	<b>PRODUCT SPECIFICATION Product specification confirmation</b>		Form No. : xxxxxx
	Author /Dept.: Yang Meng/EVC	Document #: CTPS -71H3L7-01	Rev : 1.0
	<b>Model number: Sample product Specification of 320Ah Cell</b> <b>Confirmation of 320Ah electric cell sample specification</b>		
	Confidential: () Level 3 Privacy () Level 2 High density (V) Level 1 Low density		

# Sample specification confirmation letter

Product design preparation	Product design approval	Sales approval	Project worker, program approval	Quality assurance and approval	Product Manager approval
Y ang Meng	Wa ng GuoBao	Wang H ui	Zhang YuBao	Zhao Chao	Cha n LiBing

Guest, household, indeed, recognize	Sign, name	Day, period
	Customer, code:	
	corporate seal:	

Customer requirements

Model number: 71H 3L7  
Version: 1.0

Ask customers to write information about their needs and communicate with CAT L in advance.If the customer has some special applications or operating conditions different from those described in this document, CA TL can design and produce the product for specific customer requirements.

	special requirements	standard
1		
2		
3		
4		
5		

customer code:\_\_\_\_\_sign:\_\_\_\_\_date:\_\_\_

**amendant record**

Editi on, this	ECN number	availabili ty date	author	Revision Description / Recognition status
1.0			Yang Meng/EVC	New release

## Eyes, record

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**Terms, definitions**

<b>term</b>	<b>definition</b>
product	The "product" in this specification refers to the 320Ah 3.22V rechargeable lithium iron phosphate power battery produced by CATL.
client	Represents the buyer in the CA TL EV Product Sales Contract.
CA TL	Refers to the seller in CA TL EV Product Sales Contract.
P N	To distinguish between battery applications in different use areas or under different application conditions, the CATL is the material number as defined by the 320Ah 3.22V rechargeable lithium battery.
Surrounding ambient temperature	The ambient temperature of the battery.
The Battery Management System (BMS )	An effective tracking and control system for customers to monitor and record the operating parameters of the product throughout the service period. The tracking and recording parameters 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.
Battery temperature	The temperature of the cell measured by the temperature sensor connected to the battery, the temperature sensor and the measurement line selection are agreed upon by the CATL and the customer.
New battery status	Refers to the state of the battery within 7 days from the manufacturing date of the product.
C -Rate Charging ratio	The ratio of the charge current to the capacity value of the battery measured multiple times by the battery management system. For example, if the battery capacity is 320Ah and the charging current is 60.4A, the charging rate is 0.2C; when the battery capacity drops to 270Ah and the charging current is 54A, the charging rate is 0.2C.
Cycle Follow, ring	The battery is charged in one cycle according to the prescribed charge and discharge standard. The cycle includes a short period of normal charging or a combination of regenerative charging and discharge processes, which sometimes involves only normal charging and no regenerative charging. A discharge can be formed by a combination of some partial discharges.
date of manufacture	The manufacturing date of the battery, and the clear date code marked on the top sticker of each relevant battery is the manufacturing date.
open circuit voltage (OCV )	The voltage of the battery is measured without any load and circuit access.

Product Supply Agreement	Transaction terms signed by CATL and Customer.
Standard charging	Charging mode as described in clause 2.2.4 of this specification.
Standard discharge	The discharge current of 160A as specified in clause 2.3.1 of this specification and the discharge mode of the minimum 2.5V voltage as described in clause 2.3.5 of this specification.
Charging status (S OC)	All linear relationships of battery charging capacity states measured in ampere hours or in watt hours without a load. For example, if the capacity of 320Ah is regarded as 100%SOC, then if the capacity is 0Ah, the SOC is 0%.
temperature rise	The conditions specified in this specification, such as the cell temperature increase during the charging process or the discharge process.
measurement unit	"V" (Volt) volt (V), voltage unit
	"A" (Ampere) amp (A), current unit
	"Ah" (Ampere-Hour) amp-hour (Ah), load unit
	"Wh" (Watt-Hour) Watt-Hours (Wh), energy units

"Ω" (Ohm) Ohm (Ω), resistance unit
"mΩ" (MilliOhm) milliohm (m), resistance unit
"C" (degree Celsius) degrees C (C), temperature unit
"mm" (millimetre) mm (mm), in length
"s" (second) seconds (s), time unit
"Hz" (Hertz) Hz (Hz), frequency unit

## 1 Scope of application

This specification details the product performance indicators and product use conditions and risk warnings of 3.22V 320Ah rechargeable lithium iron phosphate power battery produced by CATL; this specification is only applicable for C sample stage sample shipment, and the product specifications of mass production stage need to be redefined and provided formal

Product specification of the.

