

	PRODUCT SPECIFICATION CONFIRMATION		Form No.: xxxxxx
	Author/Dept.: Yang Meng/EVC	Document #: CTPS-MHH3L7-01	Rev: 1.0
	Model: Sample Product Specification of 228Ah Cell 228 Ah Cell Sample Specification Confirmation Document		
	Confidential: () Level 3 Private () Level 2 High Confidentiality (V) Level 1 Low Confidentiality		

Sample Specification Confirmation

Product Design Preparation	Product Design Approval	Sales Approval	Project engineering approval	Quality Assurance Approval	Product Manager Approval
Yang Meng	Wang GuoBao	Wang Hui	Zhang YuBao	Zhao Chao	Chan LiBing

Customer Confirmation	Sign one's name	Date
	Customer code :	
	Corporate seal :	

Customer Requirements

Model: MHH3L7

Version: 1.0

Customers are required to submit their requirements and coordinate with CATL in advance. If the customer has specific applications or operational conditions differing from those described herein, CATL may customize the product design and production to meet the customer's unique requirements.

	Special requirements	Standard
1		
2		
3		
4		
5		

customer code : _____ sign : _____ date : ____

Amendant Record

Edition	ECN number	Availability date	Author	Revision description/acknowledgment status
1.0			Yang Meng/EVC	New release

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Terminology

Term	Definition
Product	In this specification, the term 'product' refers to the 228Ah 3.22V rechargeable lithium iron phosphate battery manufactured by CATL.
Client	Refers to the buyer in the CATL EV Product Sales Contract.
CATL	Refers to the seller in the CATL EV Product Sales Contract.
PN	To differentiate batteries for various application scenarios, CATL assigned a material code to its 228Ah 3.22V rechargeable lithium battery.
Ambient temperature	The ambient temperature of the battery.
Battery Management System (BMS)	An effective tracking and control system for customers to monitor and record the operational parameters of products throughout their service life. The parameters tracked and recorded include, but are not limited to, voltage, current, temperature, etc., to control product operation and ensure that the operating environment and conditions comply with the specifications outlined in this manual.
Cell temperature	The cell temperature is measured by a temperature sensor connected to the battery, with the selection of the sensor and measurement circuit jointly determined by CATL and the customer.
New battery status	It refers to the battery's condition within 7 days from the manufacturing date.
C-Rate charging rate	The charge rate is the ratio of the charging current to the battery capacity measured by the battery management system. For example, if the battery capacity is 228Ah and the charging current is 45.6A, the charge rate is 0.2C. If the battery capacity drops to 200Ah and the charging current is 40A, the charge rate remains 0.2C.
Cycle recurrence	A battery cycle is defined as a complete charge-discharge process according to specified standards. A cycle may include a combination of short-duration normal charging or regenerative charging and discharging processes. During charging, there may be instances where only normal charging occurs without regenerative charging. Discharge can be formed by the combination of partial discharges.
Date of manufacture	The manufacturing date of a battery is the date code clearly marked on the top sticker of each relevant battery.
Open Circuit Voltage (OCV)	The voltage of the battery is measured when no load or circuit is connected.
Product supply agreement	The transaction terms for the products specified in this specification, jointly agreed upon by CATL and its customers.
Standard charging	The charging mode specified in Section 2.2.4 of this specification.
Standard discharge	The discharge current of 114A as specified in Clause 2.3.1 of this specification, and the discharge mode with a minimum voltage of 2.5V as specified in Clause 2.3.5 of this specification.
Charging status (SOC)	The linear relationship between battery charge capacity (measured in ampere-hours or watt-hours) and state of charge (SOC) under no-load conditions. For example, if a 228Ah state is considered 100% SOC, then at 0Ah, the SOC is 0%.
Temperature rise	The temperature rise of the cell during charging or discharging processes, as specified in this specification.
Measurement unit	"V" (Volt), a unit of voltage A" (Ampere) A, unit of electric current "Ah" (Ampere-Hour) is a unit of load. Wh (Watt-Hour) is a unit of energy. Ω (ohm), unit of resistance "m Ω " (milliohm) is a unit of resistance.

