Product Specification

280Ah lithium iron phosphate(energy storage type) product

Model name： LFP71173207/280Ah

Version： A/1

Client Name：
Client confirmation (seal): no objection to the contents of this specification.
Date:

Xiamen HITHIUM New Energy Co., Ltd.

Date:

AMENDMENT RECORDS

Date	Version	Amendment Content	Author	Confirmed
2021/08/06	A/0	New Edition Formulation	唐阳	Jacky
2021/11/07	A/1	① Cell Clear status: 40%SOC→27%SOC ② Cell Clear Voltage 3.29~3.31V→3.28~3.30V	张蕊	Allen

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1. Definition of terms

HIHIUM	Xiamen HITHIUM New Energy Co., Ltd.
Client	Purchaser of cell
Product	Unless otherwise specified, cell products
Ambient temperature	The ambient temperature of the cell, with a temperature tolerance of ± 2 ℃
PN	In order to distinguish whether the cell is used in different areas or under different application conditions, the material number defined by HITHIUM 280ah 3.2V lithium ion cell
Cell	Unless otherwise specified in this specification, it refers to the cargo state cell (27%soc, blue coated film)
BMS	An effective tracking and control system for monitoring and recording the operating parameters of products during the whole service life. The parameters tracked and recorded include but are not limited to voltage, current, temperature, etc., so as to control the operation of the product and ensure that the operating environment and conditions of the product comply with the provisions of this specification
Cell temperature	The temperature of the electric cell measured by the temperature sensor connected to the electric cell, and the selection of the temperature sensor and the measuring line are jointly agreed by HIHIUM and the client
Fresh state	It refers to the state of the cell with less than 5 times of cyclic charging and discharging within 15 days after the client receives the cells (only for domestic transportation)
Charging rate	The ratio of charging power to the energy value of the battery cell measured many times by the battery management system. For example, when the cell

	energy is 896wh and the charging power is 448w, the charging ratio is 0.5p; When the energy attenuation of the cell is 627.2wh and the charging power is 313.6w, the charging rate is 0.5p
Discharge rate	The ratio of discharge power to the energy value of the cell measured by the battery management system many times. For example, when the cell energy is 896wh and the discharge power is 448w, the discharge and charging ratio is 0.5p; When the energy attenuation of the cell is 627.2wh and the discharge power is 313.6w, the discharge rate is 0.5p
Production date	The production date of the cell. The clear production date code contained in the engraved code on the top cover of each cell is the production date
Standard Charge	At room temperature (25 ± 2 ℃), charge with 0.5p constant power to the termination voltage of 3.65v, stop charging, and let it stand for 30min
Standard Discharge	At room temperature (25 ± 2 ℃), discharge with 0.5p constant power to the termination voltage of 2.5V, stop discharging, and stand for 30min
Cycle	The battery is charged and discharged according to the specified standard. One charge and discharge is a cycle
Open circuit voltage(OCV)	The voltage of the cell measured when no load or circuit is connected
State of charge(SOC)	The ratio of the actual charging capacity of the cell to the full charging capacity indicates the charging state of the cell. The charge state of 100% SOC means that the cell is fully charged to 3.65v, and the charge state of 0% SOC means that the cell is fully discharged to 2.5V
temperature rise	According to the specific charging and discharging conditions, the temperature rise of

	the cell during the charging or discharging process
Unit of measurement	"V" (Volt), voltage unit "A" (Ampere), current unit "W" (Watt), Power unit "Ah" (Ampere Hour), capacity unit "Wh" (Watt Hour), energy unit "mΩ" (MilliOhm), internal resistance unit "℃"(degree Celsius), temperature unit "Mm" (MilliMeter), length unit "S" (Second), time unit "Hz", Frequency unit "Kg" (Kilogram), mass unit "N" (Newton), force unit

2. Scope of application

This technical specification specifies the performance requirements, test methods, transportation, storage requirements and precautions of LFP71173207/280Ah lithium ion battery cell.

