Prismatic Na-Ion Battery

Specification

Model: NaCP73174207-ME200

Nominal capacity: 200Ah

Author: Donglin Fang

Reviewer: Jianwen Hu

Approver: Wei Chen

Effective Date: 2023.08.05

HiNa Battery Technology Co., Ltd

Catalog

Product Change History From

Version	Change contents	Change date	Author	Reviewer	Approver
A	First edition released	2023-08-05	Donglin Fang	Jianwen Hu	Wei Chen

1 Scope of Application

This product specification describes the product performance indicators of NaCP73174207-ME200 Na-ion battery provided by HiNa Battery Technology Co., Ltd.

This product uses transition metal oxide cathode material system, which has excellent operation in a wide temperature zone and is not afraid of over-discharge characteristics.

This product mainly refers to the following standards for performance index evaluation:

GB 38031 *Safety requirements for power batteries for electric vehicles*

GB/T 31486 *Electrical performance requirements and test methods for power batteries for electric vehicles*

GB/T 31484 *The cycle life requirements and test methods of power batteries for electric vehicles are evaluated for performance indicators*

GB/T 31485-2015 *Safety requirements and test methods for power batteries for electric vehicles*

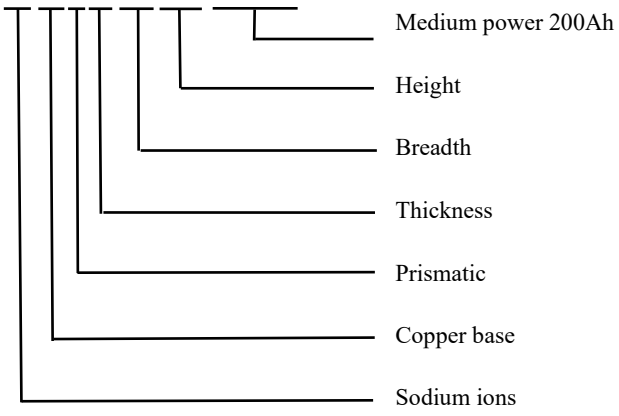
UL 1642

2 Product Type

2.1 Name: Prismatic Na-ion battery

2.2 Model: NaCP73174207-ME200

Model: Na C P 73 174 207-ME200



3 Battery Parameters

3.1 Basic parameters

NO.	Project	Standard	Units	Remarks
1	Nominal capacity @3.95～2.0V	200	Ah	0.2C discharge @25℃
2	Rated voltage	3.0	V	/
3	AC internal resistance	≤0.25	mΩ	AC 1 kHz, 3.2V
4	DC internal resistance	≤0.8	mΩ	2C 30s, 3.2V
5	Battery weight	5±0.2	kg	/
6	Battery size	Thickness：72±0.5 Breadth：174.2±0.5 Height：204±0.5	mm	Overall dimensions, thickness of 300 ±20kgf tested under pressure
7	Charge cut-off voltage	3.95 3.80	V	T>0℃ 0℃≥T≥-10℃
8	Discharge cut-off voltage	2.0	V	Can be discharged to 0V
9	Standard continuous charging current	40	A	0.2C
10	Maximum continuous charge current	200	A	1C
11	Standard continuous discharge current	40	A	0.2C
12	Maximum continuous discharge current	200	A	1C
13	Energy density	≥120	Wh/kg	/

3.2 Electrical property parameters

3.2.1 Charge performance

Project	Subproject	Battery surface temperature	Standard charge
Charge performance	Typical temperature and charge capacity	＞60℃	Charge is not allowed
		35℃＜T≤60℃	0.33C
		20℃＜T≤35℃	0.5C
		10℃＜T≤20℃	0.33C
		0℃＜T≤10℃	0.25C
		-10℃＜T≤0℃	0.2C

Subproject	Battery surface temperature	Product specification	Condition
Rate	25℃±2℃	Charge capacity≥90% rated charge capacity	1C constant current charge to 3.95V; Temperature rise≤10℃

