

产品规格书

Product Specification

产品型号/ Product No.: SLA45173184-155Ah

制定/Producer	审核/Checker	批准/Approver

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1.一般信息/ General information

1.1 适用范围/ Scope

本规格书定义了深圳市立泰能源科技有限公司（以下简称立泰）提供给客户的可充放磷酸铁锂电芯的性能及参数。

This specification defines the performance and diameter of the rechargeable lithium iron phosphate cell, produced by SHENZHEN LITHTECH ENERGY CO.,LTD.

1.2 应用范围/ Application

电动汽车/储能/电动船舶 Electric vehicle/ Energy storage/ Electric ship

1.3 适用标准/ Applicable standard

- 1) 《钢制内河船舶建造规范》（2016）及其修改通报第 3 篇第 1 章和第 5 章；
- 2) 《钢制海船入级规范》（2018）及其修改通报第 4 篇第 1 章和第 3 章；
- 3) 《太阳能光伏系统及磷酸铁锂电芯系统检验指南》 GD10-2014 第 3 章；
- 4) GB/T 31484-2015 《电动汽车用动力蓄电池循环寿命要求及实验方法》；
- 5) GB/T 31485-2015 《电动汽车用动力蓄电池安全要求及试验方法》；
- 6) GB/T 31486-2015 《电动汽车用动力蓄电池电性能要求及试验方法》；
- 1) 《Code for the construction of steel inland river ships》（2016）and its amendment notice part 3 chapters 1 and chapters 5;
- 2) 《Regulations on classification of steel seagoing ships》(2018) and notice of its amendment, part 4, chapter 1 and chapter 3;
- 3) 《Solar photovoltaic system and lithium iron phosphate cell system inspection guide》GD10-2014 chapter 3;
- 4) GB/T 31484-2015 《Cycle life requirements and test methods for traction battery of electric vehicles》；
- 5) GB/T 31485-2015 《Safety requirements and test methods for traction battery of electric vehicles》；
- 6) GB/T 31486-2015 《Electrical performance requirements and test methods for traction battery of electric vehicles》；

1.4 产品分类/ Product type

可充放磷酸铁锂电芯/ Rechargeable lithium iron phosphate cell

1.5 电化学体系/Electrochemistry system

正极（Cathode）：磷酸铁锂（LiFePO4） 负极（Anode）：石墨（Graphite）

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2.型号含义/ Model meaning

X	X	X	XXXXXXXX	-	XXXX
公司简写 (Company shorthand)	正极材料 (Anode material)	壳体材质 (Shell material)	壳体尺寸 (Case dimension)	占位标识 (Placeholder logo)	容量 (三位至五位数 字) (Capacity)
S: 星盈	L:LFP	A:铝壳 (Aluminum case)	W×L×H	-	-
	N:NCM	P:塑料 (Plastic)			
	M:锰酸锂 (LiMn2O4)	S:铝塑膜 (Aluminum-plastic film)			
	C:钴酸锂 (LiCoO2)	F:复合硬壳 (Composite shell)			
	H:混合 (Mixture)	-			

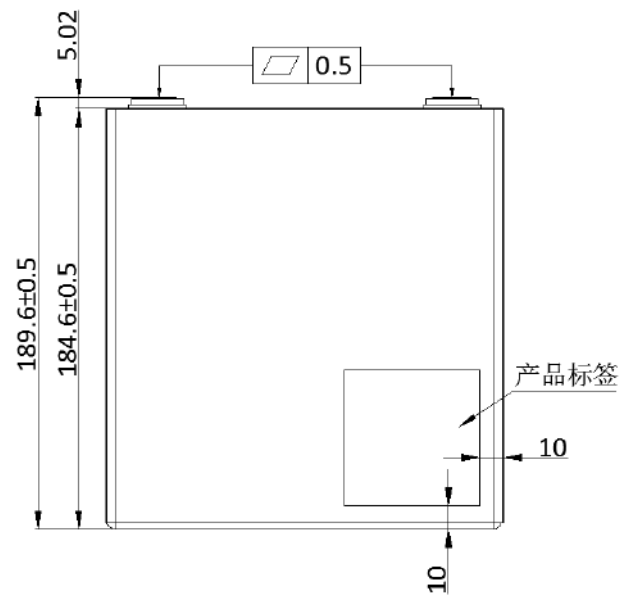
3.产品标签/ Product label

项目 (Item)	内容 (Content)
产品名称 Product Name	可充电磷酸铁锂电芯 Rechargeable lithium iron phosphate cell
生产日期 Date of manufacture	××××/××/××
制造商公司全称 name of the manufacturer	深圳市立泰能源科技有限公司 ShenZhen Lithtech Energy Co., Ltd.
额定容量 (Ah) Rated Capacity	155
能量 (Wh) Watt-hour	496
标称电压 (V) Nominal Voltage	3.2
型号 Product No.	SLA45173184-155Ah

3.1 标签尺寸及材质/Label dimension & material

项目 (Item)	内容 (Content)
尺寸 (Dimension)	62mm*62mm
材质 (Material)	聚氯乙烯 (Polyvinyl Chloride)

3.2 标签位置/Location



4.产品规格/Specification

4.1 概要 (Summary)

章节 (Section No.)	参数 (Parameter)	产品规格 (Specification)	条件 (Condition)
4.1.1	额定容量 (Rated capacity)	155Ah	1C 放电 (Discharge current:1C)
4.1.2	最小容量 (Minimum capacity)	155Ah	1C 放电 (Discharge current:1C)
4.1.3	标称电压 (Nominal voltage)	3.2V	—
4.1.4	工作电压 (Operating voltage)	2.5V-3.65V 2.0V-3.65V	温度 T>0℃ 温度 T≤0℃.
4.1.5	电芯内阻 (AC IMP) (1KHz)	≤0.35 (mΩ)	新电芯状态 (Fresh cell)
4.1.6	电芯平均内阻 (Average AC IMP) (1KHz)	0.3 (mΩ)	新电芯状态 (Fresh cell)
4.1.7	自放电率/月 (Self-discharge rate/month)	≤4%	25℃±5℃
4.1.8	出货容量 (Delivery SOC)	30%SOC	N.A.