3. Normative references

The following documents are essential for the application of this document. For dated references, only the dated version applies to this document. For undated references, the latest edition (including all amendments) applies to this document.

Gb/t 36276-2018 lithium ion batteries for electric energy storage

Gb/t 31485-2015 safety requirements and test methods for power batteries for electric vehicles 6.2.8

4. Test conditions

Unless otherwise specified, the parameters of the cell are those in the state of new cell, and the test object is the cell in the state of new cell (except self discharge test). Unless otherwise specified, the experiment and measurement shall be carried out at room temperature (25 ± 2) ℃, standard humidity (55 ± 20)% and large surface fixture force of (3000 ± 200) n.

4.1 Measuring equipment and accuracy

(1) Accuracy of test equipment: ±0.1%

(2) Current measurement accuracy: ≥0.5 level，Voltage measurement accuracy: ≥ 0.5 level

(3) Temperature measurement accuracy: ±0.5℃

(4) Time measurement accuracy: ±0.1%

(5) Dimensional measurement accuracy: ±0.1%

(6) Weight measurement accuracy: ±0.1%

4.2 Charge discharge mode

Unless otherwise specified, the charge / discharge mode shall be the standard charge / discharge mode.

4.3 Welding parameters of pole and busbar

No.	Item	standard
1	Welding output power	≤2200J
2	Penetration	≤2.0mm
3	Drawing force	≤1000N
4	Temperature of pole plastic parts	200℃ time less than 30s
5	Pole under pressure	≤1000N

HITHIUM welding parameters： P=4000~4200W，V=70~80mm/s (For reference only)；

5. Cell Technical parameters

5.1 Cell general parameters

Item	Parameter	Condition
Cell type	Lithium iron phosphate	N.A.
Cell model	LFP71173207/280Ah	N.A.
Dimension	See the finished cell drawing	See Chapter 10 cell drawings for details
Cell wight	5.43±0.20kg	After blue coating
Impedance(1kHz)	0.18±0.05mΩ	27%SOC, subject to the online test data of the production line
Typical capacity	280Ah	(25±2)℃, standard charge and discharge
Typical Voltage	3.2V	(25±2)℃, standard charge and discharge
Typical Energy	896Wh	(25±2)℃, standard charge and discharge
Operating voltage	2.5-3.65V	Temperature T＞0℃

	2.0-3.65V	Temperature T≤0℃
Shipping voltage range	3.28~3.30V	(25±2)℃， 27%SOC Open circuit voltage
Energy density	≥160Wh/kg	(25±2)℃, standard charge and discharge
SOC use window	10%~90%	N.A.
Residual capacity loss	≤3.0%	Fresh cell after 3month, 27%SOC， 25±2℃ storage
Maximum charge power (continuous)	1P	25±2℃
Maximum discharge power (continuous)	1P	25±2℃
Discharging Temperature	-30~60℃	N.A.
Charging Temperature	0~60℃	N.A.

5.2 Cell performance parameters

Item	Parameters	Test method
-20℃ discharge capacity	≥70% Typical capacity	After the standard charging of the cell, let it stand for 24h at -20 ± 2 ℃, discharge the cell to 2.0V with a current of 0.5p, and record the discharge capacity (Ah)
55℃ discharge capacity	≥95% Typical capacity	After the standard charging of the cell, stand for 5h at 55 ± 2 ℃, discharge the cell to 2.5V with a current of 0.5p, and record the discharge capacity (Ah)
Continuous charge / discharge temperature rise	≤10℃	(25±2)℃, For standard charging and discharging, the temperature sensing wire is pasted on the large surface of the cell (the cell is tested without a fixture), and the high and low temperature box is tested. The cell starts charging (discharging) and the temperature rise is recorded as continuous charging (discharging) temperature rise until the completion of charging (discharging)
Pulse discharge temperature rise	≤5℃	(25 ± 2) ℃, 50-80% SOC state of single cell, 500A pulse discharge for 10s, test in high and low temperature box, the temperature sensing line is pasted on the large surface of the cell (without fixture), and the temperature rise from the beginning of discharge to the completion of discharge is

