产 品 规 格 书

LP54173207-202Ah 磷酸铁锂蓄电池

力神动力电池系统有限公司

www.lishen.com.cn

1 适用范围

本规格书适用于力神动力电池系统有限公司生产的 LP54173207-202Ah 磷酸铁锂蓄电池。

2 常规指标

2.1 符号与缩略语说明

C_1 —— 1h 率额定容量(Ah);

I_1 —— 1h 率放电电流，其数值等于 C_1(A);

本规格书中 1 I_1 = 202 A。

SOC——荷电状态

DOD——放电深度

2.2 该产品常规指标

表 1

序 号	项 目	规 格
1	电池种类	磷酸铁锂蓄电池
2	电池型号	LP54173207-202Ah
3	标称容量☆	202Ah
4	标称电压☆	3.2 V
5	交流内阻☆	≤0.2mΩ
6	重量	3.95 ±0.1kg
7	室温最大充电电流	1I_1 (连续) 2 I_1 (50%SOC，10s)
8	充电电压	3.65 V
9	室温最大放电电流	1I_1 (连续) 3 I_1 (50%SOC，30s)
10	放电终止电压	2.5V（＞0℃） 2.0V（≤0℃）
11	最大工作温度范围：	
	充电	0℃～55℃
	放电	-30℃～60℃
12	最佳工作温度范围：	
	充电	15℃～35℃

	放电	15℃～35℃
13	储藏温度：	
	1 个月内	-40℃～45 ℃
	6 个月内	-20℃～35 ℃
*电池电压为 3.275V～3.304V，20%-40%SOC 状态下保存		

备注：以上表格中所示温度均为电芯温度，即接入电池的温度传感器测量的电芯的温度。无论电芯处在何种充、放电模式，一旦发现电芯温度超过最大工作温度范围即停止使用。

3 外观和尺寸

外观和尺寸见图 1，电池尺寸包含蓝膜。

4 性能

4.1 测试条件

进货一个月内进行测试，测试前循环充放电次数不得超过五次。除非有其他说明，实验和测量须在标准温度（25±2）℃及标准湿度（65±20）%的条件下进行，本规格书中所提到的室温，是指（25±2）℃。

4.2 测量设备

a) 伏特计 内阻>1000 Ω/V

b) 游标卡尺 精度为 0.02 mm

c) 内阻表 在 AC 1kHz 条件下测量

d） 天平 精度 0.001g

4.3 测试过程及其标准

4.3.1 充电制式

在室温下，以 1 I_1(A)电流恒流充电至终止电压 3.65V 时转恒压充电，恒压电压为 3.65V，至充电终止电流降至 0.05 I_1(A)时停止充电，充电后静置大于等于 0.5 小时。

4.3.2 测试项目及标准

具体测试项目及标准见表 2。

表 2

序号	项目	测试程序	标准
1	外观和尺寸	目测及游标卡尺测量	无明显人为划痕、无变形、无漏液，成品电池质量检验尺寸为厚度、宽度和高度，尺寸见图纸
2	重 量	电子天平	3.95 ±0.1kg
3	开路电压☆	按 4.3.1 充电后 1 小时内测量开路电压	≥ 3.350V
4	室温放电容量☆	按 4.3.1 充电后 0.5 小时内以 1 I_1 (A)电流放电到放电终止电压 2.5V，并计量容量。上述循环可以重复 5 次，当连续 3 次试验结果的极差小于额定容量的 3%，可提前结束试验，取最后 3 次试验结果平均值。	1 I_1 (A)容量≥202Ah
5	室温 最大充电电流	按 4.3.1 充电后，以 1 I_1 (A)电流放电到终止电压 2.5V，并计量容量；以 n I_1 (A)恒流充至 3.65V，再以 3.65V 恒压充至 0.05 I_1 截止。 按 4.3.1 充电后，以 1 I_1 (A)电流放电调整电池至 50%SOC，以 n I_1 (A)恒流充电 10s。	1 I_1 (A)(连续); 2 I_1 (A)(10s，50%SOC)
6	室温 最大放电电流	按 4.3.1 充电后，以 1 I_1 (A)电流放电到终止电压 2.5V，并计量容量；按 4.3.1 充电，以 n I_1 (A)放电至 2.5V。 按 4.3.1 充电后，以 1 I_1 (A)电流放电调整电池至 50%SOC，以 n I_1 (A)放电 30s。	1 I_1 (A)(连续); 3 I_1 (A)(30s，50%SOC)