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4.1.9	工作温度 (充电) (Charge temperature)	0℃-55℃	参考第 4.2 节 (Refer to section 4.2)
4.1.10	工作温度 (放电) (Discharge temperature)	-30℃-55℃	参考第 4.3 节 (Refer to section 4.3)
4.1.11	存储温度 (Storage temperature)	-10℃~45℃	
4.1.12	电芯重量 (Cell weight)	3.1 kg±0.05kg	N.A.
4.1.13	电芯尺寸 (Dimension)	W*L*H=(44.7±0.5)*(174.2±0.5)*(184.6±0.5)mm ³	参考本规格书第 6.2 条 (Refer to section 6.2)
4.1.14	循环寿命 (Cycle life)	循环次数达到 4000 次时放电容量不低于初始容量的 80%. (After 4000cycles , the discharge capacity≥80%C ₀)	参考本规格书第 5.1.1.8 条 (Refer to section 5.1.1.8)

* C₀: The discharge capacity of the first cycle

4.2 充电模式/参数(Charging mode & Parameters)

章节 (Section No.)	参数 (Parameter)	产品规格 (Specification)	条件 (Condition)
4.2.1	标准充电电流 (Nominal charge current)	0.5C	25℃±5℃
4.2.2	最大持续充电电流 (Maximum continuous charge current)	1C	25℃±5℃
4.2.3	充电截止电压 (Charge cut-off voltage)	3.65V	25℃±5℃
4.2.4	标准充电模式 (Standard charging method)	0.5C 恒流持续充电至单体电芯的充电截止电压, 然后在 3.65V 下恒压持续充电至电流降至 0.05C (CC-CV 0.5C to limited charge voltage at 0.05C)	
4.2.5	标准充电温度 (Nominal charge temp)	25±5℃	电芯温度 (Cell temp)
4.2.6	绝对充电温度 (Temp range of charging)	0℃~55℃	参考第 4.2.8 (Refer to section 4.2.8)

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4.2.8 其他充电条件（模式）（Other Charging Modes）

电芯温度 (Cell temp)	标准充电 (Nominal charge)	快速充电 (Fast charge)	脉冲充电（10S） (Pulse charge)
<0℃	不允许充电 (No charging)	不允许充电 (No charging)	不允许充电 (No charging)
0℃~10℃	1/3C	0.5C	1C
10℃~20℃	0.5C	1C	2C
20℃~30℃	0.5C	1C	400A
30℃~40℃	0.5C	1C	2C
40℃~55℃	1/3C	0.5C	1C
>55℃	不允许充电 (No charging)	不允许充电 (No charging)	不允许充电 (No charging)

4.3 放电模式/参数(Discharging mode & Parameters)

章节 (Section No.)	参数 (Parameter)	产品规格 (Specification)	条件 (Condition)
4.3.1	标准放电电流 (Nominal discharge current)	1C	25℃±5℃
4.3.2	最大持续放电电流 (Maximum continuous discharge current)	2C	25℃±5℃
4.3.3	最大脉冲放电电流 (Maximum pulse charge current)	400A	电芯温度低于 55℃，且 SOC >40%时最长放电时间为 60 秒，SOC<40%时最长放电时间为 10 秒 (SOC>40%: 60s; SOC<40%: 10s)
4.3.4	放电截止电压 (Cut-off voltage)	2.5V (Unit Cell)	25℃±5℃
4.3.5	标准放电温度 (Nominal discharge temp)	25±5℃	电芯温度 (Cell temp)
4.3.6	绝对放电温度 (Temp range of discharge temp)	-30℃-55℃	若电芯温度超过绝对放电温度，则停止放电 (The discharging must be stopped immediately when the cell temperature is beyond -30℃ to 55℃)

4.3.7 其他放电模式(Other discharge modes)

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电芯温度 (Cell temp)	标准持续放电 (Nominal continuous discharge)	倍率持续放电 (Continuous discharge with varied C-Rate)	脉冲放电 (10S) (Pulse discharge)(10s)
<-40℃	禁止 (No discharging)	禁止 (No discharging)	禁止 (No discharging)
-40℃~-30℃	0.1C	0.5C	0.5C
-30℃~0℃	1C	1C	2C
0℃~55℃	1C	2C	400A
>55℃	禁止 (No discharging)	禁止 (No discharging)	禁止 (No discharging)

4.4 低温容量 (Low temperature discharge capacity)

章节 (Section No.)	参数 (Parameter)	产品规格 (Specification)	条件 (Condition)
4.4.1	25℃的容量 (Discharge capacity at 25℃)	≥100%	25℃标准充\放电 (电芯正反面的温度) Standard charging\discharging at 25℃ (The temperature of the both sides of the cell)
4.4.2	0℃的容量 (Discharge capacity at 0℃)	≥90%	25℃标准充电, 0℃标准放电 (电芯正反面的温度) Standard charging\discharging at 25℃\0℃ (The temperature of the both sides of the cell)
4.4.3	-10℃的容量 (Discharge capacity at -10℃)	≥85%	25℃标准充电, -10℃标准放电 (电芯正反面的温度) Standard charging\discharging at 25℃\ -10℃ (The temperature of the both sides of the cell)
4.4.4	-20℃的容量 (Discharge capacity at -20℃)	≥70%	25℃标准充电, -20℃标准放电 (电芯正反面的温度) Standard charging\discharging at 25℃\ -20℃ (The temperature of the both sides of the cell)

4.5 温度上升 (温升) (Temp rise of cells)

每个电芯温升的测量位置为电芯宽面中部, 电芯应在环境温度较为稳定且空间足够大的房间里接受自然对流冷却。每个电芯温度测量应选取经过校正的可以记录时间数据的温度感应器。在这种条件下, 温升是指放电后的温度减去放电前的温度。

The temperature rise of each cell is measured in the middle of the wide surface of the cell,

and the cell should be cooled by natural convection in a room where the ambient temperature is relatively stable and the space is large enough. Temperature sensors for each cell should be calibrated and can record time. Under such conditions, the temperature rise refers to the difference between the temperature after discharge and the temperature before discharge.

