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天津力神电池股份有限公司

产品规格书

密级
版本: 4
页码: 1 of 16
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产品规格书

锂离子动力电池 LP2770120-22Ah

天津力神电池股份有限公司

www.lishen.com.cn



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1 适用范围

本规格书适用于天津力神电池股份有限公司生产的 LP2770120 锂离子电池。

2 常规指标

2.1 符号说明

C_3 ——3h 率额定容量(A · h)。

I_3 ——3h 率放电电流，其数值等于 $C_3/3(A)$ 。

本规格书中 $3I_3(A)=22A$ 。

2.2 该产品常规指标

表 1

序 号	项 目	规 格
1	电池种类	动力型锂离子电池
2	电池型号	LP2770120
3	标称容量☆	22Ah（最小容量 21.5Ah）
4	标称电压☆	3.6V
5	内阻☆	$\leq 2.5m\Omega$
6	重量	$501 \pm 10g$
7	最大充电电流	$3 I_3$ (连续) $6 I_3$ (10s)
8	充电电压	$4.20 V \pm 0.05V$
9	最大放电电流	$6 I_3$ (连续) $12 I_3$ (30s)
10	放电终止电压	2.5V
11	最大工作温度范围:	
	充电	$-10^{\circ}C \sim 45^{\circ}C$ ($-10^{\circ}C \sim 0^{\circ}C$, $I < C_3/3$)
	放电	$-20^{\circ}C \sim 60^{\circ}C$
12	最佳工作温度范围:	
	充电	$15^{\circ}C \sim 35^{\circ}C$
	放电	$15^{\circ}C \sim 35^{\circ}C$
13	储藏温度:	
	1 个月内	$-40^{\circ}C \sim 45^{\circ}C$
	6 个月内	$-20^{\circ}C \sim 35^{\circ}C$
*电池处于 30%SOC 状态下保存		

3 外观和尺寸

外观和尺寸见图 1。

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。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。

4.2 测量设备

- a) 伏特计 内阻 $>1000\ \Omega/V$
- b) 游标卡尺 精度为 $0.02\ \text{mm}$
- c) 内阻表 在 AC 1kHz 条件下测量

4.3 测试过程及其标准

4.3.1 充电制式

在环境温度（ 25 ± 2 ）℃条件下，采用先恒流再恒压方式充电。恒流电流为以 $1I_3(A)$ ，恒压电压为 $4.20V$ ，在恒压过程中电流降到 $0.15\ I_3$ 即可终止充电，静置 1 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、无漏液，尺寸见图纸
2	重 量	电子天平	$501\pm 10\text{g}$
3	开路电压☆	按 4.3.1 充电后 1 小时内测量开路电压	$\geq 3.70V$
4	标称放电容量☆	按 4.3.1 充电后 1 小时内以 $1I_3(A)$ 电流放电到放电终止电压 $2.5V$ ，并测容量。上述循环可以重复 5 次，当有 1 次循环容量符合要求时，试验即可终止。	$1I_3(A)$ 容量 $\geq$ 标称容量
5	$3\ I_3(A)$ 放电容量	按 4.3.1 充电后，1 小时内放电直到放电终止电压，放电电流为 $3I_3(A)$ ，并记下时间或容量。	$3I_3(A)$ 容量 $\geq 90\%$ 标称容量
6	最大充电电	按 4.3.1 充电后，以 $1I_3(A)$ 电流放电到放电终止电压 $2.5V$ ，	$3I_3(A)$ (连续);



