Model	LF32	Specification No. 规格书编号	PBRI-LF32-S01-LF	Version 版本	C

Product Specification

产品交付规格书

Prismatic LFP Li-ion Battery

方形铝壳磷酸铁锂电池

Model 型号： LF32

Drafted by 编制	Product Design Checked by 产品设计审核	Quality Checked by 品质审核	Sales Checked by 销售审核	Approved by 批准
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Customer Recipient 客户接收栏
Company 公司名称: **Approved by 批 准:** **Date 日期:**

April, 2022

EVE Power Co., Ltd 湖北亿纬动力有限公司

Customer Requirements

The specific requirements of customer should be provided and communicated with EVE Power. If the customer has special applications or working conditions other than those described in this specification, EVE can design and manufacture the product according to the customer's special requirements.

客户要求

要求客户写出他们的需求信息并提前与亿纬动力沟通。如果客户有一些特别的应用或者工作条件不同于此文件中所描述的，亿纬动力可以根据客户的特别要求进行产品的设计和生产。

No.	Requirements 特殊要求	Standards 标准
1		
2		
3		
4		
5		

Customer Code 客户代码：__________ Signature 签字：__________ Date 日期：__________

Change History

Version 版本	Date 日期	Contents 更改内容	Checked By 确认人
Rf	2020.03.28	First issue 新版发行	Kai Chen 陈凯
A	2020.10.12	Version update 版本升级	Kai Chen 陈凯
B	2021.02.26	Version update 版本升级	Meng Chen 陈勐
C	2022.04.25	Added English reference and test method 新增英文对照及测试方法	Ming Chen 陈明

Contents

Term Definition
术语定义

Product 产品:

Refers to rechargeable Prismatic LF32 LFP battery with aluminum shell manufactured by EVE Power Co., Ltd. in this specification.

本规格书中的"产品"是指湖北亿纬动力有限公司生产的 LF32 可充电方形铝壳 LFP 锂离子电池。

Customer 客户:

Refers to the buyer in EVE Power Sales Contract.

指《湖北亿纬动力有限公司产品销售合同》中的买方。

Environment Temperature 环境温度:

Surrounding environmental temperature where the battery is located.

电池所处的周围环境温度。

Battery Temperature 电池温度:

Temperature measure by the temperature sensor installed at the center of battery surface.

由接入电池表面中心的温度传感器测量的电池的温度。

Fresh Battery 新鲜电池:

Refers to the state of the battery within 30 days from the date of manufacture of the product.

指电池自产品生产完成日期算起 30 天以内的状态。

Rate 倍率:

The ratio of the charge-discharge current to the rated capacity of the battery is indicated by the letter C. For example, if the battery capacity is 32.0Ah, when the charging or discharging current is 32.0A corresponding to the charging or discharging rate of 1C.

充/放电电流与电池的额定容量值的比率，用字母 C 表示。例如，电池容量为 32.0Ah，当充电或放电电流为 32.0A 时，则充电或放电倍率为 1C。

State of Charge 荷电状态:

The ratio of the battery capacity state to the rated capacity can be abbreviated by SOC with the unit of ampere-hours or watt-hours under the unloaded conditions. For example, if the capacity of 32.0Ah is regarded as 100% SOC, the capacity is 0Ah corresponding to 0% SOC at a current of 1C.

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额定容量的比值，缩写用

SOC 表示。如：若将容量为 32.0Ah 的状态视为 100%SOC，则容量为 0Ah 时，SOC 为 0%（电流为 1C)。

Cycle 循环：

The battery 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。

Standard Charge 标准充电：

The charging mode described in 3.5 of this specification.

本规格书第 3.5 条所述的充电模式。

Standard Discharge 标准放电：

The discharge mode described in 3.6 of this specification.

本规格书第 3.6 条所述的放电模式。

Open Circuit Voltage 开路电压：

Open-circuit voltage refers to the potential difference between the positive and negative electrodes when the battery passes without any current. The abbreviation is expressed by OCV.

开路电压是指电池无电流通过时正负极之间的电位差，缩写用 OCV 表示。

DC Resistance 直流电阻：

The ratio of the voltage change of the battery to the corresponding current change under working conditions , the abbreviation is DCR, and the test method is as described in section 3.7.3.3 of this specification.

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，测试方法如本规格书第 3.7.3.3 条所述。

Pulse Current 脉冲电流：

The current that appears periodically is called pulse current, the pulse current appears either in the same direction or in alternating positive and negative directions.

以周期重复出现的电流称为脉冲电流，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。

Compression Force 预紧力：

When the module is assembled, the safety margin of the compressive force which the battery can withstand.

模组组装时，电池可承受压缩力的安全边界。

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Units： Refer to following table

测量单位：见下

Table 1 Unit of measurement
表 1 测量单位

No.	Unit 单位	Abbreviation 简写	Type 单位类型
1	Volt 伏特	V	Voltage 电压
2	Ampere 安培	A	Current 电流
3	Ampere-Hour 安培-小时	Ah	Capacity 容量
4	Watt-Hour 瓦特-小时	Wh	Energy 能量
5	Ohm 欧姆	Ω	Resistance 电阻
6	MilliOhm 毫欧姆	mΩ	Resistance 电阻
7	Degree Celsius 摄氏度	℃	Temperature 温度
8	Millimeter 毫米	mm	Length 长度
9	Second 秒	s	Time 时间
10	Hertz 赫兹	Hz	Frequency 频率

1. Basic Information 基本信息

1.1. Scope 适用范围

This specification is applied to Prismatic LFP Battery of LF32 with aluminum shell manufactured by EVE Power Co., Ltd.

