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# Product Specification

## Prismatic LFP Cells

### Model: LF304

Drafted by	Product Design Checked by	Quality Checked by	Sales Checked by	Approved by
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EVE Power Co., Ltd.

### Customer Requirements

EVE Power Co., Ltd. requires customer to provide specific requirements and communicates with EVE Power Co., Ltd. in advance. If special applications and operation conditions are inconsistent with the description of this specification, EVE Power Co., Ltd. may design and manufacture products according to customer's inputs.

No.	Special Requirements	Standards
1	/	/
2	/	/
3	/	/

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### Revision History

Version	Date	Contents	Checked By
A	2021.07.12	First issue	Meng He
B	2022.01.26	<ol style="list-style-type: none"> <li>1. Make a distinction between standard charge-discharge ratio and continuous charge-discharge ratio;</li> <li>2. Add the term definition of normal capacity and AC resistance;</li> <li>3. Add the center distance of cell poles;</li> <li>4. Increase the cell cycles to 2000 at 45 °C;</li> <li>5. Complete the cautions of battery in use.</li> </ol>	Meng He
C	2022.03.10	<ol style="list-style-type: none"> <li>1. Add the definition of “fresh battery” and supplement the definitions of “cell temperature” and “charging rate”;</li> <li>2. The initial internal resistance standard in the product performance index is changed to “AC, 1 kHz, 30 % ~ 40 % SOC, Fresh battery”;</li> <li>3. Revision the safety limit parameters;</li> <li>4. Revision the charge and discharge parameters;</li> <li>5. Revision the testing methods of storage;</li> <li>6. Revision the standard of discharge performance;</li> <li>7. Add pretreatment before battery test.</li> </ol>	Meng He
D	2022.11.08	<ol style="list-style-type: none"> <li>1. Add product implementation standards;</li> <li>2. Add the battery performance parameters;</li> <li>3. Add batch definition and traceability requirements;</li> <li>4. Improve transportation and loading and unloading requirements and storage environment and method requirements;</li> <li>5. Add the confidentiality agreement;</li> <li>6. Add the rights and obligations of both parties.</li> </ol>	Tan Zhao

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## Term Definition

**Product:** Refers to 304 Ah rechargeable lithium-ion cell with prismatic aluminum shell manufactured by EVE Power Co., Ltd. (EVE) in this specification.

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

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

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

**Normal capacity:** The minimum capacity that the cell can discharge under the specified discharge conditions which is indicated by the letter Q.

**Fresh battery:** Refers to the state of the battery within 7 days from the date of manufacture of the product.

**Charging Rate:** The ratio between the charging current and the capacity which measured by the battery management system for many times. For example, when the cell capacity is 304 Ah and the charging current is 152 A, the charging rate is 0.5 C. When the cell capacity drops to 280 Ah and the charging current is 140 A, the charging rate is 0.5 C.

**State of charge:** Under unloaded conditions, the ratio of the cell capacity state which measured in ampere-hour or watt-hour to the rated capacity. The abbreviation is expressed by SOC. For example, if the capacity is 304 Ah which considered as 100% SOC, the capacity is 0 Ah, considered as 0% SOC.

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

**Standard charge:** The charging mode described in 4.5 of this specification.

**Standard discharge:** The discharge mode described in 4.6 of this specification.

**Open circuit voltage:** Terminal voltage of the cell under open circuit conditions. The abbreviation is expressed by

**OCV.AC resistance:** Inject 1kHz sine wave current into the positive and negative poles of the cell, and the internal resistance obtained, which abbreviated as ACR, and the test method is as described in section 4.9.3.6 of this specification.

**DC resistance:** The ratio of the voltage change to the corresponding current change under working conditions, the abbreviation is DCR, and the test method is as described in section 4.9.3.6 of this specification.

**Module:** A combination in which more than one cell is combined in series, parallel or series parallel mixed connection and used as a power supply.

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

**Compression force:** When the module is assembled, the cell bears the force perpendicular to the cell stacking direction.

**Units of measurement:** Refer to following table

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Table 1 Units of measurement

No.	Unit	Abbreviation	Type of units
1	(Volt)	V	Voltage
2	(Ampere)	A	Current
3	(Ampere-Hour)	Ah	Capacity
4	(Watt-Hour)	Wh	Energy
5	(Ohm)	$\Omega$	Resistance
6	(Milliohm)	m $\Omega$	Resistance
7	(Degree Celsius)	$^{\circ}\text{C}$	Temperature
8	(Millimeter)	mm	Length
9	(Second)	s	Time
10	(Minute)	min	Time
11	(Hour)	h	Time
12	(Hertz)	Hz	Frequency

## 1. Executive Standard of Product

The components provided by EVE meet the regulations of sales area by customer (mainland, excluding Hong Kong, Macao and Taiwan), and the executive standards are shown in the following table.

The secondary cell meets the following standards:

Table 2 Summary of product execution standards

Standards	Standard Names	Compliance with Standard Terms
GB/T 31484-2015	Cycle life requirements and test methods for traction battery of electric vehicle	Full Text
GB/T 31485-2015	Safe requirements and test methods for traction battery of electric vehicle	Full Text
GB/T 31486-2015	Electrical performance requirements and test methods for traction battery of electric vehicle	Full Text
GB/T 34014-2017	Coding regulation for automotive traction battery	Full Text
GB 38031-2020	Electric vehicles traction battery safety requirements	Full Text

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## 2. Fundamental Information

### 2.1. Scope of Application

This specification is applied to 304 Ah lithium-ion cell with prismatic aluminum shell manufactured by EVE Power Co., Ltd.

### 2.2. Product Type: Prismatic lithium-ion cell with aluminum shell

### 2.3. Product Model : LF304

## 3. Cell Specification

### 3.1. Fundamental Parameters

Table 3 Basic parameters of cell

Items	Standards	Remarks
Min. Capacity	304.0 Ah	0.5 C / 0.5 C, 25 °C ± 2 °C, 2.5 V ~ 3.65 V Fresh battery
Initial IR	0.16 mΩ ± 0.05 mΩ	AC, 1 kHz, 30 % ~ 40 % SOC Fresh battery
Nominal Voltage	3.2 V	0.5 C discharge, 25 °C ± 2 °C, 2.5 V ~ 3.65 V
Weight	5450 g ± 164 g	/
Charging Cut-off Voltage (U <sub>max</sub> )	3.65 V	/
Discharging Cut-off Voltage (U <sub>min</sub> )	2.5 V (T > 0 °C)	/
Maximum Instantaneous Discharging Current	3 C	60 s, ≤ 80% SOC, 25°C ± 2°C
Maximum Instantaneous Charging Current	2 C	
Grouping Initial Preload N	3000 N	It can bear 7000 N within 2 min
Cell Voltage Insulation	≤ 10.5 mA	Force 300 kgf ± 20 kgf, Voltage 1500 V ~ 1550 V, Time 1 s ~ 2 s; Leakage Current ≤ 10.5 mA

