



**Lead Carbon
Battery**

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■ Background

- Power grid instability areas and remote areas with frequent power outages require stable and reliable power supply guarantee, natural environment harsh areas require the use of battery products with wide temperature range and strong environmental adaptability.
- New energy generation is unstable and needs to be supported by economical and safe battery products for grid connection.
- Energy storage, new energy and other applications require high cycle unsaturated charging, partial state of charge (PSOC) cycle life of more than 3000 times.

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■ Application scenarios

■ Power generation

- New energy power generation (solar/wind/wind-solar hybrid) connected to the energy storage system: large capacity and power requirements.
- Hybrid energy storage system without utility power and in harsh grid areas: an economical solution for customers



■ Application scenarios

■ Power transmission and distribution

- Adjust the energy storage system according to the grid frequency: Fast response
- Load-tracking energy storage systems: Dynamic adjustment and capacity expansion
- Smart grid, microgrid system: Improving power quality and reliability



■ Application scenarios

■ User side

- New energy communication base station, communication base station with Peak-shaving and valley-filling function, core computer room, and data center: effectively reduce customer TCO
- Peak shaving and valley filling energy storage system: profit for customers



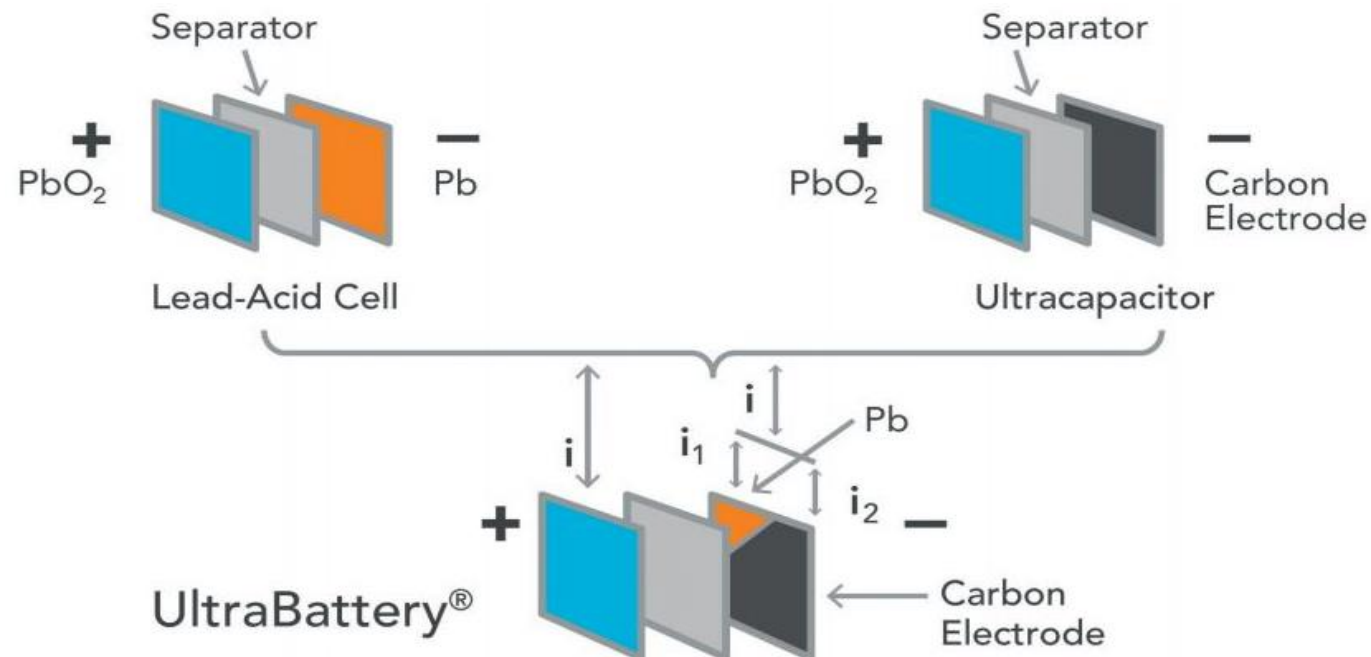
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■ Product introduction