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	流	并记录容量。以 $3n$ (n 为整数) 倍 I_3 (A) 恒流充至 4.20V, 再以 4.20V 恒压充至 $0.15I_3$ (A) 截止。	$6I_3$ (A) (10s);
7	最大放电电流	按 4.3.1 充电后, 以 $1I_3$ (A) 电流放电到放电终止电压 2.5V, 并记录容量。以 $1I_3$ (A) 充电, 以 $3n$ (n 为整数) 倍 I_3 (A) 放电至 2.5V。	$6I_3$ (A) (连续); $12I_3$ (A) (30s);
8	充放电循环寿命☆	充电: 按 4.3.1 充电 放电: $1I_3$ (A) 电流恒流放电, 80%DOD, 每第 25 次放电 100%DOD, 循环充放电 1500 次以上, 记录容量。	剩余容量 $\geq 80\%$ 标称容量 或循环寿命 ≥ 1500 次
9	荷电保持能力☆	按 4.3.1 充电后, 在环境温度 (25 ± 2) °C 条件下开路搁置 30 天, 再以 $1I_3$ (A) 电流恒流放电到放电终止电压 2.5V。 按 4.3.1 充电后, 在温度 (60 ± 2) °C 的高温箱中放置 7 天, 然后以 $1I_3$ (A) 电流恒流放电至 2.5V, 并记下容量。	容量 $\geq 90\%$ 标称容量
10	高温性能	按 4.3.1 充电后, 在温度 (60 ± 2) °C 的高温箱中放置 5h, 然后以 $1I_3$ (A) 电流恒流放电至 2.5V, 并记下容量。	容量 $\geq 95\%$ 标称容量
11	低温性能	按 4.3.1 充电后, 在温度 (-20 ± 2) °C 的低温箱中放置 20h, 然后以 $1I_3$ (A) 电流恒流放电至 2.5V, 并记下容量。	容量 $\geq 70\%$ 标称容量
12	密封性☆	将电池在进行荷电保持能力试验前和试验后分别用感量为 0.001g 的电子天平称重, 计算电池失重量。	失重 < 300 mg
13	短路试验★	按 4.3.1 充电后, 将接有热电偶的电池放入通风厨中短路, 电池经线路电阻小于 $5m\Omega$ 的外部电路短路 10min	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 $3I_3$ (A) 电流充电, 到电池电压达到 5V 或时间达到 90min (其中一个条件优先达到即停止试验) b) 以 $9I_3$ (A) 电流充电, 至电池电压达到 10V 即停止试验。	电池不起火, 不爆炸
15	过放试验★	按 4.3.1 充电后, 在 (25 ± 2) °C 下以 $1I_3$ (A) 电流放电, 直至电池电压达到 0V 结束试验。	电池不起火, 不爆炸 不漏液
16	热箱试验★	将接有热电偶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 $5^\circ\text{C} \pm 2^\circ\text{C}/\text{min}$), 箱温达到 (85 ± 2) °C 时保持 120min 后结束试验。	电池不起火, 不爆炸
17	针刺试验★	按 4.3.1 充电后, 将接有热电偶的电池放入通风厨中, 用 $\phi 3\text{mm} \sim \phi 8\text{mm}$ 的耐高温钢针以 $10\text{mm/s} \sim 40\text{mm/s}$ 的速度, 从垂直于电池极组的方向贯穿 (钢针停留在电池中)	电池不起火, 不爆炸



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18	挤压试验★	按 4.3.1 充电后，垂直于电池极板的方向挤压电池至电池壳体破裂或内部短路（电池电压变成 0V），挤压头面积不小于 20cm ² 。	电池不起火，不爆炸
19	跌落试验★	按 4.3.1 充电后，在（25±2）℃下，从 1.5m 高度处自由跌落到厚度为 20mm 的硬木地板上，每个面一次。	电池不起火，不爆炸 不漏液

