



ENIX ENERGIES

27 Rue des Glairaux, BP231
38120 Saint-Égrève cedex France
TEL: 0 825 88 65 11

Product Specification

Product Name	Lithium-ion Cell
Model	ACL9089

Customer Approval	Company Name	
	Signature	
	Date	
	Company stamp	



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1. Model

ACL9089

2. Dimension

	Item	Dimension including casing (mm)
	h	65.7±0.3
	d	≤26.45

3. Major Technical Parameters

NO.	Item	Standard	Note
1	Standard Capacity	4000 mAh	0.2C,(current value of 4000 mA at 1C)
2	Minimum Capacity	3950 mAh	0.2C
3	Standard Voltage	3.2 V	
4	Alternating Internal Resistance	≤20 mΩ	AC 1kHz measurement at 25±2°C
5	Standard Charge	Cut-off Voltage	3.65 V
		Charge Current	2.0 A
		Cut-off Current	40 mA
6	Max. Charging Current	4.0 A	
7	Standard Discharge	Discharge Current	2.0 A
		Discharge Cut-off Voltage	2.5 V
8	Fast Discharge Current	4.0 A	This current is the maximum current recommended for the combination of cells, and the specific value should be determined according to the combination structure. The maximum operating current is set at a temperature not exceeding 60 °C.
9	Max. Continuous Discharge Current	12.0 A	Only for single cell
10	Pulse Discharge Current	20 A, 5s	