	°C (degree Celsius), a temperature unit "mm" (millimeter), a unit of length "s" (second), time unit Hz (Hertz), a unit of frequency
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1 Scope of Application

This specification document provides a detailed description of the product performance indicators, usage conditions, and risk warnings for CATL's 3.22V 228Ah rechargeable lithium iron phosphate power battery. It is applicable only to C-stage sample shipments. Product specifications for mass production will require redefinition, and a formal product specification document will be provided.

2 Product Electrical Performance Specifications

2.1 Essentials

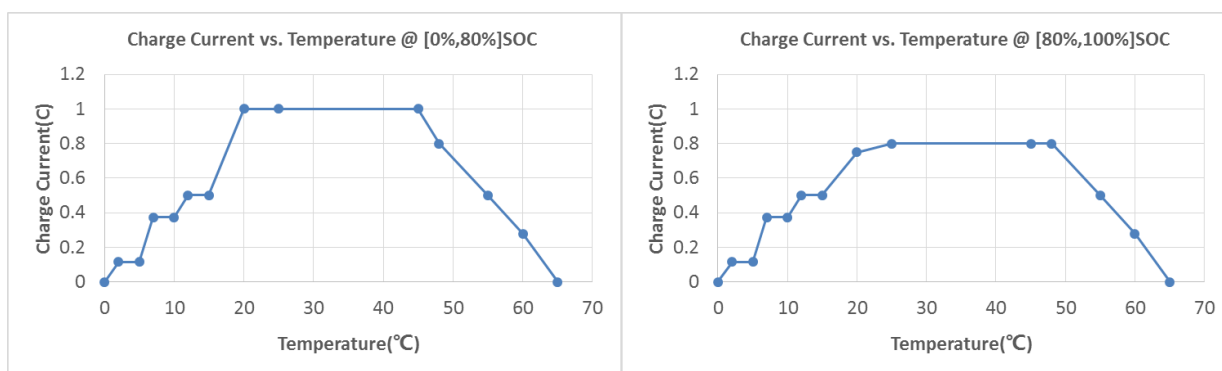
No.	Parameter	Size of product	Condition
2.1.1	Standard capacity	228 Ah	25±2°C, 1C, new battery state
2.1.2	Minimum capacity	228 Ah	25±2°C, 1C, new battery state
2.1.3	Working voltage	2.5~3.65V 2.0~3.65V	Temperature T>0°C Temperature T≤0°C
2.1.4	Battery internal resistance (1KHz)	0.22±0.05mΩ	New battery status: 40% SOC
2.1.5	Ship capacity	87~93Ah	New battery status: 40% SOC
2.1.6	Self discharge	≤3.5%	25°C, 50% SOC, storage for 3 months in new batteries
2.1.7	Working temperature (charging)	0~65°C	Refer to Section 2.2
2.1.8	Working temperature (discharge)	-35~65°C	Refer to Section 2.3
2.1.9	Battery weight	≤4.22Kg	N.A.
2.1.10	Battery size	Refer to Section 8 of this specification	At a pressure of 300 Kgf
2.1.11	Cell cycle	≥4000cycles	Initial clamping force: 300Kgf, standard charge-discharge test

2.2 Charging Mode/parameters

No.	Parameter	Size of product	Condition
2.2.1	Standard charging current	0.5C	25±2°C
2.2.2	Maximum chargeable sustained current	1C	25±2°C
2.2.3	Standard charging voltage	The maximum voltage of a single cell is 3.65V.	/
2.2.4	Standard charging mode	Charge at a constant current of 0.5C until the individual battery reaches a maximum voltage of 3.65V, then continue charging at a constant voltage of 3.65V under normal pressure until the current drops to the lower limit of 0.05C.	
2.2.5	Standard charging temperature	25±2°C	Cell temperature
2.2.6	Absolute charging temperature (cell temperature)	0~65°C	Regardless of the battery cell's charging mode, charging will stop immediately if its temperature exceeds the absolute charging temperature range.
2.2.7	Absolute charging voltage	Maximum 3.65V	Regardless of the battery cell's charging mode, charging will stop immediately if its voltage exceeds the absolute charging voltage range.

