IFP53148115-104Ah 锂离子电池

产品规格书

Product Specification of IFP53148115-104Ah Lithium-ion Rechargeable Cell

制　定 Formulated by		审 核 Checked by	批　准 Approved by
标准化 Standardized by		会 签 Counter Signed by	

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前　言 Preface

本标准为公司统一执行的企业标准。

The specification is the enterprise standard uniformly implemented by the company.

本标准的编写格式符合 GB/T 1.1-2020《标准化工作导则 第 1 部分：标准化文件的结构和起草规则》的规定。

The format of this specification is in accordance with the provisions of GB/T 1.1-2020, Directives for standardization-Part1:Rules for the structure and drafting of standardizing documents.

本标准在参照：GB/T 31484-2015 《电动汽车用动力蓄电池循环寿命要求及试验方法》、GB 38031-2020 《电动汽车用动力蓄电池安全要求》、GB/T 31486-2015 《电动汽车用动力蓄电池电性能要求及试验方法》、IEC62619-2017、IEC 62660-2-2018、GB/T36276-2018、Q/GX 60013-2020《电动汽车用锂离子动力电池单体电性能测试方法》的基础上，结合我公司产品实际和试验条件，特制定《IFP53148115-104Ah 锂离子电池产品规格书》标准，并对试验方法、判定标准内容进行了阐述，以指导 IFP53148115-104Ah 锂离子电池产品的性能检测。

This specification refers to GB/T 31484-2015 cycle life requirements and test methods for power cell for electric vehicles, GB 38031-2020 safety requirements and test methods for power cell for electrical vehicles, GB/T 31486-2015 electrical performance requirements and test methods for power cell for electric vehicles, IEC62619-2017, IEC 62660-2-2018, GB/T36276-2018, Q/GX 60013-2020 electrical performance test method of lithium ion power cell for electrical vehicles. Combined with the actual product and test conditions of our company, the standard of “IFP53148115-104Ah Lithium Ion Battery Product Specification” is specially formulated. The test method and criteria is revised and supplemented to guide the manufacturing and approval of IFP53148115-104Ah Lithium ion Cell.

注：若修改，以最新发布标准为准。

Remark：If modified, please take the latest version as standard.

修订记录 Modification Record

版本号 Version Number	变更内容 Description of Changes	修订日期 Revision date	修订者 Reviser
QGX038-2022	初稿 First Draft	2022.05.27	黄雪飞 Huang Xuefei
QGX038-2022	更新数据：A3.1 至 A8 Update data: A3.1 to A8	2022.11.01	鲁利利 Lu Lili
QGX038-2022	更新循环数据；DCR 标准由< 1.2mΩ修改为< 1mΩ；充电温度由 0℃-55℃修改为-20℃-55℃，更新相应阶梯充电矩阵表 Update loop data; DCR standard is changed from < 1.2mΩ to < 1mΩ. The charging temperature is changed from 0℃-55℃ to -20℃-55℃, Update the corresponding step charging matrix table	2023.03.24	乔荣华 Qiao Ronghua
QGX038-2022	将厚度尺寸规格由(52.3±0.5)mm（含外包膜厚度，17%±3% SOC，300±20 kgf）更改为(52.3±0.3)mm（含外包膜厚度，17%±3% SOC，300±20 kgf）。宽度由(148.6±0.5) mm（含外包膜）更改为(148.6.±0.3)mm（含外包膜），高度尺寸规格由(115.83±0.5) mm（不含极柱，含外包膜和顶盖贴片）。高度由(118.9±0.5) mm（含极柱，含外包膜）更改为（115.83±0.3) mm（含外包膜）。(118.9±0.3) mm（含极柱，含外包膜）。 The thickness specification was changed from (52.3±0.5)mm (including coating thickness, 17%±3% SOC, 300±20 kgf) to (52.3±0.3)mm (including coating thickness, 17%±3% SOC, 300±20 kgf). The width was changed from (148.6±0.5) mm (including the outer envelope) to (148.6± 0.3)mm (including the outer envelope), and the height size was changed from (115.83±0.5) mm (excluding the pole, including the outer envelope and the top cover patch). The height was changed from (118.9±0.5) mm (including pole and outer envelope) to (115.83±0.3) mm (including outer envelope). (118.9±0.3) mm (including pole, including outer envelope）	2023.05.10	乔荣华 Qiao Ronghua
QGX038-2024	1、加入“术语和定义”；Add "Terms and Definitions"; 2、根据最新版国标及企标，修订测试方法中的	2024.2.1	金建涛 Jin Jiantao

	温度等条件；Revise the temperature and other conditions in the testing method according to the latest national and enterprise standards; 3、1.5 电芯状态；Cell status; 4、2.1.9 最大持续充电倍率；Max. Constant charge rate 5、4.4 标明不同充电方式下的循环周数；Indicate the number of cycles under different charging methods; 6、5.3 产品寿命终止管理；Product End-life Management 7、5.4 保密协议；Confidentiality Agreement; 8、5.5 免责声明；Disclaimer; 9、A.1 快充 MAP 格式调整，横纵坐标明确标明 SOC 和温度区间；Quick charge MAP format adjustment, with clear indication of SOC and temperature range in the horizontal and vertical coordinates; 10、A2.2 加入电池结构件尺寸信息；Add information on the dimensions of battery structural components; 11、A.7 删除系统推荐功率 MAP，替换为电芯试功率下测试的 10/30/60s 功率值并补充测试方法；Delete the recommended power MAP from the system and replace it with the 10/30/60s power value tested under specially power test, and supplement the testing method;		

注：具体变更内容见正文。

Note: Refer to the text for specific changes.

术语和定义 Terms and Definition

产　　品：本规格书中的 "产品" 是指合肥国轩高科动力能源有限公司 (以下简称国轩) 生产的 LFP106Ah 可充电方形铝壳锂离子电池。

Product: Refers to the LFP106Ah rechargeable lithium-ion cell with prismatic aluminum shell manufactured by Gotion high-tech power energy Co., Ltd. (hereinafter referred to as Gotion) in this specification.

客　　户：指与国轩签署产品销售合同中的买方。

Customer: Refers to the buyer in the product sales contract signed with Gotion.

环境温度：电池所处的周围环境温度。

Environment temperature: The ambient temperature where the cell is located.

电池温度：由接入电池表面中心的温度传感器测量的电池表面的温度，温度传感器和测量线路的选择由国轩和客户共同商定。

Cell temperature: The temperature measured by temperature sensor installed at the center of cell surface. The selection of temperature sensor and measuring line shall be jointly agreed by Gotion and the customer.

新鲜电池：指电池自产品生产完成日期算起 7 天以内的状态。

Fresh cell: Refers to cell within 7 days after production.

充电倍率：充电电流与电池管理系统监测的电池的容量值的比率。例如：电池容量为 106 Ah，充电电流为 53 A 时，则充电倍率为 0.5C；当电池容量跌落为 100 Ah，充电电流为 50 A 时，则充电倍率为 0.5C。

Charging Rate: The ratio of the charging current to the capacity which measured by the battery management system. For example, if the cell capacity is 106 Ah and the charging current is 53 A, the charging rate is 0.5C. If the cell capacity drops to 100 Ah and the charging current is 50 A, the charging rate is 0.5C.

荷电状态：在无负载的情况下，以安培小时或者以瓦特小时为单位计量的电池容量状态与标称容量的比值，缩写用 SOC 表示。 例如：若将容量为 106 Ah 的状态视为 100% SOC，若容量为 0 Ah 时， SOC 为 0%。

State of charge: Under unloaded conditions, the ratio of the cell capacity state to the nominal capacity measured in ampere-hour or watt- hour. The abbreviation is expressed by SOC. For example, if the capacity at 106 Ah considered as 100% SOC, the capacity at 0 Ah, considered as 0% SOC.

