Technical manual

ELERIX EX-L110

Lithium Cell LiFePO4
(3.2V/110Ah)

www.elerix.com

PRODUCT WEBPAGE >

EX-L110

Glossary

Terms	Definition
Product	„Product“ in this specification refers to EX-L110 rechargeable lithium ion phosphate battery produced by ELERIX.
Room Temperature	25 ± 2°C
Cell Temperature	The temperature of the positive terminal of the battery.
Charge Rate (C-Rate)	A current corresponding to the manufacturer’s rated capacity (in ampere-hours) for n hours discharge, namely 1/nC. For example, if the battery’s rated one hour capacity is 110Ah, then 1C is 110A and 2C is 220A.
Cycle life	With the repeated charge-discharge, the capacity of cell will gradually decline. Usually the rated capacity of the cell is as a standard, the repeated number of charge-discharge is called cycle life before the capacity is less than 80% of its rated capacity.
Open circuit voltage (OCV)	Open-circuit voltage is the potential difference between positive and negative terminals of a cell with no load current flowing.
Operating Voltage	Operating voltage, known as the discharge voltage or load voltage, is defined as the potential difference between the cell positive and negative terminals when the load current is flowing. Operating voltage is always lower than the open circuit voltage, because when the current flow through the cell inside, the polarization resistance and ohmic internal resistance must be overcome.
Charge retention capability	Charge retention is the discharge capacity as a percentage of the initial capacity after the cell stored at a specific temperature for a specific time.
Capacity recovery capability	Capacity recovery capability is the discharge capacity as a percentage of the initial capacity after recharging when the cell was stored at a specific temperature for a specific time.
State of charge (SOC)	The available capacity in a battery expressed as a percentage of rated capacity. Only estimating the SOC accurately can improve the utilization efficiency of the cell, and ensure the life and safety of the cell.

ELERIX EX-L110

Lithium Cell LiFePO4
(3.2V/110Ah)

1. Scope

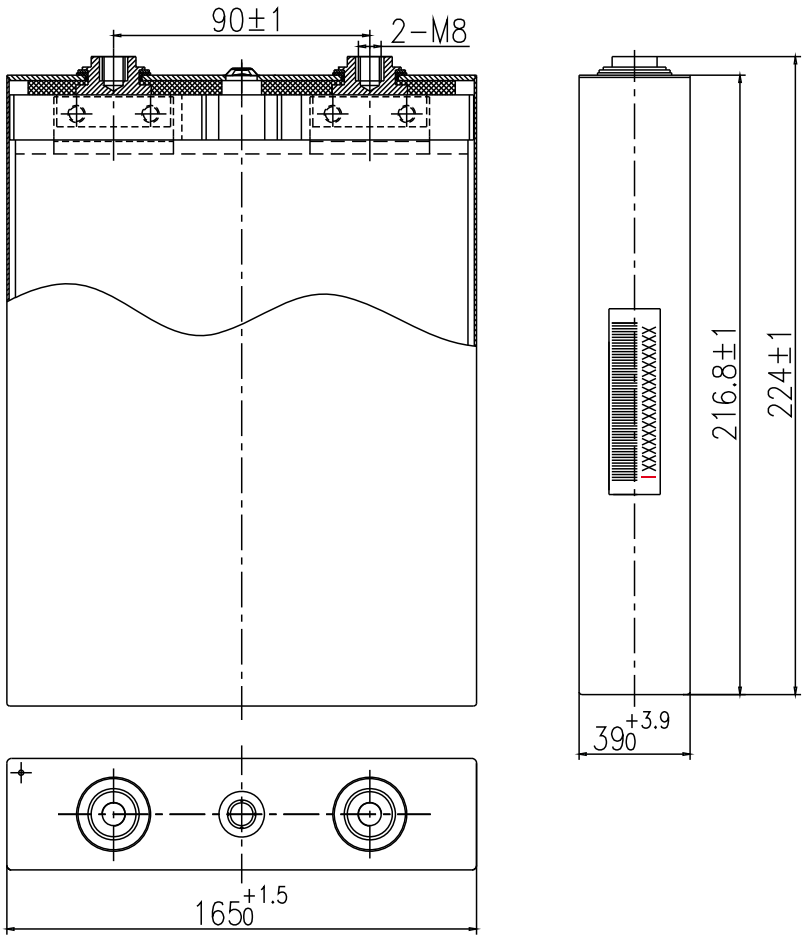
This specification contains the performance indexes, technical parameters and safety issue of the EX-L110 lithium iron phosphate cell manufactured by ELERIX.

