

PRODUCT SPECIFICATION

LITHIUM-ION RECHARGEABLE BATTERY CELL

REFERENCE

Products name:	INR18650A220
Kind:	A
Grade:	A
Customer Name:	

SHENZHEN YIKLIK ENERGY LIMITED

RECHARGEABLE BATTERY
APPLICATION ENGINEERING DIVISION

Revise note Version / Date	Prepared by	Checked by	Approved by
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SHENZHEN YIKLIK ENERGY LIMITED

Cylindrical Lithium-ion Rechargeable Battery Cell

1. Preface

This Product Specification describes the requirements for the lithium ion rechargeable battery cell ("Cell") to be supplied by ShenZhen YikLik Energy Limited.

2. Description and Model

2.1 Description Lithium ion rechargeable battery cell

2.2 Model [INR18650A220](#)

Note: [INR*18*650*A*220](#) =Li CoNiMn Cylindrical *Diameter* Height*Kind* Capacity

3. Ratings

3.1 Rated Capacity	2200mAh (Typ.) 2100mAh (Min)
3.2 Nominal Voltage	3.6V
3.3 Internal Impedance	\leq 80mΩ
3.4 Charging method	Constant Voltage with limited Current
3.5 Initial Charge Current	Standard Charge : 440mA
	Rapid Charge : 1100mA
3.6 Charging Time	Standard Charge : Approx. 5 hours
	Rapid Charge : Approx. 2.5 hours
3.7 Max. Charge Current	2200mA
3.8 Max. Discharge Current	2200mA
3.9 Discharge Cut-off Voltage	3.00V
3.10 Cell Weight	Approx. 50g
3.11 Cell Dimension	Height(with pvc Tube) 65.0\pm0.2mm
	Diameter (with pvc Tube) Φ 18.0$^{+0.3}_{-0}$ mm
3.12 Operating Temperature	Charge 0 $^{\circ}$ C ~ 45 $^{\circ}$ C
	Discharge -20 $^{\circ}$ C ~ 60 $^{\circ}$ C
3.13 Storage Temperature	1 month -20 $^{\circ}$ C ~ 45 $^{\circ}$ C
	3 month -20 $^{\circ}$ C ~ 45 $^{\circ}$ C
	1 year -20 $^{\circ}$ C ~ 20 $^{\circ}$ C

4. Outline Dimensions

See attached drawing (Fig.1).

5. Appearances

There shall be no such defect as scratch, flaw, crack, rust, discoloration, leakage, which may adversely affect commercial value of the Cell.

6. Standard Environmental Test Conditions

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature 20 +/- 5deg.C and humidity 65 +/- 20 %RH, as specified in JIS Z 8703 Standard (Standard Test Conditions). If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15 ~ 30 $^{\circ}$ C and humidity 25 ~85%RH.

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7. Characteristics

Items	Test Condition	Criteria								
7.1 Standard Charge	The "Standard Charge" means charging the Cell with initial charge current 440 mA and with constant voltage 4.20 V (Charger for exclusive use lithium ion rechargeable battery, with an accuracy 4.20+/-0.05V) at 20°C for 5 hours.									
7.2 Initial Capacity	The capacity means the discharge capacity of the Cell, which is measured with discharge current 440mAh with 3.00 V cut-off at 20deg.C within 1 hour after the Standard Charge.	Initial Capacity >=2100mAh								
7.3 Cycle Life	Each cycle is an interval between the charge (charge current 1100mA) and discharge (discharge current 1100mA) with 3.00 V cutoff, at 20°C. Capacity after 300 cycles and plus 1 day, measured under the same conditions stated in 7.2.	Capacity >= 80%								
7.4 Initial Internal Impedance	Internal resistance measured at 1KHz after Standard Charge.	Initial Internal Impedance <= 80 milli-ohm								
7.5 Temperature Dependence of Capacity (Discharge)	Cells shall meet the discharge capacity requirements listed in the below table under respective discharge temperatures. The capacities are to be measured with constant discharge current 1100mA (3.0V cut-off) after standard charge at 20°C. If charge temperature and discharge temperatures are not the same, the interval for temperature change comes to 3 hours. Percentage as an index of the capacity compared with 100% at 25°C.									
<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">Discharge Temperature</th> <th style="text-align: center;">0°C</th> <th style="text-align: center;">25°C</th> <th style="text-align: center;">45°C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Discharge Capacity</td> <td style="text-align: center;">70%</td> <td style="text-align: center;">100%</td> <td style="text-align: center;">80%</td> </tr> </tbody> </table>		Discharge Temperature	0°C	25°C	45°C	Discharge Capacity	70%	100%	80%	
Discharge Temperature	0°C	25°C	45°C							
Discharge Capacity	70%	100%	80%							
7.6 Storage Characteristics	Capacity after 30 days storage at 20°C from Standard Charge, measured under the same conditions stated in 7.2.	Remaining Capacity(after 20 °C storage) >= 85%								
7.7 Cell Voltage	As of shipment	Cell Voltage range 3.75~ 3.95 V								
7.8 Drop Test	Cell (as of shipment) to be dropped onto the oak-board (thickness >= 20 mm) from 1.2 m height at a random direction, 3 times total at 20+/-5°C.	No leakage Capacity Recovery rate >= 90% (*1)								
7.9 Vibration Test	Cell (as of shipment) vibrated for 90 minutes per each of three mutually perpendicular planes with total excursion of 1.6 mm and with frequency of 10 Hz to 55 Hz, with sweep of 1 Hz change per minute.	No leakage Capacity Recovery rate >= 90% (*1)								

