



PRODUCT SPECIFICATION

Version:**A/0****DATE:****2017-7-31**

DOC No:

ER-GSP07162227-A-0001

For Any Detail and question, Please Tel Engineer: **86(0)756-3922332****FAX: 86(0)756-3922218**GREAT POWER BATTERY(ZhuHai) CO., LTD
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地址:广东省珠海市斗门区井岸镇珠峰大道新青科技园**CUSTOMER NO:** _____

Specification Approval Sheet 规格确认书

MODEL/型号: GSP07162227**(22Ah 3.2V)**

Prepared By/Date 编制/日期	Checked By/Date 审核/日期	Checked By/Date 审核/日期	Approved By/Date 批准/日期
胡祥/2017-7-31			

Customer Approval 客户确认	Signature/签 字	Date/日 期
	Company Name/公司名称	
	Company Stamp/公司印章	

Amendment Records/修正记录

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	PRODUCT SPECIFICATION	Version:	A/0
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For Any Detail and question, Please Tel Engineer: 86(0)756-3922332 FAX: 86(0)756-3922218			

Content/目录

1. Scope/适用范围	Page 4
2. Model/型号	Page 4
3.Cell Specification/电芯规格说明	Page 4/5
4. Battery/Cell performance test Criteria/电池性能标准	Page 6
4.1 Appearance inspection by visual/外观目测	Page 6
4.2 Environmental test condition/外界环境条件	Page 6
4.3 Electrical characteristics/电气特性	Page 6
4.4 Mechanical characteristics/机械特性	Page 7
4.5 Safety performance/安全性能	Page 8
5. Cell initial Dimensions/电芯初始尺寸	Page 9
6. Handling of Cells /电池操作注意事项	Page 10
6.1 Consideration of strength of film package /外包装薄膜注意事项	Page 10
6.2 Prohibition short circuit/禁止电池短路	Page 10
6.3 Mechanical shock/机械撞击	Page 10
6.4 Handling of tabs/极耳操作注意事项	Page 10
7. Notice for Designing Battery Pack/电池外壳设计注意事项	Page 10
7.1 Pack toughness/外壳坚韧度	Page 10
7.2 Cell fixing/电池的固定	Page 10
7.3 Inside design/外壳内部设计	Page 10
7.4 Tab connection /极片连接	Page 10/11
7.5 For mishaps/针对意外事件	Page 11
8. Notice for Assembling Battery Pack 电池装配注意事项	Page 11
9. Others/其它	Page 11
9.1 Cell connection/电池连接	Page 11
9.2 Prevention of short circuit within a battery pack/电池内部的短路预防	Page 11
9.3 Prohibition of dis-assembly/禁止拆卸	Page 11/12
9.4 Prohibition of dumping of cells into fire/不要把电池倾倒在火中	Page 12
9.5 Prohibition of cells immersion into liquid such as water/禁止浸泡电池	Page 12
9.6 Battery cells replacement/更换电池	Page 12
9.7 Prohibition of use of damaged cells/禁止使用损坏的电	Page 12
10. Period of Warranty/保质期	Page 12
11. Storage of the Batteries/电池的存放	Page 12
12. Other The Chemical Reaction/其它化学反应	Page 12
13. Note/注释	Page 12

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1 Scope/适用范围

This specification is applies to describe the related Battery product in this Specification and the Battery/cell supplied by Great Power Battery Co., Ltd only.