2. Product Type

Product Name: Lithium iron phosphate cell
Specification: EX-L110

3. Dimensions

Items	Dimensions (mm)
L	39 ± 3.9
W	165 ± 1.5
H	224 ± 1



4. Parameters

4.1 TECHNICAL PARAMETERS

NO.	Items	Parameter	Remarks
1	Nominal Capacity	110Ah	Standard Discharge
2	Operating Voltage	2.5 ~ 3.65V	
3	Internal Resistance (Ac. 1kHz)	≤ 0.8mΩ	New Cell, 40% SOC
4	Charging Time	Standard Charge: 1 ~ 5h Fast Charge: 0.7 ~ 1h	
5	Recommended SOC Window	SOC: 10% ~ 90%	
6	Operating Temperature	Charging temperature: -10 ~ 50°C Discharging temperature: -20 ~ 60°C	
7	Weight	≤ 2.79kg	
8	Shell Material	Aluminium	

4.2 CHARGING MODEL

NO.	Items	Parameter	Remarks
4.2.1	Standard Charging Model	The cell shall be charged to 3.65V with a constant current of 36.7A, then,charged continuously with constant voltage of 3.65V until the current was not more than 5.5 ± 0.5A at ambient temperature of 25 ± 2°C.	
4.2.2	Standard Charging Temperature	25 ± 2°C	Cell Temperature
4.2.3	Maximum Charging Temperature	50°C	No matter any charging model, once the temperature of the cell is above the maximum charging temperature, charging should be stopped at once.
4.2.4	Maximum Charging Voltage	Maximum 3.75V	No matter any charging model, including pulse charging, once the voltage of the cell is above the maximum charging voltage, charging should be stopped at once.

4.2.5 Charging Current Limit at Different Temperature more than 3 minutes

Cell temperature	< -10°C	-9 ~ 0°C	0 ~ 5°C	6 ~ 15°C	16 ~ 35°C	36 ~ 40°C	41 ~ 45°C	46 ~ 50°C	> 51°C
Maximum charging current	0	0.1C	1/3C	1C	160A	1C	1/3C	0.1C	0

NOTE

The SOC and SOC increase should be less than 70% and 30%, respectively, at 1.5C rate charging.

4.3 At different SOCs and temperatures, the maximum charging current allowed and the pulse duration are shown in the following table:

SOC	Cell Temperature						
	≤ -10°C	-10 ~ 0°C	0 ~ 10°C	10 ~ 35°C	35 ~ 45°C	45 ~ 50°C	≥ 50°C
> 90%	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed	Not allowed
> 80%	Not allowed	Not allowed	1C/5s	1C/10s	1C/10s	1C/10s	Not allowed
> 70%	Not allowed	1C/5s	1C/10s	1.5C/10s	1.5C/10s	1C/10s	Not allowed
< 70%	Not allowed	1C/10s	1C/10s	2C/10s	1.5C/10s	1C/10s	Not allowed

After each brake charging, the battery needs to rest for a certain time, which should be equal to or longer than the duration of the pulse charging. During the rest, the battery can be discharged in low rate, or in a non-working state. But in the rest period, the battery is not allowed to pulse recharge again.