7	常温循环寿命☆	按 4.3.1 充电后；搁置 1h；以 1 I_1 (A) 电流恒流放电至 2.5V；搁置 1h。循环充放电 3500 次以上，计量放电容量。电池在夹紧状态下进行循环测试，夹具间隙恒定为 53.7mm。	循环 500 次，放电容量≥ 191.9Ah(标称容量的 95%)；或循环 1000 次，放电容量≥185.8Ah（标称容量的 92%）；或循环 3500 次，放电容量≥ 161.6Ah（标称容量的 80%）。
8	高温循环寿命☆	电池在 45℃±2℃温箱中搁置 5h 后开始循环测试。按 4.3.1 充电后；搁置 1h；以 1 I_1 (A) 电流恒流放电至 2.5V；搁置 1h。循环充放电 2000 次以上，计量放电容量。电池在夹紧状态下进行循环测试，夹具间隙恒定为 53.7mm。	循环 500 次，放电容量≥ 183.8Ah(标称容量的 91%)；或循环 1000 次，放电容量≥175.7Ah（标称容量的 87%）；或循环 2000 次，放电容量≥ 161.6Ah（标称容量的 80%）。
9	室温荷电保持与容量恢复能力☆	按 4.3.1 充电后，在环境温度（25±2）℃条件下开路搁置 28 天，再以 1 I_1 (A)电流恒流放电到终止电压 2.5V，并计量荷电保持容量。 按 4.3.1 充电，以 1 I_1 (A)电流恒流放电到放电终止电压 2.5V，并计量恢复容量。	荷电保持率 ≥ 92% 容量恢复率 ≥ 95%
10	高温荷电保持与容量恢复能力☆	按 4.3.1 充电后，在环境温度（55±2）℃条件下开路搁置 7 天，再以 1 I_1 (A)电流恒流放电到放电终止电压 2.5V，并计量荷电保持容量。 按 4.3.1 充电，以 1 I_1 (A)电流恒流放电到放电终止电压 2.5V，并计量恢复容量。	荷电保持率 ≥ 92% 容量恢复率 ≥ 95%

11	高温性能	按 4.3.1 充电后，在温度（55±2）℃的高温箱中放置 5h，然后以 1 I_1 (A)电流恒流放电至 2.5V，并计量放电容量。	容量 ≥ 95%初始容量
12	低温性能	按 4.3.1 充电后，在温度（-20±2）℃的低温箱中放置 24h，然后以 1 I_1 (A)电流恒流放电至 2.0V，并计量放电容量。	容量 ≥ 75%初始容量
13	短路试验★	按 4.3.1 充电后，将接有热电耦的电池放入通风厨中短路，电池经线路电阻小于 5mΩ 的外部电路短路 10min；观察 1h。	电池不起火，不爆炸
14	过充试验★	按 4.3.1 充电后，将接有热电偶的电池进行过充电试验，以下面任一种方式充电： a）以 1 I_1 (A)电流充电，到电池电压达到充电终止电压的 1.5 倍后停止实验，观察 1h。 b）1 I_1 (A)电流充电，充电时间到达 1h 后停止试验，观察 1h。	电池不起火，不爆炸
15	过放试验★	按 4.3.1 充电后，以 1 I_1 (A)电流放电 90min；观察 1h。	电池不起火，不爆炸 不漏液
16	热箱试验★	将接有热电耦的电池放入恒温箱中，关闭箱门后，开启恒温箱加热，监视恒温箱内温度变化(温箱升温速度为 5℃/min)，箱温达到(130±2)℃时保持 30min 后结束试验；观察 1h。	电池不起火，不爆炸
17	挤压试验★	按 4.3.1 充电后，垂直于电池极板的方向以(5±1)mm/s 的速度挤压电池，挤压板形式为半圆柱体（半径 75mm，长度大于被挤压电池的尺寸），电池电压到达 0V 或变形量达到 30%或挤压力达到 200kN 后停止挤压；观察 1h。	电池不起火，不爆炸