3.2.2 Discharge performance

Project	Parameters		Performance indexes		Conditions
Discharge performance	Typical temperature and discharge capacity		-30℃	≥75%	0.5C, set aside for 12h, relative to nominal capacity
			-20℃	≥85%	
			0℃	≥95%	
			45℃	≥98%	
			60℃	≥95%	
	Discharge temperature range		-40℃~60℃		Whenever the battery surface temperature exceeds this range, it should stop working
	Rate discharge capability	Standard discharge current	0.2C	100%	25℃, relative capacity under standard charge and discharge
		Maximum continuous discharge current	1C	≥95%	25℃, relative capacity under standard charge and discharge
		Other discharge current	0.5C	≥97%	25℃, relative capacity under standard charge and discharge

3.2.3 Storage performance

Project	Subjects	Parameters	Performance indexes		Conditions
Storage performance	Short-term	Ultra-high temperature storage	Retention rate	⩾90%	Check capacity at 25℃, store at 60℃ for 7 days, 100%SOC
			Recovery rate	⩾98%	
		High-temperature storage	Retention rate	⩾92%	Check capacity at 25℃, store at 45℃ for 7 days, 100%SOC
			Recovery rate	⩾99%	
		Low-temperature storage	Retention rate	⩾95%	Check capacity at 25℃, store at -20℃ for 7 days, 100%SOC
			Recovery rate	⩾99%	
	Long-term	Room-temperature storage	Recovery rate	⩾95% (28d⩾98%)	Store at 25℃±5℃ for 180 days, 50%SOC

3.2.4 Cycle life

Project	Parameters	Performance indexes	Conditions	Remark
Life span	High temperature cycle	⩾2000	45℃, 0.5C, capacity retention rate⩾70%	Depending on the operating conditions
	Room temperature cycle	⩾3500 ⩾4000	25℃，0.5C，capacity retention rate ⩾70% 25℃，0.5C，2~3.9V (95%DOD) capacity retention rate⩾70%	
	Rate cycle	⩾1500	25℃，1C，capacity retention rate⩾70%	
	Over-discharge characteristic cycle	⩾100	25℃，0.5C，0~3.95V cycle, capacity retention rate⩾95%	

3.3 Security performance

The following tests should be carried out in a device with forced exhaust conditions and explosion-proof measures, and all batteries should be charged according to the standard charging method of 4.1.2 before the experiment, and set aside for 12h, and then carry out the following tests.

Projects	Test methods	Inspection standards
Overdischarge	GB 38031 8.1.2	The battery should not catch fire or explosion
Overcharge	GB 38031 8.1.3	The battery should not catch fire or explosion
External short-circuit test	GB 38031 8.1.4	The battery should not catch fire or explosion
Heating test	GB 38031 8.1.5	The battery should not catch fire or explosion
Extrusion test	GB 38031 8.1.7	The battery should not catch fire or explosion

3.4 Environmental adaptability

Projects	Test methods	Inspection standards and instructions
Drop test	GB/T 31485 6.2.5	The battery should not leakage, fire or explosion
Mechanical shock test	UL1642-15	When subjected to shocks during transportation and operation, it should not cause fire, explosion or leakage
Vibration test	UL1642-16	When subjected to vibration during transportation, it should not cause leakage, fire or explosion
Temperature cycle test	UL1642-18	Repeated exposure to high and low temperatures should not cause fire or explosion
Low atmospheric pressure test	UL1642-19	During transportation, being in the cargo hold of the aircraft should not cause fire or explosion

4 Test Methods

4.1 Standard test conditions

4.1.1 Temperature and humidity

If there are no special requirements, the product test conditions on this specification are temperature 25℃±2℃; Humidity: 65%±20%RH.

4.1.2 Standard charge mode

"Standard charging" means that under the condition that the ambient temperature is 25℃±

2℃, it is first charged at a constant current 0.2C to 3.95 V, and then charged at 3.95 V constant voltage to the current to less than 0.05 C.

4.1.3 Standard discharge mode

"Standard discharge" means that under the condition that the ambient temperature is 25℃±2℃, the constant current is 0.2C to discharge to 2.0 V.