4.4 DISCHARGING MODEL

NO.	Items	Parameter	Remarks
4.4.1	Standard Discharging Model	The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C.	
4.4.2	Maximum Constant Discharging Current	220A	Maximum duration: 3 min
4.4.3	Maximum Pulse Discharging Current (Long Pulse)	250A	Maximum duration: 1 min
4.4.4	Maximum Pulse Discharging Current (Short Pulse)	275A	When battery temperature is below 50°C, the maximum pulse discharge duration should be not more than 30s.
4.4.5	Standard Discharging Temperature	25 ± 2°C	Cell Temperature
4.4.6	Maximum Discharging Temperature	60°C	No matter any discharging model, once the cell temperature is above the maximum discharging temperature, discharging should be stopped at once.

4.5 ELECTRICAL PERFORMANCE

4.5.1 Test Conditions

Unless otherwise specified, all tests should be executed at ambient temperature: 25 ± 2°C, relative humidity: 15% ~ 90%RH and atmospheric pressure: 86kPa ~ 106kPa.

4.5.2 Performance Criterion

NO.	Items	Requirements	Test Methods
1	Appearance	No damage, leakage, oil contamination. Legibly marked.	Visual Inspection
2	Discharging performance at 25°C	Discharging Capacity ≥ 110Ah	The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C, calculating the discharge capacity (in Ah).
3	Discharging characteristics under high temperature	Discharging Capacity: capicity ≥ 95% of initial capacity at 55°C	High-temperature discharge capacity: a) Standard charge; b) Rest for 5h at 55 ± 2°C; c) The cell should be discharged to 2.5V with a current of 110A at 55 ± 2°C, calculating the capacity (in Ah).

ELERIX EX-L110

Lithium Cell LiFePO4
(3.2V/110Ah)

NO.	Items	Requirements	Test Methods
4	Discharging characteristics under low temperature	Discharging Capacity: capacity ≥ 75% of initial capacity at -20°C	Low-temperature discharge capacity test: a) Standard charge; b) Rest for 24h at -20 ± 2°C; c) The cell should be discharged to 2.0V with a current of 110A at -20 ± 2°C, calculating the capacity (in Ah).
5	Rate charge performance	Capacity ≥ 90% of initial capacity	a) The cell should be discharged to 2.5V with a current of 110A at ambient temperature of 25 ± 2°C, rest for 1h; b) The cell should be charged to 3.75V with a current of 200A at ambient temperature of 25 ± 2°C, rest for 1h; c) The cell should be discharged to 2.5V with a current of 110A at ambient temperature of 25 ± 2°C. Calculating discharge capacity (in Ah).
6	Rate discharge performance	Capacity ≥ 90% of initial capacity	a) Standard charge; b) The cell should be discharged to 2.5V with a current of 275A at ambient temperature of 25 ± 2°C; c) Calculating discharge capacity (in Ah).
7	Charge retention and capacity recoverable capability under room temperature	Charge retention ≥ 85% of initial capacity; Capacity recovery ≥ 90% of initial capacity.	Charge retention and capacity recoverable capability in ambient temperature: a) Standard charge; b) The cell shall be stored on open circuit for 28 days. The average ambient temperature shall be 25 ± 2°C; c) The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C,calculating the charge retention capacity (in Ah); d) Then standard charged again; e) The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C, calculating the recovery capacity (in Ah).
8	Charge retention and capacity recoverable capability under high temperature	Charge retention ≥ 80% of initial capacity; Capacity retention rate ≥ 90% of initial capacity.	Charge retention and capacity recoverable capability under high temperature: a) Standard charge; b) Stored for 7 days at 55 ± 2°C; c) After stored for 5 hours at ambient temperature of 25 ± 2°C, the cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C,calculating the charge retention capacity (in Ah); d) Then standard charged again; e) The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C, calculating the recovery capacity (in Ah).
9	Cycle Life	≥ 3000 cycles	a) Standard charge; b) The cell shall be discharged to 2.5V with a constant current of 110A at ambient temperature of 25 ± 2°C; c) Repeating steps of a) ~ b), until the discharge capacity reached to 80% of rated capacity, the number of cycles completed was defined as the battery cycle life.