本产品规格书适用于湖北亿纬动力有限公司生产的 LF32 方形铝壳锂离子电池。

1.2. Product Type 产品类型

Prismatic LFP Battery with aluminum shell 方形铝壳锂离子电池

1.3. Model 产品名称

LF32

2. Battery Specification 电池规格

2.1. Basic Parameters 电池基本参数

Table 2 Basic parameters of battery
表 2 电池基本参数

Items 项目		Parameters 标准	Remarks 备注
Rated. Capacity C_0 额定容量 C_0		32.0Ah	0.5C，25±2℃，2.5-3.65V Fresh battery 新鲜电池
Rated. Energy 额定能量		102.4Wh	0.5C，25±2℃，2.5-3.65V Fresh battery 新鲜电池
ACR 交流内阻		≤1.5mΩ	AC，1kHz，20~50%SOC Fresh battery 新鲜电池
Nominal Voltage 标称电压		3.2V	0.5C，25℃±2℃，2.5-3.65V
Weight 重量		730±50 g	/
Charging Cut-off Voltage 充电限制电压(U_{max})		3.65V	/
Discharging Cut-off Voltage 放电截止电压(U_{min})		2.5 (0℃<T<60℃) 2.0 (-20℃<T≤0℃)	/
Charging 充电	Standard Charging Current 标准充电电流	0.5C	25℃±2℃

Discharging 放电	Standard Discharging Current 标准放电电流	0.5C	25°C±2°C
Cycling Performance 循环性能	25°C Standard Cycle 25°C标准循环	3500 Cycles，1C/1C	Capacity Retention≥80%. 容量保持率>80%
	45°C Standard Cycle 45°C标准循环	1800 Cycles，1C/1C	Capacity Retention≥80%. 容量保持率>80%
Operation Temperature 工作温度	Charging Temperature 充电温度	0~60°C	/
	Discharging Temperature 放电温度	-20~60°C	/
Storage Temperature 存储温度	>1 month,>1 个月	0~35°C	Delivery SOC State (20~50%) 出货 SOC 状态(20~50%)
	≤1 month,≤1 个月	-20~45°C	

2.2. Product Parameters 产品规格

2.2.1. Dimension and Weight 尺寸、重量标准

Table 3 Battery size and weight index
表 3 电池尺寸重量指标

No.	Items 项目		Parameters 参数	Testing Methods 测试方法章节
1	Dimension 尺寸	Terminal Height 总高(H)	94.3±0.5mm	3.7.1
		Can-top Height 肩高高度(h)	91.5±0.5mm	
		Width 宽度(L)	148.3±0.8mm	
		Thickness 厚度(T)	26.8±0.3mm (300kgf，20~50%SOC)	
2	Weight 重量	Weight (Including external protective film, top insulator) 重量（含外保护膜，顶贴片）	730±50g	3.7.2

2.2.2. Electrical Performance Index 电性能指标

Table 4 Battery electrical performance index

表 4 电池电性能指标

No.	Items 项目		Parameters 参数	Testing Methods 测试方法章节
1	Capacity 容量	0.5C Capacity 0.5C 容量	≥32Ah	3.7.3.1
2	Energy 能量	0.5C Energy 0.5C 能量	≥102.4Wh	
3	Temperature Discharge Performance 高低温放电性能	-20℃ Capacity Retention -20℃容量保持率	≥70%	3.7.3.2
		55℃ Capacity Retention 55℃容量保持率	≥95%	
4	DCR 直流内阻	25℃，50%SOC，1C，30s	≤5mΩ	3.7.3.3
5	Cycling Performance 循环性能	25℃ 0.5C/0.5C, 3500 Cycles 25℃ 0.5C/0.5C，3500 次	Capacity Retention ≥80%	3.7.3.4
		45℃ 0.5C/0.5C, 1800 Cycles 45℃ 0.5C/0.5C，1800 次		
6	Storage Performance 存储性能	100%SOC, 25℃, 28 days 100%SOC，25℃，28 天	Capacity Recovery ≥96% 容量恢复率≥96%	3.7.3.5
			Capacity Retention ≥95% 容量保持率≥95%	

2.2.3. Safety Performance 安全性能指标

Table 5 Battery safety performance index
表 5 电池安全性能指标

No.	Items 项目	Standard 标准	Testing Methods 测试方法章节
1	Overcharge 过充电	No fire and explosion 不起火、不爆炸	3.7.4.1
2	Overdischarge 过放电	No fire and explosion 不起火、不爆炸	3.7.4.2
3	External Short Circuit 外部短路	No fire and explosion 不起火、不爆炸	3.7.4.3
4	Extrusion 挤压	No fire and explosion 不起火、不爆炸	3.7.4.4
5	Drop 跌落	No fire and explosion 不起火、不爆炸	3.7.4.5
6	Low Pressure 低气压	No fire, explosion and liquid leakage 不起火、不爆炸、不漏液	3.7.4.6

2.3. Battery Drawing 电池图纸

See Figure 5.