健康状态：电池实际容量与标称容量的比值，缩写用 SOH 表示。 例如： 电池容量 106Ah 为 100% SOH，容量衰减为 84.8 Ah 时，SOH 为 80%。

State of health: The ratio of actual cell capacity to nominal capacity, the abbreviation is expressed by SOH. For

example, if the cell capacity at 106 Ah considered as 100% SOH, the cell capacity decays to 84.8 Ah, considered as 80% SOH.

循　　环：电池按规定的充放标准充放一次为一个循环。循环包括短时的正常充电或者再生充电和放电过程的组合，在充电过程中有时只有正常充电而无再生充电的情况，放电可以由一些部分放电组合在一起形成。

Cycle: The cell shall be charged and discharged once according to the specified charging and discharging standards as a cycle. The cycle includes short-term normal charging or a combination of regenerative charging and discharging processes. In the charging process, sometimes there is only normal charging and no regenerative charging. The discharge can be formed by combining some partial discharges.

标准充电：本规格书第 4.1.1 条所述的充电模式。

Standard charge: The charging mode described in 4.1.1 of this specification.

标准放电：本规格书第 4.1.2 条所述的放电模式。

Standard discharge: The discharging mode described in 4.1.2 of this specification.

开路电压：没有接入任何负载和电路时测得的电池的电压，缩写用 OCV 表示。

Open circuit voltage: The voltage of the cell measured when unloaded or circuit is disconnected. The abbreviation is expressed by OCV.

交流内阻：给电池正负极注入 1kHz 的正弦波电流，测试所得到的内阻值，缩写用 ACR 表示。

AC resistance: Apply 1kHz sine wave current between the positive and negative poles of the cell, and the internal resistance obtained, which abbreviated as ACR.

直流内阻：工作条件下电池的电压变化与相应的电流变化之比，缩写用 DCR 表示。

DC resistance: The ratio of the voltage changes to the corresponding current change under working conditions, and the abbreviation is DCR.

模　　组：锂离子电池经串并联方式组合，加装单体电池监控与管理装置后形成的电池与 pack 的中间产品。

Module: The intermediate product between single cell and pack, which is formed by lithium-ion cells in series and parallel after installing cell monitors and management devices.

脉冲电流：以周期重复出现的电流为脉冲电流，脉冲电流或是以同一方向出现，或是以正、负交替变换方向出现。

Pulse current: The currents that appear periodically are called pulse currents. The pulse currents appear either in the same direction or in alternating positive and negative directions.

压 缩 力：模组组装时，电池可承受压缩力的安全边界。

Compression force: When the module is assembled, the cell can withstand the force perpendicular to the cell stacking direction.

膨 胀 力：在使用过程中，因极片厚度反弹等固有特性导致电池膨胀，而对约束夹具产生的作用力。

Swelling force: The inherent characteristics such as the rebound of the electrode thickness may lead to cell expansion during use which generates force on the clamp.

测量单位：见下表

Units of measurement: Refer to following table

序号 No.	单位 Units	简写 Abbreviation	单位类型 Type of units
1	伏特 Volt	V	电压单位 Voltage
2	安培 Ampere	A	电流单位 Current
3	安培-小时 Ampere-Hour	Ah	容量单位 Capacity
4	瓦特-小时 Watt-Hour	Wh	能量单位 Energy
5	欧姆 Ohm	Ω	电阻单位 Resistance
6	毫欧姆 Milliohm	mΩ	电阻单位 Resistance
7	摄氏度 Degree Celsius	℃	温度单位 Temperature
8	毫米 Millimeter	mm	长度单位 Length
9	秒 Second	s	时间单位 Time
10	赫兹 Hertz	Hz	频率单位 Frequency
11	牛顿 Newton	N	力单位 Force
12	千克力 Kilogram-Force	kgf	力单位 Force

1.基本信息 Basic Information

1.1 适用范围 Scope

本产品规格书由合肥国轩高科动力能源有限公司提供给客户，描述了其锂离子二次电池的性能。

This specification specification is provided to customers by HEFEI GOTION HIGH-TECH POWER ENERGY Co. Ltd., describing Lithium ion rechargeable cell properties.

1.2 用途 Application：EV、储能 ES

1.3 产品类型 Product Type

锂离子二次电池，方形，LFP 电芯 Lithium ion rechargeable battery

1.4 型号名称 Model Name：53148115-104Ah

1.5 电芯状态 Cell Status：量产 Volume of products

2.规格 Specification

2.1 标准技术参数 Standard Technical Parameters

项目 Item	参数 Specification	条件/注释 Condition/Notes
2.1.1 标称容量 Nominal Capacity	104Ah	1C
	105Ah	0.33C
2.1.2 标称电压 Nominal Voltage	3.2V	0.33C
	3.1V	1C
2.1.3 充放电电压范围 Charge & Discharge Voltage Range	2.0 V～3.65V	T>0℃
	1.8 V～3.65V	T≤0℃
2.1.4 重量 Weight	1909g ± 57g	
2.1.5 质量能量密度 Weight Energy Density	175Wh/kg	0.33C
2.1.6 体积能量密度 Volume Energy Density	370Wh/L	0.33C
2.1.7 交流内阻 AC Resistance	0.2mΩ≤R≤0.5mΩ	25℃±2℃ 新电池状态（17%±3%SOC） Fresh cell（17%±3%SOC）
2.1.8 直流内阻 DC Resistance	＜1.0mΩ	50%SOC@5C10S，25±2℃
2.1.9 最大持续充电倍率 Max. Constant charge rate	1.5C	25℃

2.2 推荐充电规范 Recommended Charge Specification

项目 Item	参数 Specification	条件/注释 Condition/Notes
2.2.1 常规充电（慢充）Regular Charging(Slow Charge)	52A 3.65V 5.2A 10℃≤T<45℃	恒流 Constant current 恒压 Constant voltage 截止条件（终止）Cut off condition (terminating) 温度 Temperature
2.2.2 阶梯充电（快充）Step Charge	见附件 Refer to Annex A.1	不同温度的快充策略 Fast charging strategy at different temperature

2.3 工作温度范围 Working Temperature Range

项目 Item	参数 Specification	条件/注释 Condition/Notes
2.3.1 最佳工作温度 Optimum Working Temperature	10℃～35℃	
2.3.2 充电温度范围 Charge Temperature Range	-20℃～55℃	充电电流，见附件 A1 Charging current, refer to Annex A.1
2.3.3 放电温度范围 Discharge Temperature Range	-30℃～60℃	电芯温度≤60℃ Cell temperature≤60℃

3.外观尺寸 Appearance ＆ Dimensions

3.1 外观 Appearance

电池外表面无明显的划痕、裂痕、生锈、变色或电解液泄漏，无影响电池正常使用的其它外观缺陷。

Without obvious scratches, cracks, rust, discoloration or electrolyte leakage, no other appearance defects affecting cell normal operation.

3.2 尺寸 Dimensions

厚度：(52.3±0.3)mm（含外包膜厚度，17%±3% SOC，300±20 kgf）。

Thickness: (52.3±0.3)mm (including thickness of the insulating film, 17%±3% SOC, 300±20 kgf).

宽度：(149.0±0.3) mm（底部含外包膜 10 层），(148.4±0.3) mm（顶部含外包膜 4 层），(148.6±0.3) mm（中下部含外包膜 6 层）。

Width: (149.0±0.3) mm (The bottom including 10 layers of the insulating film), (148.4±0.3) mm (The top including 4 layers of the insulating film), (148.6±0.3) mm (The middle and lower part 6 layers of the insulating film).