		recorded as pulse temperature rise
Room temperature charge retention and recovery capability	Remaining capacity ≥95%Typical capacity Recovery capacity ≥97%Typical capacity	After the standard charging of the cell, it shall be open circuit for 28 days at room temperature; Discharge at 0.5p to 2.5V, and the discharged capacity is recorded as the remaining capacity; After standard charging again, discharge to 2.5V at 0.5p, and the discharged capacity is recorded as the recovery capacity
High temperature charge retention and recovery capability	Remaining capacity ≥95%Typical capacity Recovery capacity ≥97%Typical capacity	After the standard charging of the electric cell, the open circuit shall be placed for 7 days under the condition of high temperature of 55 ± 2 ℃; After shelving at room temperature for 5h, discharge to 2.5V at 0.5p, and the discharged capacity is recorded as the remaining capacity; After standard charging again, discharge to 2.5V at 0.5p, and the discharged capacity is recorded as the recovery capacity
Safety performance	The monomer meets the requirements of monomer acupuncture in GB/T 36276-2018 and GB/T 31485-2015	Refer to article GB/T 36276-2018 , 6.2.8 of GB/T 31485-2015 requirement

5.3 cell寿命

Item	Parameters	Test method
Cycle life	≥7500 cycles	(25 ± 2) ℃, the large surface of the cell is clamped with 15mm aluminum plate, and the clamping force is (3000 ± 200) n. test it in the high and low temperature box, charge it to 3.65v with 0.5p constant power, put it aside for 30min, discharge it to 2.5V with 0.5p constant power, put it aside for 30min, and repeat the above standard charge and discharge until the capacity attenuation is 70% of the typical capacity

6. Requirements for identification, packaging, transportation and storage

6.1 The cell shipping report includes the size, capacity, voltage, internal resistance and size data of the cell;

6.2 When storing the cell, it should be placed in a warehouse with ventilation, relative humidity not greater than 80%, temperature not higher than 35 ℃, which can be waterproof, corrosion-resistant and dust-proof, and the SOC of the cell should be maintained at 20~50%;

6.3 The packing box shall be marked with "handle with care", "waterproof", "anti inversion", "stackable layers", etc;

6.4 The packing box or box should be handled with care during transportation to avoid collision and knocking. It is strictly prohibited to put it together with corrosive substances such as acid and alkali;

6.5 The card board of incoming electric cell box is not allowed to tilt or collapse during normal shipping or placement.

7. Application conditions

The client should ensure that the following application conditions related to the cell are strictly observed:

7.1 After receiving the arrived cells, the client shall complete the warehousing inspection within 15 days, with specific reference to the inspection specifications negotiated by both parties;

7.2 Operating environment temperature range: charging: 0~60 ℃; Discharge: -30~60 ℃;

7.3 Short term storage temperature range (within 1 month): -20~45 ℃;

7.4 Altitude: ≤ 4500m;

7.5 Relative humidity: ≤85%RH;

7.6 The system group design needs to apply a certain preload to the cell. The preload range of the fresh cell is 500 ~ 3000n, and the recommended preload tolerance is ± 200N;

7.7 The expansion force will be generated during the use of the cell. Under the test condition that the initial large surface clamp force of the cell of 15mm steel plate is (3000 ± 200) n, the expansion force is about 25000n when it is attenuated to 70%. clients need to consider the reliability of the structural strength of the system used with the cell products in the product design process. clients need to consult HITHIUM's suggestions. If clients do not consult or adopt HITHIUM's suggestions, all quality and safety problems will occur, HITHIUM is not responsible;