5 注意事项

5.1 充电

a) 严禁过充，充电电压不得高于 3.65V。

b) 严禁反向充电。

c）充电电池温度范围为 0℃~55℃。

d) 建议最佳充电温度为 15℃~35℃。

5.2 放电

a) 严禁短路。

b) 放电电压不得低于 2.0 V。

c) 放电电池温度范围为 -30℃~60℃。

d) 建议最佳放电温度为 15℃~35℃。

5.3 将电芯放置在远离儿童的地方。

5.4 储存

短时储存（1 个月内）要将电池放置于清洁、湿度低于 65%RH、电池温度-40℃~45℃及荷电 20~40% SOC 状态。

长期储存（6 个月内）要将电池放置于清洁、湿度低于 65%RH、电池温度-20℃~35℃及荷电 20~40% SOC 状态。

6 警示

6.1 在使用之前，应详细阅读规格书并对其中警示内容和注意事项有足够深刻的理解。

6.2 严禁电池过热；严禁改装、拆解电池；这些行为非常危险，可能会引起电池起火、漏液、爆炸。

6.3 严禁将电芯暴露在极热环境或投入火中，不要将电池放置在太阳直射的地方。

6.4 严禁将电池正负极柱用金属或其他导线直接连在一起形成通路，这样将导致电池短路，可能引起电池起火甚至爆炸。

6.5 严禁将正负极柱颠倒使用。

6.6 严禁将电芯浸入水中或者其它导电性液体中，或者使其吸湿。

6.7 严禁使电芯承受过重的机械冲击。

6.8 严禁直接焊接电池，过热可能会引起电池零部件（如垫片）变形，这将导致电池鼓胀、漏液、起火甚至爆炸。

6.9 严禁使用运输中发生挤压、跌落、短路、漏液及其他不正常问题的电池。

6.10 电池壳体带正电，在使用过程中严禁将电池负极柱与电池壳体直接连在一起形成通路，这样将导致电池短路，可能引起电池起火甚至爆炸。

6.11 电池应该在远离静电的场所进行储存、使用。

6.12 禁止把电池同其他一次电池或二次电池一起使用，也不要同不同包装、不同型号或其他品牌的电池一起使用。

6.13 在使用、充放电或者存储过程中发现电池急剧变热、散发气味、变色、变形或者其他反应，应立即停止使用，并进行相应的处理。

