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电芯技术规格书

Technical Specification

280Ah 磷酸铁锂锂离子电池(储能型) 产品

280Ah LFP cell for energy storage

型号 Type: LFP71173207/280Ah

版本 Version: A/1

客户名称:
Client:
客户确认（盖章）：对本规格书内容无异议。
Client confirmation (seal): There is no objection to the content of this specification.
客户确认日期:
Client confirmation date:

Xiamen Hithium Energy Storage Technology Co., Ltd.
厦门海辰储能科技股份有限公司

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1. 术语定义 Definitions

海辰 Hithium	厦门海辰储能科技股份有限公司 Xiamen Hithium Energy Storage Technology Co., Ltd.
客 户 Customer	电芯的采购方 Purchaser of batteries in sales contract.
产 品 Product	若无特别说明，产品指客户向海辰采购的电芯产品 Unless otherwise specified, the product refers to the cell purchased by the customer from Hithium.
周围环境温度 Ambient temperature	电芯所处的周围环境温度，温度公差为 $\pm 2^{\circ}\text{C}$ The ambient temperature where the cells are exposed to the temperature tolerance is $\pm 2^{\circ}\text{C}$.
电 芯 Cell	本规格书未特别说明均指下线态电芯 (27%SOC, 包蓝膜) Unless otherwise specified in this specification, it refers to the cell off the assembly line (27% SOC, covered with blue film)
电池管理系统 Battery Management System (BMS)	用于监测和记录产品在整个服务期限内的运行参数的一种有效的追踪和控制系统。其追踪和记录的参数包括但不限于电压、电流、温度等，以控制产品的运行并确保产品运行环境及运行条件符合本规格书的规定 An effective tracking and control system to monitor and record the operating parameters of the product throughout the service life. Its tracking and recording parameters include but are not limited to voltage, current, temperature, etc., to control the operation of the product and to ensure that the product operating environment and operating conditions meet the requirements of this specification.
电芯温度 Cell temperature	由接入电芯的温度传感器测量的电芯的温度，温度传感器和测量线路的选择由海辰和客户共同商定 The temperature of the cell measured by the temperature sensor connected to the main part of cell.
新电芯状态 Fresh cell	指客户收货 15 天以内 (仅限国内运输) 且循环充放次数少于 5 次的电芯状态 Fresh cells are charged and discharged less than 5 times within 15 days after the customer receives the goods (for domestic transportation only).
充/放电倍率 C-Rate	充/放电功率与电池管理系统多次测量的电芯的能量值的比率。例如: 电芯能量为 896Wh, 充/放电功率为 448W 时, 则充/放电倍率为 0.5P; The ratio of charging/discharging power to the energy of batteries measured repeatedly by BMS. For example, when the cell energy is 896Wh and the charging/discharging power is 448W, the charging/discharging rate is 0.5P.
生产日期	电芯的生产日期，每个电芯顶盖刻码所包含的明确的生产日

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	Production date	期代码为生产日期 The production date of the cell marked on the top of the cell by date code.		
	标准充电 Standard charge	在室温下(25±2℃), 以 0.5P 恒功率充电至终止电压 3.65V, 停止充电, 静置 30min At room temperature ((25±2)°C), charge with 0.5P constant power to 3.65V, stop charging, rest for 30 min.		
	标准放电 Standard discharge	在室温下 (25±2℃), 以 0.5P 恒功率放电至终止电压 2.5V, 停止放电, 静置 30min At room temperature ((25±2)°C), discharge with 0.5P constant power to 2.5V, stop discharging, rest for 30 min.		
	循环 Cycle	电芯按规定的标准充放电充放一次为一个循环 The cell is charged and discharged according to the specified standard; one cycle consists of one charge and discharge		
	开路电压 OCV	没有接入任何负载和电路时测得的电芯的电压 The open circuit voltage is the cell voltage measured without any load connected.		
	充电状态 (SOC) State of charge (SOC)	电芯实际充电容量与满充容量的比值, 表征电芯的充电状态。100%SOC 的充电状态表示电芯满充到 3.65V, 0%SOC 的充电状态表示电芯完全放电到 2.5V The ratio of the actual lithium cell charge volume to the full charge volume, characterizing the state of charge of the cell. The state of charge of 100% SOC indicates that the cell is fully charged to 3.65V, and the state of charge of 0% SOC indicates that the cell is completely discharged to 2.5V.		
	温度上升 Temperature rise	按照特定充放电条件下, 电芯充电或者放电过程中电芯温度的升高 Means the temperature of the cell rises during the conditions specified in this document, such as the charging process or the discharging process.		
	测量单位 Units of measure	"V"(Volt)伏特(V), 电压单位 "A"(Ampere)安培(A), 电流单位 "W"(Watt)瓦特(W), 功率单位 "Ah"(Ampere-Hour)安培-小时(Ah), 容量单位 "Wh"(Watt-Hour)瓦特-小时(Wh), 能量单位 "mΩ"(milliOhm)毫欧姆(mΩ), 内阻单位 "°C"(degree Celsius)摄氏度(°C), 温度单位 "mm"(millimeter)毫米(mm), 长度单位 "s"(second)秒(s), 时间单位 "Hz"(Hertz)赫兹(Hz), 频率单位 "kg"(kilogram)千克(kg), 质量单位 "N"(Newton)牛顿(N), 力单位		

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2. 适用范围 Scope of application

本技术规格书规定了 LFP71173207/280Ah 型锂离子电芯的性能要求、试验方法、运输、贮存要求和注意事项等。

The purpose of this specification is to specify the performance requirement, test method, transportation, storage and corresponding notice tips etc.