7.8 The client shall configure a battery management system to closely monitor, manage and protect each cell;

7.9 The client shall provide HITHIUM with the detailed design scheme, system characteristics, framework, system data, format

and other relevant information of the battery management system for HITHIUM to assist in the design and evaluation of the system. The auxiliary design evaluation is a non obligatory work of HITHIUM, and the evaluation conclusions and suggestions need to be comprehensively considered by the client. If the client fails to adopt HITHIUM's evaluation suggestions, HITHIUM will not be responsible for all quality and safety problems; In order to avoid affecting the performance of the battery cell, the client shall not modify the design and framework of the battery management system that has been evaluated and finalized without authorization, otherwise, HITHIUM shall be exempted from liability for direct causality quality problems or quality accidents;

7.10 The client should keep the complete monitoring data of the operation of the battery as a reference for the division of product quality responsibility, otherwise HITHIUM will not bear the responsibility for product quality assurance;

7.11 The BMS shall meet the following basic detection and control requirements:

No.	Item	Parameters	Protective action
7.11.1	Stop charging	3.65V	Stop charging when cell voltage reaches 3.65V
7.11.2	First level overcharge protection	≥3.7V	Stop charging when cell voltage reaches 3.7V
7.11.3	Second level overcharge protection	≥3.8V	When the battery voltage reaches 3.8V, the BMS is forced to terminate charging, and the BMS should be locked until technicians solve the problem.

7.11.4	Stop discharging	Minimum 2.5V(T > 0℃) 2.0V(T≤0℃)	Minimize the discharging current when cell voltage reaches 2.5V(T > 0℃) or 2.0V(T≤0℃).
7.11.5	First level over discharge protection	Minimum 2.4V(T > 0℃) 1.8V(T≤0℃)	Stop discharging and minimize the discharging current when cell voltage reaches 2.4V(T > 0℃) or 1.8V(T≤0℃)
7.11.6	Second level over discharge protection	Minimum 2.0V(T > 0℃) 1.6V(T≤0℃)	When the cell voltage is less than 2.0V(T > 0℃) or 1.6V(T≤0℃), the cell should be charged back to 50% SOC at 0.1C in time, and the BMS should be locked until technicians solve the problem.
7.11.7	Short circuit protection	No short circuit allowed	When a short circuit, disconnect the cell by the overcurrent device
7.11.8	Over current protection	Current≤358.4A	BMS controls the charging and discharging current to meet the specification
7.11.9	Over temperature protection	Cell temperature ≤60℃	When the temperature exceeds the specified value, stop charging / discharging
7.11.10	Low temperature protection	Charging: temperature > 0℃; Discharge: temperature ≥-30℃	When the temperature is lower than the specified value, stop charging / discharging

Note: the above no.7.11.2, 7.11.3, 7.11.5 and 7.11.6 are warning terms, and the client is reminded that when the cell reaches the index and parameter state described in any of the above terms, it means that the cell has exceeded the service conditions specified in this specification, and the client needs to take protective measures for the cell in accordance with "protective action" and other relevant provisions of this specification. At the same time, HITHIUM declares that it will not assume any guarantee responsibility for the quality of the above used cells, and will exempt the client and the third party from any loss compensation caused thereby.

7.12 The client and the third party should prevent the battery from reaching the over discharge state. When the cell voltage is lower than 2.0V, the interior of the cell may be permanently damaged. At this time, HITHIUM's product quality assurance responsibility is invalid. According to Article 5.1 of this specification, when the discharge cut-off voltage is lower than 2.5V, the internal energy consumption of the system will be minimized, and the sleep time will be extended before recharging. The client needs to train the user to recharge in the shortest time to prevent the battery from entering the over discharge state.

7.13 The storage SOC of the cell shall be kept within the range of 20~50%. If the client expects to store the cell for more than 1 month and no more than 6 months, he should charge and discharge it in advance and adjust the SOC to 20% - 50%. HITHIUM will not be responsible for the capacity loss or other losses caused by the storage SOC of the cell exceeding 20~50% or the storage of more than 6 months without charge and discharge maintenance.