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Room Temperature Self-discharge Rate		$\leq 2\%$ / month	50% SOC, 25°C, Fresh battery
High Temperature Self-discharge Rate		$\leq 3\%$ / month	50% SOC, 45°C, Fresh battery
Standard Charging Current		152.0 A	0.5 C
Standard Discharging Current		152.0 A	0.5 C
Cycling Performance	25°C Cycle	4000 Cycles	Under 300 kgf $\pm$ 20 kgf initial compression force, 0.5 C / 0.5 C, 2.5 V ~ 3.65 V, Capacity retention $\geq$ 80%. Or follow the EVE recommended cycling method.
	45°C Cycle	2000 Cycles	
Operation Temperature	Charging Temperature	0°C ~ 65°C	/
	Discharging Temperature	-35°C ~ 65°C	/
Storage Temperature	3 months	0°C ~ 35°C	Delivery SOC State
	1 month	-20°C ~ 45°C	



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Welding Parameter of Al Busbar	Laser Welding Depth	$\leq 2.0$ mm	/
	Max Pressure Force on Poles	700 N	Max force in longitudinal direction, no deformation.
	Max Torque Force on Poles	6 N m	Max torsion, non-loosen.
	Max Temperature Force on Poles	130°C	The maximum temperature that the pole bears when the plastic pad will not deform.

### 3.2. Product Parameters

#### 3.2.1. Dimension and Weight

Table 4 Cell size and weight parameters

No.	Item	Standard	Testing Methods
1	Terminal Height 1 (H1)	207.20 mm $\pm$ 0.50 mm	4.9.1
	Can-top Height (H2)	204.40 mm $\pm$ 0.50 mm	
	Length (L)	173.70 mm $\pm$ 0.50 mm	
	Thickness (T)	71.70 mm $\pm$ 0.80 mm (300 kgf $\pm$ 20 kgf compression force, 30 % ~ 40 % SOC)	
	Center distance of pole (D)	123.00 mm $\pm$ 0.30 mm	/

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2	Weight	Weight (Including external protective film, top insulator and bottom insulator )	5450 g $\pm$ 164 g	4.9.2
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### 3.2.2. Electrical Performance Parameters

Table 5 Cell electrical performance parameters

No.	Item	Standards	Testing Methods
1	Capacity	0.5 C / 0.5 C Capacity, Fresh battery $\geq 304.0$ Ah	4.9.3.1
2	Energy	0.5 C / 0.5 C Energy, Fresh battery $\geq 972.8$ Wh	4.9.3.1
3	Rate Discharge Performance	-20°C Capacity Retention Rate, Fresh battery $\geq 75\%$	4.9.3.2
		0°C Capacity Retention Rate, Fresh battery $\geq 85\%$	4.9.3.3
		25°C Capacity Retention Rate, Fresh battery 100%	/
		45°C Capacity Retention Rate, Fresh battery $\geq 97\%$	4.9.3.4

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		55°C Capacity Retention Rate, Fresh battery	$\geq 97\%$	4.9.3.5	
4	DCR	25°C, 50% SOC, 1 C, 10 s, Fresh battery	$\leq 1.2 \text{ m}\Omega$	4.9.3.6	
5	Cycle	With 300 kgf $\pm$ 20 kgf initial compression force, 25°C $\pm$ 2°C @ 0.5 C / 0.5 C cycle, or follow the EVE recommended cycling method	4000 cycles, Capacity Retention $\geq 80\%$	4.9.3.7 & 4.9.3.9	
		With 300 kgf $\pm$ 20 kgf initial compression force, 45°C $\pm$ 2°C @ 0.5 C / 0.5 C cycle, or follow the EVE recommended cycling method	2000 cycles, Capacity Retention $\geq 80\%$	4.9.3.8 & 4.9.3.9	
6	Storage	25°C, 28 days, Fresh battery, 50% SOC	Capacity Recovery $\geq 98\%$	4.9.3.10	
		45°C, 28 days, Fresh battery, 50% SOC	Capacity Recovery $\geq 97\%$	4.9.3.11	

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### 3.2.3. Safety Performance parameters

Table 6 Cell safety performance parameters

No.	Item	Standard	Testing Methods
1	Over Discharge	No fire, No explosion	4.9.4.1
2	Over Charge	No fire, No explosion	4.9.4.2
3	External Short-circuit	No fire, No explosion	4.9.4.3
4	Heating	No fire, No explosion	4.9.4.4
5	Temperature Cycling	No fire, No explosion	4.9.4.5
6	Extrusion Test	No fire, No explosion	4.9.4.6

### 3.3. Cell Drawing

See Fig.9.

### 3.4. Out Appearance

Refer to the appearance inspection standard for LFP high capacity battery products signed by both parties. If both parties fail to sign the appearance inspection standard, the general appearance standard of EVE shall prevail.

## 4. Testing Conditions

### 4.1. Environmental Conditions

Unless otherwise specified, the test should be carried out in an environmental temperature of  $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ , relative humidity of 10% ~ 90%, and atmospheric pressure of 86 kPa to 106 kPa. The ambient temperature mentioned in this specification refers to  $25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ .

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#### 4.2. Measuring Instrument

The minimum accuracy requirements of measuring instruments and meters are as follows:

- A. Voltage measuring device :  $\pm 0.1\%$  ;
- B. Current measuring device :  $\pm 0.1\%$  ;
- C. Temperature measuring device :  $\pm 0.5^{\circ}\text{C}$
- D. Dimension measuring device :  $\pm 0.01\text{ mm}$  ;
- E. Weight measuring device :  $\pm 0.1\text{ g}$  .

#### 4.3. Testing Clamp Preparation

The single cell needs to be clamped with steel splints or aluminum alloy splints (thickness: greater than or equal to 8 mm). The splints need to cover the large surface of the cell. The splints are fixed with 6 M6 bolts. All sides of the splints need to be covered with insulating film. Fixtures as shown below:

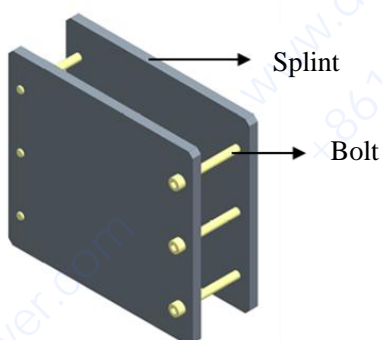


Fig. 1 Schematic diagram of cell clamp

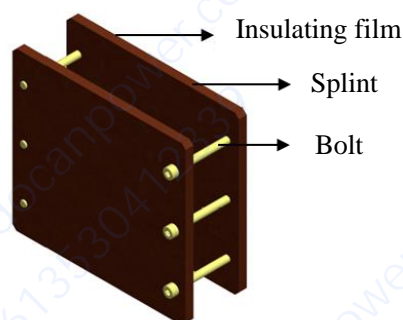


Fig. 2 Insulation film of cell clamp

#### 4.4. Testing Clamp Installation

Place the cell (30% ~ 40% SOC) covered with external protective film (material: PET, thickness 0.11 mm) and top insulator (material: PC, thickness 0.3 mm) in the middle of the clamp, the gap difference between the left and right sides of the two splint should be  $\leq 0.1\text{ mm}$ , and the initial compression force is  $300\text{ kgf} \pm 20\text{ kgf}$ .

