Approval Sheet (Tentative)

Lithium-Ion Rechargeable Battery

Attend to:

Product: ☑ Cell ☐ Pack

Model: INR-21700-P50B

Doc #: INR21700P50B-01 Rev.: 0.6

Date: 2025/02/11

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Accepted by Customer	
Title:	
Signature: (Date)	

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E-One Moli Energy Corp.				
Approved by (Date)	**Check by** (Date)	**Check by** (Date)	**Check by** (Date)	**Originator** (Date)

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TABLE OF CONTENTS

HISTORY RECORD

1. SCOPE 2
2. PRODUCT DESCRIPTION 2
3. APPEARANCE 3
4. RATED SPECIFICATIONS 3
5. PERFORMANCE 5
6. REGULATORY COMPLIANCE 8
7. PRECAUTIONS FOR USING LITHIUM ION RECHARGEABLE CELL 8
8. REQUIREMENT FOR BATTERY PACK DESDIGN 13
9. WARRANTY OF CELL 14
10. SHIPPING STATE OF CELL 14
11. PACKING SPECIFICATION 14
12. AMENDMENT OF SPECIFICATION CONTENT 14

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1. SCOPE

This specification defines the characteristics of a lithium ion rechargeable cell, INR-21700-P50B, 5.0 Ah, designed and manufactured by E-One Moli Energy Corp.

2. PRODUCT DESCRIPTION

2.1 Cell Name

Lithium ion rechargeable cell ('cell')

2.2 Cell Model

INR-21700-P50B

2.3 Cell designation: INR22/71

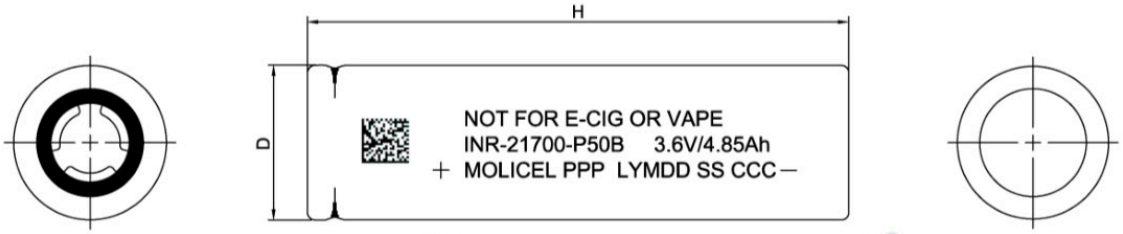
2.4 Cell Construction

2.4.1 Shape: Cylindrical

2.4.2 Outline Dimensions (refer to 2.4.3 finished cell drawing)

Outline Dimensions (mm)		Weight (g)
Diameter [D]	Height [H]	
21.40 ± 0.15 mm	70.00 ± 0.15 mm	71.0 (Max)

2.4.3 Finished Cell Drawing



2Dimensional code: , includes (PPP LYMDD SS)

PPP: last 3 digits of Molicel part number.

L: Manufacturing location, "1" Made in Canada, "2" Made in Tainan, "3" Made in Kaohsiung

Cell Date Code: YMDDSS

Y: indicates calendar year, 9=2009, A=2010, B=2011, C=2012, D=2013, E=2014, F=2015, G=2016, H=2017, I=2018 etc.

M: indicates calendar month, 1~9, 10=A, 11=B, 12=C

DD: indicates calendar date of a month, 01~31

SS: indicates the sequence number in a day, 01, 02, etc.

NOT FOR E-CIG OR VAPE: Do not use the cell in e-cigarette, vaporizers (e-cig, vape, mod) or any other similar devices applications.

3.6V：Nominal voltage

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4.85Ah：Nominal capacity

CCC：Marking Requirements For China CCC Certification Products.

3. APPEARANCE

There shall be no visual defects such as dent, rust, deformation or leakage.

