PRODUCT SPECIFICATION

产品规格书

Cell Model：

电芯型号：LFP100

Customer Code：

客户编码：

Customer Cell P/N:

客户电池内部编码：

Prepared 编制	R&D Checked R&D 审核	QA Checked QA 审核	Approved 批准

Customer Approval 客户确认	
Signature **签名**	**Date** **日期**

Product Revision History

产品修订履历表

REV. 版本	Date 日期	Mark 标记	Revision Description 修订描述	Originator 修订人
A0	2024-01-08	/	First Edition 第一版	Ming Chen 陈明

Content
目录

1. Term Definition 术语定义

NO.	Term 术语	Definition 定义
1.1	Product 产品	The "product" in this specification refers to the 100Ah 3.2V lithium iron phosphate cell for energy storage produced by Highpower Technology Co., Ltd. 本规格书中的“产品”是指豪鹏科技有限公司生产的 100Ah 3.2V 储能用磷酸铁锂电池。
1.2	Customer 客户	Refers to the buyer in Highpower Technology Sales ontract. 指《豪鹏科技销售合同》中的买方。
1.3	Environment Temperature 环境温度	Surrounding environmental temperature where the cell is located. 电池所处的周围环境温度。
1.4	Cell Temperature 电芯温度	Temperature measure by the temperature sensor installed at the center of cell surface. 由安装在电池表面中心的温度传感器测量的电池的温度。
1.5	Rate 倍率	The ratio of charge-discharge current to the capacity of cells. For example, when the cell capacity is 100Ah and the charge-discharge current is 50A, the charge-charging rate is 0.5C; when the cell capacity fades to 80Ah and the charge-discharge current is 40A, the charge-discharge rate is 0.5C. 充放电电流与电池的容量的比值。例如：电池容量为 100Ah，充放电电流为 50A 时，则充放电倍率为 0.5C；当电池容量衰减为 80Ah，充放电电流为 40A 时，则充放电倍率为 0.5C。
1.6	State of Charge 荷电状态（SOC）	The ratio of the actual cell charge to the full charge, characterizing the state of charge of the cell. For example, if the capacity of 100Ah is regarded as 100% SOC, the capacity is 0Ah corresponding to 0% SOC at a current of 0.5C. 电池实际充电量与满充充电量的比值，表征电池的充电状态。如：若将容量为 100Ah 的状态视为 100%SOC，则容量为 0Ah 时，SOC 为 0%。
1.7	Cycle 循环	The cell is charged and discharged once time according to the prescribed charging and discharging standards for a cycle. 电池按规定的充放标准充放一次为一个循环。
1.8	State of Health 电池健康状态（SOH）	The ratio of nominal parameters to rated parameters after a period of cell use. The new factory cell is 100% SOH, and the completely scrapped cell is 0% SOH. 电池使用一段时间后性能参数与标称参数的比值。新出厂电池为 100%SOH，完全报废为 0%SOH。
1.9	Depth of Discharge 放电深度（DOD）	Percentage of cell discharge capacity to cell typical capacity。 电池放电量与电池实际容量的百分比。

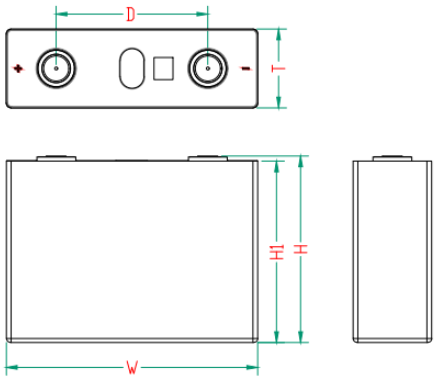
2. Scope 适用范围

The specification is applied to prismatic cell of LFP100 with aluminum shell supplied by Highpower Technology.

