Product Specifications

Product design readiness	Product Design Approval	Sales approval	Project approval	Quality Assurance Approval	Product Manager Approval
Li XiaoWei	**Teng GuoPeng**	**Wang Hui**	**Zhang YuBao**	**Liu Jie**	**Chan LiBing**

Customer Confirmation	Signature	Date
	Customer code: Company seal:	

Customer requirements

LH3L8 6
Version 1.0

Ask customers to write their needs information and communicate with CATL in advance. If the customer has some special applications or operating conditions different from those described in this document, CATL can design and produce the product according to the customer's special requirements.

	Special requirements	Standards
1		
2		
3		
4		
5		

Customer code:_____Signature:_____Date: ____

Modification record

Version	ECN number	Effective date	Author	Revised description/recognition status
1.0			Li XiaoWei/EVC	New release

Directory

Terminology definitions

Terminology	Definition
Products	The "product" in this specification refers to 271 rechargeable lithium iron phosphate battery Ah 3.22V CATL production.
Client	A buyer in the CATL EV Product Sales Contract.
CATL	A seller in a contract for the sale of CATL EV products.
PN	To distinguish between battery applications in different areas of use or under different application conditions, CATL is 271 Ah 3.22V material number defined for rechargeable lithium batteries.
Ambient Temperature	The ambient temperature of the battery.
Battery Management System (BMS)	An effective tracking and control system used by customers to monitor and record the operating parameters of products throughout their service life. The parameters tracked and recorded include, but are not limited to, voltage, current, temperature, etc. to control the operation of the product and ensure that the operating environment and operating conditions of the product comply with the provisions of this specification.
Cell temperature	Temperature sensor and measurement line selected by CATL temperature sensor connected to battery Agree with the customer.
New battery status	It refers to the state of the battery within 7 days from the date of manufacture of the product.
C-Rate Charge rate	The ratio of the charging current to the capacity value of the battery measured many times by the battery management system. When the battery capacity is 271 Ah, the charging current is 54.2 A, the charging rate is 0.2 C; When the battery capacity drops to 250 Ah, the charging current is 50 A, the charging rate is 0.2
Cycle Cycle	The battery is charged and discharged as a cycle according to the prescribed charging and discharging standard. The cycle includes a short period of normal charging or a combination of regenerative charging and discharge processes, sometimes only normal charging without regenerative charging. The discharge can be formed by some partial discharge combinations.
Date of production	The manufacturing date of the battery, the clear date code marked on the top sticker of each related battery is the manufacturing date.
Open circuit voltage(OCV)	The voltage of the battery measured without access to any load and circuit.

	"℃"(degree Celsius) degrees Celsius (℃), unit of temperature mm" mm (mm), unit of length "s"(s second) seconds (s), unit of time "Hz"(Hertz) Hertz (Hz), unit of frequency

1 Scope of application

This specification describes in detail the CATL production of 3.22 V 271Ah rechargeable lithium iron phosphate power battery product performance indicators, product use conditions and risk warning.

2 Product Electrical Performance Index

2.1 Summary

No.	Parameters	Product specifications	Conditions
2.1.1	Standard capacity	271Ah	±2℃,1 new battery status
2.1.2	Minimum capacity	271Ah	±2℃,1 new battery status
2.1.3	Working voltage	2.5~3.65 V 2.0~3.65 V	Temperature T>0℃ Temperature T≤0℃
2.1.4	Battery internal resistance (1 KHz)	0.14±0.05 m Ω	New battery status (30~40 per cent SOC)
2.1.5	Shipment capacity	108.4±1 Ah	N.A.
2.1.6	Monthly self-discharge	≤3.5%	℃25,50% SOC, new battery 3 months later
2.1.7	Operating temperature (charging)	0~60℃	Refer to Section 2.2
2.1.8	Operating temperature (discharge)	-30~60℃	Refer to Section 2.3
2.1.9	Battery weight	Kg ≤5.47	N.A.
2.1.10	Battery size	Please refer to article 8 of this specification	300Kgf pressure

