or others.

6.13 If there is leaked electrolyte from batteries, please scrub it away with fresh water to avoid any skin discomfort.

7. Shipping

7.1 During transportation, keep the battery from acutely vibration, impacting, insolation, drenching.

7.2 The delivery battery should be at a half charged state.

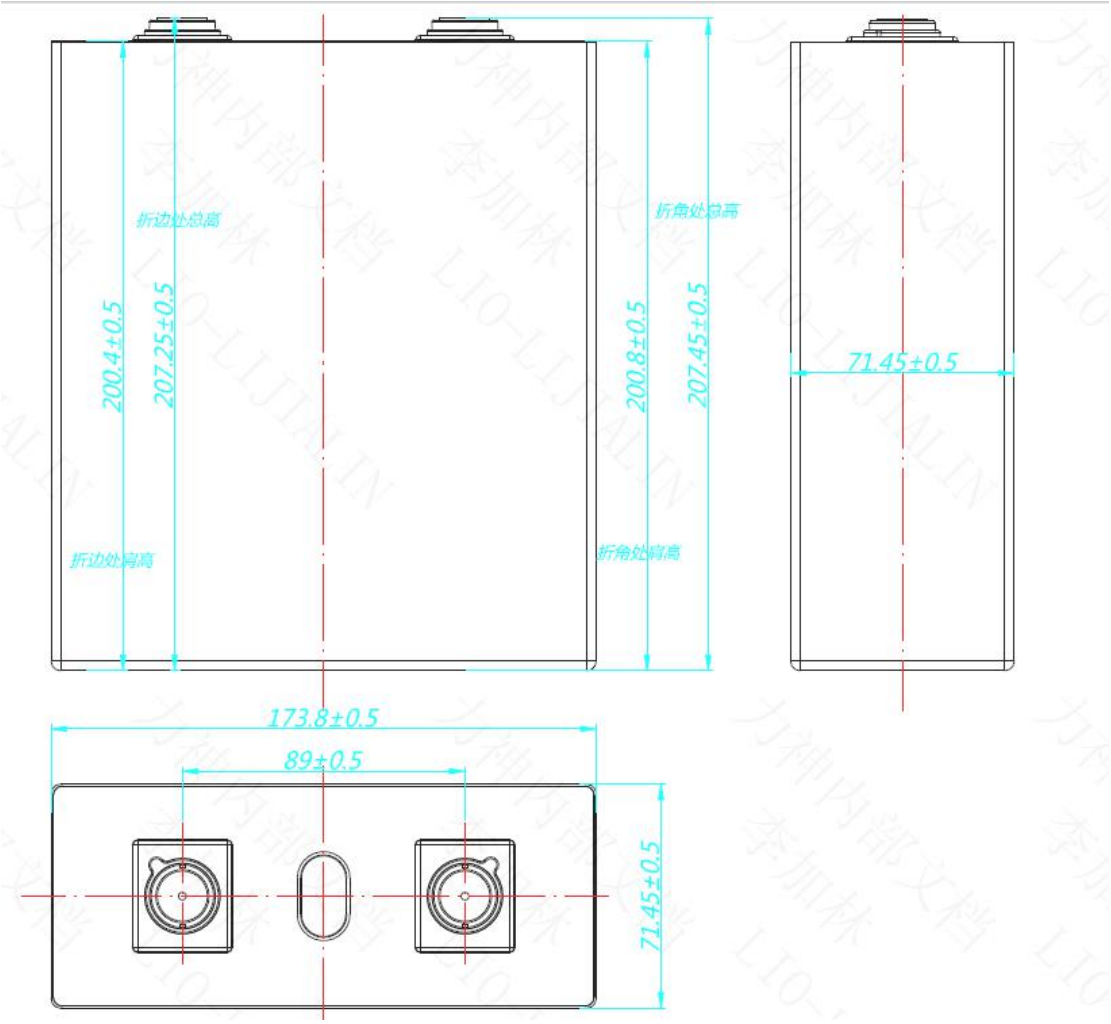
8. Others

If customers need to use or operating cells beyond the specified range of this file, please contact Tianjin Lishen Battery Joint-Stock Co., Ltd. Manufacturer will not be responsible for trouble caused by using cells beyond the specified range of this file.

Manufacturer will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.

Manufacturer will be exempt from warrantee any defect cells during assembling after acceptance.

Attached drawing 1



Remarks： The size of drawing is the cell within insulation gasket and blue film. The cell thickness was tested at 3000N pressure.