章节 (Section No.)	参数 (Parameter)	产品规格 (Specification)	条件 (Condition)
4.5.1	持续放电温升 (Continuous discharging temp rise)	$\leq 10^{\circ}\text{C}$	电芯以标准放电电流放电结束 (The fully charged cell discharge with a constant current of 1C to 2.5V)
4.5.2	脉冲放电温升 (Pulse discharging temp rise)	$\leq 5^{\circ}\text{C}$	在 $\geq 10\%$ SOC 状态下, 电芯以最大脉冲放电电流放电 10 秒 (SOC $\geq 10\%$, 400A discharge 10s)

4.6 存储及运输要求(Storage and shipment requirement)

项目 Item		标准 Criteria
存储温度 (Storage temperature)	短期少于 1 个月 (Less than 1 month)	-10 $^{\circ}\text{C}$ -45 $^{\circ}\text{C}$
	中期少于 3 个月 (Less than 3 months)	-10 $^{\circ}\text{C}$ -35 $^{\circ}\text{C}$
	长期超过 3 个月 (More than 3 months)	0 $^{\circ}\text{C}$ -30 $^{\circ}\text{C}$
相对湿度 (Relative humidity)		$\leq 75\%$ RH
荷电状态 (State of charge)		30%荷电状态 (30% SOC)

单体电芯长期不使用时, 每隔 3 个月对电芯进行一次充放电, 并将 SOC 调整至 30%。
When the cell is not used for a long time, the cell should be charged and discharged every three months, and adjust the SOC to 30%.

5.性能及适应标准 (Performance & Applicable standard)

5.1 电性能 (Electrochemical performance)

5.1.1 电性能测试项目、方法及要求 (Test items & Test method & Criteria)

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章节 (Section No.)	项目 (Item)	测试方法 Test methods	标准 Criteria
5.1.1.1	室温放电容量 (Discharge Capacity at RT)	室温条件下, 标准充电后的电芯, 1C 放电至下限截止电压, 重复 5 次 (或参照 IEC62660-1: 2010); The fully charged cell discharge to cut-off voltage with constant current 1C; (Refer to IEC62660-1: 2010)	$100\%C_R \leq C_0 \leq 110\%C_R$
5.1.1.2	低温放电容量 (Discharge capacity at -20℃)	室温条件下, 标准充电后的电芯, 在-20℃±2℃下搁置 12h, 以 1C 放电至下限截止电压 (或参照 IEC62660-1: 2010); After resting 12h at -20℃±2℃, the fully charged cell discharge to cut-off voltage with constant current 1C (Refer to IEC62660-1: 2010);	$\geq 70\%C_0$
5.1.1.3	高温放电容量 (Discharge capacity at 55℃)	室温条件下, 标准充电后的电芯, 在 55℃±2℃下搁置 5h, 以 1C 放电至下限截止电压 (或参照 IEC62660-1: 2010); After resting 12h at 55℃±2℃, the fully charged cell discharge to cut-off voltage with constant current 1C (Refer to IEC62660-1: 2010);	$\geq 90\%C_0$
5.1.1.4	室温倍率放电容量 (Discharge C-Rate at RT)	室温条件下, 标准充电后的电芯以 2C 放电至下限截止电压 (或参照 IEC62660-1: 2010); The fully charged cell discharge to cut-off voltage with constant current 3C (Refer to IEC62660-1: 2010);	$\geq 90\%C_0$
5.1.1.5	室温倍率充电性能 (Charge C-Rate at RT)	室温条件下, 以 1C 放电至下限截止电压, 静置 1h; 2C 恒流恒压充电至上限截止电压, 截止电流 0.05C, 静置 0.5h; 以 1C 电流放电至下限截止电压 (或参照 IEC62660-1: 2010); The fully discharged cell 2C CC-CV to limited charge voltage at 0.05C; Rest 0.5h; 1C discharge to cut-off voltage (Refer to IEC62660-1: 2010);	$\geq 80\%C_0$
5.1.1.6	室温荷电保持与容量恢复能力	室温条件下, 标准充电后的电芯, 在室温下储存 28d, 然后以 1C 放	保持容量 (Cap. retention) $\geq$