本规格书适用于豪鹏科技生产的 LFP100 方形铝壳锂离子电池。

3. Initial Dimension 初始尺寸

Initial Dimension 初始尺寸(mm):



Items 项目	Description 描述	Dimension 尺寸	Remark 备注
W	Width 宽度	160.2±0.5mm	With 10 layers of overlapping insulating film 含 10 层重叠绝缘膜区
T	Thickness 厚度	50.0±0.5mm	30%～40%SOC,300kgf
		51.5±1mm	30%~40%SOC, Force free 30%～40%SOC，自由状态
H	Height 高度	118.3±0.5mm	Total height 总高
H1	Height1 高度 1	115.5±0.5mm	Main body height 主体高
D	Center Pole-distance 极柱中心距	97.0±0.3mm	

The pole columns are both aluminum pole column structure (the image is for reference only), it is recommended to use laser welding method for connection.

极柱为双铝极柱结构（图示外形仅供参考），建议使用激光焊接方式进行连接。

4. Product Specification 产品规格

NO.	Items 项目	Specifications 规格	Remark 备注
4.1	Typical Capacity 额定容量	100Ah	0.5C，（25±2）℃，2.5-3.65V
4.2	Typical Energy 额定能量	320Wh	0.5C，（25±2）℃，2.5-3.65V
4.3	Charging Cut-off Voltage 充电截止电压	3.65V	
4.4	Discharging Cut-off Voltage 放电截止电压	2.5V	0℃<T≤60℃
		2.0V	-30℃<T≤0℃
4.5	Shipment State 出货状态	~30%SOC	
4.6	ACR 交流内阻	≤0.5mΩ	25℃, 1kHz,30%SOC
4.7	Cell Weight 电池重量	2000±150g	N.A.
4.8	Nominal Voltage 标称电压	3.2V	N.A.
4.9	Standard Charging Rate 标准充电倍率	0.5C	50A
4.10	Standard Discharging Rate 标准放电倍率	0.5C	50A
4.11	Residual Capacity Loss 自放电	Per month ≤3.0% ≤3.0%/月	25℃±2℃
4.12	Storage Temperature 储存温度	-30℃~45℃	Storage ambient humidity ≤ 80% RH, no condensation 存储环境湿度≤80%RH，无凝露
4.13	Operation Temperature 工作温度	-30℃~60℃	Discharge 放电
		0℃~60℃	Charge 充电
4.14	Cycle Life 循环寿命	25℃ 0.5C/0.5C, 4000 Cycles 25℃ 0.5C/0.5C, 4000 次	100% DOD，80% SOH, 300±20kgf预紧力
4.15	Cosmetic Appearance 外观	No stain, No rupture, No leakage.	N.A.

		无污渍，无破裂， 无漏液	
4.16	Standard Testing Condition 标准测试条件	Temperature 温度: 25±2℃ Humidity 湿度: ≤80%RH Atmospheric Pressure 大气压: 86-106kPa	

Note 注意:

(1) From 4.1 to 4.14, the testing condition is following 4.16 (standard testing condition).

从 4.1 至 4.14，测试条件均按照 4.16 (标准测试条件)。

(2) If the working condition is out of 4.16, the performance may have some deviation.

如果工作条件偏离 4.16，电池性能可能发生偏移。

5. Electrical Performance 电性能

Requirements for all measurements are at standard testing condition (4.16), be producted in 90 days , and standard charge/discharge method (6.1.4&6.3.4) for charge/discharge, except where noted.

电性能除特殊说明外，所有测试要求为：在标准测试条件 4.16，样品为下线 90 天以内电芯，充放电制度为标准充电 6.1.4 和标准放电 6.3.4。

No.	Items 项目	Test Methods and Condition 测试方法与条件	Criteria 标准
5.1	Capacity 容量	1）The cell is discharged at constant current 0.5C to 2.5V, rests for 30min; 2）The cell is charged by standard charge as No. 6.1.4; 3）The cell is discharged by standard charge as No. 6.3.4; 4）Repeat steps 2)~3) 3 times, taking the third capacity as C_0. 1）电池以 0.5C 恒流放电至 2.5V，静置 30min； 2）电池按照（6.1.4）进行标准充电； 3）电池按照（6.3.4）进行标准放电； 4）重复 2）~3）步骤 3 次，取第 3 次容量记为 C_0。	$C_0 \geq 100Ah$
5.2	Rated Capacity 倍率性能	1）The cell is charged by standard charge as No. 6.1.4; 2）The cell is discharged at constant current of 0.5C, 1C to 2.5V respectively, record the discharge capacity C_1; 3）C_1/ nominal capacity is the capacity retention rate.	0.5C: ≥100% 1C: ≥97%

