



惠州市恩卓能源科技有限公司

HUIZHOU ENFU ENERGY TECHNOLOGY CO.,LTD.

规格书【APPROVED SHEET】

客户名称【Customer Name】:

客户料号【Customer P/N】:

产品类型【Product Type】: 磷酸铁锂电池组【LFP Battery】

电池型号【Battery Model】: 51.2V280AH

文件编号【File No.】:

EF105-1

版本【REV No.】: V1.0

日期【Date】: 2023-8-15

客户确认【Customer Approval】

审核【Checked By】	批准【Approved By】	公司印章【Company Stamp】

惠州市恩卓能源科技有限公司

HUIZHOU ENFU ENERGY TECHNOLOGY CO.,LTD.

编制【Prepared By】	审核【Checked By】	批准【Approved By】
黎端午		

机密文件，非本公司允许，不得影印、复制、传播

Confidential documents shall not be photocopied, copied or transmitted without the permission of the company

地址【Add】: 广东省惠州市仲恺高新区惠环街道西坑工业区梧桐工业园 2 楼

【Floor 2, wutong Industrial Park, Xikeng Industrial Zone, Huihuan Street, Zhongkai High tech Zone, Huizhou City】

网址【Url】:



惠州市恩卓能源科技有限公司

HUIZHOU ENFU ENERGY TECHNOLOGY CO.,LTD.

修订记录【History of Revision】

版本号 【Version】	日期 【Date】	更改内容 【Event】
V1.0	2023-8-15	首次发行【First Issue】

1. 适用范围【Scope】

本规格书描述电池之标称参数、电气特性、安全性能、环境适应性及其实验和判定、使用说明和安全规程、质量评定及包装、标志、贮存、运输等。

This specification describes the nominal parameters of the battery, electrical characteristics, safety performance, environmental adaptability and its experiment and judgement, instructions, and safety procedures, quality valuation and packaging, marking, storage, transportation, etc.

2. 引用标准【Adopted Standard】GB 31241-2022 便携式电子产品用锂离子电池和电池组安全要求

3. 电气特性【Electrical Characteristics】

序	内容【Item】	参数【Parameter】	
1	标称电压【Rating Voltage】	51.2V	
2	标称容量【Capacity】	280Ah	
	最小容量【Minimum Capacity】 (a)	280Ah	
3	额定能量【Energy】	14.336kWh	
4	出货电压	≥48.0V	
5	充电电压【Charge Voltage】	58.4V	
6	放电截止电压【End of Discharge Voltage】	40.0V (电池标准放电)	
7	充电方式【Charging Mode】	恒流/恒压方式【C.C/C.V.】(依电压转换)	
8	充电电流【Charging Current】	标准充电【Standard】	56A (≈0.2C)
		快速充电【Fast】	140A (≈0.5C)
9	充电时间【Charging Time】	标准充电【Standard】	6.0Hours
		快速充电【Fast】	1.2Hours
10	放电电流【discharge current】	标准放电【Standard】	56A (≈0.2C)
		最大持续放电【Max】	140A (≈0.5C)
		瞬间放电	300A (≈1.0C) 3sec
11	工作温度【Operating Temperature】	充电【Charging】	0~45°C
		放电【Discharging】	-10~50°C
12	推荐贮存温度【Recommend Storage Temperature】 (b)	25±5°C	
13	内阻【Impedance】	≤100.0mΩ	
14	电池组重量【Weight】	≈ 120.0 kg	
15	循环寿命【Cycle Life】	≥2000 cycles @80% DOD @25°C @0.5C	
16	组合方式(串并联)	16S1P	
17	外形尺寸(长*宽*高)	442 (483) *703*237mm	
R	备注【Remark】		
	a、常温完全充电后用 0.2C 放电至截止电压。[Ordinary temperature 0.2C discharge after full charge]		
	b、贮存时应充电至容量的 40%~50%[Storage capacity should be 40%~50% full charge capacity]		