6.14 如电池漏液到皮肤或衣物上，请立即用清水冲洗，以免造成皮肤不适等。

7 运输

运输过程中应防止剧烈振动、冲击、日晒雨淋。

运输过程中电池应处于荷电处于 10~50%SOC 状态。

8 其它

如果客户需要将电芯在该文件之外的条件下操作或应用，请先咨询力神公司相关事宜。在该文件说明的条件之外使用该电芯而产生的事故，公司不承担任何责任。

对单体电池与电路，电池组，充电器搭配使用不当所产生的问题公司不承担任何责任。

出货后客户在电芯组装过程中，因加工产生的不良电芯不在质量保证的范围之列。

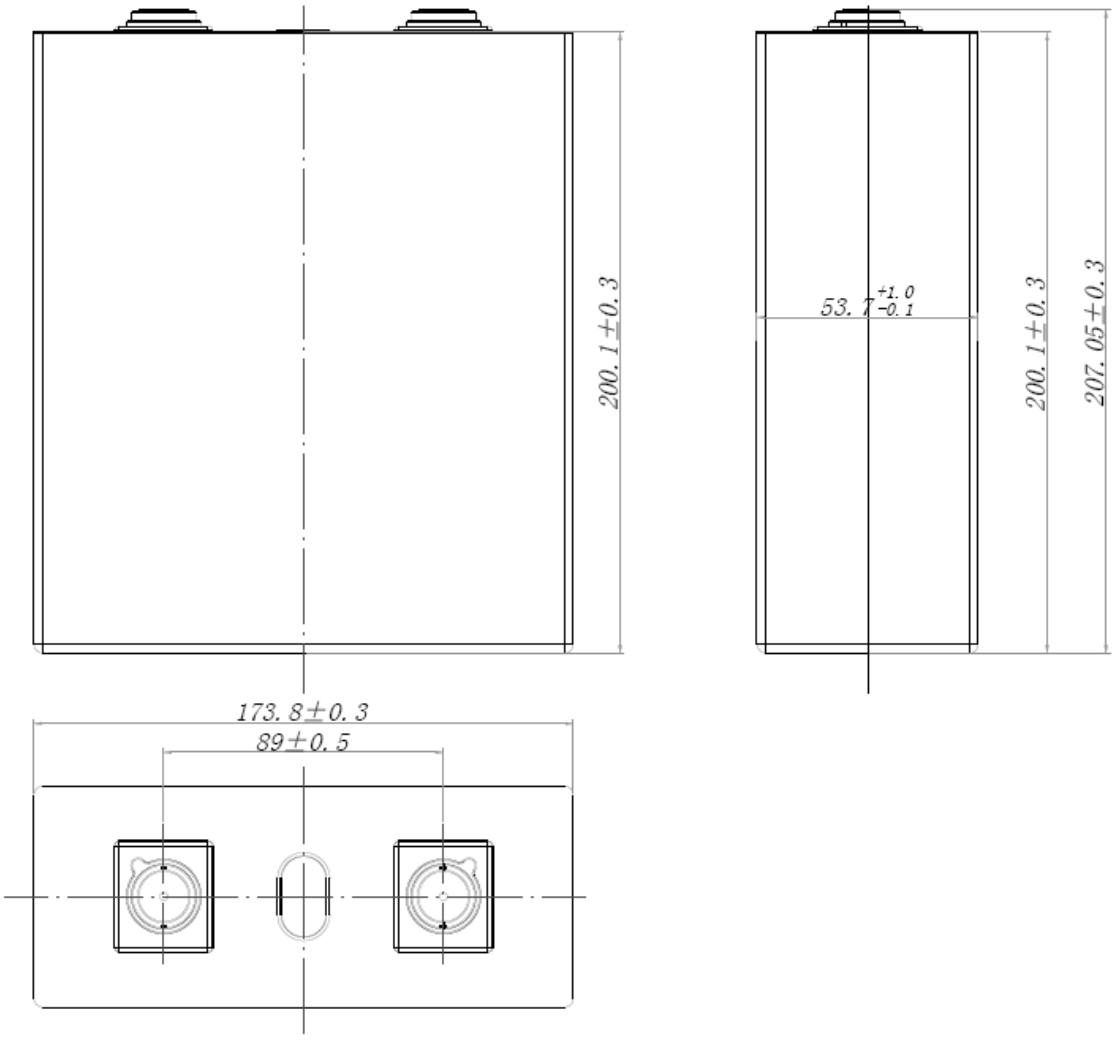


图 1 电池简易外形图

Product Specification

Lithium Iron Phosphate Battery of LP54173207-202 Ah

Lishen Power Battery System Co.,Ltd

www.lishen.com.cn

1. Scope

The product specification describes the requirement of the Prismatic Lithium Iron Phosphate Battery to be supplied to the customer by Lishen Power Battery System Co.,Ltd. If there is any additional information required by the customer, customers 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 one-hour discharge capacity (in ampere-hours), which is equal to, in numeral, the C_1.

In the following specification 1 I_1 (A) = 202A.

