Lithium-ion power battery 280Ah Product Specification

Preparation	Audit	Approval
Client sign-off.		

Catalog

1 Application scope

This product specification specifies the performance requirements, test methods, transportation, storage requirements and precautions for 310Ah lithium-ion batteries.

2 Normative Citation

The following documents are essential to the application of this document. Where a reference is dated, only the dated version applies to this document. Where the reference document is not dated, the latest version (including all change orders) applies to this document.

GB/T 31484-2015 Power battery cycle life requirements and test methods for electric vehicles
GB/T 31485-2015 Electric vehicle power battery safety requirements and test methods
GB/T 31486-2015 Electric vehicle power battery electrical performance requirements and test methods
GB/T 19596 Electric vehicle terminology

3 Performance Index

No.	Projects	Specification	Remarks
3.1	Nominal capacity	280Ah	0.5C, Room temperature
3.2	Nominal voltage	3.2V	
3.3	Working voltage range	2.5-3.65V	
3.4	Standard discharge current	0.5C	Room temperature
3.5	Maximum continuous discharge current	280Ah	Room temperature
3.6	Peak discharging current	1C	@30s，SOC≥30%
3.7	Standard charge current	140A	Room temperature
3.8	Maximum continuous charging current	280Ah	Room temperature
3.9	Peak charge current	420A	@10s，SOC≤70%
3.10	Operating temperature	Charge: 0℃~55℃ Discharge: -20℃~55℃	
3.11	Storage temperature	-30℃~60℃	
3.12	Battery Size	Thickness: $71.47^{+1.5}_{-0.5}$ mm Width:174.7±0.5mm Shoulder height:200.5±0.6mm Total height:207.1±0.6mm	
3.13	Anode Materials	Lithium iron phosphate	

3.14	Battery weight	5.27±0.16kg	
3.15	Energy Density	170Wh/kg	
3.16	Standard charging mode (CC&CV)	Under the condition of ambient temperature (25±2)℃, constant current and then constant voltage are used for charging. The constant current is 0.5I1(A), the constant voltage is 3.65V, and the charging is terminated when the current drops to 0.05I1(A) during the constant voltage process and left for 1 hour.	

4 Electrical performance

4.1 Standard test conditions

Batteries shall be new (less than 1 month in storage after manufacture) with less than 5 cycles. Unless otherwise specified, all test conditions in this specification are as follows:

Temperature: 25±5℃, humidity: 15%~90% RH, air pressure: 86kPa~106kPa. room temperature in the specification refers to 25±2℃, 1I1(A) current is 280A.

(1) Charge mode.

Cell temperature	Standard charge	Fast charging
<0℃	No charging allowed	No charging allowed
0℃≤T<10℃	0.1I1(A) charge to 80% SOC	0.2I1(A) charge to 80% SOC
10℃≤T<15℃	0.2I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until the current drops to 0.05I1(A) and terminate	0.3I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until current drops to 0.05I1(A) and terminate
15℃≤T<45℃	0.5I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until the current drops to 0.05I1(A) and terminate	1.0I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until the current drops to 0.05I1(A) and terminate
45℃≤T<55℃	0.2I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until the current drops to 0.05I1(A) and terminate	0.3I1(A) charge to 3.65V, switch to 3.65V constant voltage charge until current drops to 0.05I1(A) and terminate
>55℃	No charging allowed	

(2) Discharge mode.

Parameters	Product Specifications	Conditions
Standard discharge	140A	25±2℃
Maximum continuous discharge current	310A	25±2℃
Maximum pulse discharge current (long pulse)	560A	25±2℃, ≥30%SOC, 30s Pulse
Minimum pulse discharge cut-off voltage	2.5V	25±2℃
Standard discharge temperature	25±2℃	

(3) Pulse discharge mode.

SOC	Temperature of electric cell

	<-20℃	≥-20℃	≥0℃	≥10℃	≥15℃	≥45℃	>55℃
≥30%	Not allowed	140A/30s	280A/30s	420A/30s	560A/30s	280A/30s	Not allowed

4.2 Test equipment accuracy

(1) Voltage measurement accuracy: ≥0.5 level.
(2) Accuracy of current measurement: ≥0.5 level.
(3) Temperature measurement accuracy: ±0.5℃.
(4) Time measurement accuracy: ±0.1%.
(5) Dimensional measurement accuracy: ±0.1%.