5 注意事项

5.1 充电

- a) 严禁过充，充电电压不得高于 4.20V。
- b) 严禁反向充电。
- c) 建议最佳充电温度为 15℃-35℃，，不宜在低于 15℃温度下长期充电。

5.2 放电

- a) 严禁短路。
- b) 放电电压不得低于 2.5 V。
- c) 建议最佳放电温度为 15℃-35℃, 不宜在高于 35℃温度下长期放电。

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、温度-40℃-45℃的环境及半充满状态。

长期储存（6 个月内）要将电池放置于清洁、湿度低于 65%RH、温度-20℃-35℃的环境及半充满状态。

6 警示

6.1 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。

6.2 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。

6.3 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。

6.4 严禁将正负极柱颠倒使用。

6.5 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

6.6 严禁使电芯承受过重的机械冲击。

6.7 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。

6.8 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。

6.9 在使用过程中严禁各电池之间外壳直接接触或通过导体连接在一起形成通路。

7 运输

运输过程中应防止剧烈振动、冲击、日晒雨淋。

运输过程中应使电池处于 30%SOC 状态。

8 质量保证

电池在正常使用期半年内出现质量问题，且确由生产造成的，厂家将予以解决。但是，在此期限内，如果非电池制程原因而是客户的误用造成的电芯质量问题，公司不承诺免费更换。

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产生的不良电芯不在质量保证的范围之列。

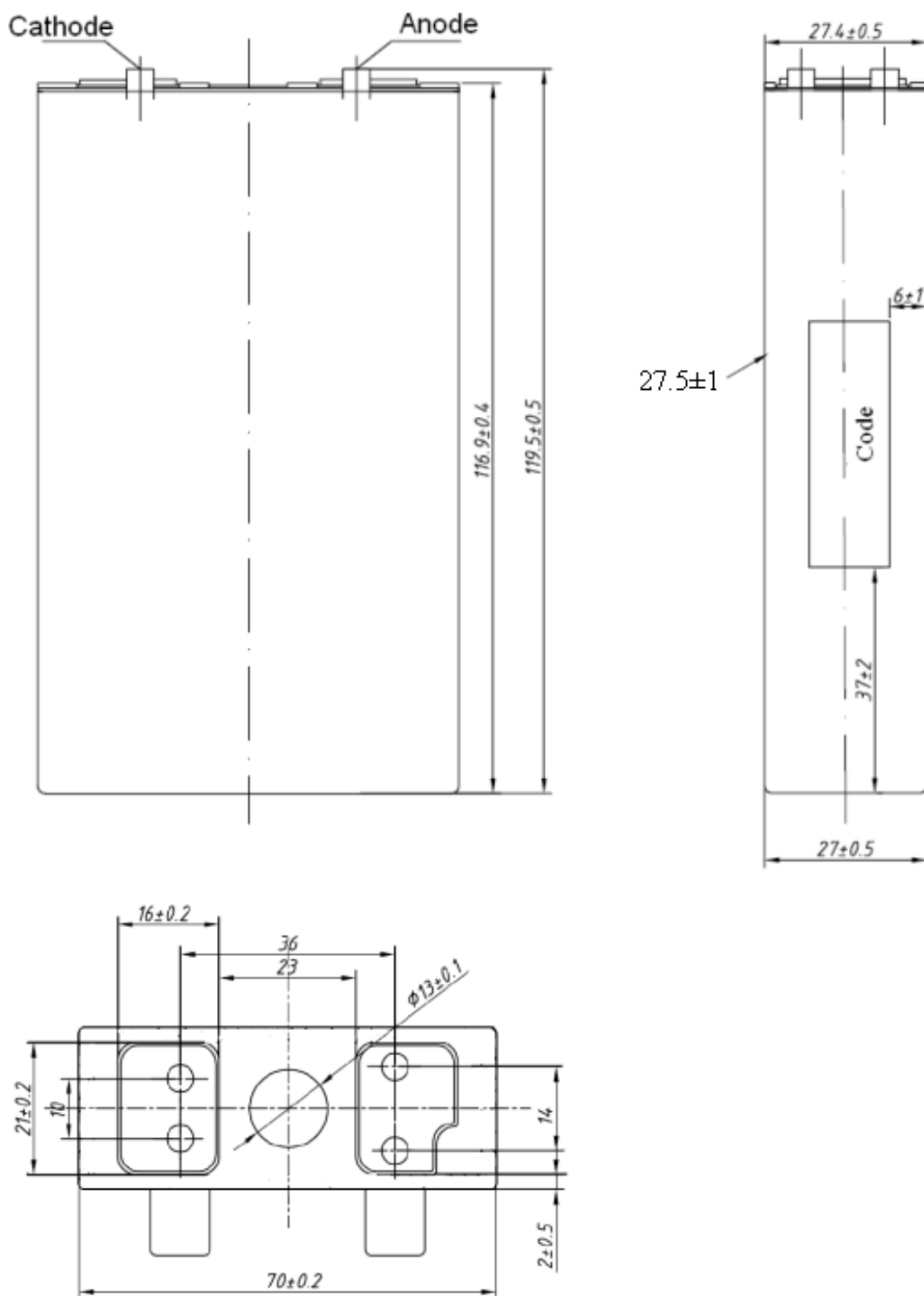


图 1 电池外形图



Product Specification

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Tianjin Lishen Battery Joint-Stock Co.,Ltd

Product Specification

Lithium-ion Power Cell of LP2770120-22Ah

Tianjin Lishen Battery Joint-Stock Co.,Ltd

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Product Specification

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Tianjin Lishen Battery Joint-Stock Co.,Ltd

1. Scope

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

2. General Specifications

2.1 Abbreviation Definitions

C_3 —— the rated capacity (in ampere-hours) of the cell for a three-hour discharge.