4.2 Electrical performance test

4.2.1 Charge performance

After discharging the battery according to the standard discharge mode, put the battery into the environmental test box and set the surface temperature of the battery according to the regulations and keep it for 6h, and then charge it according to the specified rate.

4.2.2 Discharge performance

After charging the battery according to the standard charging method, put the battery into the environmental test box according to the temperature specified by the performance index and keep it at the temperature for 12h, and then discharge it according to the specified rate.

4.2.3 Storage performance (300kgf±20kgf clamping force)

4.2.3.1 Short term

a) Ultra-high temperature storage

Charge the battery according to the standard charging mode, set aside for 30min, put the battery into the environmental test box and set it at 60℃ and maintain the temperature for 7 days, take out the battery and put it in an environment of 25℃±2℃ for 6h, and discharge the battery according to the standard discharge mode.

b) High temperature storage

Charge the battery according to the standard charging mode, set aside for 30min, put the battery into the environmental test box and set it at 45℃ and maintain the temperature for 7 days, take out the battery and put it in an environment of 25℃±2℃ for 6h, and discharge the battery according to the standard discharge mode.

c) Low temperature storage

Charge the battery according to the standard charging mode, set aside for 30min, put the battery into the environmental test box and set it at -20℃ and maintain the temperature for 7 days, take out the battery and put it in the environment of 25℃±2℃ for 6h, and discharge the battery according to the standard discharge mode.

4.2.3.2 Long term

a) Room temperature storage

Discharge the battery according to the standard discharge mode, charge it at a constant current of 0.5C for 60min, set aside for 30min, put the battery in the environmental test box and set it at

25℃ and maintain the temperature for 90 days, take out the battery and put it in an environment of 25℃±2℃ for 6h, discharge the battery according to the standard discharge mode first, set aside for 30min. Then the battery is charged according to the standard charging mode, and finally the battery is discharged according to the standard discharge mode.

4.2.4 Life span (300kgf±20kgf clamping force)

4.2.4.1 High temperature cycle

a) Put the battery into an environmental test chamber at 45℃±2℃ and set aside for 6 h;
b) Charge at 0.5C constant current to 3.95V, set aside for 30min;
c) Constant discharge at 0.5C to 2.0V, set aside for 30min;
d) Repeat step b ~ c for a total of 2000 times.

4.2.4.2 Room temperature cycle

a) Put the battery into an environmental test chamber at 25℃±2℃ and set aside for 4 h;
b) Charge at 0.5C constant current and constant voltage to 3.95V until 0.05C, set aside for 30min;
c) Constant discharge at 0.5C to 2.0V, set aside for 30min;
d) Repeat step b ~ c for a total of 3500 times.

4.2.4.3 Rate cycle

a) Put the battery into an environmental test chamber at 25℃±2℃ and set aside for 4 h;
b) Charge at 1C constant current to 3.95V, set aside for 30min;
c) Constant discharge at 1C to 2.0V, set aside for 30min;
d) Repeat step b ~ c for a total of 1500 times.

4.2.4.5 Over-discharge characteristic cycle (300kgf±20kgf clamping force)

a) Put the battery into an environmental test chamber at 25℃±2℃ and set aside for 4 h;
b) Charge at 0.5C constant current to 3.95V, set aside for 30min;
c) Constant discharge at 0.5C to 0V, set aside for 30min;
d) Repeat step b ~ c for a total of 100 times.

4.2.5 Security test

4.2.5.1 Overdischarge

After the battery is charged according to the standard charging mode, the battery is discharged at 1C current until the discharge time reaches 90min, and then observed for 1 hour. During the test, the clamping force of 300kgf±20kgf is given in the direction of cell thickness.

4.2.5.2 Overcharge

After the battery is charged according to the standard charging mode, the battery is charged at 1C constant current to 4.345V or 115%SOC, then stops charging, and observed for 1 hour. During the test, the clamping force of 300kgf±20kgf is given in the direction of cell thickness.

4.2.5.3 External short-circuit test

Short-circuit the positive and negative terminals of the battery externally for 10min(external line resistance < 5mΩ), observed for 1 hour, during the test process, 300kgf±20kgf clamping force was given in the direction of cell thickness.