见图 5。

2.4. Appearance 外观

The battery should have no obvious scratches, cracks, rust stains, discoloration, or electrolyte leakage, which have any defects that affect the commercial value of the battery.

电池应无明显擦伤、裂痕、锈渍、变色或电解液泄漏这类对电池商用价值有影响的缺陷。

3. Testing Conditions 试验条件

3.1. Environmental Conditions 环境条件

Unless otherwise specified, the test should be carried out in an environment with a temperature of 25°C ± 2°C, a relative humidity of 15%-90% RH, and an atmospheric pressure of 86 kPa to 106 kPa. The ambient temperature mentioned in this specification refers to 25°C±2°C.

除另有规定外，试验应在温度为 25°C±2°C，相对湿度 15%-90% RH，大气压力为 86 kPa~106 kPa 的环境中进行。本规格书所提到的室温，是指 25°C±2°C。

3.2. Measurement Instrument 测量设备

The accuracy of measuring instruments and meters should meet the following requirements:

测量仪器、仪表准确度应满足以下要求:

A、Voltage measuring device 电压测量装置: ±0.1%;

B、Current measuring device 电流测量装置: ±0.1%;

C、Temperature measuring device 温度测量装置: ±0.5°C;

D、Dimension measuring device 尺寸测量装置: ±0.01mm;

E、Weight measuring device 重量测量装置: ±0.1g.

3.3. Testing Clamp Preparation 测试夹具准备

The single battery needs to be clamped with steel splints or aluminum alloy splints (thickness:≥8 mm). The splints need to cover the large surface of the battery. The splints are fixed with 4 M4 bolts. All sides of the splints need to be covered with insulating film. Fixtures as shown below:

单体电池需采用钢夹板或铝合金夹板 (厚度：≥8 mm)固定，夹板需要覆盖住电池大面，夹板之间采用 4 个 M4 螺栓固定，且夹板各个面均需用绝缘膜包覆，夹具工装如下图所示：

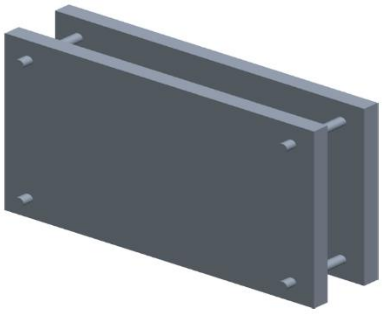

Fig. 1 Schematic diagram of battery clamp
图 1 电池夹具示意图

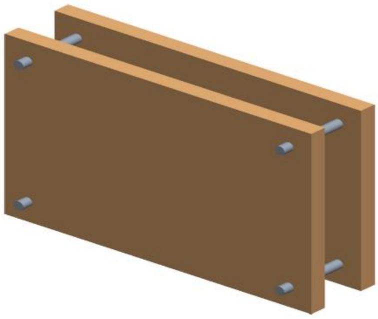

Fig. 2 Insulation film of battery clamp
图 2 电池夹具包绝缘膜图

3.4. Testing Clamp Installation 测试夹具安装

Place the battery covered with blue film and top film in the middle of the clamp, and the initial compression force is (200±20) kgf.

将包覆有蓝膜和顶贴片的电池置于夹具中间，初始夹紧力为 (200±20)kgf。

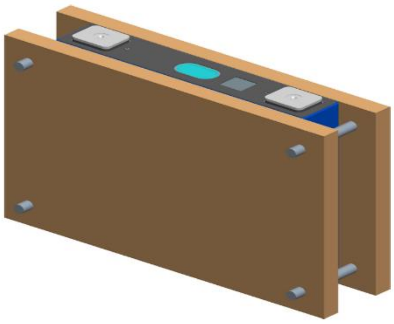

Fig. 3 Side view of battery shaft
图 3 电池轴侧图

3.5. Standard Charge 标准充电方式

Standard charging is to charge the battery with a constant current of 0.5C to 3.65V under the condition of an ambient temperature of 25°C±2°C, and then transfer to constant voltage charging at 3.65V until the charging current is less than or equal to 0.05C, and rest for 30min.

标准充电是在环境温度 25°C±2°C的条件下，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，直至充电电流小于等于 0.05C，搁置 30min。

3.6. Standard Discharge 标准放电方式

Standard discharge is to discharge the battery at a constant current of 0.5C at an ambient temperature of 25°C ± 2°C, discharge until the voltage reaches to 2.5V.

标准放电是在环境温度 25°C±2°C的条件下，电池以 0.5C 的电流恒流放电，放电至电压达到 2.5V 截止。

3.7. Testing Methods 测试方法

3.7.1. Dimension 尺寸

Testing Instrument 试验设备:

CMM Measuring instrument CMM 测量仪

Testing Method 试验方法:

Use CMM Measuring instrument to measure the width, height and thickness (under 300kgf) of the battery;

使用 CMM 测量仪测量电池宽度、高度和厚度(300kgf 下)。

*The thickness of the battery will increase as the SOC increases, and it will increase along with usage. The thickness here indicates the thickness of the battery at the time of shipment (20%~50% SOC at the time of shipment).