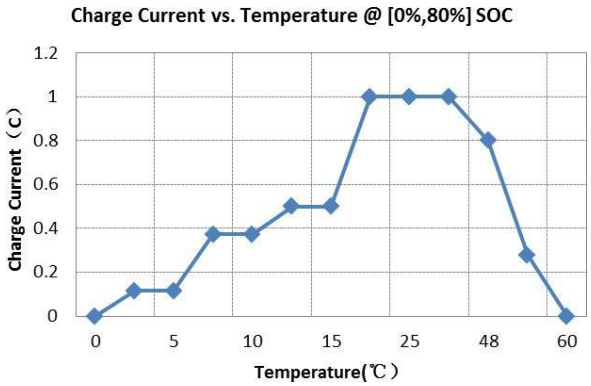
2.2 Charging mode/parameters

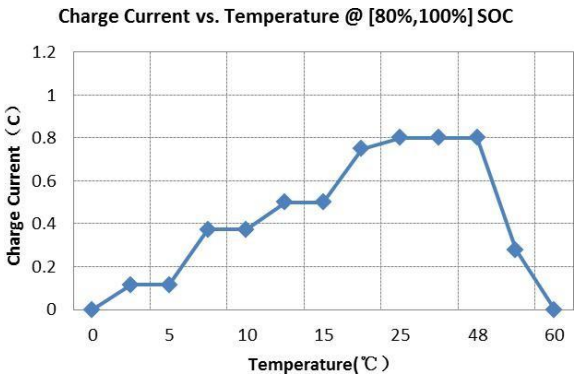
No.	Parameters	Product specifications	Conditions
2.2.1	Standard charging current	0.5 C	25±2 ℃
2.2.2	Maximum charge sustainable current	1C	25±2 ℃

2.2.3	Standard Charge Voltage	Maximum 3.65 V for single cell	/
2.2.4	Standard Charging Mode	The constant current of 0.5 C is continuously charged to the maximum 3.65 V, of the single cell, then the constant voltage is continuously charged normal pressure 3.65 V until the lower atmospheric pressure until the lower limit of the current is 0.05 C	
2.2.5	Standard charging temperature	25±2 ℃	Cell tempera ture
2.2.6	Absolute charging temperature (Cell temperature)	0~60℃	No matter what charging mode the cell is in, stop charging once the cell temperature exceeds the absolute charging temperature range
2.2.7	Absolute charging voltage	V 3.65 max	No matter what charging mode the cell is in, stop charging once the cell voltage exceeds the absolute charging voltage range

2.2.8 other charging conditions (mode) unit: C-Rate

Cell temperature/℃		0	2	5	7	10	12	15	20	25	45	48	55	60
SOC	0%~<80%	0	0.116	0.116	0.372	0.372	0.5	0.5	1.0	1.0	1.0	0.8	0.279	0
SOC	＞80%	0	0.116	0.116	0.372	0.372	0.5	0.5	0.75	0.8	0.8	0.8	0.279	0





2.3 Discharge mode

No.	Parameters	Product Specifications	Conditions
2.3.1	Standard discharge current	0.5 C	25±2 ℃
2.3.2	Maximum continuous discharge current	1C	N.A.
2.3.3	Maximum pulse discharge current (short pulse)	3C	The ce l l temperature is less than 50℃, and the maximum discharge time is 60 s ,SOCSOC>40% s 10
2.3.4	Discharge cutoff voltage	2.5 V 2.0 V	Temperature T>℃0 Temperature T≤℃0
2.3.5	Standard discharge temperature	25±2 ℃	Ce l l temperature
2.3.6	Absolute discharge temperature	-30~60℃	Whether the cell is in continuous discharge mode or pulse discharge mode, if the cell temperature exceeds the absolute discharge temperature, the discharge is stopped

2.4 Low temperature capacity

No.	Parameters	Product Specifications	Conditions
2.4.1	Capacity ℃	≥80%	New battery status ,0℃,1 C ,2.0V~3.65 V, benchmark is 271

	0		
2.4.2	-20℃ capacity	≥70%	New battery status ,-20℃,1 C ,2.0V~3.65 V, benchmark is 271

2.5 Safety and reliability (all tests comply with national standards GB/T 31485-2015,GB/T 31486-2015 standards)

No.	Parameters	Product specifications	Test conditions
2.5.1	Overcharge testing	No fire, no explosion	1. Test ambient temperature 25℃; 2. Single battery charging; 3. With 1.0 C current constant current charge to the voltage to the enterprise technical conditions specified in the charging termination voltage 1.5 times or charging time up to 1 h after stopping charging; 4. Observe 1 h, Monitor the voltage, current and temperature during the experiment.
2.5.2	Vibration test	There are no sharp discharge current, abnormal voltage, battery shell deformation, electrolyte overflow and so on.	1. Test ambient temperature 25±2℃ 2. Battery module charging 3. Fasten the battery module to the vibration test table and carry out the linear sweep vibration test according to the following conditions; -- Discharge current: C ;1/3 -- Vibration direction: up and down single vibration; - Vibration frequency :10 Hz ~55 Hz -- Maximum acceleration :30 m/s2; - Sweep cycle :10; -- Vibration time :3 h; 4. During the vibration test, observe whether there are abnormal phenomena. Do not allow sharp discharge current, abnormal voltage, battery case deformation, electricity Solution overflow and other phenomena, and maintain reliable connection, good structure.