高度：(115.83±0.3) mm（不含极柱，含外包膜和顶盖贴片）。

(118.9±0.3) mm（含极柱，含外包膜）。

Height：(115.83±0.3)mm（including outer film thickness and excluding terminals）

(118.9±0.3)mm（including outer film thickness）

4.性能测试规范 Performance Specification

4.1 标准测试条件 Standard Test Conditions

4.1.1 单体电池充电 Single cell charging

室温下（25℃±2℃），湿度：15%~90%，单体电池以 104A 电流放电至电压为 2.0V，静置 30min，然后以 104A 电流充电至电压为 3.65V 时转恒压充电，充电电流降至 5.2A 时停止充电，充电后静置 30min。

At room temperature（25℃ ± 2℃）, 104A constant current discharge to 2.0V, rest 30min, then 104A constant current charge to 3.65V followed by constant voltage charging until current drops down to 5.2A, rest 30min.

4.1.2 单体电池放电 Single battery discharge

室温下（25℃±2℃），单体电池以 104A 电流放电至电压为 2.0V，静置 30min。

At room temperature（25℃±2℃）, 104A constant current discharge to 2.0V, rest 30min.

4.2 电气特性 Electrical Characteristics

项目 Item	参数 Parameter	条件 Condition
4.2.1 初始容量 Initial Capacity	≥104Ah	按照 4.1.1 充电和 4.1.2 放电。 Refer to 4.1.1&4.1.2 standard charge and discharge procedure.
4.2.2 容量与温度的相关性 Capacity and temperature correlation	55℃，≥95% 初始容量 initial capacity 25℃，100% 初始容量 initial capacity 0℃，≥95% 初始容量 initial capacity -10℃，≥90% 初始容量 initial capacity -20℃，≥85% 初始容量 initial capacity -30℃，≥80% 初始容量 initial capacity	25℃±2℃温度下按照 4.1.1 充电，在测试温度下以 1C 放电至 2.0V（0℃及以下放电至 1.8V）。 Charge refer to 4.1.1, rest 20h at testing temperature, 1C discharge to 2.0V at testing temperature（to 1.8V at or below 0℃）.
4.2.3 SOC-OCV 表 SOC-OCV Table	见附件 A.4 Refer to annex A.4	按照 4.1.1 充电，然后以 0.33C 放电 5%容量（此容量为按照 4.1.2 放电至对应截止电压（[-30℃~0℃）2.0V, [0℃~10℃）2.3V, [10℃~55℃] 2.5V）对应的容量，静置 1h，重复 20 次，记录静置后的电压数据。 Charge as per 4.1.1, then discharge for 5% capacity at 0.33C（The capacity is obtained by discharging to certain cut-off voltage as per 4.1.2（[-30℃~0℃）2.0V, [0℃~10℃）2.3V, [10℃~55℃] 2.5V）rest 1h, repeat 20 times, record voltage after rest.
4.2.4 不同温度和不同 SOC 放电电阻（DCR）Discharge DCR at different temperature and SOC	见附件 A.5 Refer to annex A.5	按照 4.1.1 充电，然后以 1C 按照 4.2.2 不同温度下放电容量调整 SOC（截止电压 T＞0℃，2.0V；T≤0℃，1.8V），静置 1h，测试 3C 放电 30s 的 DCR。放电电阻为开路电压与放电末端电压的差值除以电流，测试 SOC 为 95%，90%，80%，70%，60%，50%，40%，30%，20%，10%，5%。 Charge as per 4.1.1, then 1C Discharge to adjust SOC according to the 4.2.2 discharge capacity at different temperatures (refer to T＞0℃，2.0V；T≤0℃，1.8V for cut-off voltage), rest 1h, and test the DCR of 3C discharge for 30s. The discharge resistance

		is the difference between the open circuit voltage and the discharge terminal voltage divided by the current. The test SOC is 95%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10% and 5%.
4.2.5 不同温度和不同 SOC 充电电阻（DCR）Charge DCR at different temperature and SOC	见附件 A.6 Refer to annex A.6	按照 4.1.1 充电，然后以 1C 按照 4.2.2 不同温度下放电容量调整 SOC（截止电压 T＞0℃，2.0V；T≤0℃，1.8V），静置 1h，测试 2.25C 充电 15s 的 DCR。充电电阻为充电末端电压与开路电压的差值除以电流，测试 SOC 为 5%，10%，20%，30%，40%，50%，60%，70%，80%，90%，95%。 Charge as per 4.1.1, then 1C Discharge to adjust SOC according to the 4.2.2 discharge capacity at different temperatures (refer to T＞0℃， 2.0V； T≤0℃， 1.8V for cut-off voltage), rest 1h, and test DCR charged at 2.25c for 15s. The charging resistance is the difference between the charging terminal voltage and the open circuit voltage divided by the current. The test SOC is 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90% and 95%.

4.3 最大极值功率（极限值）Maximum Peak Power (Limit Value)

项目 Item	参数 Parameter	条件 Condition
4.3.1 不同温度和不同 SOC 放电峰值功率 Peak power discharge at different temperature and SOC	见附件 A.7 Refer to annex A.7	按照恒功率测试的方法得到电芯在不同温度和不同 SOC 下的放电峰值功率 According to the method of constant power test, the peak discharge power of the cell under different temperatures and different SOC were obtained
4.3.2 不同温度和不同 SOC 回馈峰值功率 Peak power feedback at different temperature and SOC	见附件 A.8 Refer to annex A.8	按照恒功率测试的方法得到电芯在不同温度和不同 SOC 下的充电峰值功率 According to the method of constant power test, the peak charge power of the cell under different temperatures and different SOC were obtained

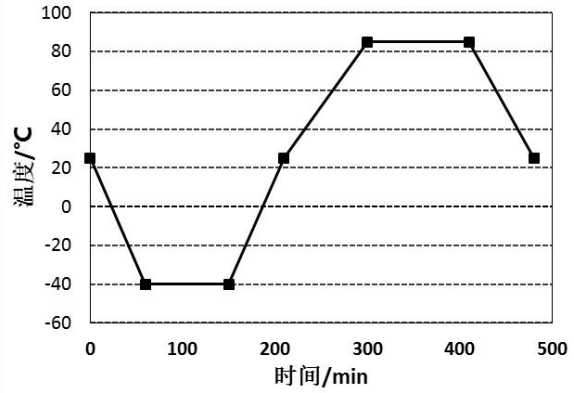
4.4 耐久性能 Durability

项目 Item	规格 Specification	条件 Condition
4.4.1 室温荷电保持率 Room Temperature Charge Retention Rate	≥95%	25℃，100%SOC，28days
4.4.2 室温容量恢复率 Room Temperature Capacity Recovery Rate	≥96%	
4.4.3 高温荷电保持率 High Temperature Charge Retention Rate	≥94%	55℃，100%SOC，7days
4.4.4 高温容量恢复率 High temperature capacity recovery rate	≥95%	
4.4.5 储存容量恢复率 Storage capacity recovery rate	＞94%	45℃，50%SOC，28days
4.4.6 高温常规循环寿命 High Temperature Circular Life	1500 cycles	80%容量保持；45℃；1C 阶梯；capacity retention rate;45℃;1C ladder
4.4.7 常温常规循环寿命 High Temperature Circular Life	3000 cycles	80%容量保持率；25℃；1C 阶梯；80% capacity retention rate;25℃;1C ladder;
4.4.8 日历寿命 Calendar Life	10 years	80%容量保持率；25℃，50%SOC 80% capacity retention rate;1C ladder；25℃，50%SOC