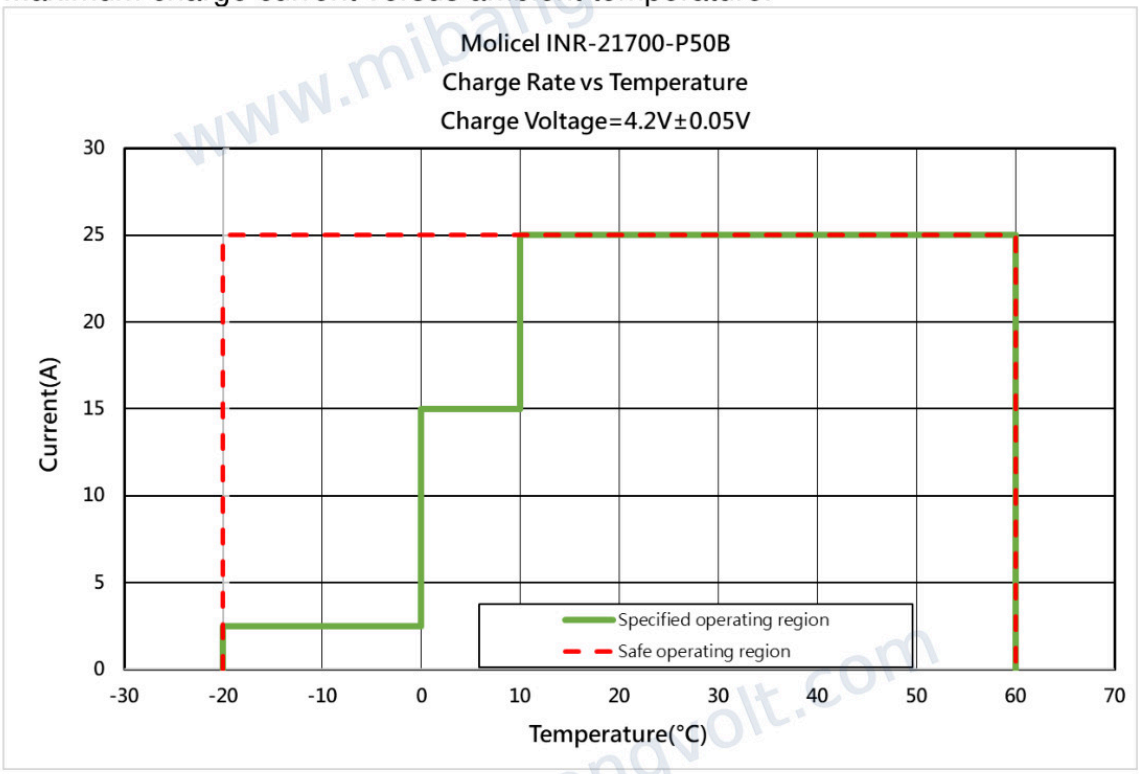
4. RATED SPECIFICATIONS

Items			Specifications	Remarks
1	Rated charge		Limiting 5.0A and constant 4.2V charge for 1.5h or 50mA taper current at 23°C.	
2	Rated discharge		Constant 1.0A discharge until 2.5V at 23°C.	
3	Rated capacity		5.0Ah (Typical)	Rated discharge capacity at 23°C.
			4.85Ah (Minimum)	Rated discharge capacity at 23°C.
4	Nominal voltage		3.6V	Mean voltage during rated discharge after rated charge.
5	Shipping voltage		≥ 3.45V	Nominal. Approximate state of charge = 30%.
6	Internal resistance at shipping		≤ 8mΩ	By AC 1kHz within 3~4 hours after rated discharge to 30% SOC.
7	End of charge voltage		4.20 ± 0.05V	
8	End of discharge voltage		2.5V	Discharge voltage for determination of rated capacity.
9	Charging time		1.5h	Rated charge.
10	Maximum continuous charging current		25A	High rate charge cycle will decay fast.
	Maximum continuous discharging current		60A	Cycle life is reduced at high rates.
11.1	Allowable environment temperature	Charging	-20°C ~60°C	Environment temperature
		Discharging	-40°C ~60°C	Environment temperature
11.2	Limit of cell surface temperature	Charging	≤70°C	
		Discharging	≤80°C	-20°C ~-40°C with reducing cut-off discharge voltage to 2.0V.