3. 规范性引用文件 Normative reference document

下列文件对于本文件的应用是必不可少的，凡是注日期的引用文件，仅注日期的版本适用于本文件。凡是不注日期的引用文件，其最新版本（包括所有的修改单）适用于本文件。

GB/T 36276-2018 电力储能用锂离子电池

GB/T 31485-2015 电动汽车用动力蓄电池安全要求及试验方法 6.2.8

There are the references in this document. The edition of references is valid edition.

GB/T 36276-2018 Lithium ion battery for electrical energy storage

GB/T 31485-2015 Safety requirements and test methods for traction battery of electric vehicle (6.2.8).

4. 测试条件 Test conditions

若无特别说明，电芯的参数均为新电芯状态下的参数，测试对象为新电芯状态的电芯(除自放电测试外)。除非有其他说明，实验和测量需在室温(25 ± 2)℃、标准湿度(55 ± 20)%以及大面夹具力为(3000 ± 200)N 条件下进行。

The test object is fresh cell (except for self-discharge test). Unless exceptions are stated, the experiment and measurement should be carried out under the conditions of room temperature (25 ± 2)℃, standard humidity (55 ± 20)% and large surface fixture of (3000 ± 200)N.

4.1 测量设备及精度 Test equipment and accuracy

- (1) 测试设备精度 Test equipment accuracy: $\pm 0.1\%$
- (2) 电流测量精度 ≥ 0.5 级 Current measurement accuracy: ≥ 0.5 level, 电压测量精度 ≥ 0.5 级 Voltage measurement accuracy: ≥ 0.5 level
- (3) 温度测量精度 Temperature measurement accuracy: $\pm 0.5^\circ\text{C}$

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(4) 时间测量精度 Time measurement accuracy: $\pm 0.1\%$

(5) 尺寸测量精度 Dimensional measurement accuracy: $\pm 0.1\%$

(6) 重量测量精度 Weight measurement accuracy: $\pm 0.1\%$

4.2 充放电模式 Standard charge/discharge method

若无特别说明，充放电模式均应为标准充电/放电模式。

If not particularly indicated, both charge and discharge modes should be standard charge/discharge modes.

4.3 极柱与 Busbar 焊接参数 Welding parameters of pole and Busbar

序号 No	项目 Items	标准 Standards
1	焊接输出能量 Welding output energy	$\leq 2200\text{J}$
2	熔深 Depth of fusion	$\leq 2.0\text{mm}$
3	极柱塑胶件温度 The temperature of the plastic part of the pole	200℃持续小于 30s
4	极柱承受压力 Overwhelming force of the pole	$\leq 1000\text{N}$

海辰焊接参数：P=4000~4200W，V=70~80mm/s（仅作为参考）；

Welding parameters: P=4000~4200W; V=70~80mm/s (for reference only);

5. 电芯技术参数 Technical parameter

5.1 电芯基本参数 General

项目 Items	参数 Parameters	条件 Conditions
电芯类型 Type	磷酸铁锂电芯 LFP	N.A.
电芯型号 Model	LFP71173207/280Ah	N.A.
外形尺寸 Dimension	见成品电芯图纸 Refer to drawings	详细见第 10 章电芯图纸 Refer to chapter.10 drawing
电芯质量 Weight	5.43 $\pm$ 0.20kg	包蓝膜后 Taking the blue film weight into account
出厂内阻（1kHz） Impedance (1KHz)	0.18 $\pm$ 0.05m Ω	27%SOC，以产线在线测试数据为准 27%SOC，1kHz

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	额定(标称)容量 Nominal capacity	280Ah		(25±2)℃，标准充放电 (25±2)℃, standard charge and discharge	
	标称电压 Nominal voltage	3.2V		(25±2)℃，标准充放电 (25±2)℃, standard charge and discharge	
	额定能量 Nominal energy	896Wh		(25±2)℃，标准充放电 (25±2)℃, standard charge and discharge	
	工作电压 Operating voltage	2.5-3.65V 2.0-3.65V		温度 T>0℃ 温度 T≤0℃	
	下线电压范围 Voltage range of the cell coming off the production line	3.28~3.30V		(25±2)℃，27%SOC 电芯开路电压 (25±2),OCV, 27%SOC	
	能量密度 Energy density	≥160Wh/kg		(25±2)℃，标准充放电 (25±2)℃, standard charge and discharge	
	月自放电 Self-discharge / per month	≤3.0%		出货三个月以后的电芯，标准充电到 27%SOC，25±2℃储存 Fresh cell after 3 months, (25±2)℃，27%SOC	
	最大持续充电功率 Max continuous charging power	1P		25±2℃	
	最大持续放电功率 Max continuous discharge power	1P		25±2℃	
	放电温度范围 Operating temperature(discharging)	-30~60℃		N.A.	
	充电温度范围 Operating temperature(charging)	0~60℃		N.A.	