## 2. Product electrical performance index

### 2.1 Summary

N o .	parameter	size of product	condition
2.1.1	standard capacity	320Ah	25 ± 2C, 1C, new battery status
2.1.2	minimum capacity	320Ah	25 ± 2C, 1C, new battery status
2.1.3	working voltage	2.5~3.65V 2.0~3.65V	temperature T>0C temperature T≤0C
2.1.4	Battery internal resistance (1KHz)	0.3±0.05mΩ	New battery status of 40%SOC
2.1.5	Shipping capacity	117~123Ah	New battery status of 40% SOC
2.1.6	Monthly self-discharge	≤3.5%	25C, 50%SOC, and the new battery storage after 3 months
2.1.7	Operating temperature (charging)	0~65C	Refer to Section 2.2
2.1.8	Operating temperature (discharge)	-35~65C	Refer to Section 2.3
2.1.9	Battery weight	≤5.51Kg	N.A.
2.1.10	Battery size	Please refer to article 8 of this specification	At 300Kgf under pressure
2.1.11	Cell cycle	≥4000cycle s	Initial clamping force of 300Kg f, a standard charge and discharge test

### 2.2. Charging mode / parameters

N o .	parameter	size of product	condition
2.2.1	Standard charge, electric	0.5C	25±2C

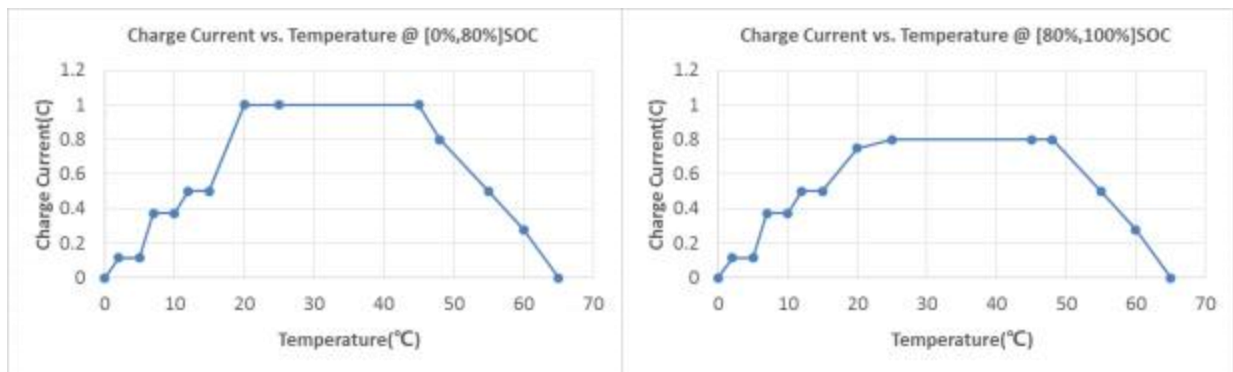
	current		
2.2.2	Maximum charge Sustainable current	1C	25±2C
2.2.3	Standard charge, electric voltage	The maximum single battery is 3.65V	/
2.2.4	Standard charge, power mode	0.5C Continuous current continuously charge to a maximum of 3.65V, and then at a constant voltage of 3.65V until the lower current limit of 0.05C	
2.2.5	Standard charge, electric temperature	25±2C	Battery temperature
2.2.6	Absolute charging temperature (cell temperature )	0~65C	Regardless of the charging mode the cell is, charging stops once the cell temperature exceeds the absolute charging temperature range



2.2.7	Absolute charging voltage	Maximum size of 3.65V	Regardless of the charging mode the cell is, charging stops once the cell voltage exceeds the absolute charging voltage range
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#### 2.2.8 Other charging conditions (mode) Unit: C-Rate