4. Battery Configuration 电池组成

No.	项目【Item】	类型【Type】
1	电芯【Cell】	72174207-3.2V-280AH
2	保护板【BMS】	16 串铁锂 150A 博强主板带屏带通讯板
3	钣金箱	SPCC 黑色
4	接线端子	200A 栅栏端子
5	断路器	2 路空开, CHCYZO RKB1/DC B200A

5. 电池性能测试规范【Battery Performances Test Criterion】

5.1 外观【Appearance】

电池外表面清洁，无电解液泄漏，无明显的划痕及机械损伤，无变形，无影响电池价值的其它外观缺陷。
There shall be no such defect as scratch, flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

5.2 测试设备【Measurement Apparatus】

(1) 尺寸测量设备【Dimension Measuring Instrument】

测量尺寸的仪器的精度应不小于 0.01mm。

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

(2) 电压表【Voltmeter】

国家标准或更灵敏等级，内阻不小于 10 KΩ/V。

Standard class specified in the national standard or more sensitive class having inner impedance not less than 10 KΩ/V.

(3) 电流表【Ammeter】

国家标准或更灵敏等级，外部总内阻包括电流表和导线应小于 0.01Ω。

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

(4) 内阻测试仪【Impedance Meter】

内阻测试仪测试方法为交流阻抗法(AC 1kHz LCR)。

Impedance shall be measured by a sinusoidal alternating current method(AC 1kHz LCR meter).

5.3 测试条件 (除非另作说明)【Testing Condition (unless otherwise specified)】

温度：20±5℃，相对湿度：60±20%，大气压强：86~106Kpa。

Temperature 20°C±5°C, Relative humidity: 60±20%, Atmosphere pressure: 86~106Kpa.

5.4 可靠性测试 (单节电芯) Reliability Test (single batteries):

见表一 TABLE1

6. 运输 Shipment

电池应在半荷电状态 40-50%充电状态下包装成箱进行运输，在运输过程中应防止剧烈振动、冲击或挤压，防止日晒雨淋，应适用汽车、火车、轮船、飞机等普通运输工具。

The battery should be packed in cartons under the condition of half capacity 40-50% for shipment. The violent vibration,impaction or squeezing should be avoided in the transport process; neither is exposed in the sunlight nor rain. The batteries shall be shipped by normal transportation such as by road, by train, by ocean or by air.

7. 贮存 Storage

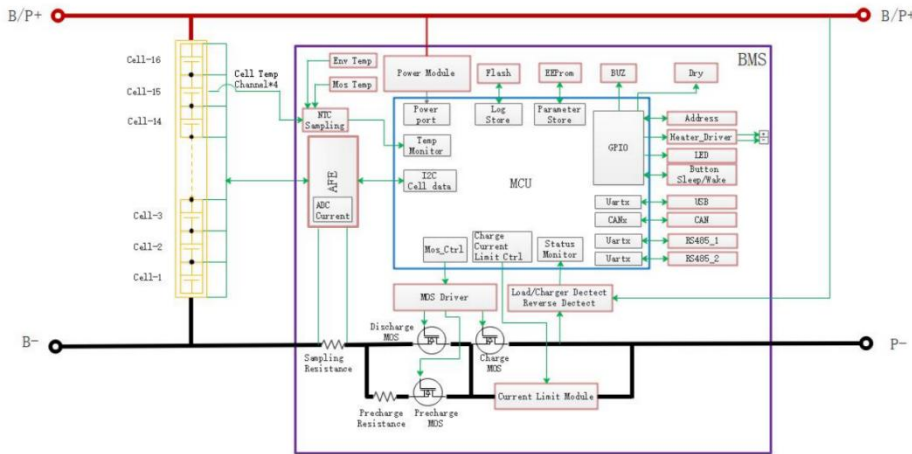
电池应贮存在环境温度 20~30℃的清洁、干燥通风的室内，应避免与蚀性物质接触，应远离火源及热源。电池贮存过程中每六个月充电一次。电池的加工过程中使用库存电芯和电池交货出库时，均应该遵循“先进先出”的原则；电池从入库之日起，保存期限为 12 个月，超过贮存期限的产品必须重新进行逐批检查，合格后才能交付订货方，逐批检查不合格的按再提交检查的批处理，若仍然不合格，将由订货方决定处置。

The battery storage shall be in the clean and dry ventilation room at the temperature of 20~30°C and shall keep out of fire or heat and avoid touching corrosion elements. The batteries shall be charged every 6 months during storage. Both the stored cells in the process of the battery and the batteries in delivery shall be "first come, first use". The battery storage period is 12 months when into the warehouse. Batteries expired must have a thorough check. Only the applicable batteries can be dispatched to the purchaser; the inapplicable ones shall be rechecked, if it remains, the purchaser shall have the right to dispose bad ones.