		1）电池按照（6.1.4）进行标准充电； 2）电池分别以 0.5C、1C 恒流放电至 2.5V，记录放电容量 C_1； 3）C_1/标称容量即为容量保持率。	
5.3	Temperature Characteristics 温度特性	1）The cell is charged by standard charge as No. 6.1.4; 2）The cell stands at X℃ for 4h and then discharged at constant current of 0.5C to the cut-off voltages, rests for 30min, record the discharge capacity C_2; 3）C_2/ nominal capacity is the capacity retention rate. Note: the cut-off voltages of X=-20 and 55℃ correspond to 2.0V and 2.5V. 1）电池按照（6.1.4）进行标准充电； 2）电池在 X℃下储存 4h，然后以 0.5C 放电至截止电压，静置 30min，记录放电容量 C_2； 3）C_2/标称容量即为容量保持率。 备注：温度 X=-20 和 55℃对应的截止电压分别为 2.0V 和 2.5V。	55℃Capacity retention≥99% -20℃Capacity retention≥60% 55℃容量保持率:≥99% -20℃容量保持率:≥60%
5.4	Cycle Life 循环性能	1）The cell is charged by standard charge as No. 6.1.4; 2）The cell is discharged by standard discharge as No. 6.3.4; 3）Repeat above steps till continuously discharge capacity lower than 80% of the initial capacity of the cell. 1）电池按照（6.1.4）进行标准充电； 2）电池按照（6.3.4）进行标准放电； 3）重复以上步骤，直到电芯放电容量降低至初始容量的 80%。	Cycle Life:≥4000 循环寿命：≥4000
5.5	Storage Characteristics 储存特性	1）The cell is charged by standard charge as No. 6.1.4; 2）No outer loading circuit, the cell is stored 28 days; 3）The cell is discharged by standard discharge as No. 6.3.4, record the discharge capacity as residual capacity; 4）The cell is charged by standard charge as No. 6.1.4 and discharged by standard discharge as No. 6.3.4, record the discharge capacity as recovery capacity. 1）电池按照（6.1.4）进行标准充电； 2）无外接负载线路，电芯静置 28 天； 3）电池按照（6.3.4）进行标准放电，放电容	Residual Capacity≥ Nominal Capacity*95% 剩余容量≥标称容量*95% Recovery Capacity ≥Nominal Capacity*97% 恢复容量≥标称容量*97%

		量记为剩余容量； 4）电池按（6.1.4）进行标准充电，再按（6.3.4）进行标准放电，放电容量记为恢复容量。	

6. Charge and Discharge Parameters 充放电参数

The following data is the reference performance data of LFP100 cell. Actual use is subject to the use mode and conditions agreed by both parties.

以下数据为 LFP100 电池参考性能数据，实际使用以双方约定的使用方式和条件为准。

6.1 Charge Mode 充电模式

No.	Item 项目	Specification 规格	Condition 条件
6.1.1	Standard charging current 标准充电电流	0.5C	25℃±2℃
6.1.2	Maximum charging current 最大充电电流	1.0C	
6.1.3	Standard charging voltage 标准充电电压	Single cell ≤3.65 V 单体电池≤3.65 V	
6.1.4	Standard charging mode 标准充电模式	0.5C constant current charge to 3.65V, then continue charge with the voltage of 3.65V, until the current decreases to 0.05C, and rest for 30min. 对电池以 0.5C 的电流恒流充电至 3.65V，然后在 3.65V 下转恒压充电，直至电流降低到 0.05C，静置 30min。	
6.1.5	Standard charging temperature 标准充电温度	25℃±2℃	
6.1.6	Absolute charging temperature (cell temperature) 绝对充电温度（电池温度）	0℃~60℃	No matter what charge mode the cell is in, stop charging once the cell temperature exceeds absolute charge temperature range. 无论电池处于何种充电模式，电池温度一旦超过绝对充电温度范围，即停止充电。
6.1.7	Absolute charging voltage 绝对充电电压	3.65V	No matter what charge mode the cell is in, stop charging once the cell voltage exceeds the absolute charging voltage. 无论电池处于何种充电模式，电池电压一旦超过绝对充电电压，即停止充电。