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Fig. 3 Schematic diagram of cell coating

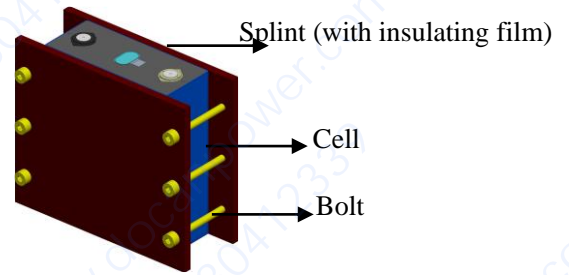


Fig. 4 Side view of cell shaft

#### 4.5. Standard Charge

At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is charged to 3.65 V with constant current of 0.5 C, then charge at constant voltage of 3.65 V until the current decreases to 0.05 C, and rest the cell for 30 min.

#### 4.6. Standard Discharge

At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is discharged to 2.5 V with constant current of 0.5 C, and rest the cell for 30 min.

#### 4.7. Pretreatment

Before the formal test, the battery needs to undergo a pretreatment cycle to ensure that the performance of the test object is activated and stable. The steps are as follows:

- The battery is charged according to the standard charge;
- The battery is discharged according to the standard discharge;
- Repeat a~b no more than 5 times;

If the discharge capacity of the battery changes no more than 3% of the rated capacity for two consecutive times, it is considered that the cell has completed the pretreatment, and the pretreatment cycle can be terminated.

#### 4.8. 1 C Capacity Calibration 1 C

At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  (constant temperature without air convection), the cell is charged to 3.65 V with constant current of 1 C. Then charge at constant voltage of 3.65 V until the current decreases to 0.05 C, rest the cell for 30 min. After that, discharging the cell to 2.5 V with constant current of 1 C, lastly rest for 30 min. Repeat the above steps 5 times, and the average discharge capacity of the last 3 times is the 1 C discharge capacity, which is recorded as  $C_0$ .

#### 4.9. Testing Methods

##### 4.9.1. Dimension

Testing Instrument: Automatic wrapping machine; Testing Method:

- Thickness, length and height of the delivery cell are measured by automatic wrapping machine
- Test conditions: 300 kgf  $\pm$  20 kgf.

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#### 4.9.2. Weight

Test Instrument: electronic scale;

Test Method: weight of the cell is measured by electronic scale.

#### 4.9.3. Electrical Performance

##### 4.9.3.1. 0.5 C Discharge Capacity and Energy

At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is charged to 3.65 V with constant current of 0.5 C, then charge at constant voltage of 3.65 V until the current decreases to 0.05 C, and rest for 30 min. After that, discharge to 2.5 V with constant current of 0.5 C and rest for 30 min. Record the discharge capacity and discharge energy. Repeat the charging method and 0.5 C discharging method 5 times. The average discharge capacity of the last 3 times is the 0.5 C discharge capacity, and the last 3 times average discharge energy is 0.5 C discharge energy.

##### 4.9.3.2. $-20^{\circ}\text{C}$ Capacity Retention Rate

Capacity calibration is carried out according to 4.8. At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is charged to 3.65 V with constant current of 1 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C. After that, rest the cell at  $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 h, and discharge it to 2.0 V with constant current of 1 C under the environment of  $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Discharge capacity is recorded as  $C_1$ , and  $C_1 / C_0$  is the capacity retention rate at  $-20^{\circ}\text{C}$ .

##### 4.9.3.3. $0^{\circ}\text{C}$ Capacity Retention Rate

Capacity calibration is carried out according to 4.8. At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is charged to 3.65 V with constant current of 1 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C. After that, rest the cell at  $0^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 24 h, and discharge it to 2.0 V with constant current of 1 C under the environment of  $0^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Discharge capacity is recorded as  $C_2$ , and  $C_2 / C_0$  is the capacity retention rate at  $0^{\circ}\text{C}$ .

##### 4.9.3.4. $45^{\circ}\text{C}$ Capacity Retention Rate

Capacity calibration is carried out according to 4.8. At ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , the cell is charged to 3.65 V with constant current of 1 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C. After that, rest the cell at  $45^{\circ}\text{C} \pm 2^{\circ}\text{C}$  for 5 h, and discharge it to 2.5 V with constant current of 1 C under the environment of  $45^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Discharge capacity is recorded as  $C_3$ , and  $C_3 / C_0$  is the capacity retention rate at  $45^{\circ}\text{C}$ .

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#### 4.9.3.5. 55°C Capacity Retention Rate

Capacity calibration is carried out according to 4.8. At ambient temperature of 25°C ± 2°C, the cell is charged to 3.65 V with constant current of 1 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C. After that, rest the cell at 55°C ± 2°C for 5 h, and discharge it to 2.5 V with constant current of 1 C under the environment of 55°C ± 2°C. Discharge capacity is recorded as C<sub>4</sub>, and C<sub>4</sub>/C<sub>0</sub> is the capacity retention rate at 55 °C.

#### 4.9.3.6. Internal Resistance

a. ACR: When the SOC is 30%~40% at ambient temperature, test the cell with a frequency of AC 1 kHz.

b. DCR: Capacity calibration is carried out according to 4.8. The cell is charged to 3.65 V with constant current of 1 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C. Rest for 30 min, and discharge with constant current of 1/3 C<sub>0</sub> for 90 min afterwards (adjust the SOC to 50%). Then rest for 2 h, and record the voltage V<sub>1</sub> at the end of the period. Put a 10 s discharge pulse current of 1 C and record the voltage V<sub>2</sub> at the end of the pulse, and calculate the DCR.  $DCR = (V_1 - V_2) \times 1000 / 304.0$  (mΩ).

$$DCR = (V_1 - V_2) \times 1000 / 304.0 \text{ (m}\Omega\text{)}$$

#### 4.9.3.7. 25°C 0.5 C / 0.5 C Cycle

Before the test, prepare the fixture according to 4.3. When the SOC is 30%~40% at ambient temperature, install the test fixture according to the method of 4.4.

Pre-cycle initial capacity test: test the cell capacity (4.9.3.1). and record the initial capacity as C<sub>5</sub>.

Cycle test: ambient temperature 25°C ± 2°C;

a. The cell is charged to 3.65 V with constant current of 0.5 C, and then charge at constant voltage of 3.65 V until the current decreases to 0.05 C and rest for 30 min;

b. Discharge to 2.5 V with constant current of 0.5 C and rest for 30 min;

c. Terminate after 4000 cycles according to steps a~b.