8、BMS (见附件)

8.1 储能系统架构如下所示:

The Energy storage system architecture is as follows:



8.2 参数指标 Parameters Ratings (可调整)

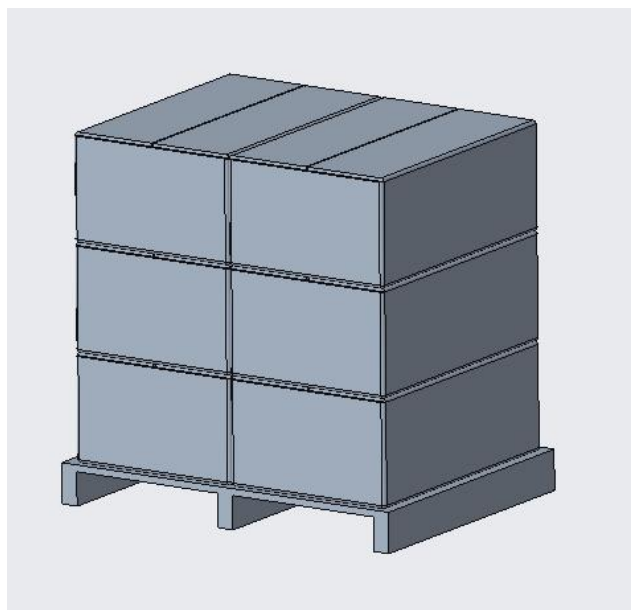
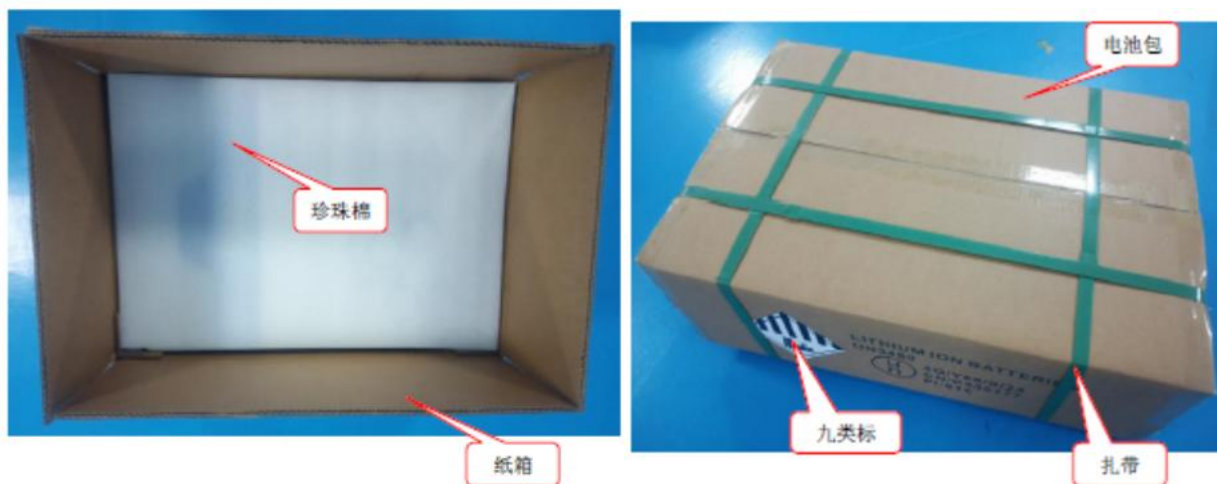
功能名称 (Function name)	项目 (Project)	规格(Specification)			单位 (Unit)
		最小值 MIN	典型值 TYP	最大值 MAX	
单体过压 Cell Over Voltage	告警值(COV alarm value)	3330	3650	3670	mV
	告警恢复值(COV alarm release value)	3380	3400	3420	mV
	告警延时(COV alarm delay)	1000	3000	5000	mS
	保护值(COV protect value)	3730	3750	3770	mV
	保护恢复值(COV protect release delay)	3380	3400	3420	mV
	保护延时(COV protect delay)	1000	3000	5000	mS
	过充保护释放条件 (Over-voltage release conditions)	电压自恢复或放电恢复 (Self-recovery by reduced voltage or discharging)			
单体过欠压 Cell Under Voltage	告警值(CUV alarm value)	2680	2700	2720	mV
	告警恢复值(CUV alarm release value)	2730	2750	2770	mV
	告警延时(CUV alarm delay)	1000	3000	5000	mS
	保护值(CUV protect value)	2480	2500	2520	mV
	保护恢复值(CUV protect release delay)	2980	3000	3020	mV