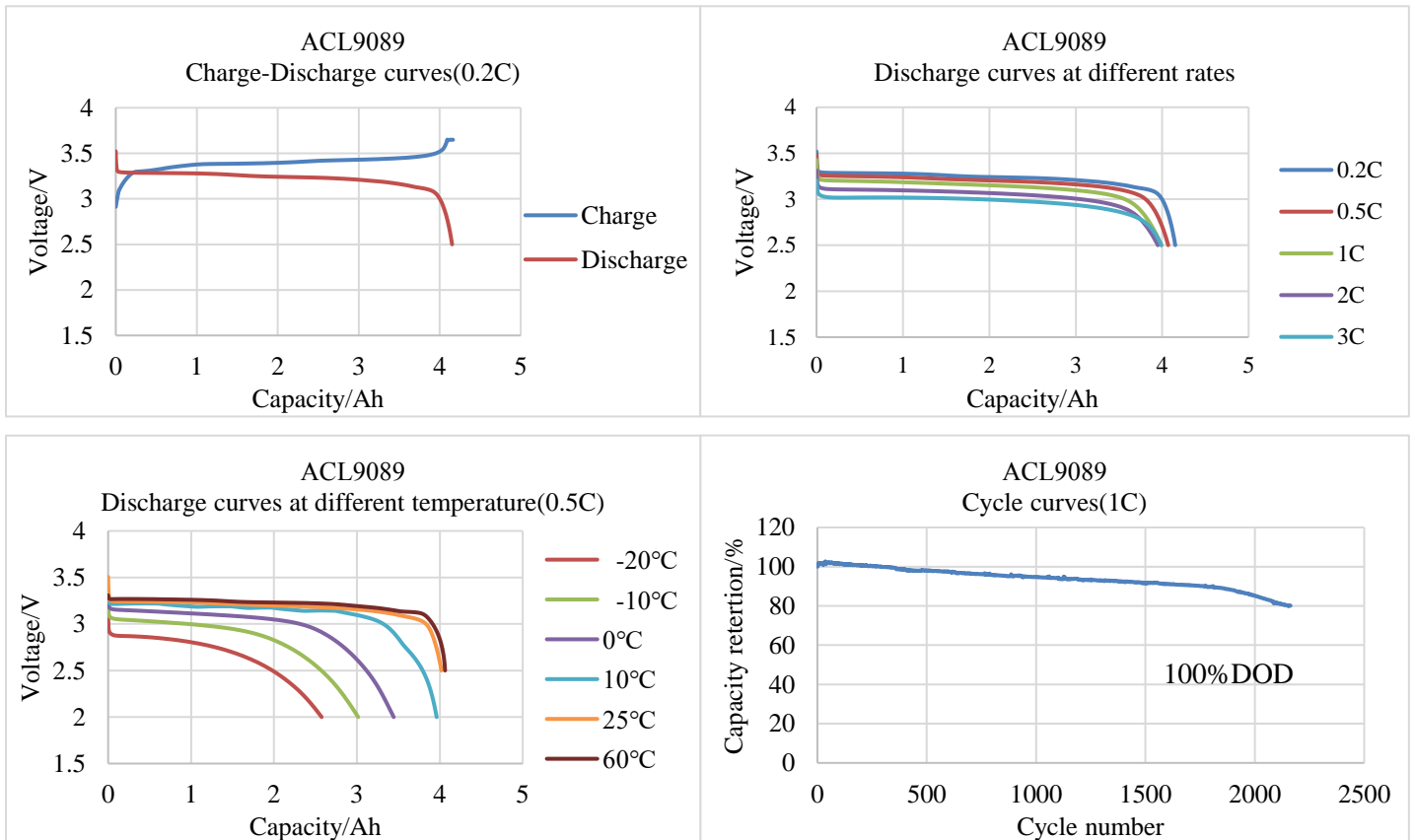


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NO.	Item	Standard	Note
11	Cycle Characteristic	2000 times (100%DOD)	the residual capacity is no less than 80% of rated capacity at 1C rate.
		4000 times (80%DOD)	
		7000 times (50%DOD)	
12	Working Temperature	Charge: 0°C~55°C	
		Discharge: -20°C~60°C	
13	Storage Temperature	-20°C~55°C	< 1 months
		-20°C~45°C	< 3 months
		-20°C~25°C	< 12 months
14	Cell Weight	Approx 88g	Including casing

4. Characteristics Curves



5. Electrical Characteristics

NO.	Item	Test Method	Standard
1	discharge capacity at normal temperature	After full charge, the experiment can be put on hold for 10 minutes; 0.2C discharge to 2.5V allows five repetitions. When the range of three consecutive experiments is less than 3% of the rated capacity, the experiment can be completed ahead of time and the maximum value of the test results can be obtained.	≥3950mAh



NO.	Item	Test Method	Standard
2	Discharge performance at different temperatures	After standard charging of normal batteries, it should be stored at least 12 hours in the constant temperature environment of - 20 °C, - 10°C, 0°C, 10 °C and 25 °C, respectively, and 5 hours of 60 °C. Then discharge with 0.5C current to the corresponding termination voltage. When the ambient temperature is more than 15 °C, the termination voltage is 2.5V, if less than 15 °C, which is 2.0V.	discharge capacity /initial capacity *100% -20°C ≥40%; 10°C ≥80%; -10°C ≥60%; 25°C ≥100%; 0°C ≥70%; 60°C ≥95%
3	Discharge performance at normal temperature different rate	After standard charging of normal batteries, it should be placed for 10 minutes at the prescribed ambient temperature. Then discharged to 2.5V at different rates of 0.2C, 0.5C, 1C, 2C and 3C, respectively. The capacity of batteries with different discharge rates was recorded, and the temperature rise T of batteries with different discharge rates was recorded synchronously.	discharge capacity / initial capacity *100% 0.2C: =100% T: ≤ 5°C 0.5C: ≥97% T: ≤ 10°C 1C: ≥95% T: ≤ 15°C 2C: ≥90% T: ≤ 25°C 3C: ≥85% T: ≤ 30°C
4	Charge retention at normal temperature	Normal batteries are charged according to the standard. They are placed in open circuit for 28 days at room temperature, and then discharged to 2.5V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards.	storage capacity ≥ initial capacity *90% recovery capacity ≥ initial capacity *95%
5	Charge retention and capacity recovery capability at high temperature	After standard charging, normal batteries are placed open circuit for 7 days in the environment of 55 ± 2°C. After the storage period expires, they are placed for 5 hours at room temperature, and then discharged to 2.5V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards	storage capacity ≥ initial capacity *90% recovery capacity ≥ initial capacity *95%
6	Cycle characteristic	After filling up the battery, stand for 10 minutes, then charge and discharge according to 1C. It is counted as a cycle. The interval between each cycle should not be less than 10 minutes, and the discharge capacity should end when it is less than 80% of the rated capacity.	≥2000 times

6. Safety Characteristics

NO.	Item	Test Method	Standard
1	Overcharge	Normal batteries are charged at 1C constant current until the charging termination voltage is 1.5 times or after charging time reaches 1h, then stop charging and the appearance changes of the batteries are observed for 1h.	No explosion, No fire.
2	Over Discharge	After the standard charging of the normal batteries, use 1C constant current discharge for 90min, and observe the appearance changes of the batteries are observed for 1h.	No explosion, No fire.
3	External Short-circuit	After standard charging of normal batteries, direct short circuit positive and negative poles for 10 minutes, external line resistance should be less than 5 mΩ. When the temperature of batteries drops to 10 °C, the test is completed and the appearance changes of batteries are observed for 1 hour.	No explosion, No fire.



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NO.	Item	Test Method	Standard
4	Thermal Abuse	The initial state of the normal battery was measured. After standard charging, the battery was placed in the oven. The temperature was increased to $130\pm 2^{\circ}\text{C}$ at a rate of $(5\pm 2^{\circ}\text{C})/\text{min}$ and kept for 30 minutes. Then the appearance of the battery was observed for one hour.	No explosion, No fire.
5	Drop	After standard charging of normal batteries, the initial state of the batteries was measured, and the test batteries were freely dropped from 1.5m height to flat cement ground, once in each direction.	No explosion, No fire.
6	Heavy Impact	A diameter of 15.8 mm steel rod is placed in the middle of the fully charged cell, then the weight of 10kg hammer from 1.0m height free falls to the cell upper.	No explosion, No fire.
7	Extrusion Test	After standard charging of normal batteries, pressure is applied perpendicular to the electrode plate or the longitudinal axis of batteries. The area of extrusion head is not less than 20 cm^2 , and the pressure gradually increases to 13 kN or the deformation reaches 30%.	No explosion, No fire.
8	Prick test	Use $\Phi 3\sim 5$ mm high temperature resistant steel needle, to 10 mm/s ~ 40 mm/s of speed, from the perpendicular to the direction of the cell plate. (The steel needle stays in battery for more than 5 minutes).	No explosion, No fire.