Capacity test after cycle: at ambient temperature of 25°C ± 2°C , discharge the cell to 2.5 V with constant current of 0.5 C. Rest for 30 min, then charging it to 3.65 V with constant current of 0.5 C, and switch to constant voltage charging until the cut-off current is 0.05 C. Rest for 30 min, then discharging to 2.5 V with constant current of 0.5 C, and record the discharge capacity C<sub>6</sub>. The capacity retention rate =

#### 4.9.3.8. 45°C 0.5 C / 0.5 C Cycle

Before the test, prepare the fixture according to 4.3. When the SOC is 30% ~ 40% at ambient temperature, install the test fixture according to the method of 4.4.

Pre-cycle initial capacity test: test the cell capacity (4.9.3.1), and record the initial capacity as C<sub>7</sub>.

Cycle test: ambient temperature 45°C ± 2°C;



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- a. Charge the cell to 3.65 V with constant current of 0.5 C, then switching to constant voltage charging until the cut-off current is 0.05 C, and rest for 30 min;
- b. Discharge to 2.5 V with constant current of 0.5 C and rest for 30 min;
- c. Terminate after 2000 cycles according to steps a~b.

Capacity test after cycle: at ambient temperature of  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , discharge the cell to 2.5 V with constant current of 0.5 C

. Rest for 30 min, then charging it to 3.65 V with constant current of 0.5 C, and switch to constant voltage charging until the cut-off current is 0.05 C. Rest for 30 min, then discharging to 2.5 V with constant current of 0.5 C, and record the discharge capacity  $C_8$ . The capacity retention rate =  $C_8 / C_7 \times 100\%$ .

#### 4.9.3.9. Recommend EVE Cycling Method

Before the test, prepare the fixture according to 4.3. When the SOC is 30% ~ 40%, install the test fixture according to the method of 4.4.

Pre-cycle capacity test: Calibrate the cell capacity (4.8), and record the calibrated capacity as  $C_0$ .

##### Steps of 25 °C Staged Charging Cycle 25 °C

- a. Ambient temperature at  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , staged charge cycle at 300 kgf  $\pm 20$  kgf;
- b. With 1 C constant current charging capacity as 80%  $C_0$ ;
- c. 0.8 C constant current charging to 3.5 V;
- d. 0.5 C constant current charging to 3.6 V;
- e. 0.1 C constant current charging to 3.65 V;
- f. Rest for 30 min in an open circuit state, discharge to 2.5 V with constant current of 1 C, and rest for 30 min;
- g. Repeat steps from b to f. When the cycle capacity retention rate decreases by 5%, the current value of 1 C is adjusted to  $1\text{ C} \times (1 - 5\% \times n)$ ,  $n=1, 2, 3, 4, \dots$ ; ensure that every decay 5% of the charging time remains the same, and the specific steps are shown in the corresponding charging and discharging ammeter of the staged charging cycle;
- h. Terminate after 4000 cycles according to steps b~g.

##### Steps of 45 °C Staged Charging Cycle

- a. Ambient temperature  $45^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , staged charge cycle at 300 kgf  $\pm 20$  kgf;
- b. With 1 C constant current charging capacity as 80%  $C_0$ ;
- c. 0.8 C constant current charging to 3.5 V;

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- d. 0.5 C constant current charging to 3.6 V;
- e. 0.1 C constant current charging to 3.65 V;
- f. Rest for 30 min in an open circuit state, discharge to 2.5 V with constant current of 1 C, and rest for 30 min;
- g. Repeat steps from b to f. When the cycle capacity retention rate decreases by 5%, the current value of 1 C is adjusted to  $1 C \times (1 - 5\% \times n)$ ,  $n=1, 2, 3, 4, \dots$ ; ensure that every decay 5% of the charging time remains the same, and the specific steps are shown in the corresponding charging and discharging ammeter of the staged charging cycle;
- h. Terminate after 2000 cycles according to steps b~g.

Table 7 Corresponding charging current meter for stepped charging cycle

Item	Current /Capacity	Current capacity / calibrated capacity $\times 100\%$ (SOH)			
		> 95%	[95% ~ 90%)	[90% ~ 85%)	[85% ~ 80%)
Charging Current (A)	1 C	250	250	250	250
	0.8 C	243.2	231.04	218.88	206.72
	0.5 C	152	144.4	136.8	129.2
	0.1 C	30.4	28.88	27.36	25.84
Discharging Current (A)	1 C	304.0	304.0	304.0	304.0
1 C constant Current Charge to 80% $C_0$ ;		80 % $C_0$	76 % $C_0$	72 % $C_0$	68 % $C_0$

Remarks:

1. When the cycle capacity retention rate decreases by 5%, the charging current 1 C / 0.8 C / 0.5 C / 0.1 C current value is adjusted to  $1 C / 0.8 C / 0.5 C / 0.1 C \times (1 - 5\% \times n)$  at this time,  $n=0, 1, 2, 3, 4, \dots$ ; set the current according to the charging and discharging ammeter corresponding to the stepped charging.

2. When the charging current is greater than or equal to 250 A, 250 A shall prevail; When the charging current is less than 250 A, the actual current shall prevail.

Capacity calibration is carried out according 4.8. The cell is charged to 3.65 V with constant current of 1 C, switching to constant voltage charging until the cut-off current is 0.05 C, and rest for 30 min. Then discharge to 2.5 V with constant current of 1 C. Rest for 28 days afterwards at ambient temperature of  $25^\circ\text{C} \pm 2^\circ\text{C}$ . At ambient temperature of  $25^\circ\text{C} \pm 2^\circ\text{C}$ , discharging the cell to 2.5 V with constant current of 1 C, rest for 30 min. Then charge it to 3.65 V with constant current of 1 C, switching to constant voltage charging until the cut-off current is 0.05 C, and rest for 30 min. Then discharge to 2.5 V with constant current of 1 C (record the discharge capacity  $C_{10}$ ). Capacity recovery rate= $C_{10} / C_0 \times 100\%$ .

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#### 4.9.3.11. 45°C Storage

Capacity calibration is carried out according 4.8. The cell is charged to 3.65 V with constant current of 1 C, switching to constant voltage charging until the cut-off current is 0.05 C, and rest for 30 min. Then discharge to 2.5 V with constant current of 1 C. Rest for 28 days afterwards at ambient temperature of 45°C ± 2°C. At ambient temperature of 25°C ± 2°C rest for 5 h, and the cell discharge to 2.5 V with constant current of 1 C. Rest for 30 min, charging it to 3.65 V with constant current of 1 C, and switch to constant voltage charging until the cut-off current is 0.05 C. Rest for 30 min, and then discharge to 2.5 V with constant current of 1 C (record the discharge capacity C<sub>11</sub>). Capacity recovery rate= C<sub>11</sub> / C<sub>0</sub> × 100%.