6.2 Other charge Condition (C-Rate) 其他充电模式

Cell temperature 电芯温度/℃		＜0	10	20	25	45	55	＞60
Max continuous charge rate (C) 最大持续充电倍率	0~100% SOC	Not allowed 不允许	0.2C	0.5C	0.5C	0.5C	0.5C	Not allowed 不允许

6.3 Discharge Mode 放电模式

No.	Item 项目	Specification 规格	Condition 条件
6.3.1	Standard discharging current 标准放电电流	50A	25℃±2℃
6.3.2	Maximum discharging current 最大放电电流	100A	
6.3.3	Discharge cut-off voltage 放电截止电压	2.5V	T＞0℃
		2.0V	T≤0℃
6.3.4	Standard discharging mode 标准放电模式	The cell is discharged at 0.5C constant current until the voltage reaches 2.5V, and rests for 30min.. 电池以 0.5C 的电流恒流放电，放电至电压达到 2.5V 截止，静置 30min。	
6.3.5	Standard discharging temperature 标准放电温度	25℃±2℃	
6.3.6	Absolute discharging temperature (cell temperature) 绝对放电温度（电池温度）	-30℃~60℃	No matter what discharge mode the cell is in, stop discharging once the cell temperature exceeds absolute discharge temperature range. 无论电池处于何种放电模式，电池温度一旦超过绝对放电温度范围，即停止放电。
6.3.7	Absolute discharging voltage 绝对放电电压	2.0V	No matter what discharge mode the cell is in, stop discharging once the cell voltage is lower than the absolute discharge voltage. 无论电池处于何种放电模式，电池电压一旦低于绝对放电电压，即停止放电。

6.4 Other discharge Condition (C-Rate) 其他放电模式

Cell temperature 电芯温度/℃	＜-30	0	15	25	45	55	＞60

Max continuous discharge rate (C) 最大持续放电倍率	0~100% SOC	Not allowed 不允许	0.5C	1.0C	1.0C	1.0C	0.5C	Not allowed 不允许

7. Safety Performance 安全性能

No.	Item 项目	Test Methods and Condition 测试方法与条件	Standard 标准
7.1	Overcharge 过充电	1）Full charge cell according to No. 6.1.4; 2）Then discharge at constant current 1C for 1h or to 5.475V; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2）然后以 1C 恒流充电 1h 或电压达到 5.475V； 3）观察电池 1h。	No fire, No explosion 不起火，不爆炸
7.2	Over-discharge 过放电	1）Full charge cell according to No. 6.1.4; 2）Then discharge for 90min or discharge to 0V at constant current 1C; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2）然后以 1C 恒流放电 90min 或电压达到 0V； 3）观察电池 1h。	No fire, No explosion 不起火，不爆炸
7.3	Short-Circuit 短路	1）Full charge cell according to No. 6.1.4; 2）Connect the cathode and anode terminals with wire directly for 10min. The resistance of external circuit should be lower than 5mΩ; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2）将电芯正、负极经外部短路 10min，外部线路电阻应小于 5mΩ； 3）观察电池 1h。	No fire, No explosion 不起火，不爆炸
7.4	Extrusion 挤压	1）Full charge cell according to No. 6.1.4; 2）Using a half cylinder with a radius of 75mm, perpendicular to the main body of the cell, squeeze the cell at a speed of 5±1mm/s until the deformation reaches 30% or the extrusion force reaches 13±0.78kN; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2）用半径为 75mm 的半圆柱，垂直于电池主体，以 5±1mm/s 的速度挤压电池，直到形变量达到 30%或挤压力达到 13±0.78kN；	No fire, No explosion 不起火，不爆炸