■ Definition of Lead Carbon battery

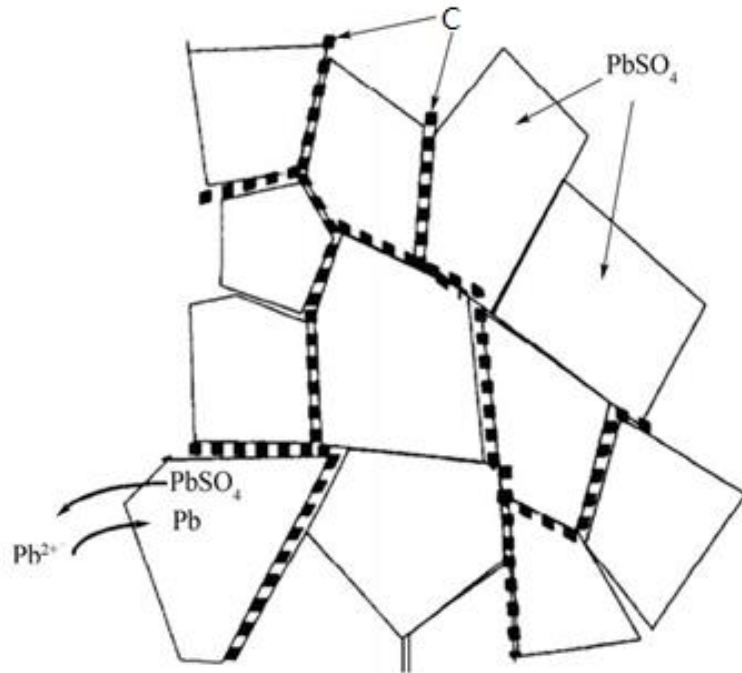
- The carbon material is used as the negative electrode or dispersed in the negative plate to improve the conductivity and reduce the risk of sulfation.
- Lead-carbon batteries have both the characteristics of lead-acid batteries and super capacitors.



■ Product introduction

■ Product Features

A core problem in original lead-acid batteries is the sulfation of the negative electrode, that is, in the partial charge-discharge mode, irreversible sulfate crystals are easily formed.



The carbon added to the lead negative electrode will form a conductive network structure as shown in the figure above. The advantages of this network structure are as follows:

1. Provide a response center: New reactive centers are formed on the surface of these carbon particles.
2. Forming a conductive grid
3. Form a smaller and more uniform grid to promote the uniformity of the electrochemical reaction on the surface and inside of the electrode;
4. As a special material, it hinders the growth of PbSO₄ particles and makes them evenly distributed.
5. Through the capacitive effect, the capacity and power characteristics of the battery are improved.

■ Product introduction

■ Product Naming

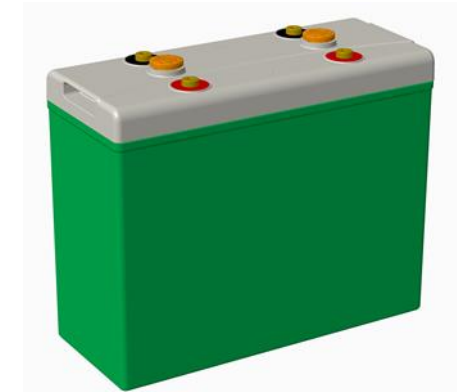
LRC2 – 1000

① ② ③

① Leoch Renewable Carbon Battery (Mainly for grid-connected system applications)

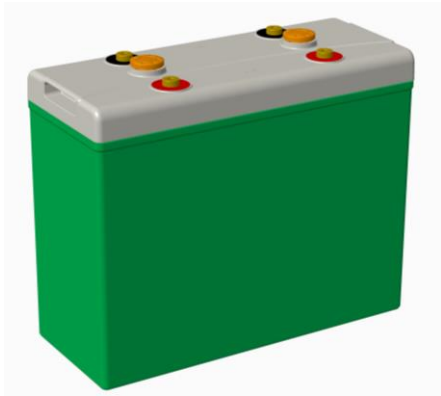
② Rated voltage: 2V

③ Rated capacity @10HR :1000Ah (C_{10} , 1.80V/cell)