3 Product life termination management

The battery life is limited. Customers should establish an effective tracking system to monitor and record the internal resistance and capacity of the battery for each lifetime.Internal resistance and capacity measurement and calculation methods need to be discussed and agreed by customers and CATL. If the internal resistance of the battery in use exceeds 150% of the initial internal resistance of the battery or the capacity is less than or equal to 70%(25℃), the battery shall be discontinued. Failure to comply with this requirement shall exempt the C A TL from product quality assurance in accordance with the product sales agreement and this specification.

4 Application conditions

Customers should ensure strict compliance with the following battery-related application conditions:

4.1 Customers should configure battery management system to closely monitor, manage and protect each battery.

4.2 The customer shall provide the CATL with detailed design scheme, system characteristics, framework, system data, format and other relevant information of the battery management system for CATL to evaluate the design of the system and

establish the battery management file

4.3 Customers may not modify or change the design and framework of the battery management system without CATL consent, so as not to affect the performance of the battery.

4.4 Customers should keep complete battery operation monitoring data as a reference for product quality responsibility division. If the monitoring data of the battery system is not complete, the CATL shall not bear the responsibility of product quality assurance.

4.5 The battery management system needs to meet the following basic testing and control requirement.

No.	Parameters	Product specifications	Protective action
4.5.1	Charge termination	3.65 V	Discontinue charging when battery voltage reaches V 3.65
4.5.2	Level 1 overcharge protection	V greater than or equal to 3.8	Discharging when battery voltage reaches 3.8 V
4.5.3	Secondary Overcharge Protection	V greater than 4.0	Discontinue charging when battery voltage reaches 4.0 V and lock battery Manage the system until the technician solves the problem
4.5.4	Discharge termination	2.5 V minimum	Discontinue discharge When the battery voltage reaches 2.5 V, current To a minimum
4.5.5	Level 1 overprotection	Minimum 2.0 V	Discontinue discharge When the battery voltage reaches 2.0 V, minimize current
4.5.6	Secondary protection	V minimum 1.8	Lock the battery management system when the battery voltage is less than V 1.8 Until technicians solve problems

4.5.7	Short circuit protection	No short circuit	In the event of a short circuit, the battery (battery) is disconnected by the overcurrent (battery)
4.5.8	Overcurrent protection	Refer to section 2.3 discharge requirements	Battery management system controls discharge current to specification
4.5.9	Overheat protection	Refer to Articles 2.2 and 2.3 Article 12	Termination of charge/discharge when temperature exceeds the specification Electricity
4.5.10	Over-charge protection	Charge time within 8 hours	If the charging time is longer than 8 hours, the charging is terminated

Remarks: The above No.4.5.2,4.5.3,4.5.5,4.5.6 are warning clauses, drawing the customer's attention: when the battery reaches the target and parameter status described in any of the above terms, it means that the battery has exceeded the operating conditions specified in this specification, the customer shall take protective measures against the battery in accordance with the "protective action" and other relevant provisions of this specification, and CATL declare that there is no warranty on the quality of the battery in the above state of use, and shall not compensate for any loss caused to the customer and third party.

4.6 Avoid the battery reaching over-discharge state. When the battery voltage is less than 1.8 V, the battery interior may be permanently damaged, CATL this time
The product quality assurance responsibility is invalid. According to Article 2.3.5 of this specification, when the discharge cutoff voltage is less than 2.5 V, the internal energy consumption of the system is reduced to a minimum and the dormancy time is prolonged before recharging. Customers need to train users to recharge in the shortest possible time to prevent the battery from entering overdischarge.

4.7 If the battery is expected to be stored for more than 30 days, the SOC should be adjusted to about 50%.

4.8 Batteries avoid charging at low temperatures prohibited by this specification (including standard charging, fast charging, emergency charging and regenerative charging), otherwise unexpected capacity reductions may occur. The battery management system shall be controlled according to the minimum charging and regenerative charging temperature. Charging below the temperature specified in this specification is prohibited, otherwise, CATL shall not be liable for quality assurance.

4.9 The heat dissipation problem of electric cell should be fully considered in the design of electric box, and the overheating damage of electric cell or battery caused by the heat dissipation design problem of electric box,
CATL is not responsible for quality assurance.

4.10 The waterproof and dustproof problems of electric core should be fully considered in the design of electric box, and the electric box must meet the waterproof and dustproof grade stipulated by the relevant national standards. Damage to the core or battery (such as corrosion, rust, etc.) caused by waterproof and dustproof problems, C A TL do not bear the responsibility of quality assurance.