4.5 安全测试规范 Safety Test Specification

项目 Item	判断标准 Judgment Standard	测试条件 Test Conditions
4.5.1 过放电 Overdischarge	不爆炸，不起火 No explosion, no fire	单体蓄电池（使用企业钢板夹具约束单体蓄电池）按 4.1.1 方法充电，单体蓄电池以 1 I_1 (A)电流放电 90min，并观察 1h。（I_1=104A）； The single cell was charged according to the method of 4.1.1, and the single cell was discharged with a current of 1 I1 (A) for 90 min and observed for 1 h.（I_1=104A）.
4.5.2 过充电 Overcharge	不爆炸，不起火 No explosion, no fire	单体蓄电池（使用企业钢板夹具约束单体蓄电池，夹紧力 150±50kgf）按 4.1.1 方法充电，以 1 I_1 (A)电流恒流充电至电压达到企业技术条件中规定的充电终止电压的 1.1 倍或 115%SOC 后

		停止充电，并观察 1h。（I_1=104A）The single cell is charged according to the method of 4.1.1, and is charged with a constant current of 1 I_1 (A) until the voltage reaches 1.1 times of the charging end voltage or 115% SOC specified in the technical conditions of the enterprise, and 1 h is observed.（I_1=104A）
4.5.3 加热 Heating	不爆炸，不起火 No explosion, no fire	单体蓄电池按 4.1.1 方法充电，温度箱按照 5℃/min 的速度由室温升至 130℃±2℃，并保持此温度 30min 后停止加热，并观察 1h。The single battery was charged according to the method of 4.1.1, and the temperature box was raised from room temperature to 130 °C ± 2 °C at a rate of 5 °C / min. After maintaining this temperature for 30 min, the heating was stopped and observed for 1 h.
4.5.4 短路 Short circuiting	不爆炸，不起火 No explosion, no fire	单体蓄电池（使用企业钢板夹具约束单体蓄电池，夹紧力 150±50kgf）按 4.1.1 方法充电，将单体蓄电池正、负极经外部短路 10min，外部线路电阻应小于 5mΩ，并观察 1h。The single cell is charged according to the method of 4.1.1, and the cathode and anode terminals of the single cell are externally short-circuited for 10 min, and the external line resistance should be less than 5 mΩ, and observed for 1 h.
4.5.5 挤压 Pressing	不爆炸，不起火 No explosion, no fire	单体蓄电池按 4.1.1 方法充电: a) 挤压方向：垂直于蓄电池极板方向施压； b) 挤压板形式：半径为 75mm 的半圆柱体，半圆柱体的长度(L)大于被挤压电池的尺寸； c) 挤压速度：（2±1）mm/s； d) 挤压程度：电压达到 0V 或变形量达到 15%或挤压力达到 100KN 后停止挤压，保持 10min；并观察 1h。 The single cell is charged according to the method of 4.1.1: Test according to the following conditions: a) extrusion direction: apply pressure perpendicular to the battery plate; b) extruded plate form: a semi-cylindrical body with a radius of 75 mm, the length (L) of the semi-cylindrical body is larger than the size of the battery to be squeezed; c) extrusion speed: (2 ± 1) mm / s; d) degree of extrusion: after the voltage reaches 0V or the deformation amount reaches 15% or the pressing force reaches 100KN, the extrusion is stopped and kept for 10 minutes; And observe 1h.

<table>
<tr>
<td>4.5.6 温度循环
Temperature Cycling</td>
<td>不爆炸，不起火
No explosion, no fire</td>
<td>单体蓄电池按 4.1.1 方法充电，单体蓄电池放入温度箱中，温度箱温度按照下表进行调节，循环次数 5 次，观察 1h。
The single battery is charged according to the method of 4.1.1, the single battery is placed in the temperature box, the temperature of the temperature box is adjusted according to the following table, the number of cycles is 5 times, and then observe for 1h.
<table>
<tr><th>温度
Temperature
℃</th><th>时间增量
Time increasing min</th><th>累计时间
Cumulative Time min</th><th>温度变化率
Temperature Change Rate ℃/min</th></tr>
<tr><td>25</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>-40</td><td>60</td><td>60</td><td>13/12</td></tr>
<tr><td>-40</td><td>90</td><td>150</td><td>0</td></tr>
<tr><td>25</td><td>60</td><td>210</td><td>13/12</td></tr>
<tr><td>85</td><td>90</td><td>300</td><td>2/3</td></tr>
<tr><td>85</td><td>110</td><td>410</td><td>0</td></tr>
<tr><td>25</td><td>70</td><td>480</td><td>6/7</td></tr>
</table>


</td>
</tr>
</table>

5.使用注意事项 Notes

锂离子充电电池的使用警告。操作不当可能会造成电池发热、起火和性能劣化，务必认真阅读以下条款。
Warning on the use of rechargeable lithium-ion batteries. Improper operation may cause the battery to heat up, catch fire and deteriorate its performance. Be sure to read the following terms carefully.

5.1 注意事项 Precautions

- 应用配有电池的设备时，使用前请参阅用户手册。

  When using a device equipped with a battery, refer to the user manual before use.

- 包装前请检查正极和负极端子的方向。

  Check the orientation of the cathode and anode terminals before packaging.

- 端子或导线与电池模块相连，注意绝缘防止短路。

  The terminal or wire is connected to the cell module, pay attention to the insulation to prevent short circuit.

- 长期不用时，电池要存放于阴凉干燥处（≤35°C，30%~50%SOC，环境湿度≤85%ROH，无凝露，3 个月进行一次充放电）。

  Store the cell in a cool dry place (≤35°C, 30%~50%SOC，Storage ambient humidity < 85% ROH, no Condensation, charge and discharge once every 3 months) when not in use for a long time.

- 不要将电池放置于阳光直射处或热源。

  Do not place the cell in direct sunlight or heat source to prevent high temperature of the cell.

- 处理电池单元时请勿穿戴金属饰品（ 如戒指，手表，饰件等 ）。

  Do not wear metal accessories (such as rings, watches, accessories, etc.) when handling cell units.,

- 请勿将电池放置在本文件规定的使用温度范围之外的地方。

  Do not place the cell outside the operating temperature range specified in this document.

5.2 禁止事项 Prohibited Matters

请勿超过最大充电倍率充电。

Do not charge more than the maximum charge rate.

请勿拆卸或改装电池。

Do not disassemble or modify the Cell.

请勿抛掷或撞击电池。

Do not throw or hit the battery.

请勿用锐器刺穿电池。(例如钉子，刀子，笔，电钻)

Do not pierce the battery with a sharp object. (eg nails, knives, pens, electric drills)

请勿与其它型号电池或模块单元混用。

Do not mix with other cell or module units.

勿将新、旧电池在 PACK 中同时使用。

Do not use both new and old cell in PACK.

请勿将电池放置于大于 60℃高温处。

Do not place the cell at a temperature higher than 60 ℃.

不要将电池放入微波炉或高压容器中。

Do not put the cell in a microwave or high pressure container.

请勿用导电材料连接正、负极端子。(例如金属，电线)

Do not connect the positive and negative terminals with conductive materials. (eg metal, wire)

不允许弄湿或将电池浸入水或海水中。

Do not allow to wet or immerse the cell in water or sea water.

请勿以制造商书面协议之外的方式使用电池。

Do not use the battery in a manner other than the manufacturer's written agreement.

5.3 产品寿命终止管理 Product End-life Management

电池使用期限是有限的，客户应建立有效的跟踪系统监测并记录每个使用期限内电池的内阻和容量。内阻及容量的测量方法和计算方法需要客户与国轩共同讨论和双方同意。当使用中电池的内阻超过这个电池最初内阻的 150%或容量小于标称容量的 70%，应停止使用电池。违反该项要求，将免除国轩依据产品销售协议以及本规格书所应承担的产品质量保证责任及由此引起的损失赔偿等一切相关责任。

The cell life is limited. Customers should establish an effective tracking system to monitor and record the internal resistance and capacity of each cell during its life. The measurement method and calculation method of internal resistance and capacity need to be discussed and agreed between the customer and Gotion. When the internal resistance of the cell in use exceeds 150% of the initial internal resistance of the cell, or the capacity is less than 70% of the nominal capacity, the cell should not to be operated. **Violation of this requirement will exempt Gotion from its responsibility for product quality**

assurance in accordance with the product sales agreement and this specification, as well as all related liabilities such as loss compensation caused thereby.