		3）观察电池 1h。	
7.5	Drop 跌落	1）Full charge cell according to No. 6.1.4; 2）Drop the cell (free drop) from 1.5 meters onto a hard flat surface for once, with terminal-side down; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2)电池的正极或负极端朝下从 1.5m 高度处自由跌落到水泥地面 1 次； 3）观察电池 1h。	No fire, No explosion 不起火，不爆炸
7.6	Thermal Runaway 热失控	1）Full charge cell according to No. 6.1.4; 2）Continue charging at constant current 1C for 12 minutes, stop overcharging, start the heating device immediately, and continue heating the test object with the maximum power, stop when thermal runaway occurs or the temperature of the monitoring point reaches 300 ℃. Note：Requirements for heating devices，refer to GB/T 36276-2018 Lithium ion cells for electric energy storage. 1)电池按照（6.1.4）进行满充； 2)用 1C 恒流继续充电 12min，停止过充，立刻启动加热装置，并以最大功率对测试对象进行持续加热，当发生热失控或者监测点温度达到 300℃停止。 备注：加热装置相关要求参考 GB/T 36276-2018《电力储能用锂离子电池》。	No fire, No explosion 不起火，不爆炸
7.7	Low Pressure 低气压	1）Full charge cell according to No. 6.1.4; 2）Store the cell in a low pressure tank for 6h in 11.6kPa; 3）Observe the cell for 1h. 1）电池按照（6.1.4）进行满充； 2）将电池放入低气压箱中，气压保持为 11.6kPa，静置 6h； 3）观察 1h。	No fire, No explosion, No leakage 不起火，不爆炸，不漏液

Remark: Above safety characteristics must be tested with protective equipment. Refer to GB/T 36276-2018 Lithium ion cells for electric energy storage. If there is no special instructions, the safety performance test environment is 25℃±5℃, RH≤80%, 86~106kPa.

注意：以上安全性能测试应在有保护措施下进行。参考 GB/T 36276-2018《电力储能用锂离子电池》。如无特殊说明，安全性能测试环境为 25℃±5℃，RH≤80%，86~106kPa。

8. Safety Instructions 安全使用说明

The cell contains flammable materials such as organic solvents. Mishandling the cell may cause fire, smoke, or an explosion and the cell's functionality will be seriously damaged. Protection circuitry must be designed into the application device to protect the cell. Additionally, Highpower Technology highly recommends adding these instructions to the owner's manual. Please read and check the following prohibited actions.

电池含有有机溶剂等易燃材料。对电池不正确的操作可能导致起火、冒烟、爆炸，或电池功能的严重破坏。应用装置中必须设计保护电路保护电池。豪鹏科技特别建议如下使用说明给电池使用者，请仔细阅读与核实如下注意事项。

8.1 Protection Function 保护功能

The cell shall be with the overcharge protection, over-discharge protection, and over-current protection during using. Protective circuit must have protective functions as follows:

电池必须在有过充、过放、过流保护的条件下使用，保护电路必须具有以下保护功能：

(1) Over-charge protection 过充电保护

Over-charge protection stops charging if any cell of the cell pack reaches 3.8V

过充保护电路防止电池中任何电池电压超过 3.8V

(2) Over-discharge protection 过放电保护

The Over-discharge protection monitors the voltage of any cell in the pack and works to avoid a drop in the cell voltage to 2.0V or less.

过放保护电路防止电池中任何电池电压低于 2.0V。

(3) Over-current protection 过流保护

The cell shall be discharged at less than the maximum discharge current specified in the Specification Approval Sheet. A high discharge current may reduce the discharge capacity observably or cause overheating.

电池放电电流不可高于规格书中指定的最大电流，高于规格书的大电流放电将导致电池容量降低或电池过热。

8.2 Danger 危险

- Do not immerse the cell in liquid such as water, beverages, or other fluids.