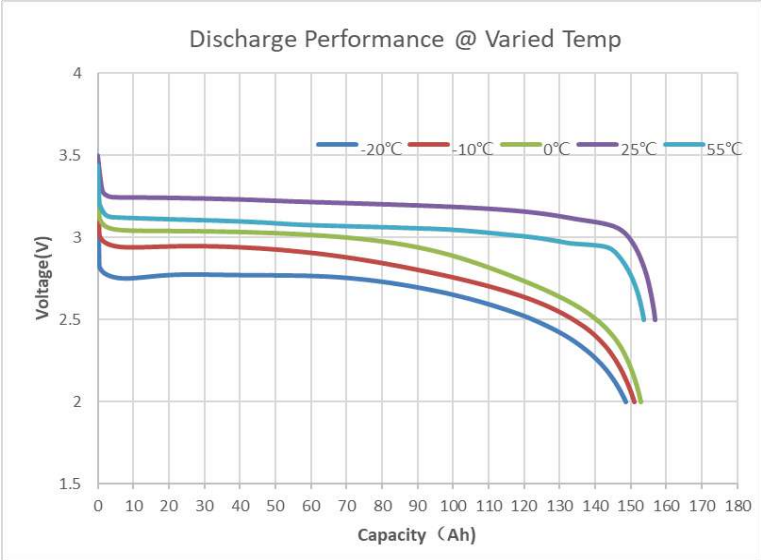
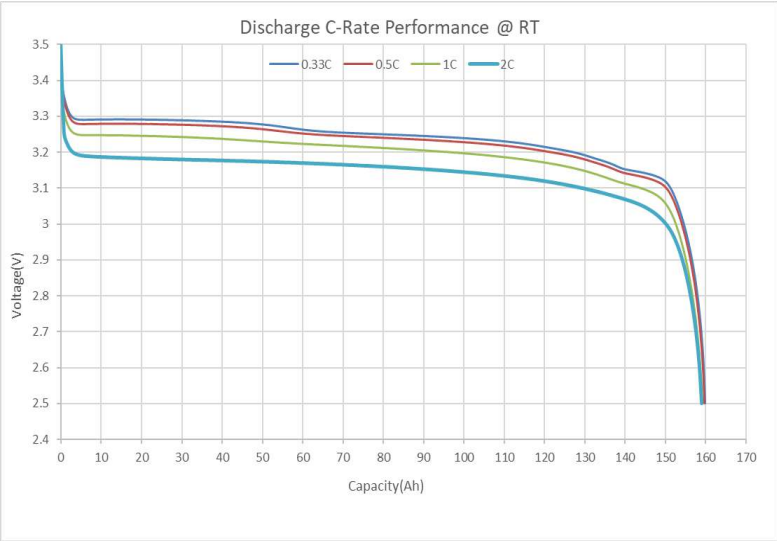
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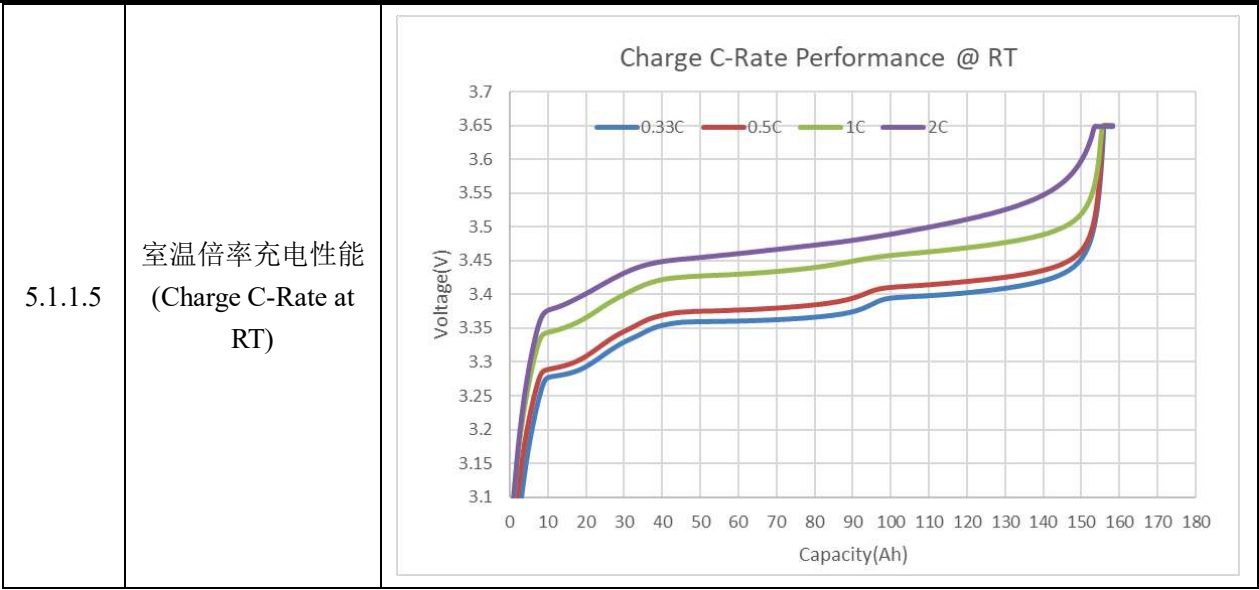
	(Capacity retention & recovery at RT)	电至下限截止电压, 充满电后 1C 放电至下限截止电压 (或参照 IEC62660-1: 2010); After resting 28d at 25℃ ± 2℃, the fully charged cell discharge to cut-off voltage with constant current 1C, rest 30min; then 0.5C CC-CV to limited charge voltage at 0.05C; rest 30min; 1C discharge to cut-off voltage (Refer to IEC62660-1: 2010);	85% C_0 ; 恢复容量 (Cap. recovery) $\geq 90\%$ C_0 ;
5.1.1.7	高温荷电保持与容量恢复能力 (Capacity retention & recovery at 55℃)	室温条件下, 标准充电后的电芯, 在 55℃ ± 2℃ 下储存 7d, 室温恢复 5 小时后以 1C 放电至下限截止电压, 充满电后, 以 1C 放电至下限截止电压 (或参照 IEC62660-1: 2010); After resting 7d at 55℃ ± 2℃, the fully charged cell rest 5h at RT, discharge to cut-off voltage with constant current 1C, rest 30min; then 0.5C CC-CV to limited charge voltage at 0.05C; rest 30min; 1C discharge to cut-off voltage (Refer to IEC62660-1: 2010);	保持容量 (Cap. retention) $\geq 85\%C_0$; 恢复容量 (Cap. recovery) $\geq 90\%$ C_0 ;
5.1.1.8	循环寿命 (Cycle life at 25℃ ± 5℃)	a. 室温下电芯 1C 放电至下限截止电压 b. 搁置 30min c. 0.5C 恒流恒压充电至上限截止电压, 终止电流降至 0.05C 停止充电 d. 搁置 30min e. 1C 放电至下限截止电压 f. 循环 b ~ e 直到放电容量达到 80% C_0 (或参照 IEC62660-1: 2010); 1C discharge to cut-off voltage, rest 0.5h, CC-CV 0.5C charge to limited charge voltage at 0.05C, rest 0.5h, Repeat above steps till continuously discharging capacity less than 80% C_0 (Refer to IEC62660-1: 2010);	循环次数达到 4000 次时放电容量不低于初始容量的 80%. (After 4000cycles, the discharge capacity $\geq 80\%C_0$)
5.1.1.9	储存 (Storage)	将电芯调节至 50%SOC, 45℃ ± 2℃ 搁置 28 天, 室温恢复 5 小时, 标准充电, 搁置 30 分钟后 1C 放电至截	恢复容量 (Cap.