5. 2 电芯性能参数 Performance parameter

项目 Items	参数 Parameters	测试方法 Testing methods
-20°C放电容量 -20°C discharge capacity	≥70%标称容量 ≥70% nominal capacity	电芯标准充电后, 在-20±2°C条件下静置 24h, 将电芯以 0.5P功率放电至 2.0V 并记录放电容量(Ah)

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			After standard charging, rest for 24h at $(-20\pm2)^{\circ}\text{C}$, discharge with 0.5P to 2.0V and record capacity.	
55°C放电容量 55°C discharge	$\geq 95\%$ 标称容量 $\geq 95\%$ nominal capacity		电芯标准充电后，在 $55\pm2^{\circ}\text{C}$ 条件下静置 5h, 将电芯以 0.5P 功率放电至 2.5V 并记录放电容量 (Ah) After standard charging, rest for 5h at $(55\pm2)^{\circ}\text{C}$, discharge with 0.5P to 2.5V and record capacity.	
持续充/放电温升 Continuous charge/discharge temperature rise	$\leq 10^{\circ}\text{C}$		$(25\pm2)^{\circ}\text{C}$ ，标准充放电，感温线贴在电芯大面(电芯不带夹具测试)，高低温箱中测试，电芯开始充(放)电到充(放)电完成温升记为持续充(放)电温升 $(25\pm2)^{\circ}\text{C}$, standard charging and discharging, the wire of the temperature sensor is attached to the large surface of the cell (the cell is tested without a fixture), tested in a high and low temperature chamber, the cell starts to charge (discharge) until the charge (discharge) is completed. Temperature rise is recorded as continuous charging (discharging) temperature rise.	
脉冲放电温升 Pulse discharge temperature rise	$\leq 5^{\circ}\text{C}$		$(25\pm2)^{\circ}\text{C}$ ，单体电芯 50-80%SOC 状态, 500A 脉冲放电 10s, 高低温箱中测试，感温线贴在电芯大面(不带夹具)，电芯开始放电到放电完成温升记为脉冲温升 50%-80% SOC, $(25\pm2)^{\circ}\text{C}$, 500A pulse discharge for 10s, tested in a high and low temperature chamber, the wire of the temperature sensor is attached to the large surface of the cell (the cell is tested without a fixture), temperature rises from the cell starting to charge/discharge to	

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			finishing charge/discharge.	
室温荷电保持与恢复能力 Retention and recovery ability at room temperature	剩余容量≥95%标称容量 恢复容量≥97%标称容量 Retention≥95% Recovery≥97%	电芯标准充电后，室温条件下开路放置 28 天；以 0.5P 放电至 2.5V，放出的容量记为剩余容量；再次标准充电后，以 0.5P 放电至 2.5V，放出的容量记为恢复容量 After standard charging of cell, rest for 28 days in an open circuit at room temperature; discharge by 0.5P to 2.5V, and the discharged capacity is recorded as the remaining capacity; after standard charging again, discharge by 0.5P to 2.5V, and the discharged capacity is recorded as the recovery capacity.		
高温荷电保持与恢复能力 Charge retention and recovery ability at high temperature	剩余容量≥95%标称容量 恢复容量≥97%标称容量 Retention≥95% Recovery ≥97%	电芯标准充电后，高温55±2℃条件下开路放置 7 天；室温搁置5h后，以0.5P放电至 2.5V，放出的容量记为剩余容量；再次标准充电后，以 0.5P 放电至 2.5V，放出的容量记为恢复容量 After standard charging of the cell, leave it in an open circuit at a high temperature of (55±2)℃ for 7 days; after leaving it at room temperature for 5h, discharge by 0.5P to 2.5V, and the discharged capacity is recorded as the remaining capacity; after standard charging again, discharge by 0.5P to 2.5 V, the released capacity is recorded as the restored capacity.		
安全性能 Safety performance	单体满足 GB/T 36276-2018 以及 GB/T 31485-2015 的单体针刺的要求 GB/T36276-2018 and GB/T31485-2015(nail penetration test)		参考 GB/T 36276-2018，GB/T 31485-2015 的 6.2.8 条要求 Refer to GB/T 36276-2018, GB/T 31485-2015 6.2.8 requirements.	

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5.3 电芯寿命 Cell cycle life

项目 Items	参数 Parameters	测试方法 Test methods
室温充放电循环寿命 Cycle life at room temperature	≥ 10000 次(cls)	(25±2)℃，电芯采用 15mm 铝板夹紧大面，夹具力为 (3000±200)N，在高低温箱中测试，以 0.5P 恒功率充电至 3.65V，搁置 30min，以 0.5P 恒功率放电至 2.5V，搁置 30min，重复如上标准充放电，直至容量衰减为标称容量的 70%截止 (25±2)℃, the cell covered with 15mm aluminum plate, the fixture force is (3000±200)N, tested in a high and low temperature chamber, charged to 3.65V with a constant power of 0.5P, rest for 30min, discharge to 2.5V by 0.5P, rest for 30 minutes, and repeat the above standard charge and discharge until the capacity fades to 70% of the nominal capacity.