	保护延时(CUV protect delay)	1000	3000	5000	mS
	过放保护释放条件 (Under-voltage release conditions)	电压自恢复或充电恢复 (Self-recovery by increasing voltage or charging)			
总压过压 Battery Over Voltage	告警值(BOV alarm value)	58.20	58.25	58.30	V
	告警延时(BOV alarm delay)	56.45	56.50	56.55	V
	告警恢复值(BOV alarm release value)	1000	3000	5000	mS
	保护值(BOV protect value)	59.95	59.00	59.05	V
	保护延时(BOV protect delay)	53.95	54.00	54.05	V
	保护恢复值(BOV protect release delay)	1000	3000	5000	mS
	过充保护释放条件 (Over-voltage release conditions)	电压自恢复或放电恢复 (Self-recovery by reduced voltage or discharging)			
总压欠压 Battery Under Voltage	告警值(BUV alarm value)	42.95	43.00	43.05	V
	告警恢复值(BUV alarm release value)	47.95	48.00	48.05	V
	告警延时(BUV alarm delay)	500	1000	3000	mS
	保护值(BUV protect value)	39.95	40.00	40.05	V
	保护恢复值(BUV protect release delay)	47.95	48.00	47.05	V
	保护延时(BUV protect delay)	1000	3000	5000	mS
	过放保护释放条件 (Under-voltage release conditions)	电压自恢复或充电恢复 (Self-recovery by increasing voltage or charging)			