7.14 clients should avoid charging the battery under conditions other than those specified in this specification (including standard charging, fast charging, low-temperature charging, emergency charging, etc.), otherwise unexpected capacity reduction may occur. The battery management system shall be controlled according to the minimum charging temperature. Otherwise, HITHIUM will not undertake quality assurance responsibility.

7.15 clients should take protective measures to avoid the damage of the blue film during the handling of the cell and the design and assembly of the box. HITHIUM will not be responsible for the quality assurance of the cell damage caused by the damage of the blue film of the cell during the handling and the design and assembly of the box.

7.16 In the design of the electric box, the stress on the large surface of the electric core shall be uniform. HITHIUM will not be responsible for the loss of the cycle life of the electric core or other losses caused by the local stress design of the electric core.

7.17 The heat dissipation of the electric cell should be fully considered in the design of the electric box. HITHIUM will not bear the responsibility of quality assurance for the overheating damage of the electric cell caused by the heat dissipation design of the electric box.

7.18 The waterproof and dustproof problems of the electric cell shall be fully considered in the design of the electric box, and the electric box must meet the waterproof and dustproof levels specified in the relevant national standards. HITHIUM is not responsible for the quality assurance of the damage (such as corrosion, rust, etc.) of the electric core caused by the waterproof and dust-proof problems.

7.19 It is forbidden to mix different PN cells in the same battery system, otherwise HITHIUM will not bear the responsibility of quality assurance. Different batches of cells of the same PN cannot be mixed in the same battery system, and problems such as excessive differential pressure may occur. HITHIUM will not bear the responsibility of quality assurance.

7.20 The service life of the cell is limited. The client should establish an effective tracking system to monitor and record the internal resistance and capacity of the cell within each service life. The

measurement and calculation methods of internal resistance and capacity need to be discussed and agreed by the client and HITHIUM. If both parties fail to reach an agreement, it shall be implemented in accordance with HITHIUM standards. When the internal resistance of the cell in use exceeds 200% of the initial internal resistance of the cell or the capacity is less than or equal to 70% of the nominal capacity (25 ℃), the cell shall be stopped.

8. 注意事项

8.1 Do not immerse the cell in water.

8.2 If the cell is not used and stored correctly, there are risks of fire, explosion and burn. Do not decompose, crush, incinerate, heat and put the cell into the fire.

8.3 It is forbidden to put the cell into a fire or expose it to a high temperature environment that exceeds the temperature conditions specified in this specification for a long time, otherwise it may cause a fire. Under any normal use condition, the cell temperature cannot exceed 60 ℃. If the cell temperature exceeds 60 ℃, the battery management system needs to shut down the cell and stop the cell operation.

8.4 Put the cell out of the reach of children. Do not remove the original packaging of the cell before use. Dispose of the waste cell in time according to local recycling or waste regulations.

8.5 Do not disassemble, disassemble or repair the cell in any way without authorization.

8.6 Do not mix lithium-ion cells of different specifications and brands.

8.7 If the cell emits peculiar smell, heating, deformation, discoloration or any other abnormal phenomena, it shall not be used and the cell shall be transferred to a safe location.

8.8 It is forbidden to short circuit the positive and negative poles of the cell, otherwise strong current and high temperature may

cause personal injury or fire. Since the positive and negative electrodes of the cell are exposed in the plastic protective sleeve, there should be sufficient safety protection during the assembly and connection of the battery system to avoid short circuit.

8.9 Connect the positive and negative poles of the cell in strict accordance with the signs and instructions. Reverse or series charging is prohibited.

8.10 It is forbidden to overcharge / discharge the cell, otherwise it may cause overheating and fire accidents. During the installation and use of the cell, it is necessary to implement multiple overcharge and discharge failure safety protection of hardware and software (including the installation of charge and discharge timer protection). See 7.11.3 and 7.11.6 of this specification for the minimum protection requirements.