6. 电芯标识、包装、运输及存储要求 Requirements for identification, appearance and packaging

- 6.1 电芯顶盖刻码符合海辰《电芯产品编码规则》；
- 6.1 The engraving code on the top cover of the cell complies with 《Battery Product Coding Rules》 of Hithium;
- 6.2 电芯标识（刻码区和目视区信息）按照客户和海辰双方约定标准执行，若双方未约定，按海辰标准执行；
- 6.2 The cell identification shall be implemented in accordance with standards agreed by the customer and Hithium. If there is no agreement between the two parties, it will be implemented according to Hithium standards;
- 6.3 包装箱和装箱规格按照客户和海辰双方约定执行，若双方未约定，按海辰

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标准执行;

- 6.3 The packing box and packing size shall be implemented in accordance with the agreement between the customer and Hithium. If there is no agreement between the two parties, it will be implemented according to Hithium standards;
- 6.4 电芯出货报告包含电芯的容量, 电压, 内阻, 尺寸数据;
- 6.4 The cell shipment report contains the capacity, voltage, internal resistance, and so on;
- 6.5 电芯存储时, 应放在空气流通、相对湿度不大于 80%, 温度不高于 35℃, 可防水、防腐、防尘的仓库中, 电芯 SOC 保持为 20~50%;
- 6.5 When the product is stored, it should be placed in a warehouse with good ventilation, relative humidity less than 80%, and room temperature less than 35 °C, waterproof, anticorrosive, dustproof, and the cell is charged at 20 ~50% SOC.
- 6.6 包装箱应标有“小心轻放”、“防水”, “防倒置”, “不可堆叠”等字样;
- 6.6 The packaging box should be marked with words such as handle with care, waterproof, anti-upside down, no stacking, etc.;
- 6.7 包装箱或包装盒在运输过程中应小心轻放, 避免碰撞和敲击, 严禁与酸碱等腐蚀物品放在一起;
- 6.7 The packing box should be handled with care during transportation to avoid collision and knocking, strictly forbidden to put it together with corrosive materials such as acid and alkali;
- 6.8 来货电芯箱卡板, 在正常托运或放置时, 不允许出现倾斜、塌陷等不良。
- 6.8 The card board of the cell carton shall not be allowed to be inclined or collapsed during normal consignment or placement.

7. 应用条件 **Application conditions**

客户应当确保严格遵守以下与电芯相关的应用条件:

Customer shall ensure that the following application conditions in connection with the products are strictly observed:

- 7.1 客户端收到到货电芯后, 应在 15 天内完成入库检验, 具体参考双方协商的检验规范;

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- 7.1 After receiving the delivered batteries, the client should complete the warehousing inspection within 15 days. Refer to the inspection specifications negotiated by both parties for details.
- 7.2 工作环境温度范围：充电：0~60℃；放电：-30~60℃；
- 7.2 Operating environment temperature range: charge: 0~60℃; discharge: -30~60℃;
- 7.3 短期储存温度范围(1个月内)：-20~45℃；
- 7.3 Short-term storage temperature range (within 1 month): -20~45℃
- 7.4 海拔：≤4500m；
- 7.4 Altitude: ≤4500m;
- 7.5 相对湿度：≤85%RH;
- 7.5 Relative humidity: ≤85%RH;
- 7.6 系统成组设计需对电芯施加一定的预紧力，新鲜电芯预紧力范围为 500~3000N，建议的预紧力公差为±200N；
- 7.6 The group design of the system requires a certain pre-tightening force to be applied to the cells. The pre-tightening force range of fresh cell is 500~3000N, and the recommended pre-tightening force tolerance is ±200N.
- 7.7 电芯在使用过程中会产生膨胀力，电芯在 15mm 铝板初始大面夹具力为 (3000±200)N 测试条件下，衰减至 70%时膨胀力约为 25000N，客户在产品的设计过程中需要考虑与电芯产品配套使用的系统结构强度的可靠性，客户需征询海辰的建议，如客户未征询或未采纳海辰建议，发生的一切质量、安全问题，海辰均不承担责任；
- 7.7 The product will generate expansion force during use. When the cell is fading to 70%SOH under the test condition of 15mm aluminum plate, the expansion force is about 25000N. Customers need to consider the reliability of the structural strength of the system that the cells use for.
- 7.8 客户应配置电池管理系统，严密监控、管理与保护每个电芯；
- 7.8 Customer shall procure that each product shall be used under the strict monitor, control and protection by BMS.
- 7.9 客户最终采用的电池管理系统方案应符合技术规格书里的 7.11 条款中的相关规定，否则发生直接因果关系质量问题或质量事故，应免除海辰责任

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7.9 The BMS that the customer ultimately adopts should be in accordance with the relevant specifications stated in 7.11 in technical specification, otherwise Hithium shall be exempt from responsibility if a direct subsequent damage or quality problem occurs.

7.10 客户应保存完整的电芯运转的监测数据, 用作产品质量责任划分的参考, 否则海辰不承担产品质量保证责任;

7.10 Customer shall keep relevant records of the BMS monitoring data throughout the entire service life of each product, including keeping record of number of occurrence of rush charge, which could be used in the determination and judgment of any product warranty and liability claim entitlement. No warranty or liability claim should be considered without BMS diagnosis records of the relevant product.