9. 包装与标志 Package and Marking

9.1 包装 Package

包装箱外应标明产品名称、型号、数量、毛重、制造厂商及联络地址、出厂日期，还应有“小心轻放”、“怕湿”、“向上”等必要标志；其包装储运的标志应符合国标 GB 的规定。

The product name, model, quantity, gross weight, manufacturer, contact address and date of manufacture shall be marked on the outside of the packing box, and necessary signs such as "handle with care", "keep away from moisture" and "up" shall also be marked; The marks of packaging, storage and transportation shall comply with the provisions of the national standard GB.



装箱参考	
纸箱	800*520*320 UN 纸箱
栈板	850*1100*120 出口胶合板免熏蒸
隔板	850*1100*10 出口胶合板免熏蒸
数量/板	2*3=6 (下) 2*3=6 (上) 6+6=12 (下+上)
总尺寸	850*1100*1080 (下) 850*1100*1080 (上) 850*1100*2170 (下+上)
20 尺货柜总堆数	6*2=12
数量/柜	12*12=144
总重/柜	0.12*144≈17.28 吨

9.2 标志 Marking

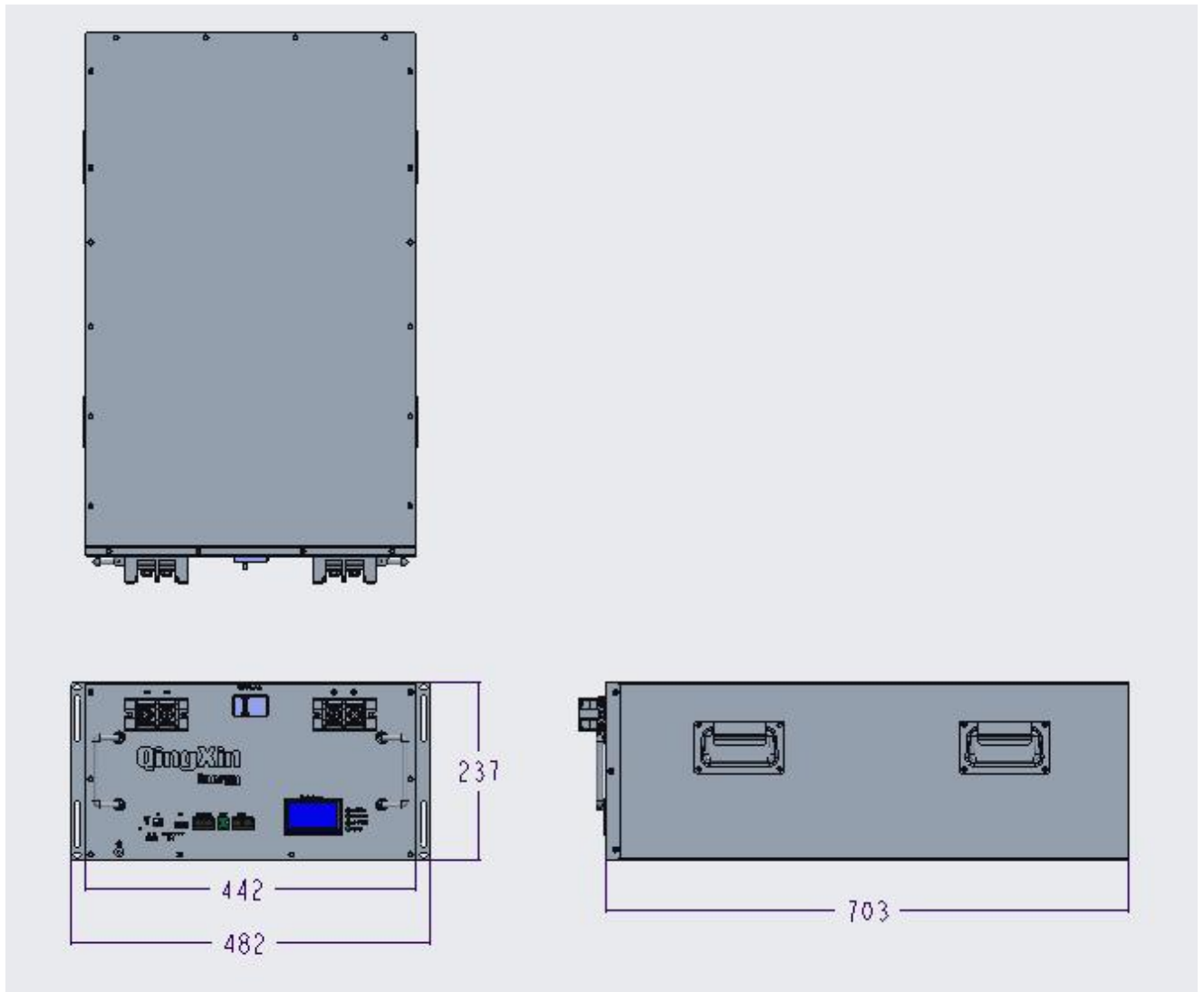
每个电池上应有下列标志：产品名称、型号、标称电压、标称容量、正负极性商标和警示说明、以及制造日期、批号、制造厂名、(或包括以上数据的串号)。

Every battery shall have the following characters: Product, type, rating voltage, rating capacity, contacts plus or minus and warnings, produce date, lot No., manufacturer, (or the marks of the above haracters)。