#### 4.9.4. Safety Performance

##### 4.9.4.1. Over Discharge

At ambient temperature of 25°C ± 2°C, the cell is charged to 3.65 V with constant current of 1 C, and then switch to constant voltage charging at 3.65 V, until the charging current decreases to 0.05 C. The cell is discharged with constant current of 1 C for 90 min at the ambient temperature of the safety test. Observe for 1 h. (Refer to GB 38031-2020 electric vehicles traction battery safety requirements)

##### 4.9.4.2. Over Charge

At ambient temperature of 25°C ± 2°C, the cell is charged to 3.65 V with constant current of 1 C, and switch to constant voltage charging at 3.65 V until the charging current reaches 0.05 C, then installing the test fixture according to 3.4. After the cell is charged to 1.1 times of the termination voltage, or 115 % SOC with constant current of not less than 1 / 3 C at the ambient temperature of the safety test, stop charging. Observe for 1 h. (Refer to GB 38031-2020 electric vehicles traction battery safety requirements)

##### 4.9.4.3. External Short-circuit

At ambient temperature of 25°C ± 2°C, the cell is charged to 3.65 V with constant current of 1 C, and then switch to constant voltage charging at 3.65 V until the charging current reaches 0.05 C. The positive and negative terminals of the cell are short-circuited externally for 10 min 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 38031-2020 electric vehicles traction battery safety requirements)

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#### 4.9.4.4. Heating (130°C)

At ambient temperature of 25°C ±2°C, the cell is charged to 3.65 V with constant current of 1 C, and then switch to constant voltage charging at 3.65 V until the charging current reaches 0.05 C. Put the cell into the temperature chamber, and the temperature chamber will rise from room temperature to 130°C ± 2°C at a rate of 5 °C/min, and keep this temperature for 30 min before stopping heating. Observe for 1 h. (Refer to GB 38031-2020 electric vehicles traction battery safety requirements)

#### 4.9.4.5. Temperature Cycling

At ambient temperature of 25°C ±2°C, the cell is charged to 3.65 V with constant current of 1 C, and then switch to constant voltage charging at 3.65 V, until the charging current reaches 0.05 C. Put the cell into the temperature chamber, and adjust the temperature chamber according to the following table and figure, and cycles for 5 times. (Refer to GB 38031-2020 electric vehicles traction battery safety requirements)

Table 8 Temperature cycle corresponding parameter table

Temperature (°C)	Time Increment (min)	Time Accumulation (min)	Temperature Change Rate (°C/min)
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7

#### 4.9.4.6. Extrusion

At ambient temperature of 25°C ±2°C, the cell is charged to 3.65 V with constant current of 1 C, and then switch to constant voltage charging at 3.65 V until the charging current reaches 0.05 C. Test under the following conditions at a safety test environment temperature of 25°C ±2°C:

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a) Extrusion direction: apply pressure perpendicular to the direction of the cell plate, or the same direction that the cell is most susceptible to extrude in the layout of the whole vehicle;

b) The form of the extruded plate: a semi-cylinder with a radius of 75 mm, 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: not more than 2 mm/s;

d) Extrusion degree: stop extruding after the voltage reaches 0 V or the deformation reaches 15% or the extruding force reaches 100 kN or 1000 times the weight of the test object;

e) Keep it for 10 min. Observe for 1 h. (Refer to GB 38031-2020 electric vehicles traction battery safety requirements).

## 5. Charge and Discharge Parameters

The following data is the reference performance data of LF230 cell for reference during BMS design. Actual use is subject to the use mode and conditions agreed by both parties.

### 5.1. Charge Mode

Table 9 Charging mode parameter table

Parameters	Product specifications	Remarks
Standard charging current	0.5 C	25°C ±2°C
Maximum continuous charging current	1 C	
Standard charging cut-off voltage	Single cell ≤ 3.65 V	
Standard charging mode	Refer to section 4.5	
Standard charging temperature	25°C ±2°C	
Absolute charging temperature (cell temperature)	0°C ~ 65°C	No matter what charging mode the cell is in, once the cell temperature exceeds the absolute charging temperature range, charging will stop
Absolute charging voltage	Max 3.65 V	No matter what charging mode the cell is in, once the cell voltage exceeds the absolute charging voltage, the charging will stop

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### 5.2. Other Charging Mode

Table 10 Continuous charging modes / C-cell level (unit: C-Rate)

T / SOC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	100%
0 °C	0	0	0	0	0	0	0	0	0	0	0	0	0
10 °C	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.37	0.12	0.12	0
25 °C	1	1	1	1	1	1	1	1	1	0.8	0.5	0.5	0
45 °C	1	1	1	1	1	1	1	1	1	0.8	0.5	0.5	0
55 °C	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0
65 °C	0	0	0	0	0	0	0	0	0	0	0	0	0

### 5.3. Discharge Mode

Table 11 Discharge mode parameter table

Parameters	Product specifications	Remarks
Standard discharge current	0.5 C	25°C ± 2°C
Maximum continuous discharge current		1 C
Discharge cut-off voltage	2.5 V	Temperature T > 0°C
	2.0 V	Temperature T ≤ 0°C
Standard discharge mode		Refer to section of 4.6
Standard discharge temperature		25°C ± 2°C
Absolute discharge temperature (cell temperature)	-35°C ~ 65°C	No matter what discharge mode the cell is in, once the cell temperature exceeds the absolute discharge temperature range, the discharging will stop
Absolute discharge voltage	Min 2.5 V (T > 0°C) Min 2.0 V (T ≤ 0°C)	No matter what kind of discharge mode the cell is in, once the cell voltage is less than the absolute discharge voltage, the discharging will stop

### 5.4. Other Discharging Mode

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Table 12 Continuous discharge rate / C-cell level (unit: C-Rate)

T / SOC	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
-36 °C	0	0	0	0	0	0	0	0	0	0	0	0	0
-35 °C	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
-20 °C	0	0.06	0.12	0.0.	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
0 °C	0	0.25	0.5	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
25 °C	0	0.38	0.75	1	1	1	1	1	1	1	1	1	1
45 °C	0	0.38	0.75	1	1	1	1	1	1	1	1	1	1
55 °C	0	0.38	0.75	1	1	1	1	1	1	1	1	1	1
65 °C	0	0	0	0	0	0	0	0	0	0	0	0	0

### 5.5. Pulsing Mode

#### 5.5.1. Pulsing Discharging Mode

Table 13 30 s pulse discharge rate / C-cell level (unit: C-Rate)

T\SOC	0 %	5 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	95 %	100%
-36 °C	0	0	0	0	0	0	0	0	0	0	0	0	0
-35 °C	0	0	0	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
-30 °C	0	0.03	0.06	0.12	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
-25 °C	0	0.06	0.12	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
-15 °C	0	0.06	0.12	0.25	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
-10 °C	0	0.12	0.25	0.62	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
-5 °C	0	0.25	0.5	1	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12	2.12
0 °C	0	0.28	0.56	1.06	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18
5 °C	0	0.31	0.62	1.12	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
10 °C	0	0.33	0.66	1.22	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
15 °C	0	0.34	0.68	1.32	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63
20 °C	0	0.36	0.72	1.41	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
25 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3
30 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3
35 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3
40 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3
45 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3

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50 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3	3
55 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3	3
60 °C	0	0.38	0.75	1.5	3	3	3	3	3	3	3	3	3	3
65 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### 5.5.2. Pulsing Feedback Mode

Table 14 30 s pulse feedback rate / C-cell level (unit: C-Rate)

T\SOC	0 %	5 %	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	95 %	98 %	100 %
0 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 °C	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.25	0.25	0.25	0
10 °C	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.4	0.25	0.25	0
15 °C	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	0.6	0.4	0.4	0
20 °C	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	0.8	0.4	0.4	0
25 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
30 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
35 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
40 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
45 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
50 °C	2	2	2	2	2	2	2	2	2	2	1.6	0.8	0.8	0
55 °C	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.2	0.8	0.8	0
60 °C	0	0	0	0	0	0	0	0	0	0	0	0	0	0

## 6. Safety Limits

### 6.1. Application Conditions

The customer shall ensure strict compliance with the following battery application conditions.