7.11 电池管理系统需满足以下最基本的检测和控制要求:

7.11 The BMS shall include the following monitoring and control features as a minimum requirement.

No.	项目 Items	参数 Parameters	保护动作 Actions
7.11.1	充电终止 Stop charging	3.65V	当电芯的电压达到3.65V 时电池管理系统申请终止充电 Stop charging when cell voltage reaches 3.65V
7.11.2	第一级过充电保护 First overcharge protection	$\geq 3.7V$	当电芯的电压达到3.7V 时电池管理系统强制终止充电 Force stop charging by BMS when cell voltage reaches 3.7V
7.11.3	第二级过充电保护 Second overcharge protection	$\geq 3.8V$	当电芯的电压达到3.8V 时电池管理系统强制终止充电, 并锁定电池管理系统直到技术人员解决问题 when the battery voltage reaches 3.8V, the BMS is forced to terminate charging and the BMS should be locked until technicians solve the

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				problem.	
7. 11. 4	放电终止 Stop discharge	最小 Minimum 2.5V(T>0°C) 2.0V(T≤0°C)		当电芯的电压达到 2.5V(T > 0 °C) 或 2.0V(T≤0°C) 时, 电池管理系统申请终止放电 Stop discharging when cell voltage reaches 2.5V (T>0°C) or 2.0V (T≤0°C)	
7. 11. 5	第一级过放保护 First over discharge protection	最小 Minimum 2.4V(T>0°C) 1.8V(T≤0°C)		当电芯的电压达到 2.4V(T > 0 °C) 或 1.8V(T≤0°C) 时, 电池管理系统强制终止放电 Force stop discharging by BMS when cell voltage reaches 2.4V (T>0°C) or 1.8V (T≤0°C)	
7. 11. 6	第二级过放保护 Second over discharge protection	最小 Minimum 2.0V(T>0°C) 1.6V(T≤0°C)		当电芯电压低于 2.0V(T>0°C) 或 1.6V(T≤0°C) 时, 电池管理系统强制终止放电, 应及时以 0.1C 回充至 50% SOC, 且电池管理系统应锁定直到技术人员解决问题 When the cell voltage is less than 2.0V(T>0°C) or 1.6V(T≤0°C), the cell should be charge back to 50% SOC at 0.1C in time, and the BMS should be locked until technicians solve the problem.	
7. 11. 7	短路保护 Short circuit protection	不允许短路 No short circuit allowed		发生短路时, 由过流器断开电芯 When a short circuit occurs, the cell should be disconnected by the overcurrent protection device.	

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7. 11. 8	过流保护 Overcurrent protection	电流 $\leq 358.4\text{A}$ Current $\leq 358.4\text{A}$	电池管理系统控制充放电电流符合规格 BMS controls the charge and discharge current to meet the specifications
7. 11. 9	过热保护 Overheating protection	电芯温度 $\leq 60^{\circ}\text{C}$ Cell temperature $\leq 60^{\circ}\text{C}$	当温度超过规定时，终止充电/放电 Stop charging and discharging when temperature exceeds specification
7. 11. 10	低温保护 Low temperature protection	充电：温度 $>0^{\circ}\text{C}$ ； 放电：温度 $\geq -30^{\circ}\text{C}$ Charging: T $>0^{\circ}\text{C}$ ； Discharge: T $\geq -30^{\circ}\text{C}$	当温度低于规定时，终止充电/放电 Stop charging and discharging when temperature exceeds specification

备注：以上 No. 7. 11. 2、7. 11. 3、7. 11. 5、7. 11. 6 为警示条款，提请客户注意：当电芯达到上述任何一项条款描述的指标和参数状态时，意味着电芯已超出本规格书规定的使用条件，客户需依“保护动作”及本规格书其他相关规定对电芯采取保护措施，同时，海辰声明对上述使用状态的电芯质量不承担任何保证责任，并免除因此而导致的客户及第三方的任何损失赔偿。

Note: the above No. 7.11.2、7.11.3、7.11.5、7.11.6 are the warning clauses, draw the attention of customers: when the battery reaches any of the terms described in the above, it means that the battery has been used beyond the specification. The customer shall take protective measures on the battery in accordance with the protection action and other relevant provisions of this specification. At the same time, Hithium shall not take any responsibility for the quality of the above-mentioned cells, and exempts customers and third parties from any loss compensation caused thereby.

7. 12 客户及第三方应避免电芯到达过放状态。电芯电压低于 2. 0V 时，电芯内部可能会遭到永久性的损坏，此时海辰的产品质量保证责任失效。根据本规格书第 5. 1 条，当放电截止电压低于 2. 5V 时，系统内部能耗降低到最小，并在重新充电之前延长休眠时间。客户需要培训使用者在最短的时间内重新充电，防止电芯进入过放状态。

7. 12 Prevent draining any product down to over discharge state. A product may be

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permanently damaged internally when the cell voltage is lower than 2.0V and which shall be strictly prohibited, failing what Hithium warranties under the contract shall cease to apply, thereby releasing the Hithium from any liability in connection therewith. After discharge cut-off in accordance with paragraph 5.1, internal power consumption of the system should be reduced to a minimum to prolong the idle time before recharge. Customer undertakes to educate the users of the products or other parties who may come to handle the products to recharge the cells at minimum time intervals to prevent reaching the over-discharge state.