4.6 SAFETY CHARACTERISTICS

NO.	Items	Technical Requirements	Test Methods & Steps
1	Overcharge	No explosion. No fire.	a) Standard charge; b) The cell should be charged to 5.625V with a constant current of 110A, or charged for 1h, then observing for 1h.
2	Over-disc harge	No explosion. No fire. No leakage.	a) Standard charge; b) The cell should be discharged for 90 min with a constant current of 110A, then observing for 1h.
3	Short-circuit	No explosion. No fire.	a) Standard charge; b) Connect the positive and negative of battery (group) by the external conductor for 10 min, the external conductor resistance should be less than 5 mΩ, then observing for 1h.
4	Nail penetration	No explosion. No fire.	a) Standard charge; b) Penetrating the cell (battery module) from the vertical direction throughout the inside plates with the φ 5 mm ~ φ 8 mm needle at a speed of (25 ± 5) mm/s (leaving needle in the battery), then observing for 1h.
5	Crushing	No explosion. No fire.	a) Standard charge; b) The test should be carried out according to the following conditions: Squeezing direction: Pressure perpendicular to the battery plates; Squeezing paper shape: half cylinder with 75mm diameter, whose length is more than the size of cell, but less than 1m; Squeezing speed: (5 ± 1) mm/s; Squeezing level: Until the battery voltage becomes 0V or the deformation is to 30% or the press is to the value listing in table 1, stop squeezing; c) Observing for 1h.
6	Drop	No explosion. No fire. No leakage.	a) Standard charge; b) The cell(battery module) drops with two terminals down from a height of 1.5m onto the cement floor freely, observing for 1h.
7	Heating	No explosion. No fire.	a) Standard charge; b) Subject the cell (battery module) into heater by raising the temperature from ambient temperature to 130°C at a constant heating rate of 5°C/min, shut down the heater after holding 30 min, observing for 1h.
8	Seawater immersing	No explosion. No fire. No leakage.	a) Standard charge; b) The cell(battery module) should be immersed entirely into 3.5(wt)% NaCl solution for 2h.

NO.	Items	Technical Requirements	Test Methods & Steps
9	Temperature cycling	No explosion. No fire.	a) Standard charge; b) Subject the cell or module into the heater, the temperature should be adjusted according to table 2, repeat 5 times, observing for 1h.
10	Low air pressure	No explosion. No fire.	a) Standard charge; b) Subject the cell or module into the low air pressure box, and set air pressure at 11.6 kPa, rest for 6h at room temperature, observing for 1h.

Table 1 Squeezing force selecting standard

Cell number /n	Squeezing force/ KN
1	200
2-5	100*n
> 5	500

Table 2 temperature and time of one temperature cycle test

Temperature/°C	Time increment/min	Cumulative time/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

5. Precautions for Transportation

Battery should be packed in box for transportation at less than 60% SOC. Severe vibration, shock or extrusion, sun-scorched and rain-drenched should be prevented, and battery upside down is prohibited. The batteries could be delivered by vehicles, trains, ships and other transport vehicles. MH/T 1020-2013 „lithium battery air transport specifications“ standard could be referred when air transport is used.

6. Precautions for Storage

The battery should be stored (more than 1 month) in a clear, dry and ventilated room under ambient temperature of -20°C ~ 25°C, and it should be far away from caustic material, fire source and heat source. Battery upside down is prohibited in the storage process, and mechanical shock and stress should be avoided.

It should be charged and discharged at the standard model every six months if the batteries will be kept for a long time, and be stored in a state of 20% ~ 40% SOC (voltage scope: 3.215V ~ 3.305V).