		止电压（或参照 IEC62660-1：2010）； Adjust SOC to 50%,rest 28 days at 45℃±2℃， after resting 5 hours, adjust SOC to 100% with standard charge method, rest 30min; 1C discharge to cut-off voltage（Refer to IEC62660-1： 2010）;	recovery）≥90% C ₀ ;
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* C₀: The discharge capacity of the first cycle; C_R: Rated Capacity;

5.1.2 充放电曲线（Charge & Discharge curve）

章节 (Section No.)	项目 (Item)	曲线 (Curve)
5.1.2.1	不同温度放电 (Discharge curve at varied temperature)	
5.1.1.4	室温倍率放电容量 (Discharge C-Rate at RT)	



5.2 安全性能 (Safety performance)

5.2.1 电安全性能 (Electrical safety tests)

章节 (Section No.)	项目 (Item)	测试方法 (Test method)	标准 (Criteria)
5.2.1.1	过放电 (Over discharge)	标准充电后的电芯，以 1C 电流放电 90min，结束后观察 1h（或参照 IEC62660-2: 2010）; The fully charged cell 1C discharge 90min; Observe the phenomenon for 1h（Refer to IEC62660-2: 2010）;	不起火，不爆炸，不漏液; No fire, No explosion; No electrolyte leakage;
5.2.1.2	过充电 (Overcharge)	标准充电后的电芯，以 1C 电流充电至 1.5 倍终止电压或充电时间达到 1h，结束后观察 1h（或参照 IEC62660-2: 2010）; The fully charged cell charge with a constant current of 1C, Stop charging when the voltage is 1.5 times of the limited voltage, or charge for 1h; Charge with a constant current of 1C, Stop charging when the voltage is 1.5 times of the limited voltage or charge for 1h; Observe the phenomenon for 1h（Refer to IEC62660-1: 2010）;	不起火，不爆炸; No fire, No explosion;
5.2.1.3	外部短路 (Short circuits)	标准充电后的电芯，经外部短路 10min，外部线路电阻 < 5mΩ，结束后	不起火，不爆炸; No fire, No explosion;

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		观察 1h（或参照 IEC62660-2: 2010）； The fully charged cells are short-circuited by connecting the positive and negative poles with a resistance load less than 5mΩ for 10 minutes（Refer to IEC62660-2: 2010）； ；	
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5.2.2 机械安全性能（Mechanical tests）

章节 (Section No.)	项目 Item	测试方法 (Test method)	标准 (Criteria)																
5.2.2.1	振动 (Vibration)	调整 SOC 为 100%，依据 IEC 60068-2-64 对电芯进行随机振动测试，持续 8h。振动加速度 27.8m/s²，功率谱密度与频率之间的关系见 5.2.2.1 表。最大振动频率为 2000Hz（或参照 GD22-2015）。 a) Adjust the SOC of cell to 100 %. b) Perform the test referring to IEC 60068-2-64 random vibration. Use test duration of 8 h for each plane of the test cell. c) The r.m.s. acceleration value shall be 27.8 m/s². The power spectrum density (PSD) vs frequency is shown in the table below. The maximum frequency shall be 2000Hz（Refer to GD22-2015）. <table><thead><tr><th>Frequency Hz</th><th>PSD (m/s²)²/Hz</th></tr></thead><tbody><tr><td>10</td><td>20</td></tr><tr><td>55</td><td>6,5</td></tr><tr><td>180</td><td>0,25</td></tr><tr><td>300</td><td>0,25</td></tr><tr><td>360</td><td>0,14</td></tr><tr><td>1 000</td><td>0,14</td></tr><tr><td>2 000</td><td>0,14</td></tr></tbody></table> Table 5.2.2.1- Values for PSD and frequency	Frequency Hz	PSD (m/s ²) ² /Hz	10	20	55	6,5	180	0,25	300	0,25	360	0,14	1 000	0,14	2 000	0,14	不起火，不爆炸，不漏液： No fire, No explosion; No electrolyte leakage;
Frequency Hz	PSD (m/s ²) ² /Hz																		
10	20																		
55	6,5																		
180	0,25																		
300	0,25																		
360	0,14																		
1 000	0,14																		
2 000	0,14																		
5.2.2.2	机械冲击 (Mechanical shock)	调整 SOC 为 100%，按照表 5.2.2.2 执行测试。在冲击试验中，加速度的方向应与车辆受到的冲击加速度方向一致。如果冲击造成的影响不明确在某个特定方向，那么电池的六个方向均应做测试（或参照 IEC62660-2: 2010）。 a) Adjust the SOC of cell to 100 %. b) Perform the test as shown in Table 5.2.2.2. Acceleration from the shock in the test shall be applied in the same	不起火，不爆炸，不漏液： No fire, No explosion; No electrolyte leakage;																