Cell temperature / C	0	2	5	7	10	12	15	20	25	45	48	55	60	65
SOC 0%~<80%	0	0.116	0.116	0.372	0.372	0.5	0.5	1.0	1.0	1.0	0.8	0.5	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	0.5	0.279	0



### 2.3 Discharge mode

No.	parameter	size of product	condition
2.3.1	Standard discharge, electric current	0.5C	25±2C
2.3.2	Maximum sustained, discharge current	1C	N.A.
2.3.3	Discharge cut, stop voltage	2.5V 2.0V	temperature T>0C temperature T≤0C
2.3.4	Standard discharge, electric temperature	25±2C	Battery temperature
2.3.5	Absolute discharge temperature	-35~65C	Whether the cell is in the continuous discharge mode or in the pulse discharge mode, the discharge stops if the cell temperature exceeds the absolute discharge temperature

### 2.4 Pulse discharge & recharge mode

#### 2.4.1 Pulse discharge mode unit: C-Rate

30s pulse discharge rate / C-cell level													
SoC/T	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%

-35 C	0.00	0.00	0.00	0.00	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
-30 C	0.00	0.03	0.06	0.13	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
-25 C	0.00	0.06	0.13	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-15 C	0.00	0.06	0.13	0.25	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
-10 C	0.00	0.19	0.38	0.63	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
-5 C	0.00	0.25	0.50	1.00	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
0 C	0.00	0.28	0.56	1.06	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18	2.18
5 C	0.00	0.31	0.63	1.13	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25
10 C	0.00	0.33	0.66	1.22	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43
15 C	0.00	0.34	0.68	1.32	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63	2.63
20 C	0.00	0.36	0.72	1.41	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82	2.82
25 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

3 0 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
3 5 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
4 0 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
4 5 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
5 0 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
5 5 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
6 0 C	0.00	0.38	0.75	1.50	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
6 5 C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

.4.22. Pulse recharge mode unit: C-Rate

30s pulse recharge rate / C-cell level													
SoC/T	0%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	100%
0 C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5 C	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	-0.42	0.00
10 C	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	-0.81	0.00
15 C	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	-1.22	0.00
20 C	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.61	-1.22	0.00
25 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
30 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
35 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
40 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
45 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
50 C	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-2.00	-1.33	0.00
55 C	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.60	-1.07	0.00
60 C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

## 2.5 Low-temperature capacity

N o .	parameter	size of product	Article, piece
2.5.1	Capacity of 0C	≥80%	New battery status, 0C, 1C, 2.0V~3.65V, datum is 320Ah
2.5.2	-Capacity of 20C	≥70%	New battery status, -20C, 1C, 2.0V~3.65V, the benchmark is 320Ah

2.6 Safety and Reliability (all tests meet GB GB / T 31485-2015, GB / T 31486-2015)

N o .	paramete r	size of product	test condition
2.6.1	Overcharge test	No fire or no explosion	1. Test the ambient temperature is 25C; 2. Single battery charging; 3. The 1.0C current constant current charging to the voltage reaches 1.5 times of the charging termination voltage specified in the technical conditions of the enterprise or stop charging after the charging time reaches 1h; 4. Observe for 1h and monitor the voltage, current and temperature during the experiment.
2.6.2	Vibration test	There is no sharp discharge current change or voltage Abnormal, battery case deformation, electrolysis Liquid overflow and other phenomena, and maintain a reliable connection, the structure is intact.	1. Test the ambient temperature is $25 \pm 2C$ 2. Battery module charging 3. Tighten the battery module to the vibration test table, and carry out the linear frequency sweep vibration test according to the following conditions; - -Discharge current: 1 / 3C; - -Vibration direction: single vibration; - -Vibration frequency: 10Hz ~55Hz - -Maximum acceleration: 30 m/s <sup>2</sup> ; - -Scan cycle: 10 times; - -Vibration time: 3h; 4. Observe whether there are any abnormal phenomena during the vibration test. Do not allow the discharge current sharp change, abnormal voltage, battery shell deformation, electrolyte overflow and other phenomena, and keep the connection reliable, intact structure.

Note: Overcharge test should be tested with clamps. Specific test procedures and precautions should be confirmed with CATL before conducting other tests or referring to other standards.