7. 13 电芯存储 SOC 应保持在 20~50%范围内。客户若预计将电芯存放大于 1 个月且不超过 6 个月的，应提前做一次充放电，将 SOC 调整为 20%~50%。电芯存储 SOC 超出 20~50%范围或存储超过 6 个月不做充放电维护，对电芯造成的容量损失或其他损失，海辰将不承担责任。
7. 13 The storage SOC of the cell should be kept within the range of 20~50%. If the customer expects to store the cells for over 1 month and less than 6 months, they should do a charge and discharge in advance and adjust the SOC to 20~50%. If the SOC of cell exceeds the range of 20~50% or if it is stored for more than 6 months without charging and discharging maintenance, Hithium will not be liable for the capacity loss or other losses caused by the cell.
7. 14 客户应避免将电芯在本规格书规定之外的条件下充电(包括标准充电、快充、低温充电、紧急情况充电等)，否则可能出现意外的容量降低现象。电池管理系统应依照最小的充电温度进行控制。否则，海辰不承担质量保证责任。
7. 14 Batteries should avoid charging at low temperature prohibited by this Technical Specification (including standard charging, fast charging and emergency charging), otherwise accident capacity reduction may occur. Battery management system should be controlled according to the minimum charging temperature. Otherwise, Hithium will not undertake the responsibility of quality assurance.
7. 15 客户在对电芯进行搬运及电池模组设计、组装的过程中，要做好防护措施，避免蓝膜破损，由于搬运及电池模组设计、组装过程中造成电芯蓝膜破损所引起的电芯损坏，海辰不承担质量保证责任。
7. 15 During the process of handling cells and designing and assembling battery

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modules, customers should take protective measures to avoid damage to the blue film. If the cell is damaged, Hithium does not assume responsibility for quality assurance.

- 7.16 电池模组设计中应保证电芯完整大面受力均匀，否则导致的电芯循环寿命损失或其他损失，海辰不承担责任。
- 7.16 In the design of the battery module, it should be ensured that the whole large surface of the cell is evenly stressed, otherwise, Hithium will not be responsible for the loss of the cycle life of the cell or other losses.
- 7.17 电池模组设计中应充分考虑电芯的散热问题，由于电池模组散热设计问题导致的电芯过热损坏，海辰不承担质量保证责任。
- 7.17 The design of the module or pack must fully consider the heat dissipation problem of the cell. Hithium does not take the responsibility due to the overheating of the cell or battery caused by the thermal design problem of the module or pack.
- 7.18 电池模组设计中应充分考虑电芯的防水、防尘问题，电池模组必须满足国家有关标准规定的防水、防尘等级。由于防水、防尘问题而导致的电芯的损坏(如腐蚀、生锈等)，海辰不承担质量保证责任。
- 7.18 The design of the module or pack must fully consider the waterproof and dustproof problems of the cells. The module or pack must meet the waterproof and dustproof grade stipulated by relevant national standards. Hithium does not take the responsibility due to damage to the cell or batteries (such as corrosion, rust, etc.) caused by water and dust.
- 7.19 海辰出货时会根据双方协商的配组要求进行配组，并以集装箱为最小单位进行标识和出货。不同集装箱电芯不能混用，若有特殊需求可与海辰沟通详细解决方案。若未经海辰允许擅自混用电芯，海辰不承担质量保证责任。
- 7.19 Hithium products are shipped in accordance with integration specifications agreed by both parties, taking the container as the smallest unit with labeling and before shipping. Cells from different containers usage cannot be mixed. Any irregular requirements can be negotiable with Hithium. It is forbidden to mix different P/N batteries in the same battery system, otherwise, Hithium must not be responsible for quality assurance.
- 7.20 电芯的使用期限是有限的，客户应该建立有效的跟踪系统监测并记录每

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个使用期限内电芯的容量。容量的测量方法和计算方法需要客户和海辰共同讨论和双方同意，若双方未达成一致，按海辰标准执行。当使用中的电芯容量小于等于标称容量 70%(25℃)，应停止使用电芯。

- 7.20 The service life of batteries is limited. Customers should establish an effective tracking system to monitor and record capacity of the batteries during service life. The capacity measurement methods and calculation methods require the customer and Hithium to discuss and agree between the two parties. If the two parties do not reach an agreement, the Hithium standard will be implemented. When the capacity is less than or equal to 70% of the nominal capacity (25 °C), the cell shall be stopped using.

8. 注意事项 Safety precautions

- 8.1 禁止将电芯浸入水中。
- 8.1 Do not immerse cells into water.
- 8.2 电芯非正确使用和存放，存在火灾、爆炸和烧伤的风险，勿将电芯分解、压碎、焚化、加热和投入火中。
- 8.2 Incorrect use and storage of the cells may result in the risk of fire, explosion and burns. Do not disassemble, crush, incinerate, heat or throw the cells into a fire.
- 8.3 禁止将电芯投入火中或长时间暴露在超过本规格书规定的温度条件的高温环境中，否则可能会导致火灾。在任何正常的使用情况下，电芯温度不能超过 60℃，如果电芯温度超过 60℃，电池管理系统需关闭电芯，停止电芯运行。
- 8.3 Do not drop cells into fire or expose them to any high temperature environment exceeding operation temperature, otherwise it may cause fire. At all use time, cell temperature should not exceed 60°C, shut down system by BMS when it occurs.
- 8.4 将电芯置于儿童能接触的范围之外，使用之前不得将电芯原包装移除，应根据当地的回收或废弃物法规及时处理废旧电芯。
- 8.4 Keep the cells out of reach of children, do not remove the original packaging of the cells before use, and dispose of used batteries in a timely manner in

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accordance with local recycling or waste regulations.