标签尺寸：80*100

标签内容：依客户要求

10. 电池成品尺寸结构图 Battery dimension and frame



11. 附录

11.1 使用说明和安全规程

11.1.1 推荐使用事项

- 1 使用电池前，请仔细阅读使用说明书和电池表面标识。
- 2 请在正常的室内环境中使用电池，温度： (25 ± 5) °C，相对湿度： $65\pm 20\%$ 。
- 3 在使用过程中，应远离热源、高压，避免儿童玩弄电池，切勿摔打电池。
- 4 本电池只能使用配套充电器充电，不要将电池放在充电器超过 24 小时。
- 5 切勿将电池正负极短路，切勿自己拆装电池，也勿让电池放在受潮处，以免发生危险。
- 6 长期不用时，请将电池储存完好，让电池处于半荷电状态。请用不导电材料包裹电池，以避免金属直接接触电池，造成电池损坏，将电池保存阴凉干燥处。
- 7 废弃电池请安全妥当处理，不要投入火中或水中。

11.1.2 危险警告

1 禁止拆装电池

电池内部具有保护机构和保护电路可以避免发生危险。不合适的拆装会损坏保护功能，将会造成让电池发热、冒烟、变形或燃烧。

2 禁止让电池短路

不要将电池的正负极用金属连接，也不要将电池与金属片放在一起存储和移动。如果电池被短路，将会有超大电流流过，将会损坏电池，造成电池发热、冒烟、变形或燃烧。

3 严禁加热和焚烧电池

加热和焚烧电池将会造成电池隔离物的溶化、安全功能丧失或电解质燃烧，过热就会使电池发热、冒烟、变形或燃烧。

4 避免在热源附近使用电池

不要在火源、烤炉附近或超过 80°C 的环境中使用电池，过热将会导致电池内部短路，使电池发热、冒烟、变形或燃烧。

5 禁止弄湿电池

不要弄湿电池，更不能将电池投入水中，否则会造成电池内部保护电路和功能丧失及发生不正常的化学反应，电池有可能发热、冒烟、变形或燃烧。

6 避免在火源附近或阳光直射下充电

否则会造成电池内部保护电路和功能丧失和发生不正常的化学反应，电池有可能发热、冒烟、变形或燃烧。

7 使用非专用充电器给电池充电，会发生危险

在非正常的条件下充电会造成电池内部保护电路功能丧失和发生不正常的化学反应，电池有可能发热、冒烟、变形或燃烧。

8 禁止破坏电池

禁止用金属凿入电池、锤打或摔打电池或其他方法破坏电池，否则会造成电池发热、冒烟、变形或燃烧，甚至会发生危险。

9 禁止在电池主体上直接焊

过热将会造成电池隔离物的溶化、安全保护功能丧失，使电池发热、冒烟、变形或燃烧。

10 严禁将电池直接在电源插座上或车载点烟器上充电

高压、大电流将会过电池而使其损坏，或使电池发热、冒烟、变形或燃烧。

11 不可将电池用于其他设备

不恰当使用会损坏电池的性能、降低寿命，甚至会使电池发热、冒烟、变形或燃烧。

12 不要直接接触及漏液电池

渗漏的电解液会造成皮肤不适，万一电解液进入眼睛，尽快用清水冲洗，不可揉眼，并迅速送医院处理。

11.1.3 警告

1 电池不可与其它类型的一次或二次电池混用，否则因为不正常的充、放电造成电池发热、冒烟、变形或燃烧。

2 将电池远离孩童不能得到的地方，以避免孩童噬咬或吞咽电池，如果吞咽了电池，应迅速送医院处理。

3 如果超过正常充电时间很长时间充电器仍在充电，应停止充电，不正常的充电有可能会使电池发热、冒烟变形或燃烧。

4 不可置于微波炉或其他压力容器中，瞬间加热或结构漏液(或有异味)，应让电池离开手机或充电器并弃用。使用不正常的电池会发热、冒烟、变形或燃烧。

11.1.4 注意事项

1 注意

避免在强光曝晒环境下使用电池，以免发热、变形、冒烟。至少避免电池性能下降、降低寿命。

2 防静电

电池中装有保护电路以避免各种意外情况发生。不要在产生静电的场所使用电池，因为静电（1000V 以上）容易损坏保护板，而导致电池工作不正常，发热、变形、冒烟或起火燃烧。