8.11 Improper termination of charging may occur during cell charging. If the allowable charging time is exceeded, the charging voltage is too high and the charging is terminated, or the charging current is too strong and the charging is terminated. The above phenomenon is defined as "improper termination of charging". When the above phenomena occur, it may mean that the battery system has leakage or some parts have failed. If you continue to charge the battery until the root cause is found and completely solved, the cell may overheat or cause a fire. When the above phenomena occur, the battery management system should prohibit subsequent charging through the automatic locking function, and remind the user to return the vehicle loaded with the battery cell to the dealer for system maintenance. The cell can only be recharged after a comprehensive inspection by qualified technicians to determine the root cause and thoroughly solve and improve it.

8.12 The client should safely fix the cell on the solid plane, and securely tie the power line in a suitable position to avoid arc and spark caused by friction.

8.13 It is forbidden to encapsulate the cell with plastic or make electrical connection with plastic. Incorrect electrical connection may cause overheating during cell use.

8.14 When electrolyte leaks, avoid contact with skin and eyes. In case of contact, wash the exposed area with plenty of water and seek help from a doctor. It is forbidden for any person or animal to swallow any parts of the cell or substances contained in the cell.

8.15 The cell should have protective measures to prevent it from mechanical vibration, collision and pressure impact, otherwise the cell interior

There may be short circuit, high temperature and fire. There are potential dangers in the cell, so appropriate protective measures must be taken during operation and maintenance; The test experiment described in Article 5.2 safety performance of this specification may cause cell fire or explosion if it is not operated properly. This test experiment can only be carried out in a professional laboratory by professionals equipped with appropriate protective equipment. Otherwise, serious personal injury and property damage may be caused. Failure to comply with the above warnings may cause a variety of disasters.

8.16 Client is aware of the following potential hazards during the use and operation of the cell: the operator may be injured by chemicals, electric shock or electric arc during operation; Although the human body reacts differently to direct current and alternating current, direct current voltage higher than 50V is as serious as alternating current. Therefore, the client must adopt a conservative posture in operation to avoid current damage. There is a chemical risk from the electrolyte in the cell. When operating the cell and selecting personal protective equipment, the client and its employees must consider the above potential risks to prevent accidental short circuit, resulting in arc, explosion or thermal runaway.

9. Other agreements

9.1 After the production of the cell is completed, it leaves the factory with 27% of the charging capacity. HITHIUM can provide the data of the capacity, voltage, internal resistance and size of the factory cell.

9.2 The quality assurance requirements shall be subject to the agreement between client and HITHIUM. If both parties fail to agree, refer to section 5.3 service life requirements of single cell.

9.3 When HITHIUM technical support is required during cell installation and use, HITHIUM can provide services and technical support. If the cell is not used according to the contents of this specification, HITHIUM can provide technical guidance and does not promise to replace the service free of charge.

9.4 Cell should use cell in strict accordance with the contents of this specification, and client should ensure that cell users use cell in accordance with the contents of this specification. Otherwise, HITHIUM will not be responsible for cell parameter discrepancies, cell quality problems, cell failures and any losses.

9.5 When the internal resistance of the cell in use exceeds 200% of the initial internal resistance of the cell or the capacity is less than or equal to 70% of the nominal capacity (25 ℃), the client should stop using the cell, otherwise the cell parameters, cell quality problems, cell failures and any losses will not be held responsible by HITHIUM.

9.6 Other product related documents involved in this specification must comply with the requirements of this specification, if

In case of any conflict with this specification, the contents in this specification shall prevail.

9.7 The client is obliged to keep the contents of this specification confidential, and the client shall not disclose it to any third party without authorization. See the confidentiality agreement signed by both parties for details.