本说明书只适用于描述本规格书中相关的产品以及鹏辉电池有限公司提供的电池。

2 Model/型号: **GSP07162227**

3 Cell Specification/电芯产品规格

No.	Items/项目	Specifications/规格	Remark 备注
1	Material system 材料体系	Lithium iron phosphate 磷酸铁锂	/
2	Nominal Capacity 标称容量	22Ah	0.2C Standard discharge 0.2C 标准放电
3	Minimum Capacity 最小容量	22Ah	
4	Nominal Voltage 标称电压	3.2V	Mean Operation Voltage 即工作电压
5	Delivery voltage 交货电压	3.200~3.300V	Within 10 days from Factory 在出厂 10 天内
6	Charge Voltage 充电电压	3.65V±0.03V	By standard charge method 标准充电方式
7	Standard charging method 标准充电方式	0.2C constant current,3.65V constant voltage charge to 3.65V,continue charging till current deadline to≤0.05C (25±3℃)	0.2C 恒流 3.65V 恒压充至电流≤0.05C ,时间 6.0h(供参考) (25±3℃)
8	Standard discharging method 标准放电方式	0.2C constant current discharge to 2.5V,	0.2C 恒流放电至 2.5V
9	Cell Internal Impedance 单电芯内阻	≤2.0mΩ	Internal resistance measured at AC 1KHz after 50% charge 半电态下用交流法测量内阻
10	Weight 重量	≤0.5Kg	/

	PRODUCT SPECIFICATION	Version:	A/0
		DATE:	2017-7-31
		DOC No: ER-GSP07162227-A-0001	
For Any Detail and question, Please Tel Engineer: 86(0)756-3922332 FAX: 86(0)756-3922218			

3 Cell Specification/产品规格(continuous/续上表)

No.	Items/项目	Specifications/规格			Remark 备注
10	CC Charge 恒流充电	CC charge 0.5C/11A、cutoff voltage 3.65V, Capacity>19.8Ah			0.5C 恒流充电容量>19.8Ah
11	High-Rate Discharge 倍率放电	DC discharge 2.0C/44A、cutoff voltage 2.50V, Capacity>19.8Ah			2.0C 恒流放电容量>19.8Ah
14	Operation Temperature and relative humidity Range 工作温度和湿度范围	Charge/充电 60±25%R.H.	0~10℃	0.1C	High/low temperature environment reduce battery charge efficiency and influence battery life. Long time working under 60 ℃ environment will lead to battery abnormal. 高/低温充电效率会下降，会影响电池使用寿命，长期在高于 60 度环境中使用会出现导致电池异常
			11~20℃	0.2C	
			21~45℃	0.5C	
		Discharge/放电 60±25%R.H.	-20~60℃		
15	Storage temperature for a long time 长时间储存温度 60±25%R.H.	-20~25℃≤6 个月 -20~25℃≤Six months -20~45℃≤一个月 -20~45℃≤one month			Do not storage exceed half year. Must charge once when storage for half year. Must charge the battery which with protect Circuit when storage for three months. (under normal storage conditions for long periods required storage capacity can lead to decay and fall of the life cycle,such as Environmental requirements exceeded the storage capacity will be further exacerbated decline and decay cycle life) 不可超过半年,达到半年须充电一次 带保护板电池 3 个月充电一次(在正常要求的储存环境下长时间存储会导致容量衰减和循环寿命的下降，如超出存储环境要求则会进一步加剧容量的衰减和循环寿命的下降.)

4 **Battery/Cell performance test Criteria/电池性能标准**

4.1 **Appearance inspection by visual/外观目测**

There shall be no such defect as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

电池外观应没有裂纹、爆裂、锈渍、污渍、漏液等影响商业价值的缺陷存在。

4.2 **Environmental test condition/外界环境条件**

Unless otherwise specified, all test stated in this product specification are conduct at below test condition
所有测试应按以下环境条件进行，除非特殊指定外。

Temperature: 25±3℃

Relative Humidity:60%±25% R.H.