I_3 —— a current corresponding to the manufacturer's rated capacity (in ampere-hours) for a three-hour discharge.

$$I_3 = C_3 (\text{Ah}) / 3\text{h}$$

In the following specification $3 I_3 (\text{A}) = 22\text{A}$.

2.2 Specification

	Item	Specification
1	Cell Type	Lithium -ion power cell
2	Cell Model	LP2770120
3	Nominal Capacity☆	22Ah (Min. 21.5Ah)
4	Average Working Voltage☆	3.6V
5	AC-impedance☆	$\leq 2.5\text{m}\Omega$
6	Weight	$501 \pm 10\text{g}$
7	Maximum Charge Current	$3I_3$ (Continuous) $6 I_3(10\text{s})$
8	Charging End Voltage	$4.20 \text{ V} \pm 0.05\text{V}$
9	Maximum Discharge Current	$6I_3$ (Continuous) $12I_3(30\text{s})$
10	Discharge End Voltage	2.5V
11	Max Operating Temperature Range	
	Charge	$-10^\circ\text{C} \sim 45^\circ\text{C}$ ($-10^\circ\text{C} \sim 0^\circ\text{C}$, $I < C_3/3$)
	Discharge	$-20^\circ\text{C} \sim 60^\circ\text{C}$
12	Optimal Operating Temperature Range	
	Charge	$15^\circ\text{C} \sim 35^\circ\text{C}$
	Discharge	$15^\circ\text{C} \sim 35^\circ\text{C}$



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13	Storage Temperature	
	1 month	-40℃ ~ 45℃
	6 months	-20℃ ~ 35℃
*Cells should be stored at the state of 30%SOC		

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 purchase 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 $(25 \pm 2)^\circ\text{C}$ and standard humidity which is $(65 \pm 2)\%$.

4.2 Test Equipment

a) Voltmeter

Inner impedance $> 1000\Omega$ 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.

4.3 Test Process and Specification

4.3.1 Charge Method

Cells are charged with Constant Current and Constant Voltage (CC/CV) method at the environment temperature of $(25 \pm 2)^\circ\text{C}$. The constant current is $1I_3$ (A) and the constant voltage is 4.20V, Charge shall be terminated when the charge current has tapered to $0.15 I_3$ A, then store cells for 1h.

4.3.2 Test Item and Specification

Test Item and Specification Should refer to table 2.



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Table 2

Number	Item	Test profile	Specification
1	Appearance and Dimension	1.Eyeballing 2.Test cells' dimension with slide caliper	No deep scratch, No leakage , dimension should refer to the attached drawing 1
2	Weight	Electronic Scale	501±10g
3	Open Circuit Voltage☆	Measure the open circuit voltage within 1h after charge cells per 4.3.1.	OCV≥3.70V
4	Rated discharge capacity☆	Discharge cells at a $1I_3$ (A) current to 2.5V within 1h after charge cells per 4.3.1. And measure the capacity. The cycle can repeat 5 times, when the capacity of one cycle meet the requirement, the test can be terminated.	$1I_3$ capacity $\geq$ Nominal capacity
5	Discharge capacity at 3 I_3 (A) current	Discharge cells at a $3I_3$ (A) current to 2.5V within 1h after charge cells per 4.3.1. And record the time or capacity.	$3I_3$ capacity $\geq$ 90% of rated capacity.
6	Maximum charge current	1、 Discharge cells at a $1I_3$ (A) current to 2.5V within 1h after charge cells per 4.3.1. And record the capacity; 2 、 Charge cells to 4.20V, charge shall be terminated when the charge current has tapered to 0.15 I_3 A, the charge current is $3nI_3$ ("n" is an integer).	$3I_3$ (A)(continuous); $6I_3$ (A)(10s);
7	Maximum discharge current	1、Discharge cells at a $1I_3$ (A) current to 2.5V after charge cells per 4.3.1. And record the capacity; 2、 Charge cells at $1I_3$ (A) current, and discharge to 2.5V at a current of $3nI_3$ ("n" is an integer).	$6I_3$ (A)(continuous); $12I_3$ (A)(30s);
8	Cycle Life☆	Charge cells per 4.3.1. then Cells shall be discharged at a constant current of $1I_3$ A to 80%DOD @ 25°C±2°C. Rest 10 minutes before recharge. A cycle is defined as one charge and one discharge. Cells shall be discharged at a	Discharge capacity (1500th Cycle) $\geq$ 80% of Nominal Capacity