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Items		Specifications	Remarks
12	Storage temperature for shipping cell	< 35°C	Recommended temperature less than 23°C for long term storage.
13	Shelf life	1 year	See Section 5.4.
14	Gravimetric energy density	264~249 Wh/kg	1C, 23°C
15	Volumetric energy density	704~682 Wh/L	1C, 23°C
16	Energy	≥ 17.46 Wh	4.85Ah * 3.60 V

4.17 Maximum charge current versus ambient temperature.



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5. PERFORMANCE

5.1 Standard Test Conditions

5.1.1 Tolerance on temperatures is ± 2°C. All tests performed at a relative humidity between 45% and 85% unless noted otherwise.

5.1.2 3 hours minimum soak time at specified temperature prior to discharging.

5.1.3 The accuracy of measuring equipment (voltmeter and ammeter, etc.) shall be higher than class 0.5.

5.1.4 5.0A charge/5.0A discharge cycling: 5.0A charge to 4.2V for 50mA and 5.0A discharge to 2.5V, rest 10 minutes between discharge and charge.

5.1.5 5.0A charge/10A discharge cycling: 5.0A charge to 4.2V for 50mA and 10A discharge to 2.5V, rest 10 minutes between discharge and charge.

5.1.6 5.0A charge/20A discharge cycling: 5.0A charge to 4.2V for 50mA and 20A discharge to 2.5V, rest 30 minutes between discharge and charge.

5.1.7 For incoming inspection purpose, the cells should be used in the tests within one week of receipt at customer.

5.2 Electrical Performance

Items		Condition	Capacity	Test Method
1	Discharge Capacity at 23°C	1.0A	≥4.85Ah	Discharge capacity to 2.5V after rated charge (4.1).
		5.0A	≥4.68Ah	Discharge capacity to 2.5V after rated charge (4.1).
		10A	≥4.66Ah	Discharge capacity to 2.5V after rated charge (4.1).
		20A	≥4.60Ah	Discharge capacity to 2.5V after rated charge (4.1).
2	Temperature Discharge Capacity at 5.0A	60°C	≥4.82Ah	Discharge capacity to 2.5V after rated charge at 23°C (4.1).
		45°C	≥4.81Ah	Discharge capacity to 2.5V after rated charge at 23°C (4.1).
		0°C	≥4.37Ah	Discharge capacity to 2.5V after rated charge at 23°C (4.1).
		-20°C	≥4.16Ah	Discharge capacity to 2.5V after rated charge at 23°C. (4.1).
		-30°C	≥4.07Ah	Discharge capacity to 2.0V after rated charge at 23°C. (4.1).

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5.3 Cycle Life

Item	Condition		Criterion	Test Method
1	23°C 5.0A	C500	≥ 80%	Per 5.1.4, 5.0A cycling at 23°C to 500 cycles. The % = (Ah / 4.68) x 100%
2.	23°C 10A	C500	≥ 75%	Per 5.1.5 10A cycling at 23°C to 500 cycles. The % = (Ah / 4.66) x 100%
3	23°C 20A	C500	≥ 70%	Per 5.1.6 20A cycling at 23°C to 500 cycles. The % = (Ah / 4.60) x 100%

5.4 Storage Performance (SOC: State of Charge)

Item	Condition		Capacity Retention	Capacity Recovery	Test Method
1	23 °C 1 month	SOC<30%	≥ 18%	≥ 95%	After storage, rated discharge (4.2) and rated charge (4.1) for two cycles. The Retention Capacity (Ah) is defined at 1st discharge after storage Retention % = (Ah / 4.0) x 100% The Recovery Capacity (Ah) is defined at 2nd Discharge after storage. Recovery % = (Ah / 4.0) x 100%
2	23 °C 3 months	SOC<30%	≥ 15%	≥ 94%	
3	23 °C 6 months	SOC<30%	≥ 12%	≥ 92%	
4	23 °C 12 months	SOC<30%	≥ 10%	≥ 91%	