4.3 **Cell Electrical characteristics/电气特性**

No	Items/项目	Test Method and Condition/测试方法及条件	Criteria/标准
1	Rated Capacity at 1.0C(Min.) 0.2C 最小额定容量	After standard charge,the capacity shall be measured on 0.2C discharge till the voltage discharge to 2.5V, 标准充电后，放电至 2.5V 截止，测量 0.2C 放电容量	≥22Ah
2	Cycle Life RT 常温循环寿命	Charging and discharging battery as blew conditions 0.2C standard charge to 3.65V end-off 0.2C standard discharge to 2.5V cut-off Continuous charge and discharge for 3000 cycles,the capacity will be measure after the 3000 th cycle, ambient temperature 20~25℃,80%DOD 充放电按以下条件： 0.2C 标准充电至 3.65V，0.2C 标准放电至 2.5V，连续充放电循环 3000 周，在第 3000 周结束后测量容量,(80%DOD)	≥70% of initial capacity for 3000 cycles 3000 周循环≥70%初始容量 (80%DOD)
3	Cycle Life 45 度循环寿命	Charging and discharging battery as blew conditions 0.5C standard charge to 3.65V end-off 0.5C standard discharge to 2.5V cut-off Continuous charge and discharge for 300 cycle,the capacity will be measure after the 300 th cycle ambient temperature 45±2℃ 充放电按以下条件： 0.5C 标准充电至 3.65V，0.5C 标准放电至 2.5V，连续充放电循环 300 周，在第 300 周结束后测量容量	≥70% of initial capacity ≥70%初始容量

	PRODUCT SPECIFICATION	Version:	A/0
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4.4 Mechanical characteristics/电气特性

No	Items/项目	Test Method and Condition/测试方法及条件	Criteria/标准
1	H/L temperature discharge 高低温放电性能	Full charged cell by standard charge displace in -20±2℃ for 24hrs then 1.0C discharge to 2.0V 将电芯放置在-20±2℃恒温箱内 24 小时, 以标准放电方式放电	Capacity remain ≥70% initial capacity 放电容量≥70%初始容量
		Full charged cell by standard charge displace in 55℃±2℃ for 5hrs then 1.0C standard discharge to 2.5V 标准充电方式充电后, 将电芯放置在 55±2℃恒温箱内 5 小时, 以标准放电方式放电	Capacity remain ≥90% initial capacity 放电容量≥90%初始容量
2	Capacity retention 容量保持	The battery to be charge in accordance with standard charge condition at 20~25℃, then storage the battery at an ambient temperature 20~25℃ for 28 days. Measure the capacity after 28 days with 1.0C at 20~25℃ as retention capacity 将电池在 20~25℃标准充电后储存在 20~25℃的环境中 28 天, 测试 1.0C 放电容量作为保持容量	Retention capacity≥90% 容量保持 ≥90%
		The battery to be charge in accordance with standard charge condition at 20~25℃, then storage the battery at an ambient temperature 55±2℃ for 7 days. Measure the capacity after 1 days with 1.0C at 20~25℃ as retention capacity 将电池在 20~25℃标准充电后储存在 55±2℃的环境中 7 天后, 测试电池在 20~25℃环境下 1.0C 放电容量作为保持容量	Retention capacity≥90%、Impedance change≤20%、Thickness change≤10% 容量保持≥90%、内阻变化≤20%、厚度变化≤10%
3	Capacity recovery 容量恢复	The battery to be charge in accordance with standard charge condition at 20~25℃, then storage the battery at an ambient temperature 20~25℃ for 28 days. Measure the rate capacity at 1.0C after 28 days 20~25℃ as recovery capacity 将电池在20~25℃标准充电后储存在20~25℃的环境中28天, 测试1.0C放电容量作为恢复容量	Recovery capacity≥95% 容量恢复 ≥95%
		The battery to be charge in accordance with standard charge condition at 20~25℃, then storage the battery at an ambient temperature 55±2℃ for 7 days, shelve 5hrs at 20~25℃ Measure the rate capacity at 1.0C after 7 days 20~25℃ as recovery capacity 将电池在20~25℃标准充电后储存在55±2℃的环境中7天后, 室温搁置5h, 测试电池在20~25℃环境下 1.0C容量作为恢复容量	Recovery capacity≥95%、Impedance change≤20%、Thickness change≤10% 容量恢复≥95%、内阻变化≤20%、厚度变化≤10%