5.4 保密协议 Confidentiality Agreement

客户应对合作内容高度保密，未经国轩许可，不得向第三方透露规格书的任何内容，否则，将依照相关法律追究责任。

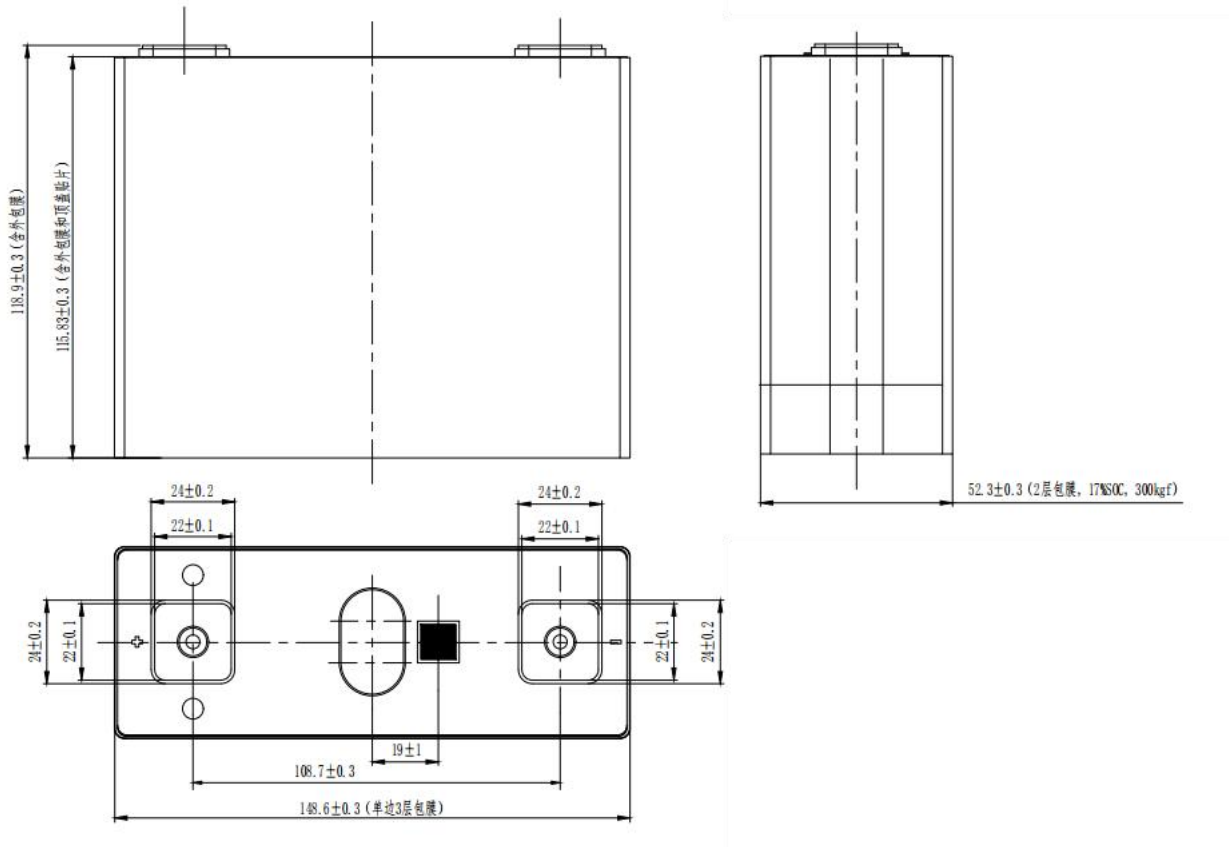
The customer shall keep the cooperation content highly confidential. Without the permission of Gotion, the customer shall not disclose any content of the technical agreement to a third party. Otherwise, the customer will be held responsible according to relevant laws.

5.5 免责声明 Disclaimer

如果由于产品需求单位或使用者不按本说明书中的规定进行使用，国轩不再承担产品质量保证责任及由此引起的损失赔偿等一切相关责任。因前述行为对国轩的声誉造成负面影响的，国轩保留追究产品需求单位法律责任的权利。

If the product demand party or user does not use the product in accordance with the provisions of this specification, Gotion will no longer take any relevant responsibility such as product quality assurance liability and loss compensation caused thereby. In case of any negative impact on Gotion's reputation due to the above-mentioned actions, Gotion reserves the right to investigate the legal liability of the product demand party.

6.外形图纸 Mechanical drawing



电芯整体尺寸 The overall size of the cell

注：图中尺寸单位为毫米（mm）。

Note: Dimensions in the figure are in millimeters (mm).

附录 Appendix

A.1 阶梯充电矩阵表 Table Of Ladder Charging Matrix（-20 ℃≤T≤55 ℃）

快充充电策略												
SOC	充电倍率(C)											
	(0%-10%】	(10%-20%】	(20%-30%】	(30%-40%】	(40%-50%】	(50%-60%】	(60%-70%】	(70%-80%】	(80%-90%】	(90%-95%】	(95%-99%】	(99%-100%】
T≤-20℃	不允许充电											
V												3.65
-20℃≤T＜-15℃	0.08	0.08	0.05	0.05	0.05	0.02	0.01	0.01	0.01	0.01	0.01	0.01
-15℃≤T＜-10℃	0.12	0.12	0.1	0.08	0.08	0.05	0.02	0.02	0.01	0.01	0.01	0.01
-10℃≤T＜-5℃	0.15	0.15	0.15	0.1	0.1	0.07	0.05	0.05	0.02	0.01	0.01	0.01
-5℃≤T＜-0℃	0.2	0.2	0.2	0.15	0.15	0.1	0.07	0.05	0.03	0.03	0.02	0.01
0℃≤T＜5℃	0.3	0.3	0.25	0.25	0.2	0.15	0.1	0.1	0.05	0.05	0.02	0.01
5℃≤T＜10℃	0.42	0.42	0.33	0.33	0.25	0.25	0.2	0.15	0.1	0.1	0.03	0.03
10℃≤T＜15℃	0.6	0.6	0.6	0.5	0.5	0.4	0.3	0.2	0.15	0.1	0.05	0.05
15℃≤T＜20℃	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.5	0.33	0.15	0.1
20℃≤T＜25℃	1	1	1	1	1	1	1	1	0.8	0.5	0.25	0.15
25℃≤T＜30℃	1.2	1.2	1.2	1.2	1.1	1.1	1	1	0.8	0.5	0.25	0.15
30℃≤T＜35℃	1.2	1.2	1.2	1.2	1.1	1.1	1	1	0.8	0.5	0.25	0.15
35℃≤T＜40℃	1.2	1.2	1.2	1.2	1.1	1.1	1	1	0.8	0.5	0.25	0.15
40℃≤T＜45℃	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.5	0.25	0.1
45℃≤T＜50℃	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.25	0.25	0.1
50℃≤T＜55℃	0.68	0.68	0.68	0.5	0.5	0.5	0.5	0.5	0.25	0.25	0.25	0.1
T＝55℃	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1

A.2 单体电芯故障阈值 Single Cell Failure Threshold

A.2.1 单体电芯故障阈值 Single Cell Failure Threshold

电池型号 Battery Model	数值 Value	说明 Illustrate	参考 Reference
单体过电压严重报警阈值 Severe alarm threshold when cell overvoltage (V)	3.8	充电时过电压超过报警阈值，将影响电池的循环寿命，用户充电不允许超过此电压值。 When the overvoltage exceeds the alarm threshold during charging, it will affect the cycle life of the battery. The user is not allowed to charge more than this voltage value.	必须强制断电。 Forced power off..
单体过电压一般报警阈值 General alarm threshold when single overvoltage (V)	3.7	充电时过电压的临界值。 Critical value of overvoltage during charging.	超过 5s 强制断电。 Forced power off for more than 5s.
最大工作电压 Maximum working voltage(V)	3.65	正常工作的最大极限值。 Maximum limit of normal operation.	