3 放电温度范围

推荐的放电温度范围是 0-40°C。在超出此范围的环境中放电会造成电池性能下降、减少寿命。

4 在使用电池之前，请仔细阅读使用手册并经常在需要时阅读。

5 充电方式

请使用专用充电器和推荐的充电方式，在推荐的环境条件下给电池充电。

6 第一次使用

在第一次使用电池时，若发现电池不整洁或有异味等不正常现象，不可继续将电池用于手机或其他它设备，应将电池返回销售商。

7 儿童使用

儿童使用电池前，应受父母指导，并在使用中受监督是否正确。

8 避免孩童接触电池

电池应放在孩童不易拿到的位置，应避免孩童将电池从充电器或手机中取出、玩弄。

9 注意避免电池漏液接触皮肤或衣物，若已接触请用清水冲洗，以免造成皮肤不适。

10 咨询

购买电池时，请注意销售商联络方法，以便需要时及时与销售商取得联系，得到咨询。

11 保用期

保用期是自出厂之日起半年，寿命为：充放电循环 2000 次。但是属于使用不当而非质量问题，即使在保用期内，生产厂家也不会无偿更换新电池。

12 安全使用保障

如果将电池用于其他设备，请与供应商讨保护功能的完善性。至少应该咨询电池的大电流、快速充电、特殊应用的问题。

11.2 质量评定

质量检验分为鉴定检验和质量一致性检验。鉴定检验一般在设计定型、更改设计和生产定型时进行，抽样方案、检验项目、顺序以及判定规则等事宜由供需双方协商确定。原则上应包括以上各项性能试验。质量一致性检验分为逐批检查和周期检查，用以判定产品生产过程中能否合格保证产品质量的持续稳定。可以参照 GB2828-1987，标准执行。具体检查的检验项目应包括外观、内阻、额定容量或 1C5A 放电容量等。

11.3 环保要求

此产品符合环保要求。

11.4 其他事项

以上述，可以作为供需双方对于电池产品性能和检验规则的约定框架。如果没有新的书面约定或更改通知，即可按此执行。

11. Appendix

11.1 Instructions and Safety Requirement

11.1.1 Recommending Usage

1 Please read the battery instructions and the label on its surface before use.

2 Use the battery indoors under normal condition, temperature: (25 ± 5) °C, absolute humidity: $65\pm 20\%$.

3 When in use, the battery shall be kept out of heat, high voltage and avoided children's touching. Do not drop the battery.

4 Use the compatible charger. Do not put the battery into the charger over 24hours.

5 Do not touch contacts together. Do not demolish or assembly the battery by yourself. Do not put the battery in the damp place to avoid danger.'

6 When the battery was stored for a long period, put it well in its half capacity. Do not wrap it with conduct material to avoid the damage caused by the direct contact between the metal and battery. Keep the battery in day places.

7 Well disposed the disused battery. Do not put it into fire or water.

11.1.2 Hazard Warning

1 Forbid Disassemble Batteries

The battery has protective component and circuit internally to avoid danger. Mishandling such as improper disassembly will destroy its protective function and make it heat, smoke, distort or burning.

2 Forbid Short-circuit Batteries

Do not touch the plus and minus contacts with metals. Do not put the battery with metal element together in either storage or movement. If the battery is short-circuit, it carries magnified current, which will cause damage and make the battery heat, smoke, distort or burning.

3 Forbid heat and burn the battery

If heating or burning the battery, it will caused the isolated element in the battery dissolved, protection function stopped or the electrode burning, over heated, which will make the battery heat, smoke, distort or burning.

4 To avoid use the battery near the heat

Do not use the battery near the fire and stove, or over 80°C, and over heating will cause the battery internal short-circuit and make it heat, smoke, distort or burning.

5 Forbid bathing the battery

Do not dampen the battery, or even immerse it in the water, which will cause internal protection circuit and its function lost or abnormal chemical reactions, which will lead to heating, smoking, distortion or burning.

6 Avoid charging near fire or in the sunlight

Otherwise, it will cause internal protection circuit and its function lost or abnormal chemical reactions, which will lead to heating, smoking, distortion or burning.