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4.5 Safety performance/安全性能

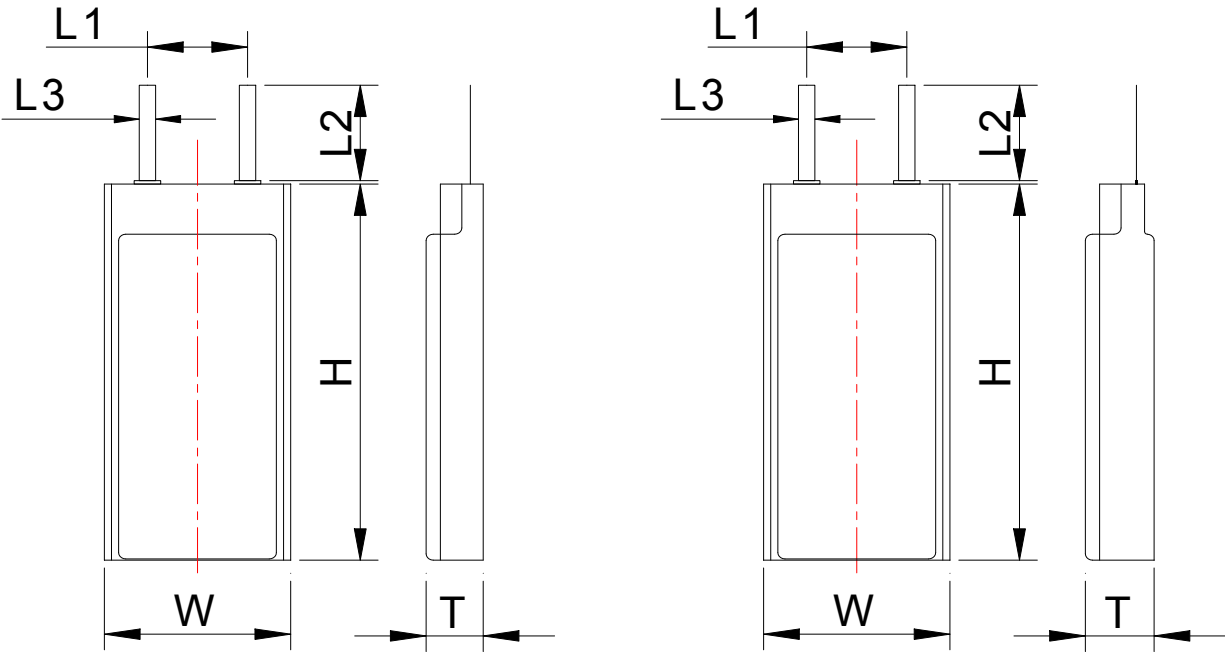
No	Items/项目	Test Method and Condition/测试方法及条件	Criteria/标准
1	Thermal exposure test 高温热冲击测试	Each fully charged cell, placed in a circulating air-convection oven. The oven temperature is raised at a rate of 5 °C/min $\pm$ 2 °C/min to a temperature of 130 °C $\pm$ 2 °C. The cell remains at this temperature for 30 min before the test is discontinued. 充满电的电池温度稳定到常温后, 放置入循环空气烘箱里, 从常温以5°C/分 $\pm$ 2 °C/分的速率升至130°C后, 在130°C放置30分钟	No explosion, No fire 无起火, 无爆炸
2	Short test 短路测试	The fully charged battery is to be short-circuited by connecting the positive and negative terminals with resistance load not exceed 5m Ω . Tests are to be conducted at temperature 25 $\pm$ 2°C. 在室温 25 $\pm$ 2°C把充满电的电池的正负极用不超过5m Ω 的负载连接起来, 连接起来使电池外部短路	No explosion, No fire The Temperature of the Battery surface not exceeded than 150°C 无起火, 无爆炸 电池表面温度不超过 150°C
3	Over discharge test 过放电测试	After 1C charge, With 1C 90 minutes of constant current discharge and observed for 1 hour. 电芯 1C 充满电后, 以 1C 的恒定电流放电 90 分钟, 观察 1 小时	No explosion, No fire, No leakage 无爆炸, 无起火, 无漏液
3.	Over charge test 过充电测试	After 1C charge, continue to charge with a constant voltage 5.5V per a cell, holding 1h. 电芯 1C 充满电后, 以 5.5V 的恒定电压继续充电, 保持 1 小时	No explosion, No fire, No leakage 无爆炸, 无起火, 无漏液
4	Nail pierce 针刺	After standard charge, 5~8mm diameter nail transpierce cell with speed 20~30mm/s and observe 1h 电芯充满电后, 用 5~8mm 直径的钉子刺穿电芯, 观察 1 小时	No explosion, No fire 无爆炸, 无起火
5	Free fall test 自由跌落测试	After 1C charge, then drop the battery three times from a height of 1.2 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations and observe 1h. 电芯1C充满电后, 然后从1.2m高度跌落电池到一个水泥地面, 随机跌落三次, 观察1小时	No explosion, No fire 不起火, 不爆炸