- The customer shall configure a battery management and monitoring system to strictly monitor, manage and protect each battery.
- The customer shall establish battery management archives for tracing problems.
- The customer shall keep complete monitoring data of battery operation for reference of product quality responsibility division. **EVE is not responsible for product quality assurance if it does not have complete monitoring data of the battery system during its service life.**



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- d) The waterproof and dustproof problems of the battery shall be fully considered in the design of the battery pack, and the battery pack must meet the waterproof and dustproof grade stipulated by relevant national standards. **EVE is not responsible for the damage (such as corrosion, rust, etc.) of the battery caused by waterproof and dustproof problems.**
- e) **It is forbidden to mix different types of cells in the same battery system (or vehicle), otherwise, EVE will not be responsible for quality assurance.**

## 6.2. Voltage Limits

Table 15 Safety limit voltage parameters

Item	Category	Parameters	Protective Action
Charging Voltage	Charging Ends	3.65 V	When the battery voltage reaches 3.65 V, stop charging.
	First Over-Charging Protection	3.80 V	When the battery voltage reaches 3.8 V, stop charging.
	Second Over-Charging Protection	3.85 V	When the battery voltage reaches 3.85 V, stop charging and lock the battery management system until the technician solves the problem.

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Discharging Voltage	Discharging Ends	Min 2.50 V	Temperature $T > 0^{\circ}\text{C}$ . When the battery voltage reaches 2.5 V, reduce the current to the minimum.		
		Min 2.00 V	Temperature $T \leq 0^{\circ}\text{C}$ . When the battery voltage reaches 2.0 V, reduce the current to the minimum.		
	First Over-Discharging Protection	Min 2.00 V	Temperature $T > 0^{\circ}\text{C}$ . When the battery voltage reaches 2.0 V, reduce the current to the minimum.		
		Min 1.90 V	Temperature $T \leq 0^{\circ}\text{C}$ . When the battery voltage reaches 1.9 V, reduce the current to the minimum.		
	Second Over-Discharging Protection	Min 1.85 V	Temperature $T > 0^{\circ}\text{C}$ . When the battery voltage is lower than 1.85 V, stop charging and lock the battery management system until the technician solves the problem.		
		Min 1.75 V	Temperature $T \leq 0^{\circ}\text{C}$ . When the battery voltage is lower than 1.75 V, stop charging and lock the battery management system until the technician solves the problem.		
BMS protection	Short circuit protection	Short circuit is not allowed	When a short circuit occurs, the cell is disconnected by the overcurrent device		
	Long charging time Protection	Charging time within 8 h	If the charging time is longer than 8 h, the charging will be terminated		

#### Remarks

- a) **Charge protection and discharge protection are warning clauses, please note: when the battery reaches indicators and parameters status of any described terms, it means that the battery has already beyond the conditions of use of the provisions in this specification. The customer shall take protective measures for the battery according to the “Protective Action” and other relevant provisions in this specification. At the same time, EVE disclaims any warranty liability for the quality of the batteries in the above states of use, and EVE will not compensate customers and the third parties for any loss caused by this situation.**

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b) **Avoid over discharge of the battery. When the battery voltage falls below 1.85 V / 1.75 V, permanent damage to the battery interior may occur, at this time, EVE's product quality assurance responsibility becomes invalid. When the cut-off voltage of discharge is below 2.5 V / 2.0 V, the internal energy consumption of system is minimized and the sleep time is extended before recharging. The customer needs to train the user to recharge the battery in the shortest time and prevent the battery from entering the over-discharge state.**

### 6.3. Temperature Limits

Table 16 Safety limit temperature parameters

Item	Value	Remarks
Recommended Operating Temperature Range	10°C ~ 35°C	Recommend cell usage temperature range.
Maximum operating temperature	60°C	If the cell temperature exceeds the maximum operating temperature, the power needs to be reduced to 0.
Minimum operating temperature	-35°C	If the cell temperature exceeds the minimum operating temperature, the power needs to be reduced to 0.
Maximum safe temperature	65°C	If the cell temperature exceeds the maximum safe temperature, it will cause irreversible and permanent damage to the cell, and the user should not use it higher than the maximum safe temperature.
Minimum safe temperature	-35°C	If the cell temperature exceeds the minimum safe temperature, it will cause irreversible and permanent damage to the cell, and the user should not lower the minimum safe temperature when using it.

#### Remarks

a) **Avoid charging the battery at low temperatures (including but not limited to standard charge, quick charge, emergency charge and regenerative charge) prohibited by this specification, otherwise unexpected capacity reduction may occur. The battery management system should be controlled according to minimum charging and regenerative charging temperatures. Charging at temperatures lower than specified in this specification is prohibited, otherwise, EVE will not bear all relevant responsibilities such as quality assurance liability and loss compensation caused thereby.**

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b) The heat dissipation of battery should be fully considered in the design of battery pack, EVE is not responsible for the quality assurance caused by overheating due to the heat dissipation design of battery pack.

## 7. Batch Definition and Traceability Requirements

### 7.1. Batch Management Shipment

The cells are delivered according to batch management. The cells that are stably produced within seven consecutive days of the production line are defined as the same batch. For example, the cells produced from Jan. 1-Jan. 7 are of the same batch. Other unresolved matter is subject to the cooperation agreement between the both party.

### 7.2. Traceability Requirements

The battery meets the relevant provisions in the interim provisions on the management of recycling and traceability of new energy vehicle power batteries. The specific requirements are shown in the figure below:

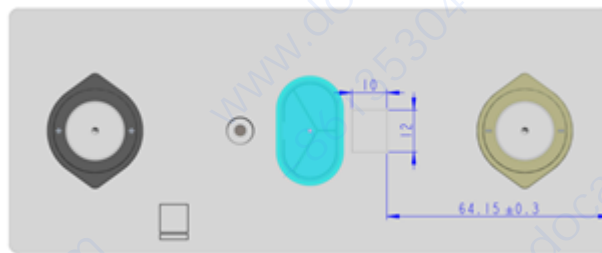


Fig.5 Schematic diagram of battery tracing QR code location



Fig.6 Schematic diagram of QR code knot

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- X1~X3: Manufacturer code: EVE code: 04Q;
- X4: Product type code: secondary: C; battery module: M; power battery pack (group): P;
- X5: Battery type code: The main body of the positive active material of the single power battery is LF code: B;
- X6~X7: Specification code: LF304 code: 73;
- X8~X14: Traceability information code;
- X15~X17: Production date code;
- X18~X24: Serial number;

## 8. Parameters Recommendation for Module Design

### 8.1. Cell Directions

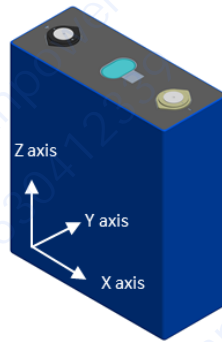


Fig.7 Schematic diagram of LF304 cell direction

### 8.2. Cell Compression Force

#### Test Conditions

- a) Compression speed : 0.02 mm/s
- b) Compression direction : Y direction Y
- c) Cell SOC: 30% ~ 40% SOC

Table 17 Cell compression force limit parameters

Observation	Compression Force
Compression force	3 kN ~ 5 kN
Normal bearing maximum compression force	7 kN

It can be seen from the above table, that the compression force of the cell cannot exceed 7 kN, otherwise the cell may be damaged.