单体欠压严重报警阈值 Critical alarm threshold when cell undervoltage(V)	[-30℃~0℃）1.8 [0℃~55℃] 2.0	放电时欠压超过报警阈值，将影响电池的循环寿命，用户放电不允许超过此电压值。When the under-voltage exceeds the alarm threshold during discharge, it will affect the cycle life of the cell. The user discharge must not exceed this voltage value.	
单体欠压一般报警阈值 General alarm threshold when cell undervoltage(V)	[-30℃~0℃）1.9 [0℃~55℃] 2.2	放电时欠压超过报警阈值，将影响电池的循环寿命，用户放电不允许超过此电压值。When the undervoltage exceeds the alarm threshold during discharge, it will affect the cycle life of the battery, and the user is not allowed to discharge more than this voltage value.	
最小工作电压 Minimum working voltage(V)	[-30℃~0℃）2.0 [0℃~55℃] 2.3	正常工作的最小临界值。Minimum limit of normal operation.	
电池温度过高一般报警阈值 General alarm thresholds when battery temperature is too high℃	55	电池工作温度超过此温度，将会限制电池使用功率。Battery operating temperature above this temperature will limit cell power	
电池温度过高严重报警阈值 Low battery temperature general alarm threshold ℃	60	电池温度超过此报警阈值，将会影响电池安全性能，用户使用时不应超过此温度。If the battery temperature exceeds this alarm threshold, it will affect the safety performance of the battery, and the user should not exceed this temperature when using it.	
电池温度过低一般报警阈值 General alarm threshold when battery temperature is too low℃	-20	电池工作温度低于此温度，将会限制电池使用功率。If the operating temperature of the battery is lower than this temperature, the power of the battery will be limited.	
电池温度过低严重报警阈值 Critical alarm threshold when battery temperature is too low	-30	电池温度低于此报警阈值，将会影响电池安全性能，用户使用时不应低于此温度。If the battery temperature is lower than this alarm threshold, the safety performance of the battery will be affected, and the user should not use it below this temperature.	

A.2.2 为 Pack 设计提供的电池信息 Battery Information For Pack Design

电池型号 Battery Model	符号 Sign	数值 Value	意见 Suggestions	参考 Reference
Pack 装配过程中最大允许压力 Maximum allowable pressure during pack assembly	Fmax	TBD		600kgf，17%±3% SOC
Pack 装配后电芯最终压力 The Final pressure of the cell after pack assembly	Fmin	TBD		150±50 kgf，17%±3% SOC

电芯结构相关信息 Information related to battery cell structure

铝壳 Aluminum shell	外形尺寸 External dimensions	148±0.1×52±0.1×115.3±0.1
	壁厚 Wall thickness	0.5mm*0.6mm*1.0mm
盖板设计 Cover plate design	端子高度 Terminal height	3.07mm(含包胶及顶盖贴片) (including adhesive and top cover patches)
	端子尺寸 Terminal size	22*22mm

A.3 在选定条件下的循环寿命 Cycle Life Under Selected Conditions

A.3.1 常温循环寿命 Normal temperature cycle life

测试条件 Test Conditions

充电：阶梯恒流充电 1C 充电至 3.51V，0.5C 充电至 3.60V，0.25C 充电至 3.62V，0.1C 充电至 3.65V;

Charging: step constant current charging 1C to 3.51V，0.5C to 3.60V，0.25C to 3.62V，0.1C to 3.65V;

放电：1C 放电至截止电压 2.5V；

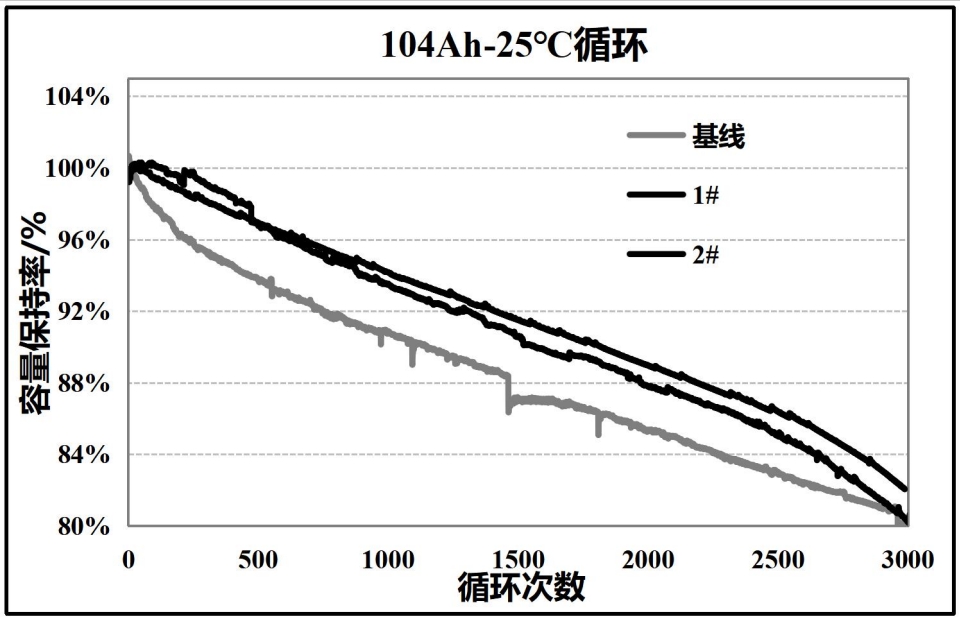
Discharge: 1C discharge to 2.5V;

温度：25℃±2℃；

Temperature: 25℃±2℃;

静置时间：充电/放电后静置 30min。

Rest time: 30 min after charging/discharging.


104Ah-25℃循环
104%
100%
96%
92%
88%
84%
80%
容量保持率/%
0
500
1000
1500
2000
2500
3000
循环次数
基线
1#
2#

A.4 SOC-OCV 表 Table of SOC-OCV

T	−30℃	−20℃	−10℃	0℃	10℃	25℃	45℃	55℃
DOD	电压/V	电压/V	电压/V	电压/V	电压/V	电压/V	电压/V	电压/V
0%	3.36	3.36	3.36	3.36	3.36	3.38	3.35	3.34
5%	3.29	3.30	3.31	3.32	3.32	3.33	3.33	3.33
10%	3.28	3.30	3.31	3.32	3.32	3.33	3.33	3.33
15%	3.28	3.30	3.31	3.32	3.32	3.33	3.33	3.33
20%	3.27	3.29	3.31	3.32	3.32	3.33	3.33	3.33
25%	3.27	3.29	3.30	3.32	3.32	3.33	3.33	3.33
30%	3.27	3.28	3.30	3.31	3.32	3.33	3.33	3.33
35%	3.26	3.28	3.29	3.30	3.31	3.32	3.33	3.33
40%	3.26	3.27	3.28	3.29	3.29	3.30	3.30	3.30
45%	3.26	3.27	3.27	3.28	3.28	3.29	3.30	3.30
50%	3.26	3.27	3.27	3.28	3.28	3.29	3.29	3.30
55%	3.25	3.26	3.27	3.27	3.28	3.29	3.29	3.30
60%	3.25	3.26	3.27	3.27	3.28	3.29	3.29	3.30
65%	3.24	3.26	3.27	3.27	3.28	3.28	3.29	3.29
70%	3.24	3.26	3.27	3.27	3.28	3.28	3.28	3.28
75%	3.24	3.25	3.26	3.27	3.27	3.26	3.26	3.26
80%	3.24	3.25	3.25	3.25	3.25	3.25	3.25	3.24
85%	3.24	3.24	3.23	3.23	3.23	3.22	3.22	3.22
90%	3.23	3.24	3.22	3.21	3.20	3.20	3.20	3.20
95%	3.23	3.23	3.21	3.20	3.19	3.16	3.16	3.14
100%	3.23	3.22	3.19	3.03	2.84	2.66	2.67	2.57