	PRODUCT SPECIFICATION	Version:	A/0
		DATE:	2017-7-31
		DOC No: ER-GSP07162227-A-0001	

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6	Crush test 挤压测试	After 1C charge, Half a cylinder with a radius of 75 mm to (5 + 1mm)/s velocity perpendicular to the cell pressure, when the battery voltage reaches 0 v or deformation of 30% or stop pressing after extrusion of 200 kn, observe 10min 电池1C充满电后，用半径75mm的半圆柱体，以（5±1）mm/s的速度垂直于电池施压，当电池电压达到0V或变形量达到30%或挤压力达到200KN后停止挤压。观察10min	No explosion, No fire 无起火无爆炸
7	Seawater immersion 海水浸泡	After 1C charge , All immersed in 3.5% brine concentration, to maintain a minimum of 2 hours or until thermal runaway when to stop, observe 1h. 电池 1C 充满电后，全部沉浸在浓度 3.5%的盐水中，保持 2 小时以上或直到发生热失控时停止，观察 1 小时	No explosion, No fire 不起火，不爆炸
8	Temperature cycle 温度循环	After 1C charge, Put the battery in 25 °C /-40 °C, 25 °C / 85 °C condition transformation temperature,after repeat 5 times observe 1h 电池 1C 充满电后，将电池放入 25℃/-40℃、25℃/85℃ 环境条件下转换温度搁置，重复 5 次后观察 1 小时	No explosion, No fire 不起火，不爆炸
9	Low pressure test 低气压测试	After 1C charge, Into the low pressure experiment box, adjust air pressure in the test chamber is 11.6 KP,Temperature to room temperature,take out after 6 h , observe 1h. 电池 1C 充满电后，放入低气压箱中，调节试验箱中气压为 11.6KP，温度为室温，放置 6h 后取出，观察 1 小时	No explosion, No fire, No leakage 无爆炸，无起火，无漏液

5 Cell initial Dimensions/电芯初始尺寸



NO	Items	Units:mm	Remark
1	Thickness/厚度	7.0MAX	/
2	Width/宽度	162.0±1.0	/
3	Height/长度	227.0±1.0	/
4	L1	61.0±2.0	/
5	L2	17.5±1.0	/
6	L3	38.0±0.5	/

注：测试电池为到货时间不超过 1 个月的新鲜电池；

Drawer/制图	Checked/审核	Approved/批准
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	PRODUCT SPECIFICATION	Version:	A/0
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6 Handling of Cells /电池操作注意事项

6.1 Consideration of strength of film package /包装薄膜注意事项

1) Soft Aluminum foil/铝箔软包装

Easily damaged by sharp edge parts such as pins and needles, Ni-tabs, so don't strike by those sharp parts.