2.2.8 Other charging conditions (modes) 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 current	0.5C	25±2°C
2.3.2	Maximum continuous discharge current	1C	N.A.
2.3.3	Discharge cutoff voltage	2.5V 2.0V	Temperature T>0°C Temperature T≤0°C
2.3.4	Standard discharge temperature	25±2°C	Cell temperature
2.3.5	Absolute discharge temperature	-35~65°C	Regardless of whether the battery cell is in continuous discharge mode or pulse discharge mode, discharge shall be stopped 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
30°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
35°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
40°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

45℃	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
50℃	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
55℃	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
60℃	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
65℃	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

2.4.2 Pulse recharging mode Unit: C-Rate

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

No.	Parameter	Size of product	Condition
2.5.1	Capacity at 0℃	≥80%	New battery condition: 0℃, 1C, 2.0V~3.65V, rated capacity 228Ah
2.5.2	Capacity at -20℃	≥70%	New battery condition: -20℃, 1C rate, voltage range 2.0V~3.65V, rated capacity 228Ah

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

No.	Parameter	Size of product	Test condition
2.6.1	Overcharge test	Non-flammable and non-explosive	1. Test ambient temperature: 25°C; 2. charging of single battery; 3. Charge at a constant current of 1.0C until the voltage reaches 1.5 times the charging termination voltage specified in the company's technical specifications, or until the charging time reaches 1 hour. 4. The voltage, current and temperature were monitored during the experiment.
2.6.2	Vibration test	The discharge current does not change sharply, the voltage is normal, the battery shell is not deformed, the electrolyte is not spilled, and the connection is reliable and the structure is intact.	1. Test environment temperature: 25±2°C 2. Battery module charging 3. Secure the battery module to the vibration test bench and conduct the linear frequency sweep vibration test under the following conditions; Discharge current: 1/3C; --Vibration direction: Upward single vibration; --Vibration frequency: 10Hz to 55Hz --Maximum acceleration: 30 m/s ² ; --Scan cycle: 10 times; --Vibration time: 3 hours; 4. During the vibration test, observe for any abnormal phenomena. Sharp changes in discharge current, abnormal voltage, battery casing deformation, electrolyte leakage, and other such phenomena are prohibited. Ensure reliable connections and structural integrity are maintained.

Note: Overcharge testing requires fixture application. Before conducting other tests or referencing standard tests, CATL must confirm the specific testing procedures and precautions.

3 Product Life Termination Management

Batteries have a limited lifespan. Customers must establish an effective tracking system to monitor and record the internal resistance and capacity of each battery during its service life. The measurement and calculation methods for internal resistance and capacity require mutual discussion and agreement between the customer and CATL. If the internal resistance of a battery in use exceeds 150% of its initial value or its capacity drops below 70% (at 25°C), the battery should be discontinued. Failure to comply with these requirements will exempt CATL from its warranty obligations under the product sales agreement and this specification.

4 Application Conditions

Customers must strictly comply with the following battery-related application conditions:

- 4.1 Customers should install a battery management system to closely monitor, manage, and protect each battery.
- 4.2 The client shall provide CATL with detailed design specifications, system features, framework, data, and format specifications for the battery management system, enabling CATL to conduct design evaluation and establish a battery management record.
- 4.3 Customers must not modify or alter the design and framework of the battery management system without CATL's approval, as such actions may compromise the battery's performance.
- 4.4 Customers must retain complete battery operation monitoring data as reference for product quality liability allocation. CATL shall not assume product quality warranty liability if the complete monitoring data within the battery system's service life is not available.
- 4.5 The battery management system must meet the following fundamental detection and control requirements.