- 8.5 勿擅自以任何方式拆解、拆卸或修整电芯。
- 8.5 Do not disassemble or repair the cell in any way without authorization.
- 8.6 勿将不同规格、不同品牌的锂离子电芯混合使用。
- 8.6 Do not mix different types and brands of cells.
- 8.7 如果电芯发出异味、发热、变形、变色或出现其它任何异常现象时不得使用并将电芯转移到安全的位置。
- 8.7 If the cell occurs peculiar smell, heat, deformation, discoloration or any other abnormal phenomenon, do not use it and move the cell to a safe location.
- 8.8 禁止电芯正负极短路，否则强电流和高温可能导致人身伤害或者火灾。由于电芯的正负极暴露于塑料保护套中，在电池系统组装和连接时，应有足够的安全保护，以避免短路。
- 8.8 Do not short circuit cell terminals, otherwise high current and temperature may cause body injury or fire hazards. Metallic cell terminals exposed from plastic packaging and ample safety precautions should be implemented to avoid short circuiting them during system integration or connections.
- 8.9 严格按照标示和说明连接电芯正负极，禁止反向或串线充电。
- 8.9 Always connect cell terminals according to its labels in right polarity. Reverse charging is strictly prohibited.
- 8.10 禁止电芯过充/过放，否则，可能引起电芯过热和火灾事故的发生。在电芯安装和使用中，需实行硬件和软件的多重过充过放失效安全保护（包括安装充放电定时器保护）。最低保护要求见本规格书第 7.11.3 条和第 7.11.6 条。
- 8.10 It is forbidden to overcharge the cell, otherwise, it may cause cell to overheat and fire accidents. In the battery installation and use, the hardware and software need to implement multiple level of overcharge-failure safety protection. See paragraph 7.11.3 and 7.11.6.
- 8.11 电芯充电过程中可能发生不适当的终止充电现象。如超出允许的充电时间，充电电压过高而终止充电或充电电流过强而终止充电。上述现象被定义为“不适当的终止充电”。当发生以上现象时，可能意味着电池系统出现漏电或某些部件出现故障。在没有找到根本原因并彻底解决之前继续对该电芯

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充电可能会引起电芯过热或发生火灾。当发生以上现象时，电池管理系统应该通过自动锁定功能，禁止后续的充电，并提醒使用者将装载有该电芯的交通工具退回到经销商处进行系统维护。该电芯只有经过有认证资格的技术人员全面检查，确定根本原因并彻底解决、改善后方可恢复充电。

8. 11 When cells charging is terminated improperly for reasons such as exceeding allowable charging time, cut-off due to exceeding charging voltage or cut-off due to exceeding charging current, all these events are defined as “improper charge termination”. Such event may indicate that there is current leaking within a cell system or some components have started to malfunction and subsequent charging of such cell systems without finding and fixing root cause of problem may cause potential overheat or fire hazards. When such event occurs, the BMS should lock itself up to prevent subsequent charging and notice should only be given to user after the system has been thoroughly checked by qualified technician who can identify and fix root cause attributed to the “improper charge termination”.
8. 12 客户应将电芯安全地固定在固体平面上，并将电源线安全地束缚在合适的位置、以避免摩擦而引起电弧和火花。
8. 12 Products should be securely fixed to solid platform, and power cables should be securely attached by fastener to avoid intermittent contact which may cause arcing and sparks.
8. 13 严禁用塑料封装电芯或用塑料进行电气连接。不正确的电气连接方式可能会造成电芯使用过程中发生过热现象。
8. 13 Do not service cells and electrical connections within plastic package of cell. Improper electrical connection within a cell may cause overheating in service.
8. 14 当电解液泄露时，应避免皮肤和眼睛接触电解液。如有接触，应使用大量的清水清洗接触到的区域并向医生寻求帮助。禁止任何人或动物吞食电芯的任何部件或电芯所含物质。
8. 14 When the electrolyte leaks, skin and eye contact with the electrolyte should be avoided. In case of contact, a large amount of clean water should be used to clean the contact area and seek help from the doctor. It is forbidden for any person or animal to swallow any part or substance contained in the battery.
8. 15 电芯应有保护措施，使其免受机械震动、碰撞及压力冲击，否则电芯内部可能短路，产生高温和火灾。电芯存在潜在的危险，在操作和维护时必须

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采取适当的防护措施；本规格书第 5.2 安全性能描述的测试实验如操作不当可能会引起电芯起火或者爆炸，该测试实验只能由配备适当的防护装备的专业人员在专业的实验室进行。否则，可能会导致严重的人身伤害和财产损失。不遵守上述警告可能造成多种灾难。

8. 15 Protect cells from mechanical shock, impact and pressure. Internal electrical circuit may short circuit to generate high temperature and fire hazards. The cell is potentially dangerous, and appropriate protective measures must be taken during operation and maintenance; improper operation of the test experiment described paragraph 5.2, may cause the cell to catch fire or explode. The test can only be carried out in a professional laboratory by professionals equipped with appropriate protective equipment. Otherwise, it may lead to serious personal injury and property loss. Failure to comply with the above warnings can cause a variety of disasters.