铝箔软包装比较容易被锐利部件刺损，如针尖、镍带,所以不要用这此锐利的部件刻划电池。

2) Sealed edge may be damaged by heat above 100°C, bend or fold sealed edge.

封边被加热到 100°C 以上以及弯折封边都容易使封边受损。

6.2 Prohibition short circuit/禁止电池短路

Never make short circuit cell. It generates very high current which causes heating of the cells and may cause electrolyte leakage, gassing or explosion that are very dangerous.

The LIP tabs may be easily short-circuited by putting them on conductive surface.

Such outer short circuit may lead to heat generation and damage of the cell.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

避免电池短路。短路会产生很高的电流而使电池发热以及电解液泄漏，产生有毒气体或爆炸是非常危险的。极片连接在导电物体表面很容易短路，外部短路会导致发热及损害电池。选用一个适当的保护电路可以在意外短路时保护电池。

6.3. Mechanical shock/机械撞击

LIP cells have less mechanical endurance than metal-can-cased LIB.

Falling, hitting, bending, etc. may cause degradation of LIP characteristics.

聚合物电池比金属外壳电池的机械耐久性更小。

跌落、碰撞、弯曲等等都可能会降低聚合物电池的性能。

6.4 Handling of tabs/极耳操作注意事项

The battery tabs are not so stubborn especially for aluminum tab.

Don't bend tab.

Do not bend tabs unnecessarily.

极耳的机械强度并非异常坚固，特别是铝片。没有必要时禁止弯折极片。

7 Notice for Designing Battery Pack/电池外壳设计注意事项

7.1 Pack toughness/外壳坚韧度

Battery pack should have sufficient strength and the LIP cell inside should be protected from mechanical shocks.

电池外壳应该有足够的机械强度使聚合物电池免受机械撞击。

7.2 Cell fixing/电池的固定

The LIP cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

电池最大面积的一面应该固定在外壳上，安装后电池不能有松动。

8.3 Inside design/外壳内部设计

No sharp edge components should be insides the pack containing the LIP cell.

外壳内安装电池的部位不应有锋锐边。

8.4 Tab connection /极片连接

Ultrasonic welding or spot welding is recommended for LIP tab connection method.

Battery pack should be designed that shear force are not applied to the LIP tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

1) The solder iron should be temperature controlled and ESD safe;

2) Soldering temperature should not exceed 350°C;

3) Soldering time should not be longer than 3s;

	PRODUCT SPECIFICATION	Version:	A/0
		DATE:	2017-7-31
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For Any Detail and question, Please Tel Engineer: 86(0)756-3922332 FAX: 86(0)756-3922218			

4) Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;

5) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

建议使用超声波或点焊焊接方法；外壳设计应使极片不受外力。

如果使用人工焊接保护板，下面的注意事项对于确保电池性能非常重要：

- 1) 焊接铬铁的温度必须可控且可防静电；
- 2) 焊接时铬铁的温度不能超过 350°C；
- 3) 焊锡时间不能超过 3 秒钟；
- 4) 焊锡次数不能超过 5 次，待极片冷却后才能进行下一次焊锡；
- 5) 严禁直接加热电芯，高于 100°C 度会损害电芯。

7.5 For mishaps/针对意外事件

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

- 1) Isolate PCM (Protection Circuit Module) from leaked electrolyte as perfectly as possible.
- 2) Avoid narrow spacing between bare circuit patterns with different voltage.

(Including around connector)

LIP battery should not have liquid from electrolyte, but in case If leaked electrolyte touch bare circuit patterns, higher potential terminal material may dissolve and precipitate at the lower potential terminal, and may cause short circuit. The design of the PCM must have this covered.