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Items	Test Condition	Criteria
7.10 External Short-circuiting Test	To short-circuit the Cell charged 4.25 V by connecting positive and negative terminal by 30milli-ohm wire for 1 hour.	No rupture, and no fire
7.11 Overcharge test	Cells are charge at constant current of 3CmA and constant voltage of 10V for 4 hour.	No rupture, and no fire
7.12 Over discharge test	after standard charge .Cells are discharged at constant Current of 0.2CmA to 3.0V,and the positive and negative terminal is connected by a 30 Ω wire for 24 hour.	No rupture, and no fire
7.13 Nail test	A Steel needle (diameter: 2.5mm-5mm) is Penetrated vertically through the center of a fully charged cell	No rupture, and no fire
7.14 Heating test	After standard charge ,Cells are heated in a circulating air Oven at a rate of 5°C per minute to 150°C and keeping the state for 10 minutes	No rupture, and no fire

Note (*1)

Recovery rate is measured by the condition of 7.2 after leaving cells at 20°C for 3 hours.

8. Product Liability

The Safety should be sure to confer previously with between the both parties.

The results of the conference must be recorded and the range of the liability or the burden should be cleared.

The indications of a warning are established by conference with between the both parties.

9. Packaging method

The YIKLIK standard packaging method for [INR18650A220](#) shall apply.

See attached drawing (Fig.2) (Fig.3).

The insulators in the carton are put between the batteries to prevent the batteries from short circuit.

The carton size is the same as before, but the quantity in the carton will be reduced accordingly than before.

PS: The packaging Method for both Cylindrical Lithium ion Rechargeable Batteries/Cells and Advanced Lithium ion Rechargeable Batteries/Cells will be not changed.

10. Warranty

As long as the Cell is treated in accordance with this Product Specification and / or Handling Precautions and Prohibitions, Supplier warrants that the Cell should be free from any defect for a period of 1 year (20°C or less) from the date of shipment or for 300 cycles (see 7.3), whichever comes earlier.

The warranty set forth above or described in Handling Precautions and Prohibitions for Lithium Ion Rechargeable Batteries excludes a defect, which is not related to manufacturing of the Cell.

11. Others

10.1 Storage for a long time If Cell is preserved for a long time (3 or 4 months), the Cell is preserved at the dry and low temperature.

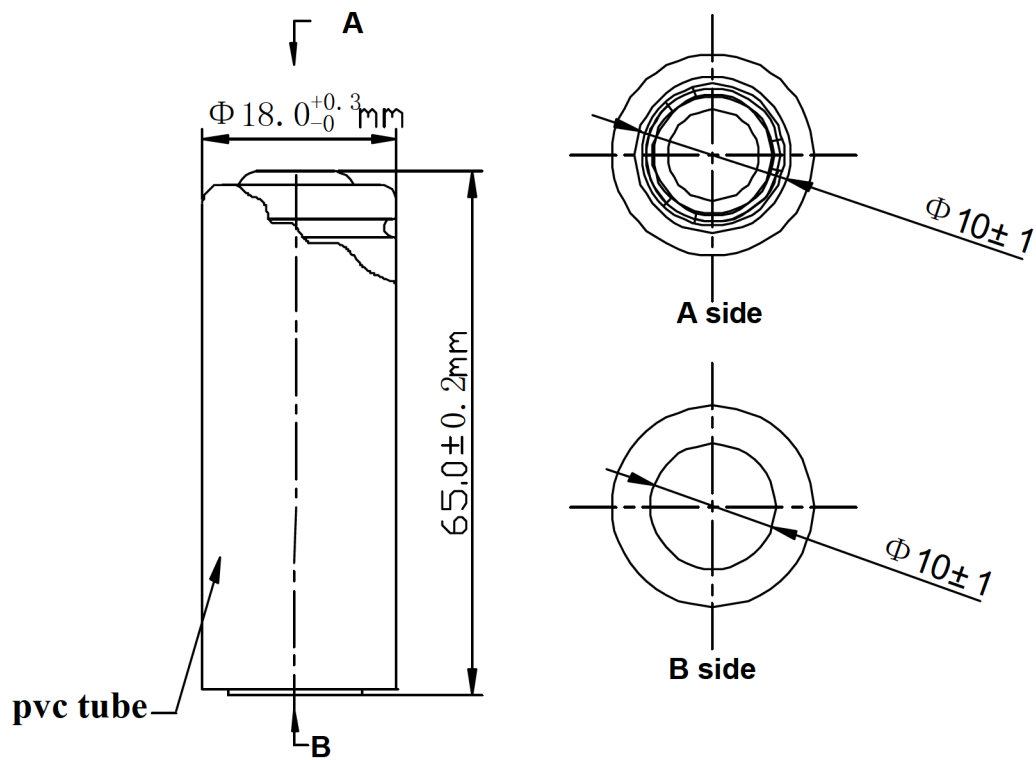
10.2 Other Any matters that this specification does not cover should be conferred between the both parties.