The requirements of storage temperature and humidity are as follows.				
1	Storage Temperature	Standard Storage Temperature Maximum storage Temperature	-20°C ~ 25°C -20°C ~ 45°C	Short term (within 1 month)
2	Storage Humidity		< 70% RH	

7. Precautions for Charging

7.1 CHARGING CURRENT

The charging current should not be higher than the maximum value described in this specification. Higher charge current than the recommended value will result in problems with the charge and discharge performance, mechanical properties and safety performance of the battery even cause heat runaway or electrolyte leakage.

7.2 CHARGING VOLTAGE

The charging voltage should not be higher than the maximum charging voltage described in this specification. When the voltage is higher than the maximum charge voltage, it may cause problems with the charge and discharge performance, mechanical properties and safety performance of the battery, and may cause heat or leakage.

7.3 CHARGING TEMPERATURE

The battery should be charged under the temperature from 0°C to 45°C (As shown in the technical parameters table).

7.4 REVERSAL CHARGING IS PROHIBITED

The positive and negative of batteries should be connected properly. Reversal charging is strictly prohibited. If the polarity is reversed, the battery will be overcharged or overdischarged and severe safety risks.

8. Precautions for Discharging

8.1 DISCHARGING CURRENT

The current should not be higher than the maximum discharging current described in this specification. Higher discharging current may result in the fast capacity decay and over-heat, even safety problem such as electrolyte leakage and gas venting.

8.2 DISCHARGING TEMPERATURE

The battery should be discharged under the specified temperature from -20°C to 55°C (As shown in the Technical Parameters table).

8.3 OVER DISCHARGING IS PROHIBITED

Battery management system must be applied to avoid over-discharging and provide safety protection and alerm for the battery module. The battery will be damaged even dangerous when over-discharged. It should be noticed that the battery may be over-discharged for the sake of self-discharging over specified storage period .The battery should be charged&discharged regularly to keep the battery within 20%-40% SOC and prevent over-discharge.

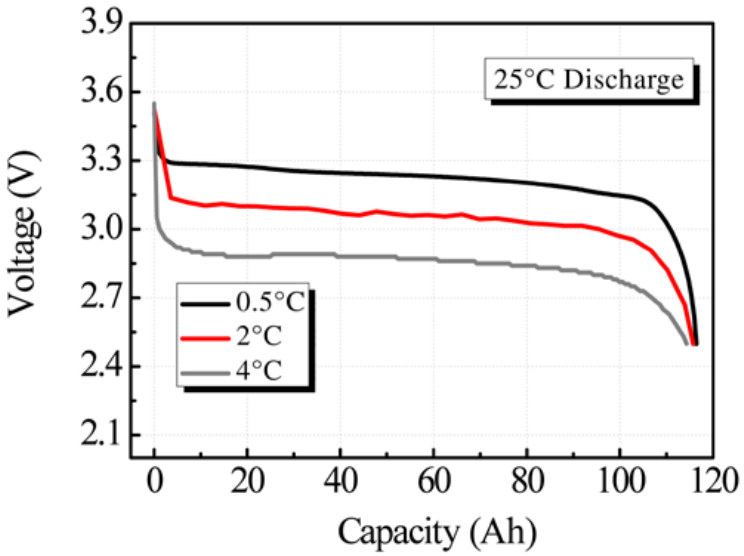
9. Others

Any other precautions not mentioned in this specification, please contact us. When the version of the specification is updated, a separate notice will not be issued.