7. Environmental Adaptability

NO.	Item	Test Method	Standard
1	Thermal Cycle	Store the cell for 48 hours at $75\pm 2^{\circ}\text{C}$ after standard charge, then store the cell at -20°C for 6 hours, and at room temperature for 24 hours. Observe the batteries' appearance.	No leakage, No smoke, No fire, No explosion.
2	Static Humidity	Put the cell at $40^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and 95% RH chamber for 48h, then get it out and store it for 2h at room temperature. Observe the appearance and discharge at 0.5C to 2.5V, then test the final capacity.	Discharge capacity after storage is more than 90% of rated capacity. No obvious outside damage, No corrosion, No smoke, No explosion
3	Vibration	Standard charge. Equip it to the vibration platform, prepare the test equipment according to following vibration frequency and relevant swing, doing frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min: A)vibration frequency:10Hz \sim 30Hz Displacement breadth (single swing): 0.38mm B)vibration frequency:30Hz \sim 55Hz Displacement breadth (single swing): 0.19mm. Observe the final state after scanning.	Residual Capacity $\geq 90\%$ Rated Capacity Voltage Decrease Rate $\leq 0.5\%$ No obvious outside damage, No leakage, No smoke, No explosion.

8. Standard Test Environment

Unless especially specified, all tests stated in this Product Specification are conducted at below condition:

Temperature: $25\pm 2^{\circ}\text{C}$

Humidity: $(65\pm 20)\%$ RH



9. Storage and Others

Long Time Storage

The cell should be placed in a dry (humidity $\leq 85\%$ RH) environment without corrosive gas, and the cell should not bear any pressure; And in order to ensure that the environmental control under this condition cannot make the surface of the cell appear condensate droplets, while the surface of the storage cell cannot appear moisture phenomenon. The batteries' storage voltage should be 3.3~3.4V and the cell should be charged and discharged once every three months.

Any matters that this specification does not cover should be consulted between the customer and Enix Energies.

10. Notice in Using Cell

Abuse of cell may cause accidents such as damage to cores or personal injury. So please read the following safety codes and precautions carefully before used:

- Do not immerse the cell in water or seawater, and keep the cell in a cool dry surrounding if it stands by.
- Do not use or leave the cell at high temperature as fire or heater. Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not reverse the position and negative terminals.
- Do not connect the cell electrodes to an electrical outlet.
- Do not short circuit. Otherwise it will cause serious damage of the cell.
- Do not transport or store the cell together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample, throw, fall and shock the cell.
- Do not directly solder the cell and pierce the cell with a nail or other sharp objects.
- Do not use the cell in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- Use the cell charger specifically when recharging.
- If the cell leaks and the electrolyte gets into the eyes, do not rub the eyes, instead, rinse the eyes with clean water, and immediately seek medical attention. Otherwise, it may injure eyes.
- If the cell gives off strange odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately stop charging, using, and remove it from the device.
- In case the cell terminals are dirty, clean the terminals with a dry cloth before use. Otherwise poor performance may occur due to the poor connection with the instrument.
- Tape the discarded cell terminals to insulate them.
- Do not dissect the battery. Otherwise, the battery is no longer protected, and the cell may have potential safety hazards, such as liquid leakage, heat generation, smoke, fire, explosion, etc.

11. Disclaimer

Quality assurance does not include normal wear and tear, as well as problems caused by improper maintenance, handling and storage. Failure to follow the use and installation specified in this product specification, including but not limited to the following:

- Damage during transportation or storage.
- Problems arising from the combination of circuit, batteries and chargers.
- Incorrect battery installation or maintenance.
- Use cell or cell pack in inappropriate environments.
- Used improper or incorrect charging and discharging methods which is not included in this specification.
- Failure to comply with operational precautions.
- Bad battery cells generated in the process of assembling by the customer after shipment.
- In case of force majeure, such as lightning, storm, flood, fire, earthquake, etc.

Before using the product, please read this Product Specification carefully.

Enix Energies is not responsible for any direct or indirect damage caused by the battery or battery pack caused by the product assembly or use that does not meet the requirements of this specification.



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The company is not responsible for the damage (personal safety) of the product, load and surrounding connectors caused by incorrect use of the product, incorrect circuit connection, or the input power supply and load function parameters used do not match the performance parameters marked in this Product Specification. Without affecting the use of the product, if the product is upgraded without prior notice. Before ordering the products of Enix Energies, the buyer needs to confirm the latest status of the products with Enix Energies in advance.

Enix Energies reserves the right to revise the specifications and performance parameters of the product. The content is subject to change without prior notice; the final interpretation right of this information belongs to the company.