		direction as the acceleration of the shock that occurs in the vehicle. If the direction of the effect is not known, the cell shall be tested in all six spatial directions (Refer to IEC62660-2: 2010) . <table><tr><td>Pulse shape</td><td>half-sinusoidal</td></tr><tr><td>Acceleration</td><td>500 m/s²</td></tr><tr><td>Duration</td><td>6 ms</td></tr><tr><td>Number of shocks</td><td>10 per test direction</td></tr></table> Table 5.2.2.2- Mechanical shock test – parameters	Pulse shape	half-sinusoidal	Acceleration	500 m/s ²	Duration	6 ms	Number of shocks	10 per test direction	
Pulse shape	half-sinusoidal										
Acceleration	500 m/s ²										
Duration	6 ms										
Number of shocks	10 per test direction										
5.2.2.3	挤压 (Crush)	调整 SOC 为 100%。电池放置在绝缘平面上, 用直径为 150mm 球型挤压工具挤压电池, 挤压力的方向应与电池内部正负极分层界面垂直。这个挤压工具使电池产生形变, 形变量近乎与挤压力成正比。当电池电压降为初始电压的 1/3, 或电池出现 15%或者超过 15%的形变, 又或者挤压力达到电池重量的 1000 倍时, 挤压力撤除。电池保持测试状态 24h 或者温度下降到最大温度的 20%, 两者取最快结束 (或参照 IEC62660-2: 2010)。 a) Adjust the SOC of cell to 100 %. b) The cell shall be placed on an insulated flat surface and be crushed with a crushing tool of hemisphere with a 150 mm diameter. The force for the crushing shall be applied in direction nearly perpendicular to a layered face of positive and negative electrodes inside cell. The crushing tool shall be selected so that the cell is deformed nearly in proportion to the increase of crushing force. c) The force shall be released when an abrupt voltage drop of one-third of the original cell voltage occurs, or a deformation of 15 % or more of initial cell dimension occurs, or the force of 1 000 times the weight of cell applied. The cells remain on test for 24 h or until the case temperature declines by 20 % of the maximum temperature rise, whichever is the sooner (Refer to IEC62660-2: 2010) .	不起火, 不爆炸; No fire, No explosion;								
5.2.2.4	跌落 (Drop)	将标准充电后的电芯正负极端子朝下, 从 1.5m 高度处自由跌落到水泥地面上 (或参照 GB/T 31485-2015)。 The fully charged upside down cell is dropped from a height of 1.5m to strike a concrete surface (Refer to GB/T 31485-2015) .	不起火, 不爆炸, 不漏液; No fire, No explosion; No electrolyte leakage;								

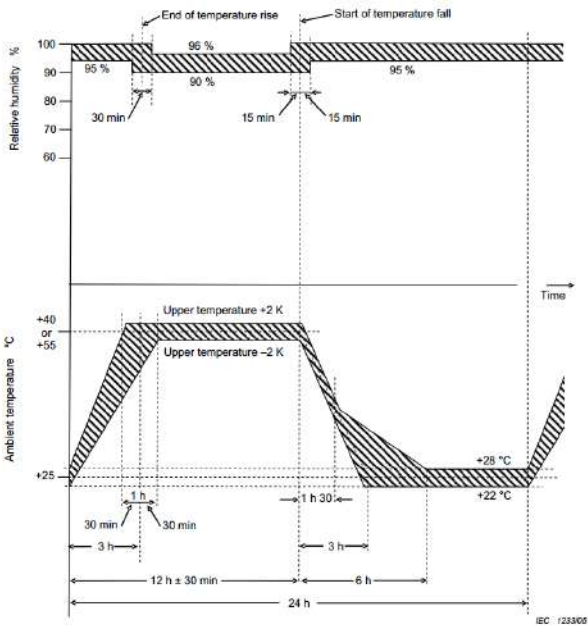
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5.2.3 环境安全性能 (Environmental safety tests)

章节 (Section No.)	项目 Item	测试方法 (Test method)	标准 (Criteria)
5.2.3.1	外观检查 (Appearance inspection)	检查受试电芯的外观结构、选用材料、制造工艺和标志等，以确保受试电芯符合：1) 符合 GD 22-2015 有关规定；2) 制造厂制定的技术条件；3) 有关电芯标准；4) 图纸及设计资料（或参照 GD 22-2015）。Check the appearance structure, material selection, manufacturing process and logo of the tested cells to ensure that the tested cells conform to: 1) comply with relevant provisions of GD 22-2015; 2) technical conditions formulated by the manufacturer; 3) relevant cell standards;4) drawings and design materials（Refer to GD 22-2015）.	符合测试方法中 1）～4 内 容 ； Comply with content 1)-4) of test method;
5.2.3.2	绝缘电阻测量 (Insulation resistance measurement)	测试位置：1) 正极与壳体；2) 负极与壳体（或参照 GD 22-2015）。 The test position: 1) positive pole and shell; 2) negative pole and shell（Refer to GD 22-2015）.	阻值不小于 100 Ω /V； Resistance is not less than 100 Ω/V
5.2.3.3	温度循环 (Temperature cycling)	调整 SOC 为 100%，按照表 5.2.3.1 执行温度循环。最低测试温度为-40℃或者厂商规定的温度，最高测试温度是 85℃或者厂商规定温度，按照说明测试 30 次循环（或参照 IEC62660-2： 2010）。 a) Adjust the SOC of cell to 100 % b) Perform the temperature cycling in Table 5.2.3.1. The minimum operating temperature shall be -40 °C or T_{min} specified by the manufacturer and the maximum operating temperature shall be 85 °C or T_{max} specified by the manufacturer. Perform 30 test cycles as specified（Refer to IEC62660-2： 2010）.	不起火，不爆炸，不漏液； No fire, No explosion; No electrolyte leakage;