*电池厚度随着 SOC 增加会有所增加，随着使用时间增加会有所增加，此处厚度指出货时电池的厚度(出货时 20%~50%SOC)。

3.7.2. Weight 重量

Test Instrument 实验设备:

Electronic Scale 电子秤

Test Method 试验方法:

The weight of the battery is measured by using an electronic scale.

使用电子秤测量电池的重量。

3.7.3. Electrical Performance 电性能

3.7.3.1. 0.5C Discharge Capacity and Energy 0.5C 放电容量和能量

Under the condition of an ambient temperature of 25℃±2℃, 1) The battery is discharged to 2.5V by standard discharge mode (3.6), 2) The battery is charged to 3.65V by standard charge mode (3.5), 3) The battery is discharged to 2.5V by standard discharge mode (3.6), 4) Repeat steps from 2 to 3 three times, record the final discharge capacity C_0 and discharge energy E_0 are 0.5C capacity and energy, respectively.

在环境温度 25±2℃的条件下，1）电池按照（3.6）进行标准放电；2）电池按照（3.5）进行标准充电；3）电池按照（3.6）进行标准放电；4）循环第 2-3 步 3 次；记录记录第三圈容量为 0.5C 容量 C_1，第三圈放电能量为 0.5C 能量 E_1。

3.7.3.2. Temperature Discharge Performance 高低温放电性能

Under the condition of an ambient temperature of 25℃±2℃, 1) The battery is discharged to 2.5V by standard discharge mode (3.6), 2) The battery is charged to 3.65V by standard charge mode (3.5), 3) The battery is discharged to 2.5V by standard discharge mode (3.6), 4) Repeat steps from 2 to 3 three times, 5) The battery is charged to 3.65V by standard charge mode (3.5), 6) The battery stands at -20/55℃ for 4h and then discharged at a current of 1C to 2.5V, rests for 30min, record the discharge capacity C_2, C_2/C_0 is the capacity retention rate.

在环境温度 25±2°C的条件下，1）电池按照（3.6）进行标准放电；2）电池按照（3.5）进行标准充电；3）电池按照（3.6）进行标准放电；4）循环第 2-3 步 3 次；5）电池按照（3.5）进行标准充电；6）电池在-20/ 55 °C环境下搁置 4 小时，然后以 1C 恒流放电至放电截止电压 2.0/2.5V，搁置 30min，记录放电容量 C_2，C_2/C_0 即为容量保持率。

3.7.3.3. DCR 直流内阻

Under the condition of an ambient temperature of 25℃±2℃, 1) The battery is discharged to 2.5V by standard discharge mode (3.6), 2) The battery is charged to 3.65V by standard charge mode (3.5), 3) The battery is discharged to 2.5V by standard discharge mode (3.6), 4) Repeat steps from 2 to 3 three times, 5) The battery is charged to 3.65V by standard charge mode (3.5), 6) The battery is discharged at 0.5C for 60min, rests for 60min (adjust the SOC to 50 %), record the voltage V1 at the end of the period. 7) The battery is discharged at a constant current of 1C for 30s, record the voltage V2 at the end of the discharge. 8) calculate the DCR, DCR= (V1-V2)*1000/32 (mΩ).

在环境温度 25±2°C的条件下，1）电池按照（3.6）进行标准放电；2）电池按照（3.5）进行标准充电；3）电池按照（3.6）进行标准放电；4）循环第 2-3 步 3 次；5）电池按照（3.5）进行标准充电；6）电池以 0.5C 放 60min（恒流放电 50%DOD），搁置 60min，记录搁置末期电压 V1；7）电池以 1C 恒流放电 30 秒，记录放电末期电压 V2；8）计算 DCR，DCR=(V1-V2)*1000/32 mΩ。

3.7.3.4. Cycling Performance 循环性能

Under the condition of ambient temperature of 25±2°C, prepare the clamp according to (3.3) before the test. When the SOC is shipped at room temperature, install the testing clamp according to the method in (3.4).

1) The battery is discharged to 2.5V by standard discharge mode (3.6), 2) The battery is placed in 25±2°C/45±2°C for 4 hours, 3) The battery is charged to 3.65V at a constant current of 1 C, and then switched to constant voltage charging at 3.65V, until the charging current is less than or equal to 0.05C, rests for 30min, 4) The battery is discharged to 2.5V at 1C constant current then rests for 30min, 5) Repeat steps from 3 to 4 until the discharge capacity of step 4 < 80% of the rated capacity, record the number of cycles.

在环境温度 25±2°C的条件下，测试前按照（3.3）进行夹具准备，在常温下出货态 SOC 时，按照（3.4）的方法安装测试夹具。

1）电池按照（3.6）进行标准放电；2）电池置于 25±2°C/45±2°C的环境中，搁置 4h；3）电池以 1C 的电流恒流充电至 3.65V，然后在 3.65V 下转恒压充电，直至充电电流小于等于 0.05C，搁置 30min；4）电池以 1C 恒流放电至 2.5V，搁置 30min；5）循环第 3-4 步，直至第 4 步放电容量< 80%额定容量为终止，记录充放电圈数。

3.7.3.5. Storage Performance 存储性能

1) The battery is discharged to 2.5V by standard discharge mode (3.6), 2) The battery is charged to 3.65V by standard

charge mode (3.5), 3) The battery is discharged to 2.5V by standard discharge mode (3.6), record the discharge capacity as C_3, 4) The battery is discharged to 2.5V by standard discharge mode (3.6), 5) The batteries are stored in the temperatures of 25°C for 28 days, 6) The battery is placed at 25℃ for 4 hours， 7) The battery is discharged to 2.5V by standard discharge mode (3.6), record the discharge capacity as C_4, 8) The battery is charged to 3.65V by standard charge mode (3.5)，9) The battery is discharged to 2.5V by standard discharge mode (3.6), record the discharge capacity as C_5, capacity retention rate=$C_4/C_3\times100\%$, capacity recovery rate=$C_5/C_3\times100\%$.