4.11 No different P/N number cells are mixed in the same battery system (or vehicle), otherwise, CATL do not assume responsibility for quality assurance.

5 Security precautions

5.1 It is forbidden to immerse the battery in water.

5.2 It is prohibited to put the battery into fire or expose it for a long time to a high temperature environment exceeding the temperature conditions specified in articles 2.1.7 and 2.1.8 of this specification, otherwise it may lead to fire. Under any normal

condition, the battery cell temperature should not exceed 60℃. If the battery core temperature exceeds 60℃, the battery management system should close the battery and stop the battery operation.

5.3 Battery positive and negative short circuit is prohibited, otherwise strong current and high temperature may lead to personal injury or fire. Because the positive and negative electrodes of the battery are exposed to the plastic protective sleeve, there should be sufficient safety protection when the battery system is assembled and connected to avoid short circuit.

5.4 Connect battery positive and negative electrodes strictly in accordance with marking and instructions, prohibit reverse charging.

5.5 Do not overcharge the battery, otherwise, may cause battery overheating and fire accident. In battery installation and use, hardware and software need to implement multiple overcharge failure safety protection. Minimum protection requirements are specified in Articles 4.5.3 and 5.11 of this specification.

5.6 Normal charging shall be completed after charging according to Article 4.5.9 of this specification. When the continuous charging time exceeds the reasonable time limit, the overheating of the battery may cause heat runaway and fire. A timer should be installed to protect it. Once the charging current is overcharged and can not be terminated, the timer will function to terminate the charge, see Article 5.11 of this Specification.

5.7 The customer shall secure the battery to the solid plane and securely bind the power cord to the right position to avoid friction and cause arcs and sparks.

5.8 It is strictly forbidden to use plastic to encapsulate batteries or to use plastic for electrical connection. Incorrect electrical connection may cause overheating during battery use.

5.9 When the electrolyte leaks, the skin and eyes should be avoided contact with the electrolyte. If in contact, use plenty of water to clean the area and ask the doctor for help. It is prohibited for any person or animal to swallow any part of the battery or the substance contained in the battery.

5.10 Try to protect the battery from mechanical vibration, collision and pressure impact, otherwise the battery may be short circuit, high temperature and fire.

5.11 Improper termination of charging may occur during battery charging. For example: charging beyond the allowable charging time, charging voltage is too high to stop charging or charging current is too strong to stop charging. the above phenomenon is defined as "improper termination charging ". When the above phenomenon occurs, it may mean leakage of electricity or failure of some components in the battery system. Continuing to charge the battery without finding the root cause and resolving it thoroughly may cause overheating or fire. When the above phenomenon occurs, the battery management system should prohibit subsequent charging through automatic locking function, and remind the user to return the vehicle loaded with the battery to the dealer for system maintenance.

The battery can only be fully checked by certified technical personnel, determine the root cause and completely solve, improve before resuming charging.

5.12 The test experiments described in Article 2.5 of this specification may cause battery fire or explosion if not operated properly. The test can only be matched
Professionals with appropriate protective equipment are carried out in professional laboratories. Otherwise, it may lead to serious personal injury and property loss.

6 Disclaimer

6.1 If the product demand unit does not use according to the provisions of this specification, causing social impact, and affecting the reputation of the CATL, the CATL will be held responsible for the product demand unit. The product demand unit shall provide compensation to the CATL according to the degree of impact on the CATL.

6.2 CATL reserves the right to modify the specifications and performance parameters of the product. The buyer needs to confirm the latest status of the product with CATL in advance before ordering the CATL product.

7 Risk warning

7.1 Warning statements

Warning

The battery is potentially dangerous and must be properly protected during operation and maintenance!

Improper operation of the test experiments described in Article 2.5 of this specification may lead to serious personal injury and property loss!

The battery must be operated using the correct tools and protective equipment.

Battery maintenance must be performed by a person with battery.

7.2 Type of risk:

Customers are aware of the following potential hazards in battery use and operation:

7.2.1 Operators may be exposed to chemicals, electric shocks or electric arcs during operation. Although the reaction of human body to suffer DC and AC is different, the DC voltage above 50 V is as serious as that of AC to human body, so the customer must take a conservative posture in operation to avoid the damage of current.

7.2.2 There is a chemical risk from the electrolyte in the battery.

7.2.3 When operating batteries and selecting personal protective equipment, customers and their employees must take into account the above potential risks to prevent accidental short circuit and cause arc, explosion or thermal runaway.

8 Battery (cell) drawings