No.	Parameter	Size of product	Protective action
4.5.1	Charge termination	3.65V	Stop charging when the battery voltage reaches 3.65V
4.5.2	First stage overcharge protection	≥ 3.8V	Stop charging when the battery voltage reaches 3.8V
4.5.3	Second stage overcharge protection	Greater than 4.0V	The charging process terminates when the battery voltage reaches 4.0V, and the battery management system (BMS) locks until technicians resolve the issue.
4.5.4	Discharge off	Minimum 2.5V	Discharge termination occurs when the battery voltage reaches 2.5V, at which point the current is reduced to its minimum.
4.5.5	First level over discharge protection	Minimum 2.0V	Stop discharging when the battery voltage reaches 2.0V, and reduce the current to the minimum.

4.5.6	Second level over discharge protection	Minimum 1.8V	When the battery voltage drops below 1.8V, the battery management system will lock until the technician resolves the issue.
4.5.7	Short-circuit protection	Short circuits are not permitted	During a short circuit, the overcurrent device disconnects the battery.
4.5.8	Overcurrent protection	Refer to Section 2.3 Discharge Requirements	Battery management system controls discharge current to meet specifications
4.5.9	Overheat protection	Refer to 2.2 and 2.3	Charging/discharging shall be terminated when the temperature exceeds the specifications in this manual.
4.5.10	Protection due to prolonged charging time	Charging time within 8 hours	If the charging time exceeds 8 hours, the charging will be terminated.

Note: Items No.4.5.2, 4.5.3, 4.5.5, and 4.5.6 constitute warning clauses. Customers are hereby reminded that when a battery reaches any of the specified performance indicators or parameter thresholds outlined in these clauses, it indicates the battery has exceeded the operational conditions defined in this specification. Customers must implement protective measures in accordance with the "Protection Actions" and other relevant provisions herein. CATL hereby disclaims all warranty obligations regarding battery quality under such usage conditions and shall not be liable for any losses incurred by customers or third parties as a result.

- 4.6 Prevent batteries from reaching over-discharge conditions. When the battery voltage drops below 1.8V, permanent internal damage may occur, at which point CATL's product quality warranty becomes invalid. As specified in Section 2.3.5 of this specification, when the discharge cutoff voltage falls below 2.5V, the system minimizes internal energy consumption and extends the sleep time before recharging. Customers must train users to recharge promptly to prevent battery over-discharge.
- 4.7 If the battery is expected to be stored for over 30 days, the SOC should be adjusted to around 50%.
- 4.8 Batteries must not be charged under low-temperature conditions prohibited by this specification (including standard charging, fast charging, emergency charging, and regenerative charging), as this may lead to unexpected capacity reduction. The battery management system should operate at the minimum charging and regenerative charging temperatures. Charging below the temperature limits specified in this specification is strictly prohibited; otherwise, CATL shall not be liable for quality assurance.
- 4.9 The design of the battery box must fully address the heat dissipation of the cells. CATL shall not be liable for any damage to the cells or batteries caused by inadequate heat dissipation in the battery box.
- 4.10 The design of the battery case must fully address waterproofing and dustproofing requirements for the cells, and it must meet the waterproofing and dustproofing standards specified by national regulations. CATL shall not be liable for any damage to the cells or batteries (e.g., corrosion or rust) caused by these issues.
- 4.11 CATL prohibits the use of cells with different P/N codes in the same battery system (or vehicle). Otherwise, CATL will not be liable for quality assurance.