  禁止将电池浸入如水、饮料或其它液体中。

- Do not use or place the cell near fire, heater or high temperature environment.
  禁止在靠近火、加热器或高温环境中使用或搁置电池。
- Do not attach or insert cell with polarity reversed.
  禁止将电池极性反转连接。
- Do not incineration the cell in fire or heat it.
  禁止焚烧电池或对其进行加热。
- Do not short-circuit the cell by directly connecting the positive and negative terminal with metal object such as wire.
  禁止使用导线等金属物体直接连接电池正负极短路电池。
- Do not excessive impact to the cell such as striking, throwing, trampling, etc.
  禁止撞击、抛掷、践踏等对电池的过度机械冲击。
- Do not penetrate the cell with a nail or other sharp object.
  禁止使用钉子或其它尖锐物体刺穿电池。
- Do not disassemble the cell.
  禁止拆解电池。

8.3 Warning 警告

- Do not place the cell in or near a microwave or other cooking appliances. If subjected to heat or strong electromagnetic radiation, the cell may leak, generate heat, smoke, catch fire, or explode.
  禁止将电池放在靠近微波设备或其它烹饪装置附近，如果电池被加热或受到强电磁辐射，可能发生漏液、发热、冒烟、着火等。
- Do not mix with other batteries. The cell should not be used with other batteries having a different capacity, chemistry, or manufacturer. Doing so could cause the cell to generate heat, smoke, catch fire, or explode.
  禁止与其它电池混用，因与其它电池有不同的容量、化学成分、制造工艺等，相互混用可能会发热、冒烟、着火等。
- Immediately remove it from the device or charger, and stop using it, if there are noticeable abnormalities, such as smell, heat, discoloration, or deformity. The cell may be defective and could generate heat, smoke, catch fire, or explode with continued use.

如果电池在使用或贮存中有明显异常，如发出异味、发热、变色、变形，或者是在充电过程中出现任何异常现象，立即将电池从使用装置或充电器中移开，并停止使用。电池可能有缺陷，继续使用可能导致发热、冒烟、着火等。

- Stop charging if the charge process cannot be finished within the specified time.
  如果充电不能在规定的时间内完成，停止充电。
- Do not use a leaking cell near open flame.
  禁止将漏液电池靠近火源。
- Do not touch a leaking cell. If liquid leaking from the cell gets into your eyes, immediately flush your eyes with clean water and seek medical attention. If left untreated, it will cause significant eye damage.
  禁止触摸漏液电池。如果电解液不小心进入眼睛，请不要揉擦，应马上用清水冲洗眼睛，并立即送医院治疗，否则会伤害眼睛。

8.4 Caution 注意

- Do not use or leave the cell at very high temperature. Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
  禁止在高温下使用或搁置电池，否则可能会引起电池过热、起火或功能失效，或者导致电池寿命减短或损坏电池。
- Only charge the cell between 0℃ and 60℃. Charging outside of this temperature range may cause the cell to leak, generate heat, or result in serious damage. It may also cause the cell's performance and life to deteriorate.
  电池只能在 0℃~60℃ 温度范围充电。超出此温度范围可能导致电池漏液、发热，或导致电池严重的损坏。它也可能导致电池的性能和寿命的恶化。
- Please contact the supplier if the cell gives off an unusual odor, generates heat, or shows signs of rust prior to its initial use.
  在首次使用前，如果电池发出明显的异味、发热或锈蚀迹象，请联系电池供应商。

9. Handling of Cells 电池操作注意事项

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

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 Highpower Technology. 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 be operated. Violation of this requirement will exempt Highpower Technology, from its responsibility for product quality assurance in accordance with the product sales agreement and this specification.

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和豪鹏科技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，将免除豪鹏科技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。

9.2 Transportation 运输

The cells should be packaged in boxes at 30%~50% SOC for transportation. During transportation, they should be protected from severe vibration, impact or extrusion, and protected from sun and rain. They are suitable for transportation by vehicles, trains, ships, and airplanes.

电池应在 30%~50%SOC 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，适用于汽车、火车、轮船、飞机等交通工具运输。

9.3 Long-term Storage 长期存储

Cells should be stored (more than 1 month) in a clean, low humidity room (RH≤85%) with an ambient temperature of 0℃ to 35℃, avoid contact with corrosive substances, and keep away from fire and heat sources, and the cell needs to be charged and discharged every 6 months.