4.3 Test process

No.	Projects	Testing process	Standard
4.3.1	Room temperature discharge capacity (initial capacity)	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Discharge the battery to 2.5V with 0.5I1(A) current and record the discharge capacity (Ah).	110%* Rated capacity ≥ Discharge capacity ≥100%*rated capacity
4.3.2	Room temperature multiplier charging	1) Test temperature: 25±2℃. 2) Discharge the battery with 0.5I1(A) to 2.5V, and leave it for 1h. 3) Charge the battery with 400A current to 3.65V and let it stand for 1h. 4) Discharge the battery to 2.5V with 0.5I1(A) current and record the discharge capacity (Ah).	Discharge capacity ≥ 85%* initial capacity
4.3.3	Room temperature multiplier discharge	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Discharge the battery to 2.5V with 400A current and record the discharge capacity (Ah).	Discharge capacity ≥ 90%* initial capacity
4.3.4	High temperature discharge	1) Fully charge the battery according to 3.17 2) Let the battery stand at 55±2℃ for 5h. 3) Discharge the battery to 2.5V with 0.5I1(A) current at 55±2℃ and record the discharge capacity (Ah). 4) Leave the battery at 25±5℃ for 12h and check the appearance of the battery.	No deformation, expansion or other abnormalities; Discharge capacity ≥95%* initial capacity
4.3.5	Low temperature discharge	1) Fully charge the battery according to 3.17 2) Leave the battery at -20±2℃ for 24h. 3) Discharge the battery to 2.0V with 0.5I1(A) current at -20±2℃ and record the discharge capacity (Ah). 4) Leave the battery at 25±5℃ for 12h and check the appearance of the battery.	No deformation, expansion or other abnormalities; Discharge capacity ≥75%* initial capacity

4.3.6	Cyclic life time	1) Test temperature: 25±2℃. 2) Adopt constant current and then constant voltage charging method, the constant current is 0.5I1(A), the constant voltage is 3.65V, in the process of constant voltage until the current drops to 0.05I1(A) to terminate the charging, and leave it for 60min. 3) Discharge the battery at 0.5I1(A) to 2.5V and leave it for 60min. 4) Repeat steps 2) and 3) until the battery capacity is less than 80% of the initial capacity, and record the number of cycles.	25℃0.5C/0.5C 80% ≥5000Cycle & 25℃0.5C/0.5C 70% ≥6000Cycle
4.3.7	Room temperature storage and recovery	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Store the battery at room temperature for 28 days. 4) Discharge the battery to 2.5V with 0.5I1(A) current, and record the remaining capacity (Ah). 5) Fully charge the battery according to 3.17. 6) Discharge the battery to 2.5V at 0.5I1(A) and record the recovered capacity (Ah).	No deformation, expansion or other abnormal conditions; Residual capacity ≥ 92% * initial capacity; Recovery capacity ≥ 94% * initial capacity
4.3.8	High temperature storage and recovery	1) Fully charge the battery according to 3.17. 2) Store the battery at 55±2℃ for 28 days. 3) Remove the battery and leave it at 25±2℃ for 5h, then discharge the battery to 2.5V with 0.5I1(A) current and record the remaining capacity (Ah). 4) Fully charge the battery according to 3.17. 5) Discharge the battery to 2.5V with 0.5I1(A) current and record the recovered capacity (Ah).	No deformation, expansion or other abnormal conditions; Residual capacity ≥ 92% * initial capacity; Recovery capacity ≥ 94% * initial capacity

5 Safety performance

No.	Projects	Testing process	Standard
5.1	Temperature cycling	1) Fully charge the battery according to 3.17. 2) Put the battery into the oven. The oven temperature is changed 5 times according to Table 5.1 and Figure 5.1. 3) Observe the battery for 1h.	No fire, explosion or leakage
5.2	Thermal stability	1) Fully charge the battery according to 3.17. 2) Put the battery into the oven, the battery temperature will reach 130±2℃ at 5℃/min and keep it for 30min. 3) Observe the battery for 1h.	No fire or explosion
5.3	Falling	1) Fully charge the battery according to 3.17. 2) Place the positive and negative battery terminals downward from a height of 1.5m.	No fire, explosion or leakage