4.2.5.4 Extrusion test

The battery is placed between the two extrusion surfaces of the extrusion equipment, the Prismatic cell is parallel to the extrusion plane, and the extrusion speed is ≤2mm/s, and the pressure is gradually increased until the voltage reaches 0V or the deformation reaches 15% or the extrusion pressure reaches 100kN or 1000 times the battery weight, and the pressure is maintained for 10min and observed for 1 hour.

4.2.5.5 Drop test

After the battery is charged according to the standard charging mode, the positive and negative terminals of the battery sample are freely dropped down to the concrete floor at a height of 1m, and observed for 1 hour.

4.2.5.6 Mechanical shock test

The battery can be fixed to the test equipment in a flat rigid mounting mode by supporting it. Each single cell should withstand 3 equal acceleration shocks. Each cell bears the shock in three perpendicular directions. The direction of each impact is perpendicular to the surface of the cell. Acceleration requirements: The minimum average acceleration within the initial 3ms should reach 75g, the peak acceleration between 125-175g. The test temperature was 25±5℃.

4.5.2.7 Vibration test

The battery shall be subjected to vibration with an amplitude of 0.8mm. The vibration frequency varies at a rate of 1Hz/min in the range of 10-55Hz, and cycles once in 90-100min. The battery vibrates in three perpendicular directions.

4.2.5.8 Low air pressure test

The sample battery is stored for 6 hours at an absolute pressure of 11.6kPa and a temperature of 25±5℃.

4.2.5.9 Heat test

Put the battery in an electric blower drying box, and increase the temperature from room temperature to 130℃±2℃ at the rate of 5±2℃/min and hold for 30min before stopping heating and observe for 1 hour. During the test, 300kgf±20kgf clamping force is applied in the direction of cell thickness.

4.2.5.10 Temperature cycle test

The battery is placed in the temperature test box and adjusted according to the following table. After 5 times cycle, the battery is placed in an environment of 25±5℃ for observation for 1h.

During the test, 300kgf±20kgf clamping force is applied in the direction of cell thickness.

Temperature/℃	Time increment/min	Accumulated time/min	Rate of temperature change/℃/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 Instructions and Precautions

5.1 Battery instructions

5.1.1 Transport

The battery transportation state of charge is 30% ~ 50% SOC, the battery is packed into boxes for transportation, in the process of transportation should prevent severe vibration, shock or extrusion, to prevent sun and rain, must not be inverted.

In the process of loading and unloading, the product should be handled lightly to prevent throwing, rolling and heavy pressure.

5.1.2 Battery storage

Long-term storage of batteries for more than 6 months must be placed in a dry, ventilated place, storage state of charge of 20% to 50%SOC, and every 6 months to carry out a charge and discharge cycle of the battery.

5.2 Safety rules

Abuse of Na-ion rechargeable batteries may cause battery damage or personal injury. Before using Na-ion batteries, please read the following safety rules carefully:

Note 1: If the customer needs to operate the battery under conditions other than this document, please consult HiNa Battery first.

Note 2: HiNa Battery is not responsible for accidents arising from the use of the battery outside the conditions stated in this document.

5.2.1 Battery precautions

a) Do not throw the battery into fire or heat it.

b) Do not short circuit, overcharge or overdischarge the battery.

c) Do not subject the battery to excessive mechanical shock;

d) Do not immerse the battery in seawater or water, or make it moisture-absorbing.
e) Do not reverse the positive and negative electrodes of the battery.
f) Do not disassemble or repair the battery.
g) Do not cause visible damage or deformation to the battery.
h) Do not touch the leaking battery directly.
i) Keep the battery away from children.
j) Do not needle, hammer or step on the battery.
k) Do not hit or throw the battery.

6 Revision Statement

Due to the continuous improvement of product quality and characteristics, the company has the right to revise this specification, and will not notify the user in advance after the revision.