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5.5 Safety Performance

5.5.1 Environmental Endurance Performance

Items		Criteria	Conditions
1	Heating	No fire or explosion	At 100% SOC heat cell up in gravity convection and/or circulating air oven. Oven temperature is to be raised at a rate of 5ºC (± 2ºC) per minute to a temperature of 130ºC (± 2ºC). Hold oven at 130°C for 10 minutes.
2	Thermal test	Mass loss <0.1%, No leakage, venting, explosion, fire, disassembly, or rupture.	6 Hours @ 72 ± 2°C followed by 6 Hours @ -40 ± 2°C x 10 Cycles (interval time of no more than 30 minutes between temperatures). Measurements taken after 10 cycles and 24 hours storage at 20± 5°C. (UN method)

5.5.2 Electrical Endurance Performance

Items		Criteria	Conditions
1	Short Circuit	No disassembly, rupture or fire within 6 hours of test. Max temp: < 150°C.	While in preheated oven and cell temperature reaches 57 ± 4°C, short circuit cell using a total external resistance < 0.1 ohm until cell temperature has returned to 57 ± 4°C. (UN method)
2	Overcharge	No fire or explosion	Charging at a current of 27A to 15V from the fully discharged state for 2.5hrs.
3	FORCED DISCHARGE	No disassembly and no fire within 7 days of test	Connect cell in series with a 12V DC power supply at a current equal to maximum discharge specified. (UN method)

5.5.3 Mechanical Endurance Performance

Items		Criteria	Conditions
1	Crush	No fire or explosion	Crush between two flat plates. Applied force is about 13KN.
2	Impact	No fire or explosion	Impact by 15.8mmφ bar with 9.1kg weight dropped from 61cm height on the flat surface.

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5.6 Environmental Reliability

Items		Criteria	Conditions
1	Shock	No leakage, mass loss, no venting, disassembly, no rupture and no fire. 90% voltage recovery	Subject to 6 shocks/axis, 18 total, of peak acceleration of150g and pulse duration of 6 ms. (UN method)
2	High Temp. Storage	No leakage, no vent, no fire or explosion	0.9A discharge capacity test after leaving at 85°C for 10h.
3	Drop	No visible electrolyte leakage, no temperature rising.	Drop from a height of 4ft onto a concrete floor 3 times each for bottom, side and header orientations (total=9 drops).
4	Vibration	No leakage, mass loss, no venting, disassembly, no rupture and no fire. 90% voltage recovery	Subject to 7↔200Hz / 15 min vibration, 12x15 min /3 axes at amplitude of 0.8mm (1.6 mm total excursion). (UN method)
5	High Altitude Exposure	No leakage, weight loss, no vent, fire or explosion, 90% voltage recovery	Stored at a pressure of 11.6 kPa for 6 hrs at 20°C. (UN method)

6. REGULATORY COMPLIANCE
   - 6.1 Comply with UN 38.3.
   - 6.2 Comply with EU RoHS & REACH
   - 6.3 Comply with IEC62133
   - 6.4 UL 1642recognized component.
   - 6.5 Comply with GB31241 , China CCC Certificate

7. PRECAUTIONS FOR USING LITHIUM ION RECHARGEABLE CELL

The precautions described below are important to assure the performance and safety of

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designed pack. Mishandling may cause cell leakage, heat, smoke, explosion or fire. Please follow instructions carefully.

7.1 Intended Use

e-Mobility, BEV/HEV, Hypercar, Evtol/e-aircraft, power/garden tools, marine, drone/UAV, household, and energy storage.

The cell is prohibited to use in e-cigarette, vaporizers (e-cig, vape, mod) or any other similar devices applications.

7.2 Handling Precautions

7.2.1 Charging

The lithium ion rechargeable cell is to be charged by “constant current/constant voltage” method. The lithium ion cell is charged at a constant current (CC Mode) until the cell voltage reaches a specific voltage, followed by a constant voltage charge (CV Mode) at the specific voltage. The charging current at this constant voltage tapers off. As long as the tapering current is down to a particular current, the charge process is deemed complete.

1) Charge voltage:
   Do not exceed the specified charge voltage (4.2V per single cell). If the cells are used in battery packs, the maximum voltage is 4.2 x N (N= number of cells connected in series) V.
2) Charge current:
   Charge the cell at the specified charge current listed in section 4.10 or less.
3) Charge temperature:
   Charge the cell at the temperature range of -20°C ~ 60°C. Due consideration should also be given to the arrangement of the battery pack so that it is in that temperature range even though it is effected by heat generated from the cell charger.