### 3. End of product life life management

The life of a battery is limited. Customers should establish an effective tracking system to monitor and record the internal resistance and capacity of the battery during each lifetime. The measurement and calculation methods of internal resistance and capacity require mutual discussion and agreement between the customer and CAT L. When the internal resistance of the battery in use exceeds 150% of the initial internal resistance or less than 70% (25°C), the battery shall be stopped. Violviolation of this requirement waixempt CATL

Liability for product quality assurance in accordance with the Product Sales Agreement and this Specification.

### 4. Application conditions

The customer shall ensure that the following battery-related application conditions are strictly followed:

4.1 The customer shall be equipped with a battery management system to closely monitor, manage and protect each battery.

- 4.2 The Customer shall provide CATL with the detailed design scheme, system characteristics, framework, system data, format and other related information of the battery management system for CATL to design and evaluate the system and establish the battery management files
- 4.3 Without the consent of CATL, customers shall not modify or change the design and framework of the battery management system to avoid affecting the performance of the battery.
- 4.4 The customer shall keep the complete monitoring data of the battery operation and serve as a reference for the product quality responsibility division. CATL does not bear the product quality assurance responsibility without the complete monitoring data of the battery system.
- 4.5 The battery management system shall meet the following most basic detection and control requirements

No .	parameter	size of product	Protect the action
4.5.1	Charging termination	3.65V	Charge charging when the battery voltage reaches 3.65V
4.5.2	Level 1 overcharge protection	Greater than or equal to 3.8V	Charge charging when the battery voltage reaches 3.8V
4.5.3	Level 2 overcharging protection	Greater than 4.0V	When the battery voltage reaches 4.0V, terminate the charge and lock the battery management system until the technician solves the problem
4.5.4	discharge off	Minimum of 2.5V	Stop the discharge when the battery voltage reaches 2.5V to minimize the current
4.5.5	Level 1 overrelease protection	Minimum of 2.0V	Stop discharge when the battery voltage reaches 2.0V. Min

4.5.6	Level 2 overrelease protection	Minimum of 1.8V	When the battery voltage is below 1.8V, lock the battery management system until the technician solves the problem
4.5.7	short-circuit protection	Short circuit is not allowed	Disconnect the battery (battery) during the short circuit
4.5.8	overcurrent protection	Refer to clause 2.3 for discharge requirements	The battery management system controls the discharge current according to the specifications
4.5.9	overheat protection	Refer to Articles 2.2 and 2.3	Charge / discharge is terminated when the temperature exceeds that specified in this specification
4.5.10	Charging time is too long to protect it	Charging time is within 8 hours	If the charging time is longer than 8 hours, the charging is terminated

4.5.2Note: The above No, 4.5.3, 4.5.5 and 4.5.6 are warning clauses to the customer that when the battery reaches the indicators and parameters described in any of the above conditions, the battery has exceeded the service conditions, the customer shall protect the battery according to the "protection action" and other relevant provisions of the specification, CATL declares that it does not bear the quality of the battery in the above service condition

Any warranty liability and shall not indemnify any loss to the customer and the third party.

4.6 Avoid the battery from overrelease. When the battery voltage is below 1.8V, the battery interior may be permanently damaged, and then the CATL's product quality assurance responsibility fails. According to clause 2.3.5 of this specification, when the discharge cutoff is below 2.5V, the internal energy consumption is reduced to the minimum and dormancy is extended before recharging. Customers need to train users to recharge in the shortest possible time to prevent the battery from discharging.

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 Avoid battery charging under low temperature conditions (including standard charging, fast charging, emergency charging and regenerative charging) prohibited in this specification, otherwise unexpected capacity reduction may occur. The battery management system shall be controlled at the minimum charging and regenerative charging temperature. It is prohibited to charge below the temperature specified in this specification, otherwise CATL shall not be liable for quality assurance.

4.9 The heat dissipation problem of the electric cell should be fully considered in the design of the electric tank. CATL shall not bear the quality assurance responsibility for the overheating and damage of the electric cell or the battery caused by the heat dissipation design problem of the electric tank.

4.10 The waterproof and dust proof problems of the cell should be fully considered in the design of the electric box. The electric box must meet the waterproof and dust proof grades stipulated by the relevant national standards. CATL shall not be liable for quality assurance for damage to cells or batteries (such as corrosion, rust, etc.) due to waterproof and dust-proof problems.