1）电池按照（3.6）进行标准放电；2）电池按照（3.5）进行标准充电；3）电池按照（3.6）进行标准放电，记录放电容量 C_3；4）电池按照（3.5）进行标准充电；5)电池在 25°C环境下存储 28d；6）再将电池在 25℃下搁置 4 小时；7）电池按照（3.6）进行标准放电，记录放电容量 C_4；8）电池按照（3.5）进行标准充电；9）电池按照（3.6）进行标准放电，记录放电容量 C_5，容量保持率=C_4/C_3，容量恢复率=C_5/C_3。

3.7.4. Safety Performance 安全性能

3.7.4.1. Overcharge 过充电

Under the condition of an ambient temperature of 25°C±2°C, the battery is charged to 3.65V by standard charge mode (3.5), and then install the test fixture according to 3.4. After the battery is charged to 1.5 times the termination voltage or the charge time of 1h at a constant current of 1C at the ambient temperature of the safety test, stop charging, observe for 1h.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

在环境温度 25°C±2°C的条件下，电池按照（3.5）进行标准充电，然后按照 3.4 的方法安装测试夹具。在安全试验环境温度下电池以 1C 恒流充电至终止电压的 1.5 倍或时间达到 1h 后，停止充电。观察 1 h。

(参考 GB/T 36276-2018《电力储能用锂离子电池》)。

3.7.4.2. Overdischarge 过放电

Under the condition of an ambient temperature of 25°C±2°C, the battery is charged to 3.65V by standard charge mode (3.5). The battery was discharged at a constant current of 1C for 90 min or the voltage reaches 0V at the ambient temperature of the safety test. Observe for 1 h.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

在环境温度 25°C±2°C的条件下，电池按照（3.5）进行标准充电。在安全试验环境温度下电池以 1C 恒流放电 90 min 或电压达到 0V。观察 1 h。

(参考 GB 36276-2018《电力储能用锂离子电池》)。

3.7.4.3. External Short Circuit 外部短路

Under the condition of an ambient temperature of 25°C±2°C, the battery is charged to 3.65V by standard charge mode (3.5), and then install the test fixture according to 3.4. The positive and negative terminals of the battery are shortcircuited externally for 10 minutes under the environmental temperature of the safety test, and the resistance of the external circuit should be less than 5 mΩ. Observe for 1 h.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

在环境温度 25°C±2°C的条件下，电池按照（3.5）进行标准充电，然后按照 3.4 的方法安装测试夹具。在安全试验环境温度下将电池正、负极经外部短路 10 min，外部线路电阻值应小于 5 mΩ。观察 1 h。

(参考 GB 36276-2018《电力储能用锂离子电池》)。

3.7.4.4. Extrusion 挤压

Under the condition of an ambient temperature of 25°C±2°C, the battery is charged to 3.65V by standard charge mode (3.5). Test under the following conditions at a safety test environment temperature of 25±5°C:

在环境温度 25°C±2°C的条件下，电池以 1C 的电流恒流充电至 3.65V，在 3.65V 下转恒压充电，直至充电电流小于等于 0.05C。在安全试验环境温度 25±5°C下按照如下条件进行试验：

a) Extrusion direction: apply pressure perpendicular to the direction of the battery cell plate;

b) The form of the extruded plate: a semi-cylinder with a radius of 75mm, the length (L) of the semi-cylinder is greater than the size of the cell being extruded (refer to the figure below);

c) Extrusion speed: (5±1)mm/s;

d) Termination condition: stop extruding after the voltage reaches 0V or the deformation reaches 30% or the extruding force reaches 200kN;

e) Observe for 1h.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

a) 挤压方向：垂直于电池单体极板方向施压；

b) 挤压板形式：半径 75mm 的半圆柱体，半圆柱体的长度 (L)大于被挤压电池单体的尺寸；

c) 挤压速度：(5±1)mm/s；

d) 终止条件：电压达到 0V 或变形量达到 30%或挤压力达到 13±0.78kN 后停止挤压；

e) 观察 1h。

(参考 GB 36276-2018《电力储能用锂离子电池》)。

3.7.4.5. Drop 跌落

Under the condition of an ambient temperature of 25°C±2°C, the battery is discharged by a standard mode (3.6), then the battery is charged by a standard mode (3.5). The positive and negative terminals of the cell are freely dropped from a height of 1.5m to the cement floor, observe for 1h.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

在环境温度 25°C±2°C的条件下，电池按照（3.6）进行标准放电，再按照（3.5）进行标准充电；.电池正负极端子向下从 1.5m 高度处自由跌落到水泥地面上；观察 1h。

(参考 GB 36276-2018《电力储能用锂离子电池》)。

3.7.4.6. Low Pressure 低气压

Under the condition of an ambient temperature of 25°C±2°C, the battery is discharged by a standard mode (3.6), then the battery is charged by a standard mode (3.5), the batteries were placed in a low-pressure box, the air pressure in the test box was adjusted to 11.6KPa, the temperature was room temperature, rest for 6 hours, observed for 1 hour.