SOC —— the state of charge.

DOD —— the depth of discharge.

2.2 General Specifications

Number	Item	Specification
1	Cell Type	Lithium iron phosphate battery
2	Cell Model	LP54173207-202Ah
3	Nominal Capacity☆	202.0Ah
4	Average Working Voltage☆	3.2V
5	AC-Impedance☆	≤0.2mΩ
6	Weight	3.95±0.1kg
7	Maximum Charge Current at Room Temperature	$1I_1$（Continuous） $2I_1$(50%SOC，10s)
8	Charging End Voltage	3.65V
9	Maximum Discharge Current at Room Temperature	$1I_1$（Continuous） $3I_1$(50%SOC，30s)
10	Discharge End Voltage	2.5V（＞0℃） 2.0V（≤0℃）
11	Max Operating Temperature Range	

	Charge	0℃ ~ 55℃
	Discharge	-30℃ ~ 60℃
12	Optimal Operating Temperature Range	
	Charge	15℃ ~ 35℃
	Discharge	15℃ ~ 35℃
13	Storage Temperature	
	1 month	-40℃~ 45℃
	6 months	-20℃ ~ 35℃
*Cells should be stored at the state of 20%~40%SOC or the voltage is between 3.275V and3.304V.		

Note: The temperature shown in the above table is the cell temperature. That is, the temperature of the cell measured by the temperature sensor connected to the battery. No matter what charging and discharging mode the battery is in, the battery will be stopped when the temperature exceeds the maximum operating temperature range.

3. Appearance and Dimension

Appearance and Dimension refer to the attached drawing 1.The dimension includes the insulating film outside of the battery.

4. Characteristics

4.1 Test Condition

Cells should be tested within a month after purchase and the charge-discharge times of the test cells should be less than 5. Unless noted otherwise, all tests will be conducted at standard temperature which is (25±2)℃ and standard humidity which is (65±20)%. 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 minimum 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 Charge Method

Cells are charged with Constant Current and Constant Voltage (CC/CV) method at room temperature. The constant current is $1I_1$ (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 more than 0.5h.

4.3.2 Test Item and Specification

Test item and specification should refer to table 2.

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 , Dimension should refer to the attached drawing 1.
2	Weight	Electronic Scale	3.95 ±0.1kg
3	Open Circuit Voltage☆	Measure the open circuit voltage within 1h after charging cells per 4.3.1.	OCV ⩾ 3.350V
4	Nominal Discharge Capacity ☆	Discharge cells at a $1I_1$(A) current to 2.5V within 1h after charging cells per 4.3.1. 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.	$1I_1$ Capacity ⩾ Nominal Capacity
5	Maximum Charge Current at Room Temperature	Continuous: Charge cells per 4.3.1. Discharge cells to 2.5V at a $1I_1$ (A) current. And record the capacity. Charge cells to 3.65V at a nI_1 (A) current, and then charge cells at constant voltage (3.65V) until the current has tapered to $0.05I_1$ (A). 50%SOC: Charge cells per 4.3.1. Discharge cells to 50%SOC at a $1I_1$ (A) current. Charge cells 10s in a nI_1 (A) current.	$1I_1$(A)(Continuous); $2I_1$(A)(10s,50%SOC);