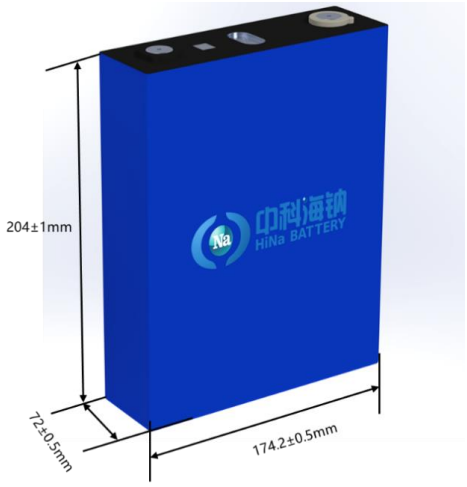
7 Other Notes

The matters that are not mentioned in this specification must be confirmed by the Company, and the Company reserves the right of final interpretation of the content stated in this specification.

8 Appendix

8.1 Battery size

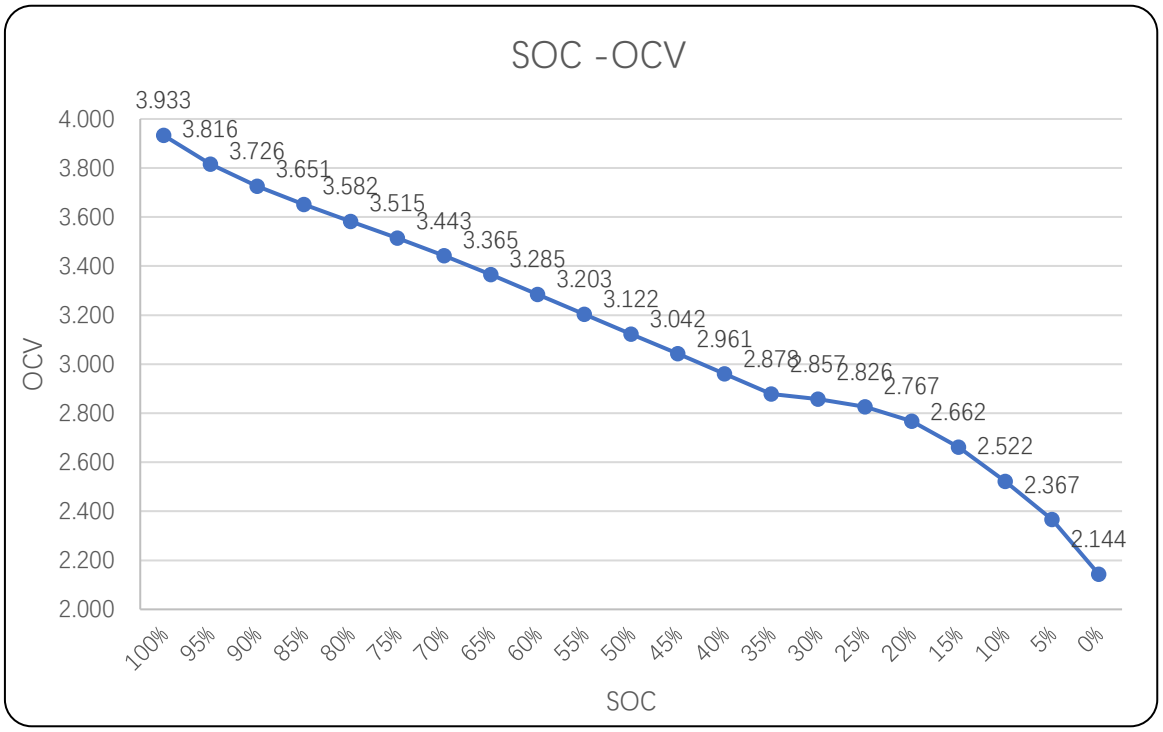
(Note: The appearance and logo are subject to the actual product)



8.2 Packing mode

Each box is loaded with 5pcs batteries, and RoHS logo and finished battery identification card are posted on the outside of the box.

8.3：SOC-OCV


SOC -OCV
OCV
SOC
4.000
3.800
3.600
3.400
3.200
3.000
2.800
2.600
2.400
2.200
2.000
100%
95%
90%
85%
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3.365
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