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Cylindrical Lithium-ion Rechargeable Battery Cell

Fig.1 Dimensional Drawing of INR18650A220

(Unit: mm)



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Cylindrical Lithium-ion Rechargeable Battery Cell

Handling Precautions and Prohibitions for Lithium Ion Rechargeable Batteries

Subject to change without notice

Preface

This document of “Handling Precautions and Prohibitions for Lithium Ion Rechargeable Batteries” shall be applied to a battery cell of [INR18650A220](#), which are to be manufactured by SHENZHEN YIKLIK ENERGY LIMITED.

Note (1):

The customer is requested to contact YIKLIK in advance, if and when the customer needs other applications or operating conditions than those described in this Document, because additional tests and experiments may be necessary to verify performance and safety under such conditions.

Note (2):

YIKLIK will take no responsibility for any accident when the Cell is used under other conditions than those described in this Document.

Note (3):

YIKLIK will inform, in a written form, the customer of improvement(s) from a view of proper using and handling of the Cell, if it is deemed necessary.

1. Charging

1.1 Charging current:

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended may cause damage to cell performance and safety features deeply and can lead to heat generation or leakage.

1.2 Charging voltage:

Charging shall be done by voltage less than that specified in the Product Specification (4.2V/cell)

Charging at above 4.25V, which is the absolute maximum voltage, must be strictly prohibited.

The charger shall be designed to be applicable to this condition.

Because it is very dangerous that the Charging with higher voltage than specified may cause damage to the cell performance and safety features deeply and can lead to heat generation or leakage.

1.3 Charging temperature:

The Cell shall be charged within a range of specified temperatures in the Product Specification.

1.4 Prohibition of Reverse charging:

Reverse charging is prohibited. The Cell shall be connected correctly.

The polarity has to be confirmed before you make wiring. In case if the Cell is connected improperly, the Cell cannot be charged.

Simultaneously, the reverse charging may cause damaging to the Cell(s) which may lead to lose cell performance and damage to the cell safety which can lead to heat generation or leakage.

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2. Discharging

2.1 Discharging current:

The Cell shall be discharged at less than the maximum discharge current specified in the Product Specification.

High discharging current may reduce the discharging capacity remarkably or cause overheats.

It should be noted that the discharge capability may be reduced by working of PTC device, if the atmospheric temperature is high.

2.2 Discharging temperature:

The Cell shall be discharged within a range of temperatures specified in the Product Specification.

2.3 Over-discharging:

It should be noted that the Cell(s) would be over-discharged state by its self-discharge characteristics in case the Cell(s) is not used for long time. In order prevent over-discharging, the Cell(s) shall be charged periodically to maintain around 3V to 3.8V.

Over-discharging may causes loss of cell performance, characteristics, or battery functions.

The charger shall equip with a device to prevent further discharging exceeding a cut-off voltage specified in the Product Specification.

Also the charger shall equip a device to control the recharging procedures as follows;

The Cell(s)/Battery Pack shall start with a low current (0.01CmA-0.07mA) for 15-30 minutes, i.e. pre charging, before rapid charging starts. The rapid charging shall be started after the individual Cell voltage has been reached above around 3V within 15-30minutes, which can be determined and controlled with use of appropriate timer for pre-charging.

In case the individual Cell voltage does not rise to around 3V within the pre-charging time, then the charger shall have functions to stop the further charging and display the Cell(s)/Pack is under abnormal state.

3. Protection Circuit Module (PCM)

3.1 The Cell(s)/Battery Pack shall be with a PCM which can protect Cell(s)/Battery Pack properly.

3.2 PCM shall have functions of (i) overcharging prevention, (ii) over-discharging prevention, and (iii) over current prevention, to maintain safety and prevent significant deterioration of cell performance. The over current can occur by external short circuit.