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		Table 5.2.3.1 Temperatures and time duration for temperature cycling	
5.2.3.4	耐高温 (High temperature endurance)	待测电芯在热滥用试验箱中加热, 以 $5\pm 2^{\circ}\text{C}/\text{min}$ 速度升温至 130°C , 并保持 30min 后停止, 观察 1 小时 (或参照 IEC62660-2: 2010)。The fully charged cell is stabilized at room temperature, is placed in a gravity or circulating air-convection oven; The oven temperature is raised at a rate of $5^{\circ}\text{C}/\text{min}\pm 2^{\circ}\text{C}/\text{min}$ to a temperature of $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$; The cell remains at this temperature for 30min before the test is discontinued; Observe the phenomenon for 1h (Refer to IEC62660-2: 2010) .	不起火, 不爆炸, 不漏液; No fire, No explosion; No electrolyte leakage;
5.2.3.5	海水浸泡 (Immersion)	将单体蓄电芯浸入 3.5%NaCl 溶液 (质量分数模拟常温下的海水成分) 中 2h, 水深应完全没过电芯 (或参照 GB/T 31485-2015)。The fully charged cell is completely submerged in the sea (3.5% NaCl Solution) for 2 hours; Observe the phenomenon for 1h (Refer to GB/T31485-2015) .	不起火, 不爆炸; No fire, No explosion;
5.2.3.6	低气压 (Altitude simulation)	将单体蓄电芯放入气压为 11.6kPa 的试验箱中, 静置 6h (或参照 GB/T 31485-2015)。The fully charged cell is placed in an altitude simulation test chamber; The pressure is reduced to 11.6kPa and maintaining this pressure for 6h; Observe the phenomenon for 1h (Refer to GB/T31485-2015).	不起火, 不爆炸, 不漏液; No fire, No explosion; No electrolyte leakage;
5.2.3.7	交变湿热 (Damp heat, cyclic)	将待测电芯放入试验箱的有效空间内, 先在温度为 $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$, 相对湿度为 45%~75% 的条件下进行预处理, 使待测电芯温度达到稳定。按图 5.2.3.5 所示的周期循环 2 次 (或参照 GD22-2015)。The temperature of the cell shall be stabilized at $25^{\circ}\text{C} \pm 3^{\circ}\text{C}$. During the stabilization of temperature, the relative humidity shall be 45%~75%, After the temperature of cell is steady, 2 Damp heat cycles should be performed in Figure 5.2.3.5 (Refer to GD22-2015) .	不起火, 不爆炸, 不漏液; No fire, No explosion; No electrolyte leakage;

		 Figure 5.2.3.5- Damp heat, cyclic	
5.2.3.8	恒定湿热 (Damp heat, steady state)	将待测电芯放入试验箱的有效空间内, 先在不加湿的条件下 2h 内把温度从 20℃ 上升至 40℃ ± 3℃, 进行预热, 当待测电芯温度达到稳定后加湿到 90%~95%, 并在此条件下保持 96h, 然后在 2h 时间内下降至 20℃, 并将受试电芯取出在常温条件下恢复 (或参照 GD22-2015)。 The fully charged cell is stabilized at room temperature, is placed in a Programmable Temperature & Humidity Chamber), then the temperature is raised to a temperature of 40℃ ± 3℃ in 2 hours, after the temperature of cell is steady, the humidity should be raised to 90%~95%, the cells remain at temperature and humidity for 96 hours, then reduce the temperature to 20℃ and remove the cells from chamber (Refer to GD22-2015) .	不起火, 不爆炸, 不漏液; No fire, No explosion; No electrolyte leakage;
5.2.3.9	倾斜 (Incline)	电气设备的结构和布置应能保证船舶处于横倾或横摇 22.5° 和纵倾或纵摇 10° 的情况下仍能正常工作 (参照《钢制内河船舶建造规范》)。 Electrical equipment of the structure and layout should be able to ensure the vessels in the heel or rolling 22.5° and trim or pitching can still work normally under the condition of 10° (Refer to 《Code for the construction of steel inland river ships》) .	正常工作 (Work normally)