■ Product introduction

■ Product performance



LRC series

- The charging acceptance capacity is 1.63-1.8 times higher than the original batteries.
- Over 3000 cycles in PSOC (Partially Charged) state
- Fast charging and discharging performance, the charging time is shortened by more than 30% compared with conventional batteries
- Using super carbon technology + deep cycle technology, both energy and life advantages
- Modular design and installation method, save installation space, easy maintenance

■ Product introduction

■ Long life



Lead-acid battery

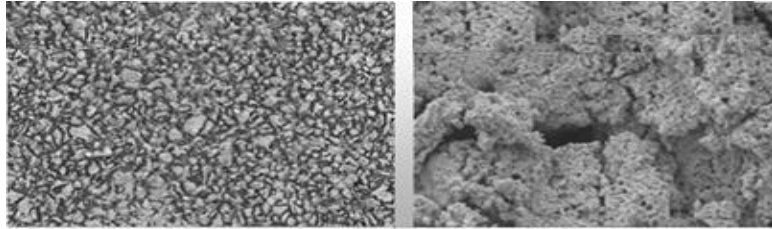


Lead carbon battery

- Lead paste of negative plate adopts carbon material compound technology.
- The negative plate lead paste adopts carbon material composite technology.
- Extends operating life at partial state of charge (PSOC).

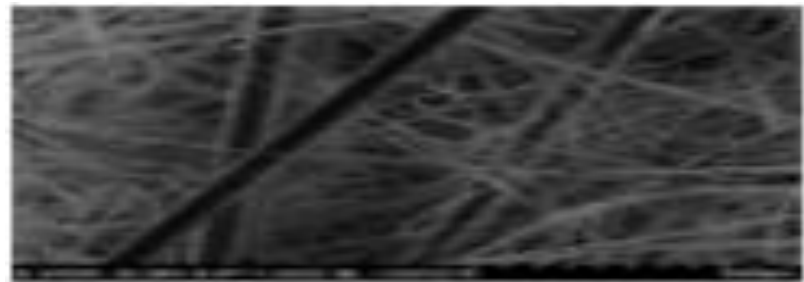
■ Product introduction

■ Long life



Lighter corrosion

The corrosion layer is dense and effectively prevents further corrosion.



- New six-element lead-calcium alloy formula, more than 10% higher corrosion resistance than conventional alloy.
- The new grid structure reduces the uneven distribution of current density, reduces the local corrosion damage of the grid, and obtains a long service life.
- Using a high-strength L-AGM composite fiber separator, it has an excellent anti-short-circuit ability and inhibits dendrite growth in the whole life cycle.