3.3 Overcharging Prohibition:

Overcharging prevention function shall work if any one of the Cells of the battery pack reaches to 4.40V above which the charging shall be stopped.

3.4 Over-discharge Prohibition:

Overcharging prevention function shall work if any one of the Cells of the battery pack reaches to below 2.15V, which the discharging shall be stopped.

It is recommended that the dissipation current of PCM shall be designed to be minimized such as 0.5 micro-amperes or less after the over-discharge prevention function works.

The protection function shall watch each bank of the battery pack for controlling current all time.

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3.5 Protection circuit module (PCM) design

- (1) Electrolyte has corrosive characteristics. PCM may cause emitting smoke or heating, if the leaked electrolytes come in contact with the circuit of PCM.
- (2) These points should be considered for protection circuit module design.
 - PCM shall be away from the gas-release-vent of the Cells as much as possible.
 - Circuit patterns of PCM shall be away from each other as much as possible.

4. Storage

The Cell should be stored within a proper temperature range specified in the Product Specification.

5. Others

5.1 Cell connection:

- (1) Direct soldering of wire leads or devices to the Cell is strictly prohibited.
- (2) Lead tabs with pre-soldered wiring shall be spot welded to the Cells.

Direct soldering may cause damage of components, such as separator and insulator, by heat generation.

5.2 Ultrasonic Welding:

- (1) Never attempt to use direct ultrasonic welding of tabs to the Cells. It may cause serious damage to the Cells.
- (2) Ultrasonic welding of plastic lid to the plastic shell can be applied. However, the welding shall be done to avoid the ultrasonic wave power to the Cells. Otherwise it may cause serious damage to the Cells.

5.3 Prevention of Short Circuit within a Battery Pack:

A plastic tube of the Cells can be damaged during a battery pack is assembled which may cause a short circuit problem. The additional with enough insulation layers between wiring and the Cells shall be used to maintain multiple safety protection.

The battery pack shall be structured with no short circuit within the battery pack.

It is because that the short circuit within the pack may cause generation of smoke or firing.

5.4 Prohibition of Disassembly:

- (1) Never disassemble the Cells.

The disassembling may cause a chance to generate internal short circuit in the Cell, which may cause gassing, firing, explosion or other troubles.

- (2) Electrolyte is harmful: An electrolyte happens to be leaked out from the Cells is harmful to the human bodies. In case if the electrolyte is coming in contact with the skin, eyes or others, the electrolyte shall be flushed immediately with fresh water and seek medical advice by medical doctor.

5.5 Prohibition of Short Circuit:

Never make short circuit the Cells. It makes generation of very high currents which subsidiary cause heating of the Cells, which may cause the electrolyte leakage, gassing or explosion, which are very dangerous.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

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5.6 Prohibition of Dumping of Cells into Fire:

Never incinerate nor dispose the Cells in fire. These may cause explosion of the Cells, which is very dangerous and is prohibited.

5.7 Prohibition of Cells immersion into liquid such as water:

The Cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

5.8 Battery Cells Replacement:

The battery replacement shall be done only by either Cells supplier or device supplier and never be done by the user.

5.9 Prohibition of Use of Damaged Cells:

The Cells happens to have a chance to be damaged during shipping by any shocks.

If any abnormal features of the Cells are found such as damages in a plastic envelop of the Cell, deformation of the Cell can, smelling of an electrolyte, an electrolyte leakage and others, the Cells shall never be used any more.

The Cells with a smell of the electrolyte or a leakage shall be away from fire to avoid firing or explosion.

6. Marking

The customer shall prepare the comprehensive explanation and appropriate markings for the end users.

The battery packs will need its packing and handling (or safety) instructions in which Cell usage, storage, replacement or others in accordance with regulations, if any.

The prohibited items mentioned in this document, regulations in UL1642, and others shall be clearly explained to the users.

The markings shall also be done, in which necessary items based on the marking guidelines of the rechargeable lithium ion batteries for maintaining of safety of the Cells.

<Example for marking of UL1642 regulation>

- (1) Mark the manufacturer's name, business name or trademark, and specified model name.
- (2) Use the word "Warning" or "Cautions" and indicate the statement "Risk of fire, explosion, and burns. Do not disassemble, crush, heat above 212deg.F, or incinerate" or equivalent.
- (3) It should be marked on the final product that " Replacement can only be done with the Battery Pack specified by the final product manufacturer with the parts number. It may cause firing, explosion or burning if the customer uses the battery pack other than specified by the final product manufacturer. The customer shall refer to the handling instruction issued by the final product manufacturer." If it is not possible to mark the warnings mentioned above on the final products, the final product manufacturer shall mark and print the warnings in the handling or maintenance instructions or manuals of the products.