(Refer to GB/T 36276-2018 Lithium ion batteries for electric energy storage).

在环境温度 25°C±2°C的条件下，电池按照（3.6）进行标准放电，再按照（3.5）进行标准充电；电池放入低气压箱中，调节试验箱体中气压为 11.6KPa，温度为室温，静置 6h；观察 1h。

(参考 GB 36276-2018《电力储能用锂离子电池》)。

4. Charge and Discharge Parameters 充放电参数

4.1. Charge Mode 充电模式

4.1.1. Charge Mode Parameter 充电模式参数

Table 6 Charging mode parameter table
表 6 充电模式参数表

Items 项目	Specification 规格	Condition 条件
Standard charging current 标准充电电流	0.5C	25°C±2°C
Maximum continuous charging current 最大充电可持续电流	1.0C	
Standard charging voltage 标准充电电压	Single battery 单体电池≤ 3.65 V	
Standard charging mode 标准充电模式	Refer to section 3.5 参考 3.5 节	
Standard charging temperature 标准充电温度	25°C±2°C	
Absolute charging temperature (battery temperature) 绝对充电温度（电池温度）	0°C~60°C	No matter what charging mode the battery is in, once the battery temperature exceeds the absolute charging temperature range, charging will stop 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

Absolute charging voltage 绝对充电电压	Max 3.65 V 最大 3.65V	No matter what charging mode the battery is in, once the battery voltage exceeds the absolute charging voltage, the charging will stop 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

4.1.2. Other Charge Mode 其他充电模式

Table 7 Charging mapping table
表 7 充电 mapping 表

温度/℃		0	(0~10)	[10~20)	[20~25)	[25~45]	(45~55)	[55~60)	65
SOC	0%~60%	0	0.1	0.2	0.5	1	0.5	0.2	0
SOC	60%~70%	0	0.1	0.2	0.5	1	0.5	0.2	0
SOC	70%~80%	0	0.1	0.2	0.5	1	0.5	0.2	0
SOC	80%~90%	0	0.1	0.2	0.5	0.8	0.5	0.2	0
SOC	90%~95%	0	0.1	0.1	0.3	0.5	0.3	0.2	0
SOC	95%~100%	0	0	0.1	0.1	0.1	0.1	0.1	0

4.2. Discharge Mode 放电模式

4.2.1. Discharge Mode Parameter 放电模式参数

Table 8 Discharge mode parameter table
表 8 放电模式参数表

Items 项目	Specification 规格	Condition 条件
Standard discharge current 标准放电电流	0.5C	25℃±2℃
Maximum continuous discharge current 最大放电可持续电流	1.0C	25℃±2℃
Discharge cut-off voltage 放电截止电压	2.5 V	T>0℃
	2.0 V	T≤0℃
Standard discharge mode 标准放电模式	Refer to section 3.6 参考 3.6	
Standard discharge temperature 标准放电温度	25℃±2℃	
Absolute discharge temperature (battery temperature) 绝对放电温度（电池温度）	-20℃~60℃	No matter what discharge mode the battery is in, once the battery temperature exceeds the absolute discharge temperature range, the discharge will stop 无论电池处于何种放电模式，电池温度一旦超出

		绝对放电温度范围，即停止放电
Absolute discharge voltage 绝对放电电压	Min 2.5V (T > 0°C) Min 2.0V (T ≤ 0°C) 最小 2.5V（T ＞0°C） 最小 2.0V（T ≤0°C）	No matter what kind of discharge mode the battery is in, once the battery voltage is less than the absolute discharge voltage, it stops discharging 无论电池处于何种放电模式，电池电压一旦小于绝对放电电压，即停止放电

4.2.2. Other Discharge Mode 其他放电模式

Table 9 Discharging mapping table
表 9 放电 mapping 表

电芯温度/°C		-20	-10	0	10	20	25	30	35	40	45	50	55	60	65
SOC	60%~100%	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	50%~60%	0.5	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	40%~50%	0.3	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	30%~40%	0.3	0.5	0.5	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	20%~30%	0	0.3	0.3	0.5	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	10%~20%	0	0	0.3	0.3	0.5	1.0	1.0	1.0	1.0	1.0	0.5	0.5	0.5	0
SOC	0%~10%	0	0	0	0.3	0.5	1.0	1.0	0.5	0.5	0.5	0.5	0.5	0.5	0