发生意外时外壳设计应考虑即使在电池出现漏液时也不会发热。

- 1) 尽量把保护电路与渗漏的电解液隔离开。
- 2) 在不同的电压情况下避免出现小间距的裸露电路——包括插头周围。
- 3) 聚合物电池不应该有来自电解液的液体，但是一旦发生电解液渗漏触及裸露电路，高电势端子材料可能会溶解然后沉淀到低电势端子，可能会造成短路。保护板的设计必须含有覆盖保护层。

8 Notice for Assembling Battery Pack 电池装配注意事项

Shocks, high temperature, or contacts of sharp edge components should not be allowed in battery pack assembling process.

在电池装配过程中不允许撞击、高温或接触尖锐部分。

9 Others/其它

9.1 Cell connection/电池连接

- 1) Direct soldering of wire leads or devices to the cell is strictly prohibited.
- 2) Pole piece should first before welding wire welding to the battery.

Direct soldering may cause damage of components, such as separator and insulator, by heat generation.

- 1) 严禁直接焊接引线或设备到电池上。
- 2) 极片在焊接引线之前应该先点焊到电池上，直接与电池热焊接，产生的热量会使电池的隔离体及绝缘体受损。

9.2 Prevention of short circuit within a battery pack/电池内部的短路预防

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack shall be structured with no short circuit within the battery pack, which may cause generation of smoke or firing.

在电池和引线之间应该有足够的绝缘层用于安全保护。电池的包装构成应没有导致起烟起火的短路情况。

9.3 Prohibition of dis-assembly/禁止拆卸

- 1) Never disassemble the cells

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

- 2) Electrolyte is harmful

LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

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1) 不要拆卸电池。

拆卸电池会发生电池内部短路，会引起起火、爆炸、有害气体或者其它问题。

2) 电解液是有害的

万一电解液沾到皮肤、进入眼睛，应立即用清水冲洗以及求助医生。

9.4 Prohibition of dumping of cells into fire/不要把电池倾倒在火中

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very dangerous and is prohibited.

不要焚毁电池，否则会导致电池爆炸，这个很危险，必须禁止。

9.5 Prohibition of cells immersion into liquid such as water/禁止浸泡电池

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

请不要把电池浸泡在液体当中，像清水、海水，及非酒精饮料、果汁、咖啡或者其它的饮料。

9.6 Battery cells replacement/更换电池

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

更换电池应由电池生产商或设备供应商完成，用户不要自行更换。

9.7 Prohibition of use of damaged cells/禁止使用损坏的电池

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more.

The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

电池可能在出货途中碰撞而受损。如果发现电池有异常，例如包装损坏、电池包裹变形，有电解液的味道、发现漏液等等，不要再使用这些电池。

电池如果有电解液的味道或者出现漏液，电池放置应该远离火源避免起火及爆炸。

10 Period of Warranty/保质期

The period of warranty is three years from the date of shipment. Great Power guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

电池的保质期从出货之日算起为三年。如果电池的缺陷是在制造过程中形成的而不是由于用户滥用及错误使用造成，本公司负责退换货。

11 Storage of the Batteries/电池的存放

The batteries should be stored at room temperature, charged to about 10% to 30% of capacity.

We recommend that batteries be charged about once per half a year to prevent over discharge.

电池应当在室温下存放，应充到 10%至 30%的电量。如长时间储存，建议每半年充一次电（带 BMS 装置的为 3 个月）以防止电池过放电。

12 Other The Chemical Reaction/其它化学反应

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

由于电池是利用化学反应的原理，所以随时间的增加电池的性能会降低，即使是存放很长一段时间而不使用。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，会使缩短电池的使用寿命，或者会产生漏液导致设备损坏。如果电池长周期不能充电，即使充电方法正确，这样需要更换电池了。

13 Note/注释

Any other items which are not covered in this specification shall be agreed by both parties.

本说明书未包括事项应由双方协议确定。