5 Security Protection

- 5.1 Do not immerse batteries in water.
- 5.2 Batteries must not be placed in fire or exposed to high temperatures exceeding the conditions specified in Sections 2.1.7 and 2.1.8 of this specification, as this may cause fires. Under normal operating conditions, the temperature of battery cells must not exceed 65°C. If the temperature of any cell in the battery exceeds 65°C, the battery management system must shut down the battery and terminate its operation.
- 5.3 Short-circuiting between the positive and negative terminals of the battery is strictly prohibited, as it may result in electric shock or fire due to high current and elevated temperatures. Since the battery's terminals are enclosed within a plastic protective casing, adequate safety measures must be implemented during system assembly and connection to prevent short-circuiting.
- 5.4 Connect the battery terminals strictly according to the labeled polarity and instructions. Reverse charging is strictly prohibited.
- 5.5 Overcharging of batteries is strictly prohibited, as it may cause overheating and fire hazards. During battery installation and operation, both hardware and software must implement multiple overcharge failure safety protections. The minimum protection requirements are specified in Sections 4.5.3 and 5.11 of this specification.
- 5.6 According to Clause 4.5.9 of this specification, normal charging shall terminate after completion. If the charging duration exceeds the reasonable time limit, the battery may overheat, potentially causing thermal runaway and fire. A timer must be installed for protection. Should the charging current reach an over-charge state and fail to terminate, the timer will activate to stop the charging process, as specified in Clause 5.11 of this specification.
- 5.7 The customer should fix the battery safely on the solid plane and tie the power line safely in the right place to avoid the friction and the electric arc and spark.
- 5.8 Plastic encapsulation of batteries or electrical connections made with plastic are strictly prohibited. Incorrect electrical connections may cause overheating during battery operation.
- 5.9 In the event of electrolyte leakage, avoid contact with the skin and eyes. If contact occurs, wash the affected area thoroughly with large amounts of clean water and seek medical assistance. It is strictly prohibited for any person or animal to ingest any components of the battery or substances contained within the battery.
- 5.10 Protect the battery from mechanical vibrations, impacts, and pressure shocks, as these may cause internal short circuits, leading to high temperatures and fires.
- 5.11 During battery charging, improper termination of charging may occur. Examples include exceeding the permitted charging duration, terminating charging due to excessively high voltage, or stopping charging due to overly strong current. These phenomena are collectively termed "improper termination of charging." When such occurrences happen, they may indicate electrical leakage in the battery system or malfunctioning components. Continuing charging without identifying and resolving the root cause may lead to further issues.

Charging this battery **may** cause overheating or fire. If such incidents occur, the battery management system should automatically disable further charging through its lockout function and notify the user to return the vehicle containing the battery to the dealer for system maintenance. Charging may only be resumed after the battery has undergone a comprehensive inspection by certified technicians, with the root cause identified and thoroughly resolved through corrective measures.

5.12 Improper operation of the test procedure described in Section 2.5 of this specification may cause battery fire or explosion. This test shall only be conducted by qualified personnel in a certified laboratory with appropriate protective equipment. Failure to comply may result in serious personal injury and property damage.

6 Disclaimer

If the product user fails to comply with the instructions in this manual, resulting in social consequences and damage to CATL's reputation, CATL will hold the user accountable. The user shall compensate CATL based on the severity of the impact.

7 Risk Warning

7.1 Warning Statement

Warning The battery poses potential hazards. Proper protective measures must be taken during operation and maintenance!

Incorrect operation of the test procedures described in Section 2.5 of this specification may result in serious personal injury and property damage!

The correct tools and protective equipment must be used when handling batteries.

Battery maintenance must be performed by personnel with battery expertise and safety training. Non-compliance with the above warnings may result in multiple disasters.

7.2 Danger type:

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

- 7.2.1 Operators may be injured by chemicals, electric shocks, or electric arcs during operation. Although the human body reacts differently to direct current (DC) and alternating current (AC), both DC voltages above 50V and AC currents pose equally severe hazards. Therefore, operators must adopt conservative postures to avoid electric current injuries.
- 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 consider the above potential risks to prevent accidental short circuits that could cause arcs, explosions, or thermal runaway.

8 Battery (Cell) Drawing