4.3. Pulse Mode 脉冲模式

4.3.1. Pulse Charge Mode 脉冲充电模式

Table 10 30s Pulse Charge rate table
表 10 30s 脉冲充电倍率表/C

SOC\T	0°C	5°C	10°C	15°C	25°C	35°C	45°C	55°C	60°C
0%	0	0.3	0.8	1.0	1.5	1.5	1.2	1.0	0.5
5%	0	0.3	0.8	1.0	1.5	1.5	1.2	1.0	0.5
10%	0	0.3	0.8	1.0	1.5	1.5	1.2	1.0	0.5
20%	0	0.3	0.8	1.0	1.5	1.5	1.2	1.0	0.5
30%	0	0.3	0.8	1.0	1.5	1.5	1.2	1.0	0.5
40%	0	0.2	0.5	0.8	1.2	1.2	0.8	0.8	0.5
50%	0	0.2	0.5	0.8	1.2	1.2	0.8	0.8	0.5
60%	0	0.2	0.5	0.8	1.2	1.2	0.8	0.8	0.5
70%	0	0.2	0.5	0.8	1.2	1.2	0.8	0.8	0.5
80%	0	0.1	0.2	0.5	1.0	1.0	0.5	0.5	0.5

90%	0	0.1	0.2	0.5	1.0	1.0	0.5	0.5	0.5
95%	0	0.1	0.2	0.5	0.8	0.8	0.5	0.5	0.5
100%	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0

4.3.2. Pulse Discharge Mode 脉冲放电模式

Table 11 30s Pulse Discharge rate table
表 11 30s 脉冲放电倍率表/C

SOC\T	-20°C	-10°C	-5°C	0°C	5°C	10°C	15°C	25°C	35°C	45°C	55°C	60°C
100%	1.0	1.5	1.8	1.8	1.8	2.0	2.0	2.0	2.0	1.5	1.0	1.0
95%	1.0	1.5	1.8	1.8	1.8	2.0	2.0	2.0	2.0	1.5	1.0	1.0
90%	1.0	1.5	1.8	1.8	1.8	2.0	2.0	2.0	2.0	1.5	1.0	1.0
80%	1.0	1.5	1.8	1.8	1.8	2.0	2.0	2.0	2.0	1.5	1.0	1.0
70%	0.8	0.8	1.5	1.5	1.5	1.8	1.8	2.0	2.0	1.0	0.8	0.8
60%	0.8	0.8	1.5	1.5	1.5	1.8	1.8	2.0	2.0	1.0	0.8	0.8
50%	0.8	0.8	1.5	1.5	1.5	1.8	1.8	2.0	2.0	1.0	0.8	0.8
40%	0.8	0.8	1.5	1.5	1.5	1.8	1.8	2.0	2.0	1.0	0.8	0.8
30%	0.4	0.5	0.8	0.8	0.8	1.0	1.0	1.5	1.5	0.8	0.5	0.5
20%	0.2	0.5	0.8	0.8	0.8	1.0	1.0	1.2	1.2	0.8	0.5	0.5
10%	0.0	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

5. Safety Limits 安全限制

5.1. Voltage Limits 电压限制

Table 12 Safety limit voltage parameters
表 12 安全限制电压参数

Item 项目	Category 类别	Parameters 参数	Protection Action 保护动作
Voltage 电压	First Over-Charging Protection 第一级过充保护	3.70 V	Decrease current or power 降流或降功率
	Second Over-Charging Protection 第二级过充保护	3.80 V	Stop charging 停止充电
	First Over-Discharging Protection	2.0V（T＞0°C） 1.9V（-20°C≤T≤0°C）	Decrease current or power 降流或降功率

	第一级过放保护		
	Second Over-Discharging Protection 第二级过放保护	1.9V（T＞0℃） 1.8V（-20℃≤T≤0℃）	Stop discharging 停止放电

5.2. Temperature Limits 温度限制

Table 13 Safety limit temperature parameters
表 13 安全限制温度参数

Item 项目	Specification 规格	Remark 备注
Recommended Operating Temperature Range 推荐使用温度范围	10℃~45℃	Recommended battery usage temperature range. 推荐使用电池的温度范围
Maximum operating temperature 最高使用温度	60℃	If the battery temperature exceeds the maximum operating temperature, the current needs to be reduced to 0. 如果电池使用温度超过最高操作温度，电流需要降为 0
Minimum operating temperature 最低使用温度	-20°C	If the battery temperature exceeds the minimum operating temperature, the current needs to be reduced to 0. 如果电池使用温度超过最低操作温度，电流需要降为 0

6. Battery Operation Instruction and Precautions 电池操作说明及注意事项

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

The battery life is limited. Customers should establish an effective tracking systemto monitor and record the internal resistance and capacity of each battery during its life. The measurement method and calculation method of internal resistance and capacity need to be discussed and agreed between the customer and EVE Power Co., Ltd. When the internal resistance of the battery in use exceeds 150% of the initial internal resistance of the battery or the capacity is less than 70% of the nominal capacity, the battery should not to operate. Violation of this requirement will exempt EVE Power Co., Ltd. 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湖北亿纬动力有限公司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，将免除湖北亿纬动力有限公司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。

6.2. Long-term Storage 长期存储

After the battery is charged, it should be used as soon as possible to avoid loss of usable capacity due to self-discharge. If storage is required, the battery needs to be stored in a low SOC state. The recommended storage conditions are: 20%~50% SOC 0°C~35°C, relative humidity ≤60%.

电池进行充电后，需尽快使用，以免因自放电而造成可用容量损失。若需要存储，则电池需要在低 SOC 态下进行存储。推荐的存储条件为：20%~50% SOC，0°C~35°C，相对湿度≤60%。

6.3. Transportation 运输

Battery for shipping should be packed in boxes with the SOC of 20%~50%. The severe vibration, impact, extrusion, sun and rain should be prevented during shipping. Applicable methods of transportation include truck, train, ship, airplane, etc.