		Drop to the concrete floor; 3) Observe the battery for 1h.	
5.4	Vibration	1) Fully charge the battery according to 3.17. 2) Fix the battery to the vibration test bench and conduct the linear sweep vibration test according to the following conditions: --- Discharge current: 1/3 I1(A) --- Vibration direction: up and down single vibration --- Vibration frequency: 10~55Hz --- Maximum acceleration: 30m/s2 --- Sweeping cycle: 10 times --- Vibration time: 3h 3) Observe the battery phenomenon during the test.	No current fluctuation, abnormal voltage; No deformation, leakage or other abnormalities;
5.5	Seawater immersion	1) Fully charge the battery according to 3.17. 2) Immerse the battery in 3.5% NaCl solution for 2h. 3) The water depth should be completely submerged in the battery.	No fires or explosions
5.6	Low pressure	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Put the battery into the low pressure box, keep the air pressure at 11.6kPa and leave it for 6h. 4) Observe the battery for 1h.	No fires, explosions or leaks
5.7	overcharge	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Charge the battery with 1I1(A) current for 1h or the voltage reaches 5.5V. 4) Observe the battery for 1h.	No fire or explosion
5.8	over-release	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Discharge the battery with 1I1(A) current for 90min. 4) Observe the battery for 1h.	No fire, explosion or leakage
5.9	Short Circuit	1) Test temperature: 25±2℃. 2) Fully charge the battery according to 3.17. 3) Short circuit the battery for 10min, the resistance of the external circuit ≤5mΩ. 4) Observe the battery for 1h.	No fire or explosion

Table 5.1 Variation of time and temperature in the temperature cycle

Temperature (°C)	Time interval(min)	Accumulated 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