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### 8.3. Cell Expansion Force

#### 8.3.1. Testing Conditions

Before the test, prepare the expansion force clamp, place the cell in the middle of the clamp at 30% ~40% SOC, and the initial compression force is 300 kgf  $\pm$  20 kgf.

##### 8.3.1.1. 0.5 C / 0.5 C Cycle 0.5 C / 0.5 C

At ambient temperature:

- Charge: 0.5 C constant current charge to 3.65 V, then constant voltage charge to cut-off current 0.05 C, rest for 30 min.
- Discharge: discharge at 0.5 C constant current to 2.5 V, and rest for 30 min.
- The charge-discharge cycle is 4000 times.

##### 8.3.1.2. Recommend EVE Cycling Method

- Ambient temperature at 25°C  $\pm$  2°C, staged charge cycle at 300 kgf  $\pm$  20 kgf;
- With 1 C constant current charging capacity as 80% C<sub>0</sub>;
- 0.8 C constant current charging to 3.5 V;
- 0.5 C constant current charging to 3.6 V;
- 0.1 C constant current charging to 3.65 V;
- Rest for 30 min in an open circuit state, discharge to 2.5 V with constant current of 1 C, and rest for 30 min;
- Repeat steps from b to f for 4000 times. When the cycle capacity retention rate decreases by 5%, the current value of 1 C is adjusted to 1 C  $\times$  (1 - 5%  $\times$  n), n=1, 2, 3, 4, ...; ensure that every decay 5% of the charging time remains the same, the specific steps are shown in the table 6;

#### 8.3.2. Testing Results

Table 18 Cell expansion force parameter

Expansion Force	BOL	$\leq 3$ kN
	EOL	$\leq 30$ kN

### 8.4. Recommend Temperature Collection Points

When collecting temperature on the cell surface, it is recommended that the temperature collection points to be arranged at the center of the poles and the surface, as shown in the figure below.

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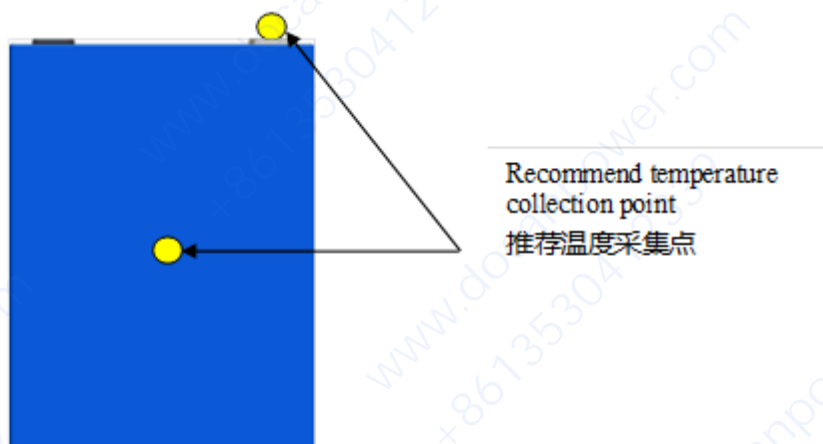


Fig.8 Schematic diagram of LF304 cell temperature collection point

## 9. Cell Operation Instructions and Precautions

### 9.1. Product End-life Management

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 EVE. When the internal resistance of the cell in use exceeds 150% of the initial internal resistance of the cell, or the capacity is less than 70% of the nominal capacity, the cell should not to be operated. **Violation of this requirement will exempt EVE from its responsibility for product quality assurance in accordance with the product sales agreement and this specification and all related liabilities such as loss compensation caused thereby.**

### 9.2. Long-term Storage

After charge, the cell should be used as soon as possible to avoid loss of usable capacity due to self-discharge. If storage is required, the cell needs to be stored in a low SOC state. The recommended storage conditions are: 30% ~ 40% SOC, 0°C ~ 35°C, relative humidity ≤ 60%.

### 9.3. Transportation and Handling Requirements

- It is not allowed to ship with inflammable, explosive and corrosive articles in the same vehicle during transportation, and stacking is prohibited during large package transportation; The product shall not be subjected to rain, snow or liquid substances and mechanical damage;
- When loading and unloading products, lift trucks or special tools shall be used to load and unload products; Handle with care, do not throw or squeeze, which may cause battery damage or personal injury. It is strictly prohibited to put it together with corrosive substances such as acid and alkali.

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#### 9.4. Operation Precautions

- It is strictly forbidden to immerse the cell in water. When it is not in use, it should be placed in a cool and dry environment.
- It is forbidden to use and place the cell next to a hot and high temperature source, such as fire or heater. The temperature of the battery cannot exceed 65°C in any normal use, otherwise the battery management system must shut down the battery and stop running the battery.
- Please use a special charger for lithium-ion batteries when charging.
- Do not overcharge the cell. Otherwise, cell overheating and fire may occur. During cell installation and use, hardware and software must be protected against multiple overcharge failures. See 6.2 of this specification for the minimum requirements of protection.
- During use please connect the positive and the negative of the cell strictly according to the labels and instructions, and forbid reverse charging.
- It is forbidden to use metal to directly connect the positive and the negative of the cell to short-circuit. Otherwise, strong current and high temperature may cause personal injury or fire.
- It is forbidden to transport or store the cell with metal, such as hairpins, necklaces, etc.
- It is forbidden to knock or throw, step on, or bend the cell.
- It is forbidden to directly weld the cell or pierce the cell with nails or other sharp objects
- Try to protect the battery from mechanical shock, collision and pressure impact. Otherwise, the battery may be short-circuited internally, resulting in high temperature and fire.
- It is forbidden to use or place the battery at a high temperature (under the hot sun). Otherwise, the battery may overheat, fail to function, and its service life may be shortened.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields; otherwise it will easily damage the protection device of cell safety and bring potential for insecurity.
- Normal charging should be terminated when charging exceeds 8 hours. When charging for longer than a reasonable time limit, the battery occurs overheat, potentially causing thermal runaway and fire. A timer should be installed for protection. Once the charging current reaches a certain overcharge state that cannot be terminated, the timer will kick in and terminate the charge.
- Improper charging termination may occur during battery charging. Such as: charging beyond the allowed charging time, when charging voltage is too high or charging current is too strong, the charge is terminated. This phenomenon is defined as “inappropriate termination of charging”. When this happens, it can mean that the battery system is leaking electricity or some components are faulty. Continuing to charge the battery before the root cause is identified and resolved may cause the battery to overheat or catch fire. When the above phenomenon occurs, the battery management system should prohibit subsequent charging through the automatic lock function and remind the user to return the product with the battery to the dealer for system maintenance. The battery can be recharged only after a thorough inspection by a qualified technician to determine the root cause, solve it thoroughly and improve it.
- The customer shall securely secure the battery to a solid surface and securely bind the power cord in place to avoid arcing and sparks caused by friction.
- Do not use plastic to encapsulate batteries or use plastic for electrical connection. Improper electrical connection may cause overheating during battery use.