A.5 不同温度和不同 SOC 条件下的放电 DCR Discharge DCR at Different Temperatures and Different SOC Conditions

3C 10s 放电 Discharge DCR/mΩ								
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	45℃	55℃
10%	9.87	6.82	3.81	2.32	1.58	1.23	0.66	0.59
20%	9.35	6.28	3.45	2.16	1.50	1.07	0.64	0.57
30%	8.91	6.42	3.09	2.05	1.44	0.99	0.62	0.56
40%	8.64	6.05	2.91	1.98	1.39	0.94	0.60	0.54
50%	8.79	5.63	2.79	1.92	1.36	0.90	0.59	0.53
60%	8.79	5.32	2.73	1.90	1.37	0.88	0.62	0.55
70%	7.96	5.19	2.68	1.88	1.35	0.90	0.60	0.54
80%	7.70	5.10	2.62	1.79	1.32	0.86	0.58	0.53
90%	7.60	5.08	2.58	1.82	1.29	0.83	0.57	0.51

A.6 不同温度和不同 SOC 条件下的回馈 DCR Feedback DCR at Different Temperatures and Different SOC conditions

T/SOC	10℃	25℃	35℃	45℃
10%	1.48	1.06	/	0.63
20%	1.46	0.98	/	0.62
30%	1.43	0.95	/	0.61
40%	1.40	0.92	/	0.59
50%	1.37	0.90	/	0.57
60%	1.36	0.87	/	0.59
70%	1.34	0.87	/	0.59
80%	1.32	0.85	/	0.58
90%	1.29	0.82	/	0.55

A.7 不同温度和不同 SOC 放电峰值功率 Discharge Peak Power at Different Temperatures and Different SOC

测试方法：1/3C 定容 3 次，取最后一圈放电容量 C0，设置温箱 25℃，静置 3h， 1/3C 恒流放电，截止电压 2.5V，静置 1h，1/3C 恒流恒压充电，截止电压 3.65V，截止电流 0.05C，静置 1h，1/3C 恒流放电，放电至 X SOC（C0），调至目标温度 T℃，静置 t h（T＞0，t=3; T≤0, t=5，T=25, t=1）， P1 恒功率放电 10S，放电容量为 Q1，静置 40s，指定倍率恒流充电(充电容量为 Q1)，静置 20min；重复前两个步骤，直至：截止电压≤结束电压≤放电截止电压＋150mV，记录电流和结束电压；重复前三个步骤，完成不同放电时间 t（t=10s、30s、60s）；重复前四个步骤，，直至完成所有目标 XSOC（XSOC=90%70%、50%、30%、20%、10%、5%、3%、0%）；重复前五个步骤，直至完成所有目标温度 T（T=25℃、10℃、0℃、-10℃、-20℃、-30℃），充电 map 则相反。

Test method: 1/3C capacity test 3 times, take the last turn of discharge capacity as C0, put the cells into corresponding temperature T=25 ℃, rest 3h, 1/3C CC discharge, cut off voltage 2.5V, rest 1h, 1/3CC CV charge, cut off voltage 3.65V, 0.05C, rest 1h; 1/3C CC discharge to X SOC(C0), set the temperature as T℃, rest t h(T＞0，t=3; T≤0, t=5; T=25, t=1), P1 constant power discharge 10s, record discharge capacity Q1, rest 40s, charge at a specified rate constant current (charging capacity Q1), rest 20mins; Repeat the two steps until: cut-off voltage ≤ end voltage ≤ discharge cut-off voltage+150mV, record the current and end voltage; Repeat the three steps to complete different discharge times t (t=10s, 30s, 60s); Repeat the four steps until all target XSOCs are completed (XSOC=90%, 70%, 50%, 30%, 20%, 10%, 5%, 3%, 0%); Repeat the five steps until all target temperatures T (T=25 ℃, 10 ℃, 0 ℃, -10 ℃, -20 ℃, -30 ℃) are achieved, while the

charging map is the opposite.

10s最大放电功率Maximum allowable discharge power/W									
SOC状态	-30℃	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
100%	278	625	1285	1702	1911	2258	2779	2779	1911
90%	259	588	1211	1592	1799	2214	2768	2768	1799
80%	242	554	1107	1522	1661	2180	2768	2768	1661
70%	225	519	1038	1418	1557	2145	2767	2767	1557
60%	207	482	930	1275	1378	2101	2377	2377	1378
50%	198	445	855	1197	1334	2052	2359	2359	1334
40%	188	410	752	1094	1264	1982	2221	2221	1264
30%	171	376	615	956	1127	1878	2220	2220	1127
20%	135	305	474	812	947	1692	2030	2030	947
10%	117	267	334	567	700	1167	1501	1501	834
5%	83	233	266	500	599	833	1166	1166	666
1%	39	88	114	260	325	649	747	747	584

30s最大放电功率Maximum allowable discharge power/W									
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
100%	243	556	1112	1390	1563	2258	2606	2606	1563
90%	235	536	1038	1315	1488	2076	2422	2422	1488
80%	225	519	969	1211	1384	2007	2353	2353	1384
70%	208	466	865	1141	1314	1902	2179	2179	1314
60%	189	448	792	1034	1240	1723	2067	2067	1240
50%	171	376	684	923	1094	1470	1881	1881	1094
40%	154	342	513	854	1025	1367	1709	1709	1025
30%	137	307	410	717	854	1195	1537	1537	854
20%	118	271	338	508	609	1015	1354	1354	744
10%	100	233	267	400	500	667	1001	1001	667
5%	83	167	233	266	333	500	666	666	500
1%	23	49	65	162	195	325	357	357	325

60s最大放电功率Maximum allowable discharge power/W									
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
100%	226	452	1042	1216	1563	2085	2432	2432	1563
90%	208	432	969	1107	1384	1903	2249	2249	1384
80%	190	415	865	1038	1211	1730	2076	2076	1211
70%	173	380	761	934	1107	1626	1729	1729	1107
60%	155	345	689	861	965	1378	1550	1550	965
50%	137	308	616	752	923	1197	1470	1470	923
40%	120	273	547	615	854	1094	1367	1367	854
30%	102	239	376	512	683	1024	1195	1195	683
20%	85	203	271	338	508	846	1015	1015	609
10%	67	167	233	167	367	500	667	667	500
5%	33	67	117	133	266	400	500	500	400
1%	16	39	49	81	162	195	227	227	195

A.8 不同温度和不同 SOC 回馈峰值功率 Feedback Peak Power at Different Temperature and Different SOC