6	Maximum Discharge Current at Room Temperature	Continuous: Discharge cells at a 1 I_1 (A) current to 2.5V after charge cells per 4.3.1. And record the capacity. Charge cells per 4.3.1. Discharge cells in a nI_1 (A) current to 2.5V. 50%SOC: Discharge cells to 50%SOC at a 1 I_1 (A) current after charging cells per 4.3.1. Discharge cells 30s at a nI_1 (A) current.	1I_1(A)(Continuous); 3I_1(A)(30s,50%SOC);
7	Cycle Life（Normal Temperature）☆	Charge cells per 4.3.1. Discharge cells to 2.5V at a constant current of 1I_1 (A), 100%DOD. Discharge capacity shall be measured after 3500 cycles. Cells should be clamping during cycling.	500th Discharge Capacity ≥ 191.9Ah(95% Nominal Capacity)or 1000th Discharge Capacity ≥185.8Ah(92% Nominal Capacity)or 3500th Discharge Capacity ≥161.6Ah(80% Nominal Capacity)
8	Cycle Life（High Temperature）☆	Store the testing cells at (45±2)℃ for 5 hours and then began the cycle test. Charge cells per 4.3.1. Discharge cells to 2.5V at a constant current of 1I_1 (A), 100%DOD. Discharge capacity shall be measured after 2000 cycles. Cells should be clamping during cycling.	500th Discharge Capacity ≥ 183.8Ah(91% Nominal Capacity)or 1000th Discharge Capacity ≥175.7Ah(87% Nominal Capacity) or 2000th Discharge Capacity ≥ 161.6Ah(80% Nominal Capacity)
9	Capacity Retention and Capacity Recovery at Room Temperature☆	After charging per 4.3.1, store the testing cells for 28 days at the environment temperature of (25±2)℃, then discharge the cells to 2.5V at a 1 I_1 (A) current. Record the retention capacity. Charge cells per 4.3.1. Discharge the cells to 2.5V at a 1 I_1 (A) current. Record the recovery capacity.	Capacity Retention ≥ 92% Capacity Recovery ≥ 95%

10	Capacity Retention and Capacity Recovery at High Temperature☆	After charging per 4.3.1, store the testing cells at (55±2)℃ for 7 days, then discharge the cells to 2.5V at a 1 I_1 (A) current. Record the discharge capacity. Charge cells per 4.3.1. Discharge the cells to 2.5V at a 1 I_1 (A) current. Record the discharge capacity.	Capacity Retention ≥ 92% Capacity Recovery ≥ 95%
11	Characteristics at High Temperature	Cells shall be charged per 4.3.1 and stored for 5h at (55±2)℃. Then discharge cells to 2.5V at a 1 I_1 (A) current and record the capacity.	Residual Capacity ≥ 95% of Initial Capacity
12	Characteristics at Low Temperature	Cells shall be charged per 4.3.1 and stored for 24h at (-20±2)℃. Then discharge cells to 2.0V at a 1 I_1 (A) current and record the capacity.	Residual Capacity ≥ 75% of Initial Capacity
13	Short-Circuit Test★	Cells, charged per 4.3.1, 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
14	Overcharge Test★	After charged per 4.3.1, test cells (with thermocouple) shall be overcharged with a sort of method below: 1st Method: Charge test cells at1 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
15	Over Discharge test★	Cell shall be charged per 4.3.1. 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
16	Thermal Test★	Put cells (with thermocouple) into the oven, then close the door. The oven temperature shall be raised at a rate of 5℃/min to (130±2) ℃ . The	No Explosion, No Fire

		cells shall be remained at this temperature for 30 min. Then, stop the test and observe 1h.	
17	Crush Test★	After charged per 4.3.1, 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

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 of cell is 0℃ ~ 55℃.

d) Optimal charge temperature range is 15℃ ~ 35℃.

5.2 Discharge

a) No short circuit.

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

c) The discharge temperature range of cell is -30 ℃~ 60℃.

c) Optimal discharge temperature range is 15 ℃~ 35℃.

5.3 Put cells away from children.

5.4 Storage

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

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 charged stage.

6. Warning

6.1 Read the specification carefully before application. Be have profound understanding with the warnings and announcements.

6.2 Avoid overheat in any circumstances. Don't modify or disassemble the battery. It will be

dangerous, and may cause ignition, heating, leakage or explosion.

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

6.4 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.

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

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

6.7 Don't impact cells excessively.

6.8 Don't weld 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.

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

6.10 Cell cans were connected with positive (+) terminals. Don't contact cans with negative (-) terminals or other cell cans during the using process. It will be dangerous, and may cause ignition or explosion.

6.11 Keep away form static circumstances during storage and using.

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

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

6.14 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.