7.2.2 Reverse charging:

The cell must be prevented from reverse-polarity charging.

7.2.3 Discharging

A lithium ion rechargeable cell starts to discharge at 4.2V and terminates at a cut off voltage of 2.5V.

1) Discharge current:
   Discharge the cell at the specified discharge current listed in section 4.10 or less. In case a peak current of higher than maximum discharge current depending on the pulse interval may reduce the cell capacity.

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2) Discharge temperature:
Discharge the cell at temperature range from –40°C to 60°C. At a temperature of –30°C or less, the cell will show a significant decrease in discharge capacity. The cell surface temperature must not exceed 80°C. Recommended thermal cut-off of 80°C at high rates.

3) Discharge termination voltage/Over discharge:
Avoid discharge to voltage less than 2.5V per single cell. A leakage current to the equipment may over discharge the cell, which may damage the performance of cell.

7.2.4 Long-term Storage

1) In case of long-term storage, store the cell at <23°C, low humidity, noncorrosive gas atmosphere.
2) The cell voltage should be maintained at greater than 2.5V. Should the cell voltage approach to 2.5V (0% SOC) it is recommended that the cell be charged back up to 30% capacity.
3) Do not store cell in humid environment.

7.3 Safety Precautions

7.3.1 When using the cell

ⓘWARNING

1) Mishandling of a cell can lead to generation of heat, possible explosion or ignition and potential serious injury. Safe handling guidelines include the following:
   (1) Do not expose cell to fire or heat.
   (2) Do not install the cell backwards.
   (3) Do not expose the cell to water or salt water, or allow the cell to get wet.
   (4) Do not carry or store the cells together with necklaces, hairpins or other metal objects.
   (5) Do not place the cells in microwave ovens, high-pressure containers, or on induction cookware.

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(6) Do not connect the positive terminal and the negative terminal of the cell to each other with any metal objects such as chains, coins or wire.

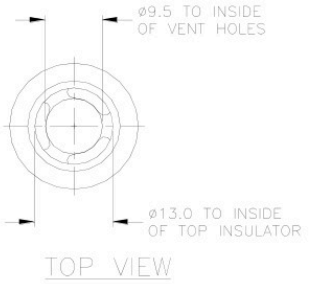
(7) Do not pierce the cell with nails, strike the cell with a hammer, step on the cell, or otherwise subject it to strong impacts or shocks.

2) Do not disassemble or modify the cell. The cell contains safety and protection devices, that if damaged, may cause the cell to generate heat, explode or ignite.

3) Do not place the cell in or near fire, stoves, or other high-temperature locations. Do not place the cell in direct sunshine or use or store the cell inside cars in hot weather. Doing so may cause the cell to generate heat, explode, or ignite. Using the cell in this manner may also result in a loss of performance and a shortened life expectancy.

4) Do not use the cell in e-cigarette, vaporizers (e-cig, vape, mod) or any other similar devices applications.

5) Venting device description
Safety Valve: Allowing controlled release of pressure in the event of excessive internal gas build up.



ⓘ CAUTION

1) If the device is to be used by small children, the caregiver should explain the contents of the user's manual to the children. The caregiver should provide adequate supervision to ensure that the device is being used as explained in the user's manual.

2) When the cell is worn out, insulate the terminals with adhesive tape or similar materials before disposal.

3) Immediately discontinue use of the cell if, while using, charging, or storing the cell, the cell emits an unusual smell, feels hot, changes color, changes shape, or appears abnormal in any other way. Contact your sales location or E-One Moli Energy if any of these problems are observed.

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4) In the event that the cell leaks and the fluid get into one's eye, do not rub the eye. Rinse well with water and immediately seek medical care. If left untreated the cell fluid could cause damage to the eye.