7 Danger in using non-indicated chargers in

Charging in abnormal condition, the battery will cause internal protection circuit and its function lost or abnormal chemical reactions, which will lead to heating, smoking, distortion or burning.

8 Forbid Damage Battery

Do not allow damage the battery with the metals gouged, forged or dropped etc., otherwise, it will cause over-heated, distort, smoke or burning, even in danger.

9 Forbid directly welding on the battery

Over-heated will cause the isolated element dissolved in the battery and losing protective function its cycle life, even will cause over-heated, distort, smoke or burning.

10 Forbid directly charging on the power socket or car kit cigarette

High voltage and amplified current will damage the battery and reduce its cycle life, even will cause over-heated, distort, smoke or burning.

11 Do not use this battery for other equipment

Improprate usage will damage the battery and reduce its cycle life, even will cause over-heated, distort, smoke or burning.

12 Do not touch the leak-out battery

The leak-out electrolyte will cause the skin uncomfortable. If it drops into eyes, do not rob the eyes but wash in time, and go to hospital for treatment.

11.1.3 Warning

1 This battery cannot mix with deposal or twice- recycled batteries in use. Otherwise, for its abnormal charge and discharge, it will cause over-heated, distort, smoke or burning.

2 Keep the battery out of children' s reach and prevent them biting or swallowing the battery.

3 Do not insert the battery onto the charger for a long time If charging beyond the normal time, the battery is still in the charger, please stop charging. The abnormal charging will cause battery over-heated, distort, smoke or burning.

4 Do not put into microwave stove or any other pressure apparatus. Take the battery away from the cellular phone or the charger if it is instant heated or leak-out (or odors) and depose it. The bad battery will causes over-heated, smoke or burning.

11.1.4 Cautions

1 Notice

The battery shall be prevented to be exposed in effulgence so as not to cause over-heated, distort, smoke and weaken its performance and cycle life.

2 Electro Static-free

There is a protective circuit inside the battery to prevent contingency. Do not use the battery in the Electro static circumstances, (above 1000V), for it is easily destroyed the circuit board so that the battery doses not work and causes over-heated, distort, smoke or burning.

3 Discharging Temperature Range

Recommended discharging temperature range is 0-40°C, beyond which it will result in decadence of the battery performance and shortness of its life.

4 Read carefully the manual before use or whenever in need.

5 Charging Method

Use the special chargers in the recommended charging method to charge the battery.

6 First Usage

When you use the battery for its first time, do not put it into the cellular phone or any other equipment once you find it in unusual conditions such as unclearness or odors. The battery should be returned to the vendor.

7 Children Use

When Children use the battery, they should be under their parents' instructions and superintend in use.

8 Avoid Children' s Touch

Battery should keep out of the place where children in reach. Prevent children taking the battery out of the charger or the cellular phone to play.

9 To avoid the leak-out liquid be exposed to the skin or clothes. If touched, please wash by clean water so as not to cause the skin uncomfotable

10 Consultation

When you buy the battery, please note how to contact with the vendors, so that you may get intouch with vendors for consultation whenever in need.

11 Guarantee period

Guarantee is half a year since it is out of the factory. Life time:2000 cycles。 Any damage by incorrect use and not quality problem, even in its guarantee period, free service won' t be provided by the manufacture.

12 Safety Usage Guarantee

If the battery is used on other instruments, please contact with your manufacturer for how to get the best performance, at least consult its maximum current, fast charge and special application.

11.2 Quality Evaluation Programme

Quality evaluation composes of authoritative check and quality consistence check. Authoritative check is carried out on design decision, emended design and production decision. It should be confirmed by both Purchaser and Vendor on sampling proposal, check project, sequence and judgment etc., which in principle, should be all included. Quality consistence check should be divided into lot by lot check-up and periodical check-up, as to test the quality steadiness during the products in production (refer to GB2828—1987 standard)。 The detailed check-ups compose of appearance, internal resistance, rating capacity or 1C5A discharging capacity etc.

11.3 Environment Protection

This product accord with requirement.

11.4 Others

All the above are the agreed the battery descriptions and test regulation between Purchaser and Vendor. It can be carried out if there is no any new written agreement or modification notice occurred.