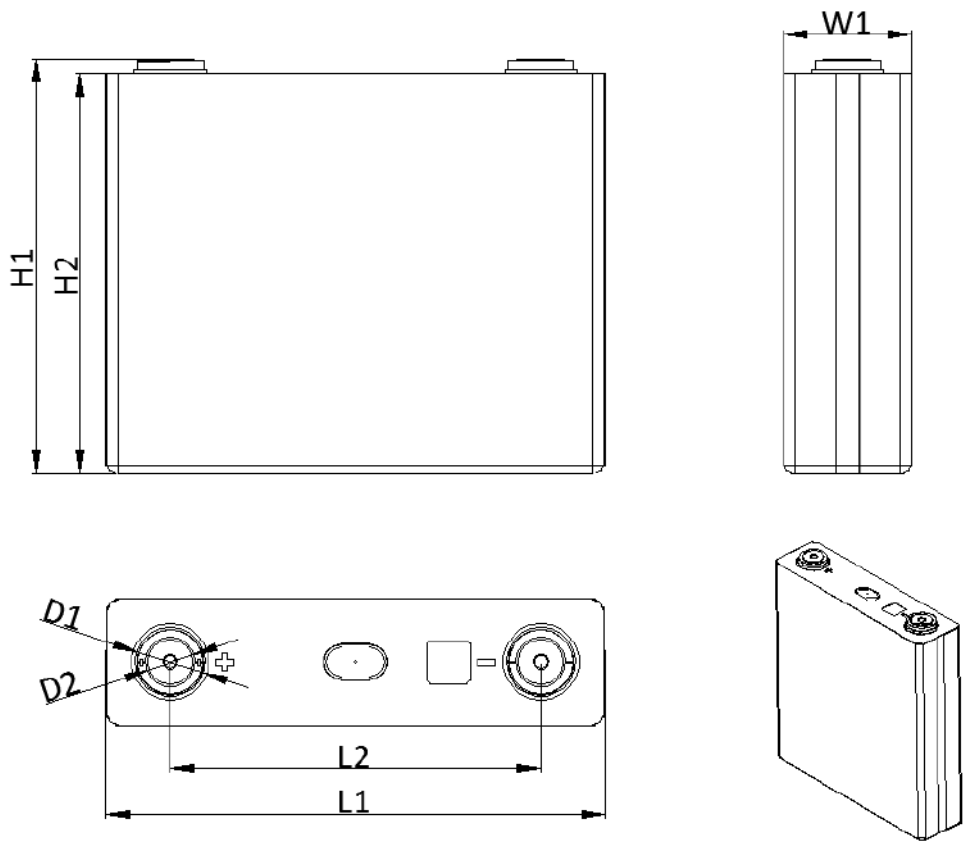
6.外观和尺寸/ Appearance & Dimension

6.1 外观/ Appearance

外观没有深划痕，裂缝，锈蚀，污点或泄漏，等影响产品商业价值的缺陷。

There is no scratch, no rip, corrosion, no stain, no leakage or other defect would affect the commercial value.

6.2 尺寸/ Dimension



序号	代码	尺寸 (mm)
1	L1	174.2±0.5
2	L2	129.3±0.5
3	H1	189.6±0.5
4	H2	184.6±0.5
5	W1	44.7±0.5

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7.注意事项及禁止条款/ Notice and Caution

下面是使用可充放磷酸铁锂电芯的注意事项。电芯处理不当可能会导致发热、着火和性能恶化。请务必遵守以下事项: / Please notice the following cautions. It would cause heating, fire and broken if do not handle the battery correctly.

注意/ Notice

- √ 使用装有电芯的设备前, 应先阅读使用手册。在充电前请阅读充电装置说明书。 / Please read the handbook at first, before using the equipment with battery. Please read the charging equipment indication before using charging.
- √ 当电芯连接充电装置一段时间后, 却并未充入电量的话, 停止充电。 / Stop charging, if do not get electric power when you charge some time.
- √ 装配电芯前请检查正(+)、负(-)方向。 / Please check the Positive (+) and negative (-) before assembling batteries.
- √ 对电芯进行连接装配时, 应检查绝缘, 以防短路。 / Please check insulation when connecting batteries, prevent short circuit.
- √ 电芯必须单独存储。 / Batteries must be stored separate.
- √ 电芯需要长期存储时, 必须存储在干燥与温度较低 ($\leq 25^{\circ}\text{C}$) 的环境中。 / Please store in dry and low temp ($\leq 25^{\circ}\text{C}$) environment if batteries would be stored for long time.
- √ 不可以将电芯放置在阳光直射或高温环境中。 / Do not put the battery under sun-light and high temp.
- √ 在第一次使用时检测到气味或生锈, 请立即将产品退回卖方。 / Please return battery pack to the seller, if there is smell or stain when you use the first time.
- √ 电芯必须远离儿童和宠物。 / Keep batteries far away from children and pets.
- √ 当电芯经过长时间使用后寿命缩短, 请更换新电芯。 / Please change the battery when the cycle life shorter after long time using.
- √ 在处理电芯时, 不可以佩戴金属物体。(例如戒指, 手表, 配件等) / When operating batteries, please keep from metal materials. (For example: ring, watch, components)
- √ 使用电芯制作模块或电池组时, 应遵循“先进先出”原则。 / Please do as the rule of “1st in, 1st out ” when you operating batteries.
- √ 充放电条件符合规格书中规定。 / Charging condition must follow specification.
- √ 电芯不可以暴露于本文件规定的工作温度范围外。 / Do not put the battery in the temperature do not specified in the specification.

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禁止 / Caution

- √ 不可以使用不同的充电设备。 / Do not use different charger.
- √ 不可以超过最大充电倍率。 / Do not be over than Max charging current.
- √ 不可以拆卸或改造电芯。 / Do not disassemble or reform the battery.
- √ 不可以扔或撞击电芯。 / Do not drop or shock the battery.
- √ 不可以用锋利的东西刺破电芯。(如钉、刀、铅笔、钻孔机) / Do not use sharp goods to puncture batteries. (For example: nail, knife, pencil, drill)
- √ 不可以与其他电芯混用。 / Do not use with other batteries.
- √ 不可以直接焊接电芯。 / Do not weld the batteries directly.
- √ 制造过程中电芯不可以负载。 / Do not be with load when make batteries.
- √ 不可以将旧电芯和新电芯一起包装。 / Do not use the new battery and old battery together.
- √ 不可以将电芯暴露在高温下。(如火) / Do not put the battery in high temperature. (For example: fire)
- √ 不可以将电芯放入微波炉或高压容器中。 / Do not put the battery in microwave oven and high pressure container.
- √ 不可以将电芯倒置。 / Do not put the battery convert.
- √ 不可以将正负极与金属材料接触。(如金属、电线) / Do not connect the positive and negative pole with metal material.
- √ 不允许用水或海水将电芯淹没或浸湿。 / Do not submerge and soak the battery by water and seawater.
- √ 未经电芯制造商允许时不可以弯曲电芯。 / Do not wind the battery without permission of the manufacturer.