10s最大回馈功率Maximum allowable feedback power/W								
T/SOC	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
99%	46	76	190	304	569	949	949	437
95%	57	133	228	418	835	1139	1139	626
90%	68	140	266	456	949	1329	1329	702
80%	76	152	285	493	1025	1518	1518	759
70%	76	159	323	531	1101	1556	1556	816
60%	84	171	330	569	1139	1594	1594	854
50%	87	178	334	607	1215	1708	1708	911
40%	91	182	342	645	1329	1784	1784	987
30%	95	190	380	683	1405	1898	1898	1044
20%	99	209	399	759	1480	1974	1974	1120
10%	102	228	417	797	1898	2278	2278	1348
0%	106	266	493	1139	1974	2467	2467	1556

30s最大回馈功率Maximum allowable feedback power/W								
T/SOC	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
99%	30	57	114	209	323	456	456	266
95%	46	95	210	342	645	949	949	493
90%	49	114	228	380	759	1139	1139	569
80%	57	133	266	418	835	1215	1215	626
70%	61	140	273	456	873	1291	1291	664
60%	65	152	285	475	949	1329	1329	712
50%	66	156	288	512	1025	1405	1405	769
40%	68	159	304	569	1139	1556	1556	854
30%	72	171	323	607	1215	1632	1632	911
20%	76	190	342	645	1253	1708	1708	949
10%	80	209	418	702	1518	1898	1898	1110
0%	84	228	456	835	1632	1974	1974	1234

60s最大回馈功率Maximum allowable feedback power/W								
T/SOC	-20℃	-10℃	0℃	10℃	25℃	35℃	45℃	55℃
99%	23	57	95	133	190	266	266	161
95%	38	95	190	323	569	759	759	446
90%	46	114	228	361	607	949	949	484
80%	49	121	239	380	759	1025	1025	569
70%	53	129	243	399	797	1139	1139	598
60%	57	133	247	418	835	1177	1177	626
50%	61	140	251	456	949	1291	1291	702
40%	65	152	266	493	1025	1405	1405	759
30%	68	163	304	569	1063	1518	1518	816
20%	70	171	323	607	1139	1594	1594	873
10%	72	190	380	645	1329	1746	1746	987
0%	76	209	418	759	1480	1860	1860	1120

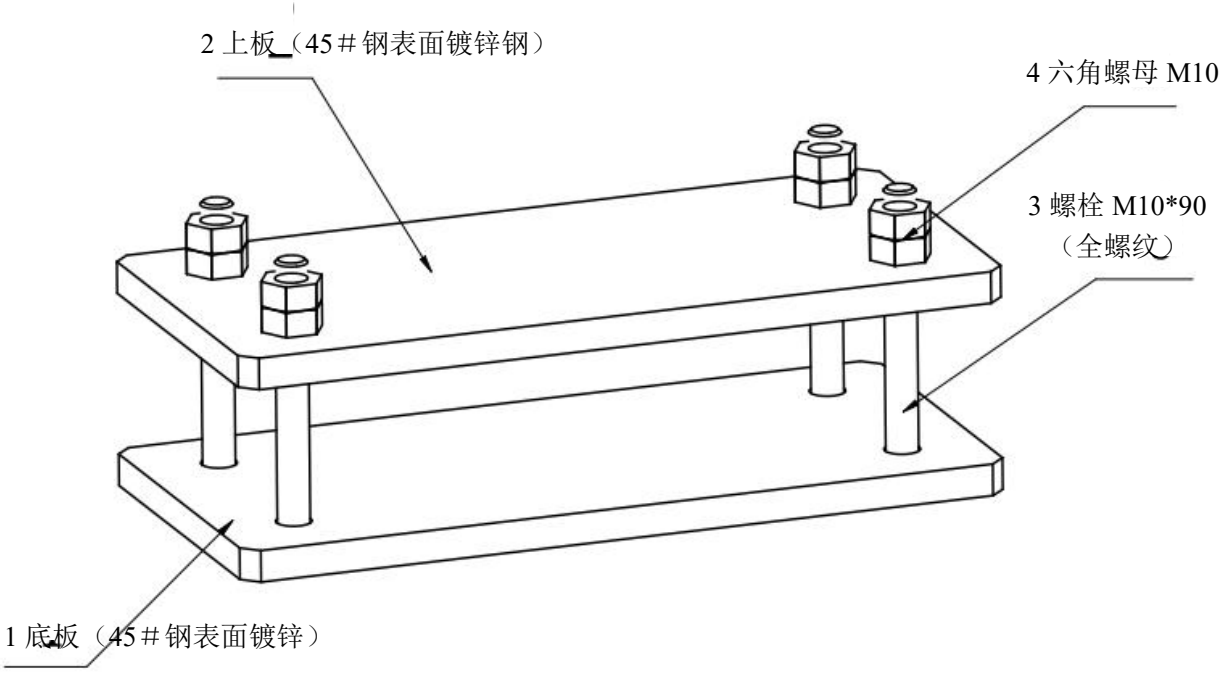
备注：脉冲回馈功率的大小必须严格遵守表中所列的所有充电状态以及电芯温度等条件。违反脉冲回馈条件可能会造成电芯永久性的损伤导致使用寿命下降。

Remarks: The size of the pulse feedback power must strictly comply with all the state of charge and cell temperature listed in the table. Violation of the pulse feedback conditions may cause permanent damage to the cells and reduce their service life.

A.9 企业钢板夹具的使用 Using of steel plate

钢制夹板（45#钢，厚度 1cm）：夹具需覆盖住电芯大面，并做好绝缘处理，以免接触正负极导致电芯短路，夹板之间用 4 个 M10 螺栓固定，夹具工装如下图所示：

Steel plate(45#, thickness of 1 cm):The plates should cover the cell, and pay attention to the insulation to prevent short circuits, the plates should to be secured with four M18 bolts, as shown below:



电芯夹具示意图 Steel plat

IFP53148115-104Ah 锂离子电池产品环保声明 Li-ion Battery Product Environmental Declaration

根据欧盟(EU)2015/863 指令；2006-66-EC 电池指令要求，如下表所示镉、铅、汞、六价铬、多溴联苯(PBB)、多溴二苯醚(PBDE)及邻苯二甲酸酯(PAEs)共计 10 种物质纳入禁用物质清单。

In accordance with EU directive 2015/863, battery instruction requirements in 2006-66-EC， as shown in the following table, a total of 10 substances are included in the RSL, for example Cadmium、Lead 、Mercury、Hexavalent chromium 、 Polybrominated biphenyls (PBB) 、 Polybrominated diphenyl ethers (PBDE) and phthalate (PAEs).

表 Table A.11 十种禁用物质清单 List of Ten Prohibited Substances

RoHS 禁用物质 Prohibited Substances	最高限值 Upper Limit（PPM）	说明 Illustrate
镉(Cd)	20	2006-66-EC 指令要求 Instruction requirements
铅 (Pb)	40	2006-66-EC 指令要求 Instruction requirements
汞 (Hg)	5	2006-66-EC 指令要求 Instruction requirements
六价铬 (Cr^{6+})	1000	RoHS 1.0 已有限用物质 Substances that have been restricted
多溴联苯 (PBB)	1000	RoHS 1.0 已有限用物质 Substances that have been restricted
多溴二苯醚 (PBDE)	1000	RoHS 1.0 已有限用物质 Substances that have been restricted
邻苯二甲酸二(2-乙基已基)酯 （DEHP- Di(2-ethylhexyl)Phthalate）	1000	RoHS 2.0 新增限用物质 Added restricted substances
邻苯二甲酸丁苄酯 （BBP- Benzyl Butyl Phthalate）	1000	RoHS 2.0 新增限用物质 Added restricted substances
邻苯二甲酸二丁酯 （DBP-Di-n-butyl Phtalate）	1000	RoHS 2.0 新增限用物质 Added restricted substances
邻苯二甲酸二异丁酯 （DIBP-Diiso butyl Phthalate）	1000	RoHS 2.0 新增限用物质 Added restricted substances

从发布日期立即实施执行。Execution is implemented immediately from the release date