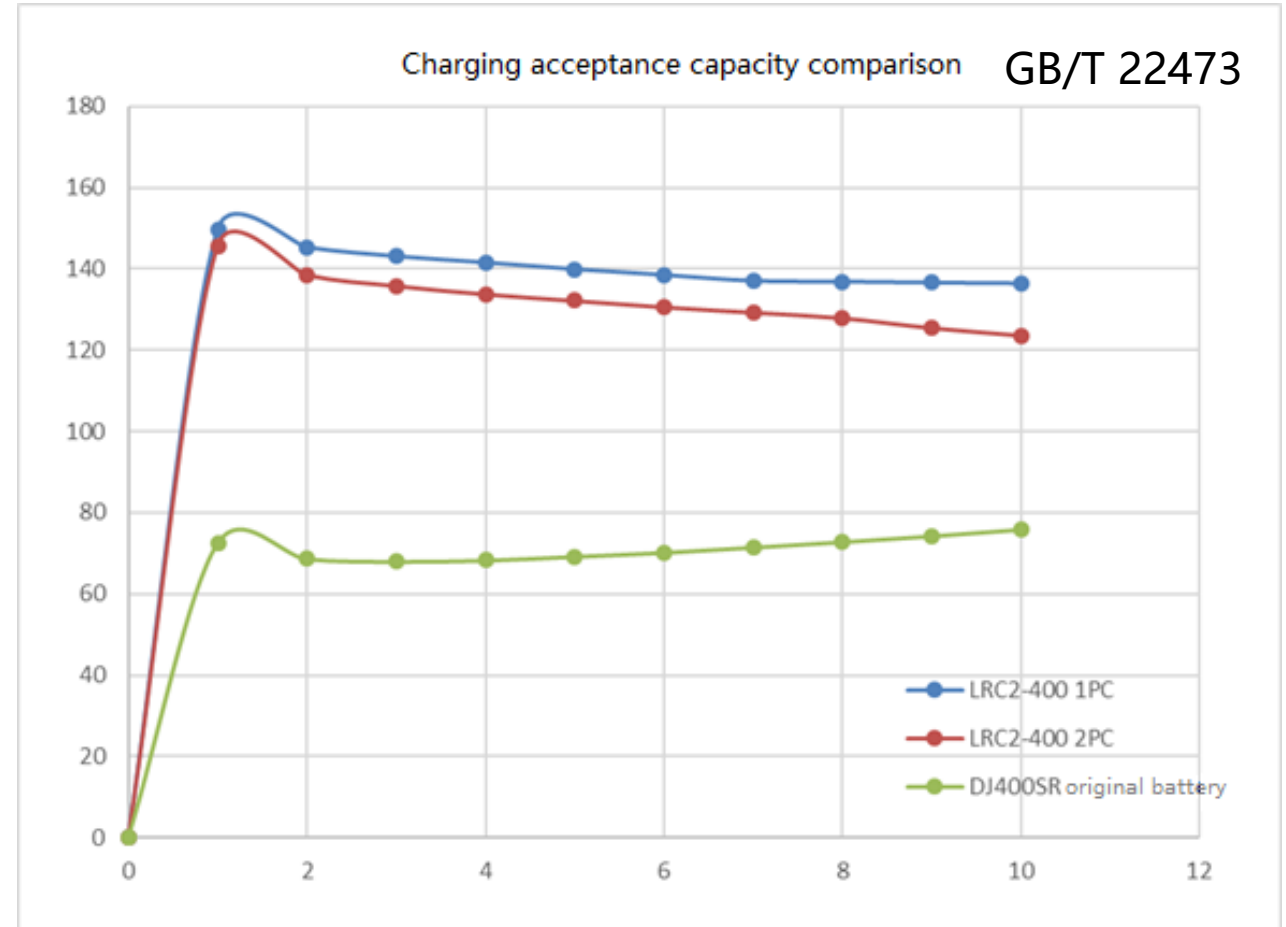
Product introduction

Charging acceptance capacity

The charging acceptance capacity of LRC2-400 lead-carbon battery is 1.63-1.8 times that of ordinary batteries, which has obvious advantages compared to ordinary batteries.

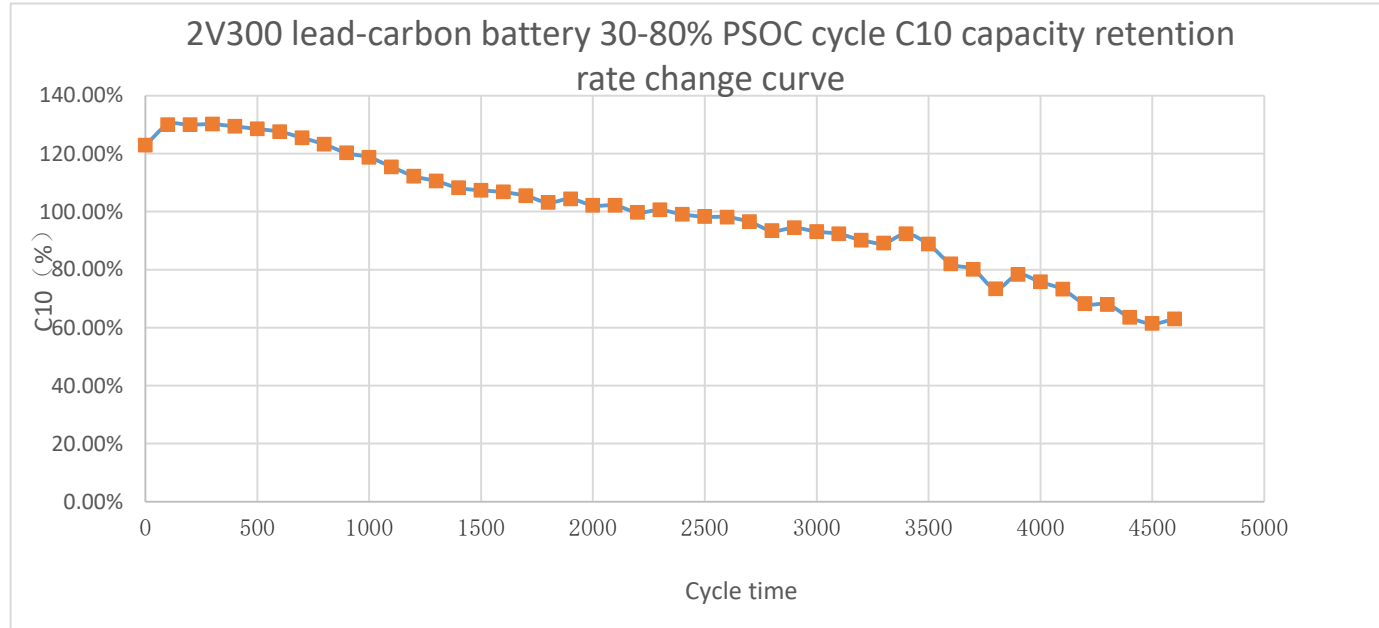
	2V400Ah		
Items	LRC2-400 1pc	LRC2-400 2pc	DJ2-400SR
I_{Ca}	136.445	123.612	75.845
I_{10}	40	40	40
I_{Ca}/I_{10}	3.411	3.090	1.896