电池应贮存（超过 1 个月）在环境温度为 0℃～35℃的清洁、低湿度（RH≤85%）的室内，应避免与腐蚀性物质接触，应远离火源及热源，且每 6 个月对电池进行一次充放电。

9.4 Parameters Recomendation for Design 模组设计参数建议

9.4.1 Cell Preload force 电池预紧力：

Test Condition 测试条件：

-Compression area 压缩面积：160.2mm×115.5mm（L×h）

Compression speed 压缩速度：≤0.05mm/sec

Cell SOC 电池 SOC: 20%SOC~50%SOC

Compression direction 压缩方向：In the thickness direction

When assembling the module, to prevent misalignment, movement, and welding point deviation between batteries, a preload must be applied to the cells. Different ranges of preload will have different effects on the batteries. Referring to the table below, the preload that the battery can withstand should not exceed 7 kN, otherwise the battery may be damaged.

在进行模组组装时，为防止电池之间出现错位，移动，焊接点位偏移，需对电芯施加预紧力，预紧力施加不同范围会对电电池产生不同影响，参照下表，电池承受的预紧力不能超过7kN,否则可能电池会受到损害。

Observation 现象	Compression Force 压缩力
Recommended preload force	1.5~3kN
Normal bearing maximum preload force 正常承受最大预紧力	5kN
Internal defects are generated 内部产生缺陷	≥7kN
Leakage 漏液	≥10kN

9.4.2 Cell expansion force 电池膨胀力

During the battery cycle, an expansion force is generated outward. When designing the module, there must be sufficient binding force in the thickness direction of the battery. To prevent the binding structure in the module from failing, it is necessary to refer to the expansion force parameters of the cell at the end of the cycle (see the table below).

电池循环过程中会对外产生膨胀力，在模组设计时需对电池厚度方向有足够的束缚力，为防止模组中束缚结构失效，需参考电芯循环末期的膨胀力参数（见下表）

Expasion Force 膨胀力	100%SOH.	≤3kN
	80%SOH	≤15kN
	60%SOH	≤25kN

10. Others 其它事项

(1) The customer is requested to contact Highpower Technology in advance, if the customer needs other applications or operating conditions out of those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

客户若需要将电池用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电池，应事先联系豪鹏科技，因为需要进行特定的实验测试以验证电池在该使用条件下的性能及安全性。

(2) Highpower Technology will take no responsibility for any accident when the cell is used under other conditions than those described in this document and not approved in writing.

对于未经书面认可的、超出文件规定以外的条件下使用电池而造成的任何事故，豪鹏科技恕不负责。

(3) Any matters that this specification does not cover should be conferred between the customer and Highpower Technology.

任何本说明书中未提及的事项，须经双方协商确定。

(4) Products comply with 《Hazardous substances control standards of Highpower Green Product》.

产品符合《豪鹏集团绿色产品有害物质管制标准》。

(5) Highpower Technology reserves the right to modify the product specification, Customers need to confirm the latest product specifications with our company in advance when purchasing Highpower Technology products.

豪鹏科技保留对产品规格书修改权利，客户在购买豪鹏产品时需提前与我司确认最新产品规格书。

(6) In the event of discrepancy between English and Chinese, the Chinese shall prevail.

当英文与中文意思不符合时，以中文版本为准。

11. Contact Information 联系方式

Address: Guangdong Highpower New Energy Technology Co., Ltd, No.73 Song Bai Ling Road, Qi Bu District, China-South Korea Industrial Park, Zhongkai High-tech Zone

Tel: 86-0752-5807996

Fax: 86-0752-5807900

Website: http://www.highpowertech.com

Email: ESS@HIGHPOWERTECH.COM

联系地址：惠州仲恺高新区中韩产业园起步区松柏岭大道 73 号，广东省豪鹏新能源科技有限公司

联系电话：86-0752-5807996

传真：86-0752-5807900

网址：http://www.highpowertech.com

邮件：ESS@HIGHPOWERTECH.COM