4.11 Different P / N material number cells shall not be mixed in the same battery system (or the whole vehicle), otherwise, CATL shall not be liable for quality assurance.

## 5. Safety precautions

5.1 Never immerse the battery in water.

- 5.2 It is forbidden to expose batteries into fire or to high temperature conditions exceeding the temperature conditions specified in Articles 2.1.7 and C. 2.1.8 of this specification, otherwise it may lead to fire. In any normal use situation, the battery cell temperature cannot exceed 65C. If the battery cell temperature in the battery exceeds 65C, the battery management system needs to close the battery and stop the battery operation.
- 5.3 No short circuit on the positive and negative electrodes of the battery, otherwise the strong current and high temperature may cause personal injury or fire. Since the positive and negative electrodes of the battery are exposed to plastic protective covers, sufficient safety protection should be provided to avoid short circuits when the battery system is assembled and connected.
- 5.4 Connect the positive and negative electrodes of the battery strictly in accordance with the labels and instructions, and prohibit reverse charging.
- 5.5 No battery overcharging, otherwise, battery overheating and fire accidents. In the battery installation and use, the hardware and software need to implement multiple overcharge failure safety protection. The minimum protection requirements are specified in clauses 4.5.3 and clauses 5.11 of this specification.
- 5.6 Normal charging shall be completed after charging under to 4.5.9 of this specification. When the continuous charging time exceeds the reasonable time limit, the battery overheating phenomenon may cause thermal runaway and fire. The previous timer shall be installed to protect it. Once the charging current reaches the overcharge state and cannot be terminated, the timer will work to terminate the charging, see Article 5.11 of this specification.
- 5.7 The customer shall safely secure the battery to the solid plane and safely bind the power cord in place to avoid friction and causing arcs and sparks.
- 5.8 Do not package batteries with plastic or make electrical connection with plastic. Incorrect electrical connections may cause overheating during battery use.
- 5.9 When the electrolyte leaks, avoid skin and eye contact with the electrolyte. In case of contact, use a lot of clean water to clean the contact area and seek help from your doctor. No anyone or animal to swallow any part or substance contained in the battery.
- 5.10 Try to protect the battery from mechanical vibration, collision and pressure impact, otherwise the battery may short circuit, produce high temperature and fire.
- 5.11 Inappropriate charging termination phenomenon may occur during battery charging. For example: charging beyond the allowable charging time, charging voltage is too high or charging current is too strong. The above phenomenon is defined as "inappropriate termination of charging". When the above phenomenon occurs, it may mean leakage of the battery system or failure of some components. Continue until you find the root cause and solve it completely

Charging the battery can cause the battery to overheat or cause a fire. When the above phenomenon occurs, the battery management system should use the automatic locking function to prohibit the subsequent charging, and remind the user to return the vehicle loaded with the battery to the dealer for system maintenance. The battery can only be recharged after comprehensive inspection by certified technicians, the root cause and thoroughly solved and improved.

- 5.12 The test experiment described in Article 2.5 of this specification may cause battery fire or explosion. The test experiment can only be performed in professional laboratories by professionals equipped with appropriate protective equipment. Otherwise, it may cause serious personal injury and property damage.

## **6. Disclaimer**

If the product demand unit does not use it in accordance with the provisions of this manual, causing a social impact and affecting the reputation of CATL, CATL will hold the product demand unit responsible. Based on the extent of the impact on the CATL, the product demand unit needs to mention the CATL

For compensation.

## **7. Risk warning**

- .17. Warning statement

**Police, Sue**

**The battery is potentially dangerous, and appropriate protective measures must be taken during operation and maintenance!**

**Incorrect operation of the test experiment described in Article 2.5 of this specification may result in serious personal injury and property damage!**

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

**Battery maintenance must be performed by people with battery expertise and safety training.**

**Failure to comply with these warnings can cause multiple disasters.**

### **7.2 Hazard type:**

The customer is aware of the following potential hazards during battery use and operation:

- 7.2.1 The operator may be harmed by chemicals, shocks, or arcs during operation. Although the human body responds differently to DC and AC power, a DC voltage higher than 50V is equally harmful to the human body, so customers must take a conservative posture in the operation to avoid current damage.
- 7.2.2 There is a chemical risk coming from the electrolyte in the battery.



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

## **8 Battery (cell) drawings**