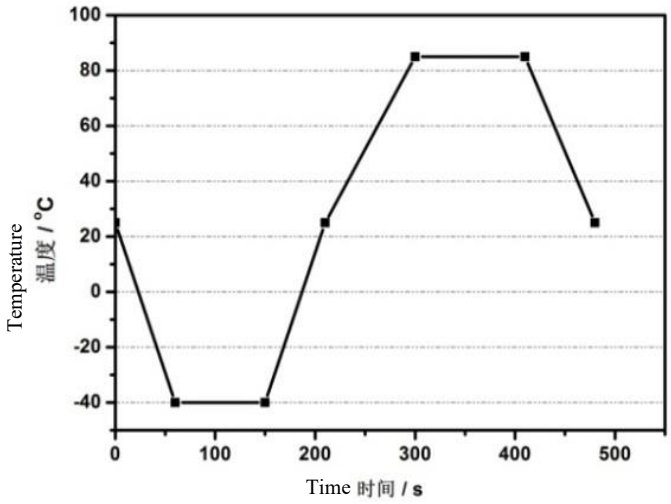


Figure 5.1 Temperature time curve in temperature cycle

6 Shipping and Storage

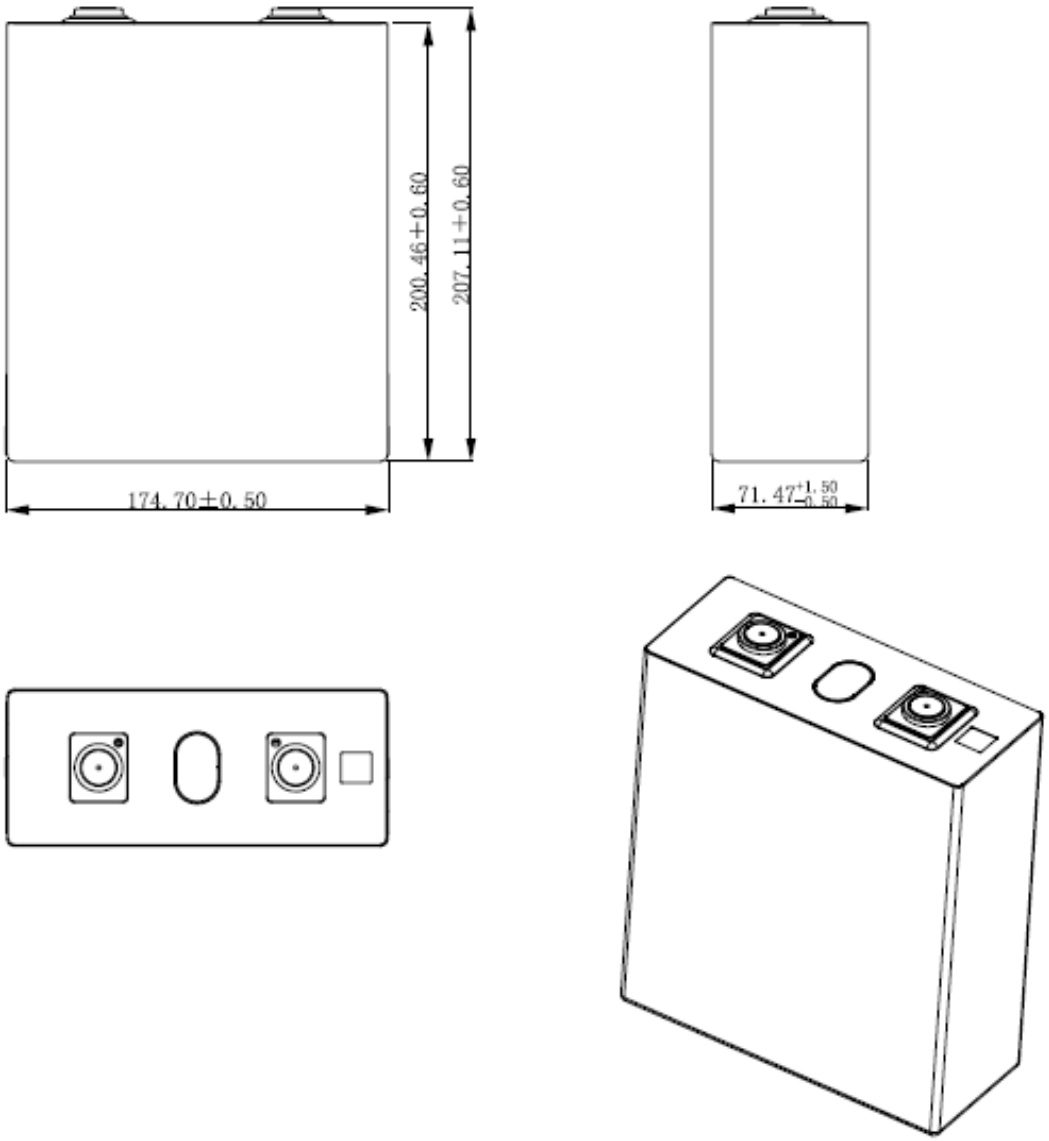
6.1 Shipping

Suitable battery packaging should be selected according to the destination and mode of transportation. During the transportation process, it should be prevented from violent vibration, external impact or extrusion, sun and rain, and for transportation by airplane to maintain ≤ 30% power during transportation, and for transportation by car, train and ship to maintain 10-30% power or according to the special requirements of customers.

6.2 Storage

The battery should be stored at an allowable ambient temperature of -30~60℃, with a recommended storage temperature of -10~40℃ and relative humidity of 10% RH ~90%RH. The battery should be stored in a clean, dry and ventilated environment, away from fire and heat sources, avoiding contact with corrosive substances or magnetic environments. When the battery is not in use, continuous storage is recommended for no more than 3 months.

7 Dimension



8 Quality Assurance

Battery warranty. Within this period, if the battery problem is not caused by the manufacturer's process and quality management, but by the user's misuse, we can provide technical guidance, but do not promise free replacement service.

No responsibility will be taken for problems and safety incidents arising from the following.

1) Problems and safety incidents arising from violations of safety use guidelines.
2) Defective batteries generated by users during the battery assembly process after shipment.
3) Problems arising from the use of batteries in combination with circuits, battery packs and chargers.

For safety reasons, please consult Ripley Energy Ltd. first for any special applications such as ancillary equipment design, lithium-ion battery system protection circuits or high currents.

9 Safe Use Guide

To avoid battery damage or personal injury caused by misuse of square lithium-ion battery modules, please read the following safety guidelines carefully before using square lithium-ion batteries.

Warning! 

∇ - Do not disassemble, crush, incinerate, heat or throw batteries into fire.
- Keep batteries out of the reach of children, do not remove batteries from their original packaging before use, and dispose of used batteries promptly in accordance with local recycling or waste regulations.
- If batteries need to be replaced, use batteries from the same manufacturer; use of batteries from other manufacturers may pose a risk of fire and explosion.
- Do not put the battery into water or get it wet.
- Do not place the positive and negative terminals of the battery in contact with the metal case at the same time.
- Do not short-circuit, overcharge or over-discharge the battery.
- Do not use or store the battery near heat sources (such as fire or heaters).
- Do not reverse the positive and negative terminals of the battery.
- Do not place the battery with coins, metal jewelry or other metal objects.
- Do not pierce the battery case with nails or other sharp objects, and do not hammer or step on the battery.
- Do not solder the battery directly.
- Do not disassemble or trim the battery in any way without permission.
- Do not hit, throw or subject the battery to mechanical shock and natural fall.
- Do not mix different types and brands of lithium-ion batteries.
- Do not connect the negative pole to the case (positive charge).
- Do not use the battery if it emits odor, heat, deformation, discoloration or any other abnormal phenomenon and transfer the battery out of the use environment.
- If the battery catches fire, use dry powder, foam extinguisher, sand, etc. to extinguish and keep away from the use environment

10 Shipping Status

If the customer does not have special requirements and does not use airplane transportation, the battery has about 30-50% power when it leaves the factory.

11 Manufacturer Information

Manufacturer: Rui Pu Energy Co.