Lead-carbon batteries shorten the charging time by 60% compared with ordinary batteries.



■ Product introduction

■ PSOC long cycle life



30%~80% test more than 4500 times

After the battery is fully charged, under the ambient conditions of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$:

1. Discharge with 30A constant current for 2h;
2. Discharge with 90A constant current for 1h40min, recording interval 2min/time;
3. Charge 156Ah with a constant voltage of 7.05V and a current limit of 100A, with a recording interval of 2min/time;
4. Repeat steps 2-3 100 times;
5. Charge for 12h with a constant voltage of 7.05V and a current limit of 45A;
6. Discharge at 30A to a final voltage of 5.4V, and then charge at a constant voltage of 7.05V with a current limit of 45A for 16h;
7. Repeat steps 1 to 8;
8. When the 7th step 30A discharge to the termination voltage 5.4V, the test is terminated when the time is lower than the 8hr (2 confirmations are required);
9. Record the number of cycles.

■ Product introduction

■ investment cost economy

Items	Energy Density (Wh/kg)	Cycles	Charge and discharge efficiency	Recyclable rate	system cost (¥/kW)
Lithium iron phosphate battery	180~220	3500 times	90%	0%-5%	1400~2300
Lead carbon battery	30~60	3000 times	82%	30~40%	1200~1600

Because of its high energy density and high cost, lithium batteries are more suitable for some occasions that require space and are less cost-sensitive. At present, lead-carbon technology still has good competitiveness in cost-sensitive occasions.

■ Product specification

Model	Rated voltage	Capacity@C10	Length	Width	Height	Total height	Terminal
LRCF12-140	12	140	550	125	315	315	T6-A
LRCF12-170	12	170	560	126	320	320	T11
LRC12-80	12	80	330	173	212	218	T11
LRC12-100	12	100	408	177	225	225	T11
LRC12-150	12	150	532	207	214	220	T11
LRC12-200	12	200	522	268	220	226	T11
LRC2-300	2	300	158	181	350	365	T11
LRC2-400	2	400	191	181	350	365	T11
LRC2-500	2	500	225	181	350	365	T11
LRC2-600	2	600	303	181	350	365	T11
LRC2-800	2	800	370	181	350	365	T11
LRC2-1000	2	1000	440	181	350	365	T11

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■ Application Cases

- State Grid National Key R&D Program Project



Project Requirements : The project site is a remote area with no grid available.

Project Solutions : LRC12-170 with PCS and other equipment to form a container system.

Project Values : Storage of power generated by solar panels for use in the area during rainy days and nights.

■ Application Cases

- Factory peak-shaving R&D program project



Project Requirements : The project is located in the Jiangsu factory, which is used to cut peaks and fill valleys to obtain benefits.

Project Solutions : LR2-500 is matched with PCS and other equipment to form a container system.

Project Values : Used for peak and valley arbitrage and emergency backup in Jiangsu factory.

Thank you!



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