产品的运输应在 20%~50% SOC 下包装成箱进行。在运输过程中应防止剧烈振动、冲击或挤压、避免日晒雨淋。适用于汽车、火车、轮船、飞机等交通工具运输。

6.4. Operation Precautions 操作说明

- It is strictly forbidden to immerse the battery in water. When it is not in use, it should be placed in a cool and dry environment
- It is forbidden to use and leave the battery next to heat and high temperature sources, such as fire, heater, etc.
- Please use a special charger for lithium-ion batteries when charging
- During usage, it is strictly prohibited to reverse the positive and negative terminals of the battery
- Do not throw the battery in the fire or heater
- It is forbidden to use metal to directly connect the positive and negative terminals of the battery to short-circuit
- It is forbidden to transport or store the battery with metal, such as hairpins, necklaces, etc.
- It is forbidden to knock or throw, step on, or bend the battery.
- It is forbidden to directly weld the battery or pierce the battery with nails or other sharp objects
- It is forbidden to use or place the battery under high temperature (under hot sunlight), otherwise it may cause the battery to overheat or fail to function and shorten its life.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields; otherwise it will easily damage the battery safety protection device and bring hidden dangers of safety.
- If the battery leaks and the electrolyte splashes on the skin or clothes, immediately wash the affected area with running water. If the battery leaks and the electrolyte enters the open parts of the human body such as the eyes, mouth, nose, etc., immediately rinse the eyes with a large amount of water and send to a doctor for treatment immediately, otherwise it will cause serious harm to the human body.
- If the battery emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or

charging, immediately remove the battery from the device or charger and stop using it

- 严禁将电池浸入水中，保存不用时，应放置于阴凉干燥的环境中
- 禁止将电池放在热高温源旁，如火、加热器等旁边使用和留置
- 充电时请选用锂离子电池专用充电器
- 在使用过程中，严禁将电池正负极颠倒
- 禁止将电池丢于火或加热器中
- 禁止用金属直接连接电池正负极
- 禁止将电池与金属，如发夹、项链等一起运输或贮存
- 禁止敲击、抛掷、踩踏或者弯折电池等.
- 禁止直接焊接电池以及用钉子或其它利器刺穿电池
- 禁止在高温下 (炙热的阳光下)使用或放置电池，否则可能会引起电池过热或功能失效、寿命减短
- 禁止在强静电和强磁场的地方使用,否则易破坏电池安全保护装置，带来不安全的隐患
- 如果电池漏液，电解液溅到皮肤或衣服上，应立即用流动的水清洗受影响区域,。如果电池发生泄露，电解液进入眼睛、口、鼻等人体开放部位，应立即用大量清水冲洗眼睛，并马上送医治疗，否则会对人体造成严重伤害。
- 如果电池发出异味、发热、变色、变形或电池在使用、贮存、充电过程中出现任何异常，应立即将电池从装置或充电器中移离并停用

6.5. Disclaimer 免责声明

If the product demanding party does not use the provisions in this manual, which causes social impact and affects the reputation of EVE Power Co., Ltd., EVE Power will pursue the responsibility of the product demanding party. According to the degree of impact on EVE Power, the product demand party must provide compensation to EVE Power.

如果由于产品需求单位不按本说明书中的规定进行使用，造成社会性影响，并对湖北亿纬动力有限公司的声誉造成影响的，湖北亿纬动力有限公司将会追究产品需求单位的责任。根据对湖北亿纬动力有限公司造成的影响程度，产品需求单位需向湖北亿纬动力有限公司提供赔偿。

6.6. Other 其它

Any matters not mentioned in this specification must be negotiated and determined by both parties.

任何本规格书中未提及的事项，须经双方协商确定。

7. Contact Information 联系方式

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8. LF32 Drawing 电池图纸

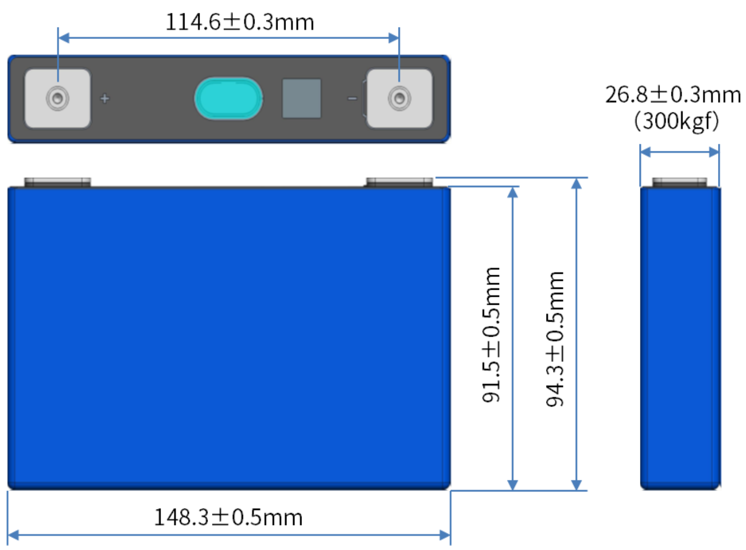

Fig.4 LF32 Battery Drawing

图 4 LF32 电池图纸