8. 16 客户知悉在电芯使用和操作过程中存在以下潜在的危險:操作者在操作时可能会受到化学品、电击或者电弧的伤害；尽管人体对遭受直流电与交流电的反应不同,但是高于 50V 的直流电压与交流电对人体的伤害是同样严重的,因此客户必须在操作中采取保守的姿势以避免电流的伤害。存在来自电芯中的电解液的化学风险。在操作电芯和选择个人防护装备时,客户及其雇员必须考虑到以上潜在的风险防止发生意外短路,造成电弧、爆炸或热失控。

8. 16 Customer acknowledges the following potential hazards in connection with the usage and handling of products: Working with battery can expose the handler to chemical, shock and arcing hazards. Although a person's body might react to contact with direct current voltage differently than from contact with alternate current voltage. Customer shall take a conservative position and consider the risk of shock or electrocution to be the same for both alternate current and direct current exposures greater than 50V. When selecting work practices and personal protective equipment, customer and its employees should consider potential exposure to these hazard and therefore prevent accidental short-circuit that can result in electrical arcing, explosion, and/or "thermal runaway" of the cells.

9. 其他约定 Other agreements

9. 1 电芯生产完成后,以充电量 27%状态下线,海辰可提供下线电芯容量、电压、

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内阻、尺寸的数据。

- 9.1 The cell coming off the production line with 27% SOC. Hithium can provide the data of capacity, voltage, internal resistance and size.
- 9.2 质保要求按照客户和海辰双方约定为准，若双方未约定参考 5.3 节单体电芯寿命要求。
- 9.2 The quality assurance requirements shall be subject to the agreement between the customer and Hithium. If the two parties have not agreed, please refer to paragraph 5.3 for the cycle life requirements.
- 9.3 电芯安装、使用过程中需要海辰技术支持时，海辰可提供服务和技术支持。若是未按照本规格书当中的内容使用造成的电芯问题，海辰可提供技术指导意见，不承诺免费更换服务。
- 9.3 When Hithium technical support is required during the installation and use of the battery, Hithium is obliged to provide service and technical support. During the warranty period, if the problem is not caused from manufacturing procedure and quality of Hithium, instead the cell problem caused by the user's misuse, Hithium can provide technical guidance and does not promise free replacement services.
- 9.4 电芯应严格按照本规格书当中的内容使用电芯，客户并确保电芯的使用者按本规格书的内容使用电芯，否则发生的电芯参数不符、电芯质量问题、电芯故障及任何损失，海辰均不承担责任。
- 9.4 The customer shall use the battery in strict accordance with the battery usage requirements in this specification. Hithium shall not be responsible for the failure and loss caused by the violation of the battery usage requirements.
- 9.5 当使用中的电芯的内阻超过这个电芯最初内阻的 200%或容量小于等于标称容量 70%(25℃)，客户应停止使用电芯，否则发生的电芯参数不符、电芯质量问题、电芯故障及任何损失，海辰均不承担责任。
- 9.5 When the internal resistance in use exceeds 200% of the initial internal resistance or the capacity drops to below or equal to 70% of the nominal capacity (25℃), the customer should stop using the cell, otherwise the parameters will be so poor, Hithium shall not be liable for quality problems, failures and any losses.
- 9.6 本规格书中所涉及到的其它产品相关文件都必须符合本规格书要求，如果

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与本规格书相违背，以本规格书中的内容为准。

- 9.6 Other product-related documents involved in this specification must meet the requirements of this specification. If it violates this specification, the content of this specification shall prevail.
- 9.7 客户对本规格书的内容负有保密义务，客户不得擅自向任何第三方泄露，具体约定见双方签订的保密协议。
- 9.7 The customer is obliged to keep the content of this specification confidential, and the customer shall not disclose it to any third party without authorization. For details, please refer to the confidentiality agreement signed by both parties.
- 9.8 未经海辰的同意，客户、产品使用者及任何相关方在任何情况下不得综合、分离、修改电芯的技术方案，不得对电芯进行刺探、做反向工程等。
- 9.8 Without the consent of Hithium, customers, product users and any related parties shall not synthesize, separate or modify the technical solutions of the cell under any circumstances. It is also not allowed to disassemble cell and dismantling as a competitor etc.
- 9.9 海辰保留对产品的规格及性能参数修改的权利。客户在订购海辰产品前，需要与海辰提前确认产品的最新规格及性能参数。
- 9.9 Hithium reserves the right to modify the specifications and performance of the product. Before ordering Hithium products, the customer needs to confirm the latest status of the products in advance with Hithium.
- 9.10 如果由于客户、产品使用者及任何相关方不当使用产品造成社会性影响，并对海辰的声誉造成影响的，客户、产品使用者及任何相关方应赔偿海辰的一切损失。
- 9.10 If the product demand unit does not use the product according to the provisions of this specification, causing social impact and affecting the reputation of Hithium, Hithium will investigate the responsibility of the product demand unit. According to the degree of impact on Hithium, the product demander should provide compensation to Hithium.