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- If the battery leaks and the electrolyte spills onto the skin or clothes, immediately wash the affected area with running water. If the battery leaks and the electrolyte enters the eyes, mouth, nose and other open parts of the human body, immediately wash the eyes with plenty of water and seek medical treatment immediately, otherwise serious injuries will be caused to the human body. No person or animal is allowed to swallow any part of the battery or any substance contained in the battery.
- If the cell emits peculiar smell, heat, discoloration, deformation, or any abnormality during use, storage, or charging, immediately remove the cell from the device or charger and stop using it.
- It is prohibited to disassemble the product without the written consent of EVE.

## 9.5. Disclaimer

**If the product demand unit or user does not use the product in accordance with the provisions of this manual, EVE will no longer bear all relevant responsibilities such as product quality assurance liability and loss compensation caused thereby. In case of any negative impact on EVE's reputation due to the above-mentioned acts, EVE reserves the right to investigate the legal liability of the product demand unit.**

## 10. Confidentiality agreement

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

## 11. Rights and Obligations of Both Parties

### 11.1. Rights and Obligations of EVE

- EVE shall inspect according to the inspection standards in the protocol signed with Customer, and the products provided shall meet the requirements of various parameters in the protocol;
- EVE shall provide customer with stable and reliable products confirmed by both parties;
- EVE is obliged to provide high-quality services for its products, and the service standards shall be in accordance with the standards promised by EVE;
- EVE shall provide timely technical support and service in case of any problem or failure during the use and maintenance of system products by customer;

### 11.2. Rights and Obligations of Customer

- Customer must conduct production in strict accordance with the technical data provided by EVE, and strictly implement the battery prevention measures, safety limits and battery operation instructions in the technical data provided by EVE.
- Customer has the obligation to ensure the safety of products by EVE and shall take corresponding fire prevention, waterproof and other measures.

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- Customer has the obligation to make fair and detailed use records and monitoring data of product operation for EVE's products, which can be used as a reference for the division of product quality responsibilities. If there is no complete monitoring data within the service life of the battery system, EVE shall not be responsible for product quality assurance.
- Customer has the obligation to notify EVE's personnel to be present and understand the actual situation when products of EVE operate abnormally.
- In the process of product manufacturing, customer shall bear the corresponding responsibilities for the problems or accidents caused by the operation in violation of the safety rules, the use beyond the conditions specified in this technical agreement and the combination of the product and the circuit (not the quality defects of the product itself).
- The customer shall configure a battery management and monitoring system to strictly monitor, manage and protect each battery. The battery management file shall be established for the purpose of tracing problems.
- In the design of the battery pack of customer, the waterproof and dustproof problems of the battery shall be fully considered. The battery pack must meet the waterproof and dustproof levels specified in relevant national standards. EVE shall not be responsible for the quality assurance of the battery or battery damage (such as corrosion, rust, etc.) caused by waterproof and dust-proof problems.

## 12. Risk Warning

### 12.1. Warning Declaration

**Warning**

**The battery has potential hazards, and take proper precautions when operating and maintaining the battery!**

**The battery must be operated with proper tools and protective equipment.**

**Battery maintenance must be performed by professional with battery expertise and safety training.**

**Failure to comply with these warnings could result in multiple disasters.**

### 12.2. Types of Dangerous

The customer is aware of the following potential hazards in the use and operation of batteries:

- a) The operator may be injured by chemicals, electric shocks, or electric arcs during operation. Although the human body reacts differently to direct current and alternating current, DC voltage higher than 50 V is just as serious as alternating current. Therefore, the customer must adopt a conservative posture during operation to avoid the injury of current.
- b) There is a chemical risk from the electrolyte in the battery.
- c) When operating batteries and selecting personal protective equipment, customers and their employees must take these potential risks into account to prevent accidental short circuits, arcing, explosions or thermal runaway.

## 13. Other

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

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### 14. Contact Information

Address: EVE Power Co., Ltd., No. 68 Jingnan Avenue High-Tech Zone, Duodao District, Jingmen, Hubei .

### 15. Cell Drawing of LF304 LF304

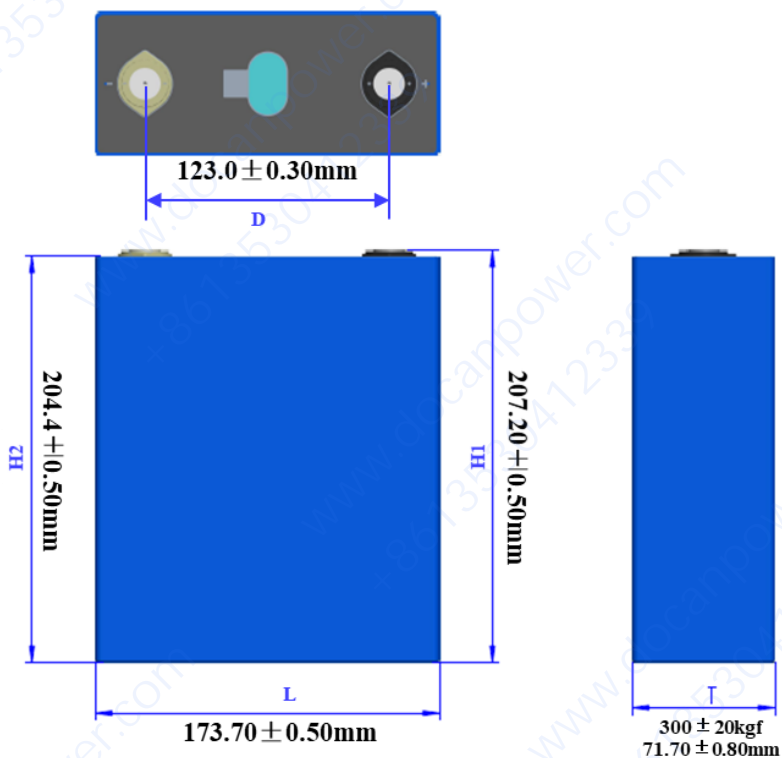


Fig.9 Cell Drawing of LF304