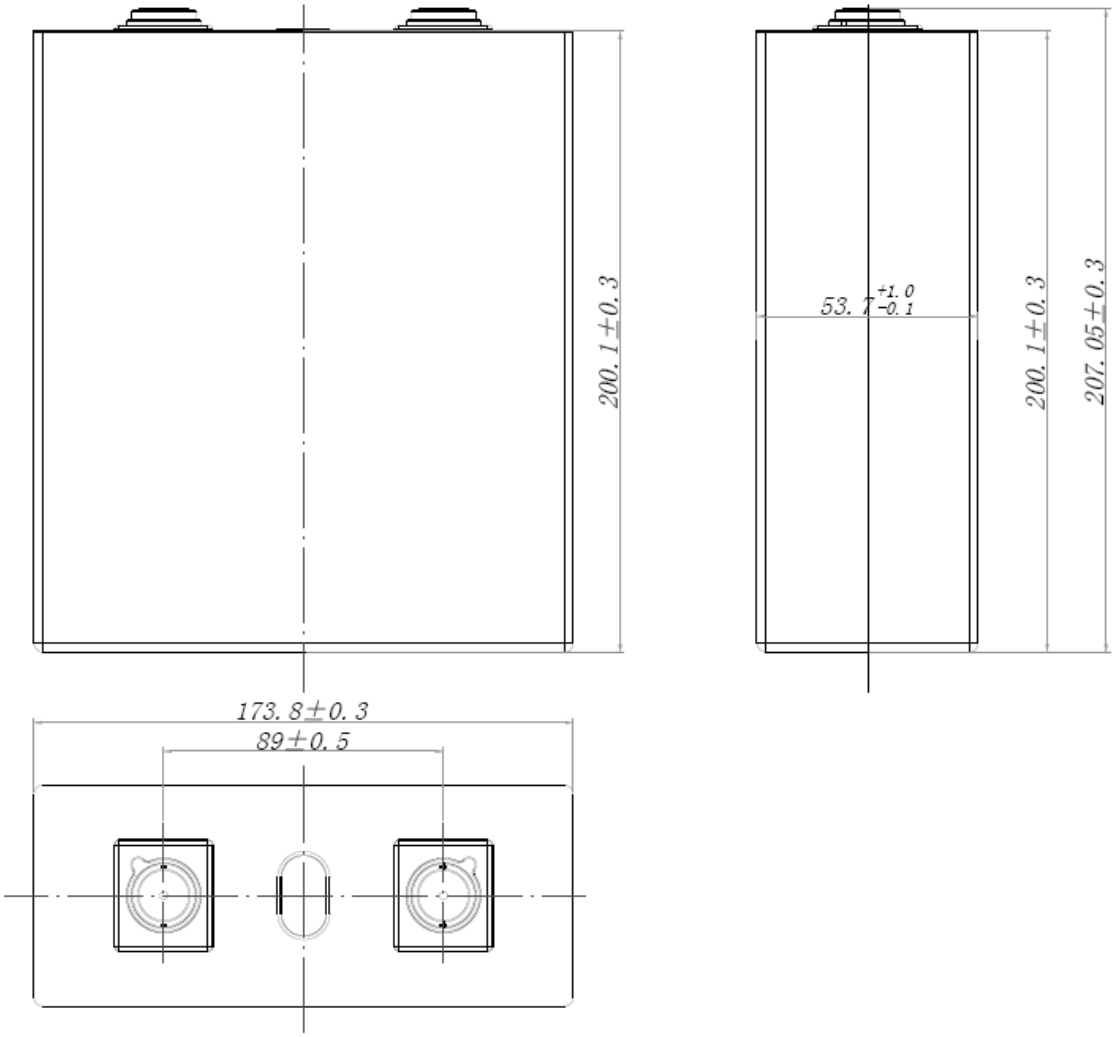
7.2 The delivery battery should be at 10%~50%SOC charged state.

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.



Drawing 1 Appearance and dimension of the battery