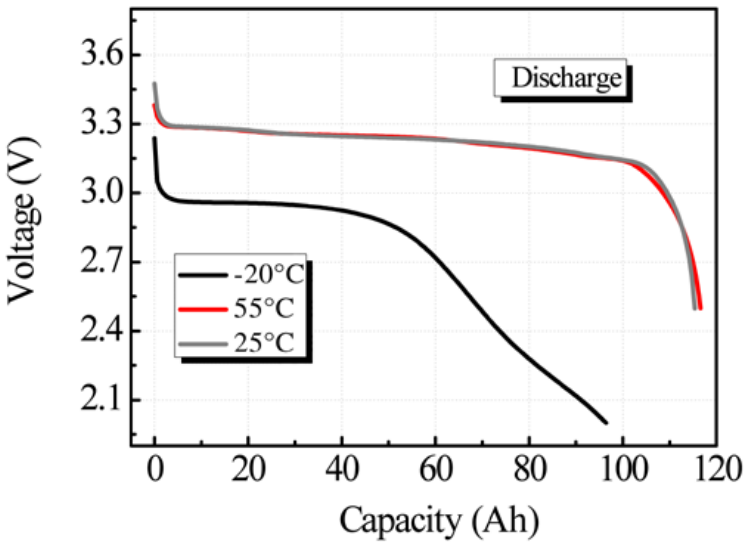
ELERIX has the final explanation right for this instruction manual.

Appendix:

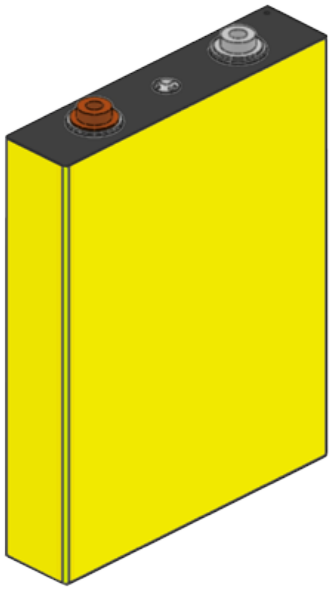
1. A typical discharging curve of battery at ambient temperature of 25°C ± 2°C.



2. A typical discharging curve of battery at different temperatures.

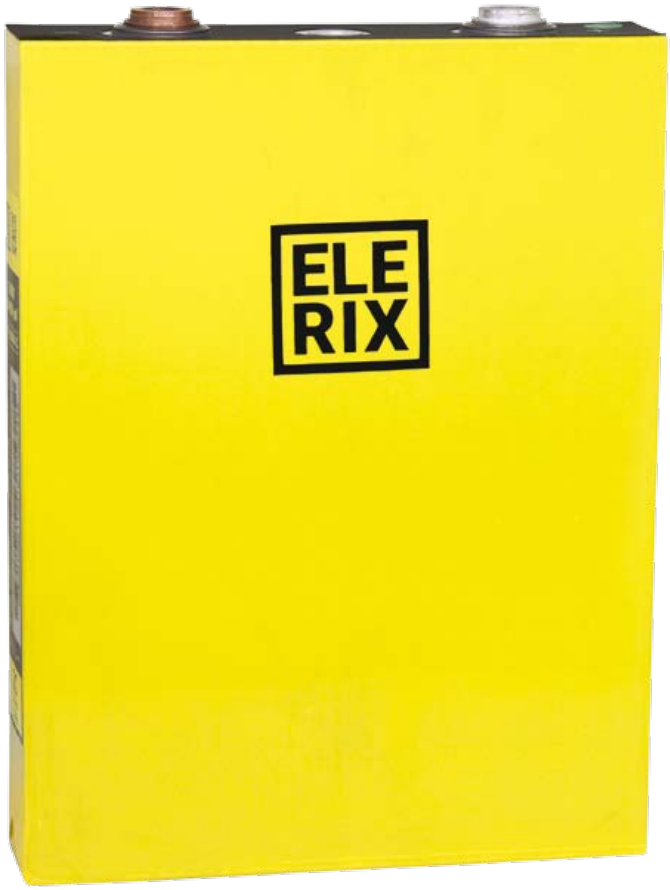


3. 3D sketch of the battery



ELERIX EX-L110

Lithium Cell LiFePO4
(3.2V/110Ah)



Are you interested in more details?

Visit our online presentation.

PRODUCT WEBPAGE ›