		constant current of $1I_3$ A to 100% DOD @ $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ every 25 cycles. Discharge capacity shall be measured after 1500 cycles.	
9	Capacity Retention☆	1、After charge per 4.3.1. store the testing cells for 30 days at the environment temperature of $(25\pm 2)^{\circ}\text{C}$, then discharge to 2.5V at a $1I_3$ (A) current. 2、After charge per 4.3.1. store the testing cells at $(60\pm 2)^{\circ}\text{C}$ for 7 days, then discharge to 2.5V at a $1I_3$ (A) current and measure the capacity.	Residual capacity $\geq 90\%$ of Nominal capacity
10	Characteristics at high temperature	Cells shall be charged per 4.3.1 and store for 5h at $(60\pm 2)^{\circ}\text{C}$, then discharge to 2.5V at a $1I_3$ (A) current and measure the capacity.	Residual capacity $\geq 95\%$ of Nominal capacity
11	Characteristics at low temperature	Cells shall be charged per 4.3.1 and store for 20h at $(-20\pm 2)^{\circ}\text{C}$, then discharge to 2.5V at a $1I_3$ (A) current and measure the capacity.	Residual capacity $\geq 70\%$ of Nominal capacity
12	Airproof Characteristics☆	Weighed the testing cells before and after the storage test with an electronic scale which has a minimum scale of 0.001g, and then calculate the weight loss.	Loss of weight < 300 mg
13	Short-circuit Test★	Cell, charged per 4.3.1, shall be short circuited by connecting the positive and negative terminals of the cell with a copper wire having a maximum resistance $\leq 5\text{ m}\Omega$ for 10min.	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 at $3I_3$ (A), end test when the voltage reached 5V or the charge time reached 90min (test can be stopped when one of the conditions above reached first). 2nd Method: Charge test cells at $9I_3$ (A), then stop the test when the voltage reached 10V.	No Explosion, No Fire



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15	Over Discharge test★	Discharge test cells at a $1I_3$ (A) current to 0V after charge cells per 4.3.1.	No Explosion, No Fire, No leakage
16	Thermal Test★	Put cells (with thermocouple) into the oven, then close the door of it The oven temperature shall be raised at a rate of $5^{\circ}\text{C}\pm 2^{\circ}\text{C}/\text{min}$ to a temperature of $(85\pm 2)^{\circ}\text{C}$, the cells shall remain at this temperature for 120min before the test is discontinued.	No Explosion, No Fire
17	Nail penetration Test★	After charged test cells per 4.3.1, put the cells with thermocouple into the fume hood, then penetrate completely the center of the largest side at the speed of 10-40mm per second by a $\Phi 3.0$ - $\Phi 8.0$ mm stainless steel nail.	No Explosion, No Fire
18	Crush Test★	After charged test cells per 4.3.1, crush the cells vertically until the shell rupture or the voltage tapered to 0V, the area of the extrusion head should be larger than 20cm^2 .	No Explosion, No Fire
19	Drop Test★	A cell is charged in accordance with 4.3.1, then dropped from a height of 1500mm to a wooden board (20mm thick) which is placed on the concrete ground .Cells shall be dropped in each of three mutually perpendicular directions.	No Explosion, No Fire, No leakage

5. Caution

5.1 Charge

- a) NO over-charge, the charge voltage should not be over 4.20V.
- b) NO reverse charging
- c) Optimal charge temperature range is $15^{\circ}\text{C} \sim 35^{\circ}\text{C}$. Do not charge for a long time in the temperature less than 15°C .

5.2 Discharge

- a) No short circuit
- b) The end of discharge voltage must be over 2.5V.



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

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 $\leq 65\%$ RH) and at -40°C ~+45°C at half charged stage.

b) For any long time storage (in 6 month), cell should be in a clean and dry area (humidity $\leq 65\%$ RH) and at -20°C ~+35°C at half charged stage.

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 moisture.

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 materials during the using process.

7. Shipping

7.1 During transportation, keep the battery from acute vibration, impacting, insulation,



drenching.

7.2 The delivery battery should be at a 30%SOC state .

8. Quality guarantee

If cells have any quality problem in half a year and it's caused by production, Manufacturer will give the solve method; but Manufacturer will not change cells free if the problem is caused by customers misuse.

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