7.3.2 When charging the cell

ⓘWARNING

1) Be sure to follow the rules listed below while charging the cell. Failure to do so may cause the cell to become hot, explode, or ignite and cause serious injury.
   (1) Do not attach the cell to a power supply plug or directly to a car's cigarette lighter plug.
   (2) When charging the cell, use a specified cell charger or ensure that the cell charging conditions specified by E-One Moli Energy are met.
   (3) Do not place the cells in or near fire, or into direct sunlight. When the cell becomes hot, the built in safety equipment is activated, preventing the cell from charging further, and heating the cell can destroy the safety equipment and can cause additional heating, breaking, or ignition of the cell.
2) Do not continue charging the cell if it does not recharge within the specified charging time. Doing so may cause the cell to become hot, explode, or ignite.

ⓘ CAUTION

3) The temperature range over which the cell can be charged is -20°C to 60°C. Charging the cell at temperatures outside of this range may cause the cell to become hot or malfunction. Charging the cell outside of this temperature range may also harm the performance of the cell or reduce the cell's life expectancy.

7.3.3 When Discharging the Cell

ⓘWARNING

1) Do not discharge the cell using any device except for the specified device. When the cell is used in unspecified devices it may damage the performance of the cell or reduce its life expectancy, and if the device causes an abnormal current to flow, it may cause the cell to become hot,

explode, or ignite and cause serious injury.

ⓘ CAUTION

2) The temperature range over which the cell can be discharged is –40°C to 60°C (Consult E-One Moli Energy if you plan to discharge the cells at temperature less than –40°C. Use of the cell outside of this temperature range may damage the performance of the cell or may reduce its life expectancy).

7.4 Pack-Assembly Precautions

7.4.1 Avoid excessive force on the cell terminals and prevent sparking during welding.

7.4.2 Do NOT mix different cell types or manufacturers within a battery pack.

7.4.3 Do NOT over-stress or rotate at positive terminal. It is possible to cause over-stress by removing the welding point.

7.4.4 All battery packs should be inspected for voltage, impedance, and function of protection circuit prior to shipment.

7.4.5 Do NOT assemble damaged cells into packs.

7.4.6 If the cells are re-shipped to assembling manufacturer, package carefully into the original shipping boxes.

7.5 Disposal Instructions

When disposing of secondary cells or batteries, keep cells or batteries of different electrochemical systems separate from each other.

8. REQUIREMENT FOR BATTERY PACK DESDIGN

E-One Moli Energy recommends that cells be assembled in a pack with protection circuit. Various protection circuit modules are available for applications of multiple series and parallel configurations. In order to ensure safe use of cell, be sure to consult with E-One Moli Energy regarding charging and discharging specifications and contact E-One Moli Energy in advance when designing a device with this cell.

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8.1 Protective circuit function recommendations:

8.1.1 Overcharge protection: recommend overcharge voltage under 4.3V/cell within a tolerance 0.05V/cell maximum. The voltage tolerance is better under 0.03V/cell. The charge current shall be shut down once overcharge protection function working.

8.1.2 Over discharge protection: recommend over discharge voltage range 2.5V/cell. Below this level the discharge current shall be shut down and the consumption current should be below 10uA.

8.1.3 Over temperature protection: The battery should have over temperature warning system. The battery shall control FET directly and stop charge/discharge once cell over temperature.

8.2 Battery position: To prevent degradation of battery performance by heat exposure, battery shall be positioned away from heat generating source inside application equipment and charger.

8.3 Cell configuration: An isolation design that involves a plastic barrier or non-thermal conductive material between cell and PCBA is recommended.

9. WARRANTY OF CELL

Warranty period is one year after shipment under normal conditions. Within this period, E-One Moli Energy will replace the cell for free against defects as long as it is confirmed such defects are the failure of the cell manufacturing process. Any other defects caused by pack assembly equipment/system malfunction or abnormal usage of the cell are not covered by this warranty.

10. SHIPPING STATE OF CELL

The cell is shipped at a state of charge not to exceed 30% of rated capacity. Less than 35°C is recommended for cell shipping during transportation.

11. PACKING SPECIFICATION

The maximum quantity of the cells is 100pcs in inner box, 200pcs in master box.

12. AMENDMENT OF SPECIFICATION CONTENT

This specification stipulates the final and comprehensive characteristics of the product. It is the responsibility of the customer to explicitly disclose in writing any additional requirements to E-One Moli Energy prior to agreement of purchase.

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