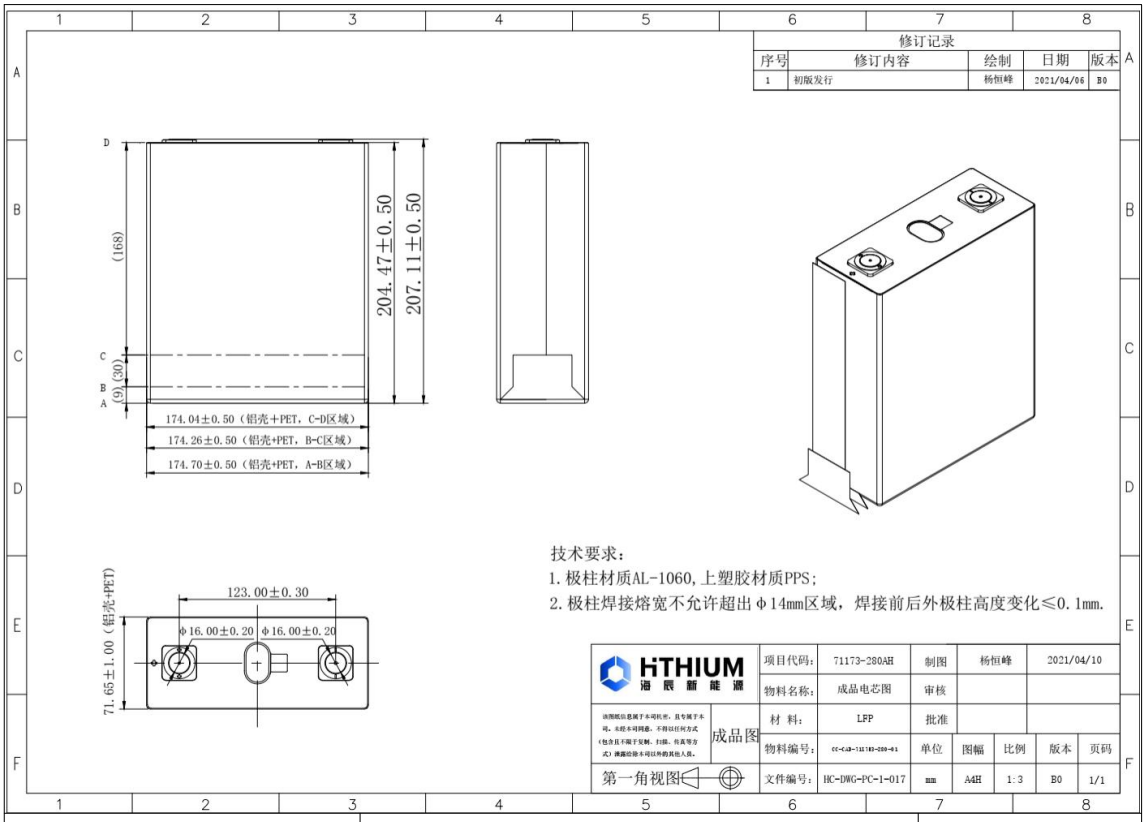
9.8 Without the consent of HITHIUM, clients, product users and any interested parties shall not synthesize, separate or modify the technical scheme of the cell under any circumstances, nor shall they spy on the cell, do reverse engineering, etc.

9.9 HITHIUM reserves the right to modify the specifications and performance parameters of products. Before ordering HITHIUM products, the client needs to confirm the latest specifications and performance parameters of the products with HITHIUM in advance.

9.10 If the cell sample is in the development stage, it is only used for testing. The specific test items of the client need to be determined through consultation with HITHIUM. It is forbidden to sell it to any third party without authorization.

9.11 If the improper use of the product by client, product user and any related party causes social impact and affects the reputation of HITHIUM, client, product user and any related party shall compensate all losses of HITHIUM.

10. Cell drawing



Item	Standard	Tolerance
Height (excluding pole)	204.47mm (including insulating film and outer gasket)	±0.5mm
Height (including pole)	207.11mm (Including insulating film)	±0.5mm
Thickness	71.65mm (Including insulating film)	±1.0mm
Width	174.70mm (Bottom hem, including insulating film)	±0.5mm
Pole welding area	Φ16mm (Excluding plastic outside pole)	±0.2mm
Center distance of positive (negative) pole	123mm	±0.3mm

Note: the thickness is measured under the condition that the large surface pressure is 3000 ± 200N