



# Product Specification

Tianjin Lishen Battery Joint-Stock Co., Ltd.

CONFIDENTIAL

REV: V 1

TITLE: Cylindrical Lithium Ion Cell LR1865BE

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Date: 20090306

# PRODUCT SPECIFICATION

## Cylindrical Lithium-ion Cell

**Model: LR1865BE**

<b>Customer Approval</b>	<b>Signature</b>	<b>Date</b>
	<b>Company Name :</b>	
	<b>Company Stamp :</b>	

<b>Prepared By</b>	<b>Checked By</b>	<b>QA</b>	<b>Approved By</b>

TEL: (86)-22-83716775 FAX: (86)-22-83711060





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LS431.377GS

Revision	Date	Originator	Reason of Revision
0	2009-03-06		--

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## 1. SCOPE

The product specification describes the requirement of the Cylindrical Lithium-ion Cell to be supplied to the customer by Tianjin Lishen Battery J/S Co.,Ltd.. Should there be any additional information required by the customer, customer are advised to contact Tianjin Lishen Battery J/S Co.,Ltd..

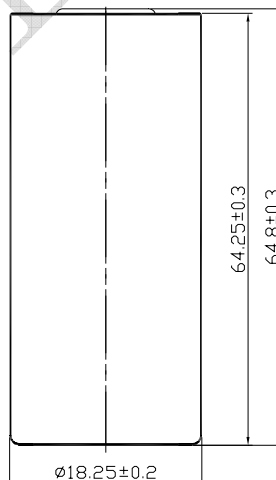
TITLE: Cylindrical Lithium Ion Cell LR1865BE

### 2. DEFINITIONS

1. 1C Charge: 1C constant current (CC) charge to 4.2 V, follow by 4.2 V constant voltage (CV) charge until current taper to  $\leq 60\text{mA}$
2. 3C Charge: 3C constant current (CC) charge to 4.2 V, follow by 4.2 V constant voltage (CV) charge until current taper to  $\leq 60\text{mA}$
3. 1C discharge: 1C constant current(CC) discharge to 2.0V.
4. 10A discharge: 10A constant current(CC) discharge to 2.0V
5. Rated Capacity: 1C charge ,and the 1C discharge , record the discharge capacity
6. DC IR: Measured as  $(V_{1C} - V_{6C}) / (I_{6C} - I_{1C})$  after 1 second of a  $I_{6C}$  pulse of a minimum duration of 1 second from standard discharge at 100% SOC
- 7 AC IR: Measured at 1 kHz
- 8 Current : 1C = 1400mA
- 9 Unless otherwise specified, all testing should use fresh cell which stored for 0-1 months

### 3. DESCRIPTION AND MODEL

- 3.1. Description : Cylindrical Lithium Ion Cell
- 3.2. Model : LR1865BE 1.4Ah
- 3.3. Diameter





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### 4. GENERAL SPECIFICATIONS

Items		Specifications	
4.1 Chemistry		Pure Spinel	
4.2 Dimensions	Diameter (mm)	18.25 ± 0.2	
	Height(mm)	64.8 ± 0.22	
4.3 Weight (g)		45 ± 1.5	
4.4 AC IR(AC 1kHz) (mΩ)		18	
4.5 DC IR (mΩ)		25	
4.6 Nominal Voltage	1C (V)	≥3.7	
4.7 Minimum Capacity (Ah) 1C		1.35	
4.8 Charge Method		CC-CV(4.2V)	
4.9 Charge Time	Standard (min)	90	
	Rapid (min)	40	
4.10 Charge Current	Normal Current (A)	1.4	
	Max. Current (A)	4.2A	
4.11 Discharge	End Voltage (V)	2.0	
	Max. Current (A)	25	
4.12 Energy Density		Normal (Wh/kg)	115
4.13 Operating Temperature	Charging	0 °C ~ 45°C	
	Discharge	-20 °C ~ 70 °C	
4.14 Storage temperature		-20 °C ~ + 40 °C	

### 5. APPEARANCE

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

### 6. TEST CONDITION AND DEFINITIONS

6.1	Standard environmental test conditions	Unless otherwise specified, all tests stated in this document shall be performed at: Temperature of 23 ± 2 °C, Relative ambient humidity of 5-95%
6.2	Electrical characteristics	Unless otherwise specified, all electrical tests stated in this document shall be performed to no less than the following levels of precision: End of charge and end of discharge voltage: ± 0.050 V, Open circuit voltage (OCV): ± 0.001 V, Charge and discharge current: ± 10 mA, or at ≤ 1% of full scale, Impedance: ± 0.2 mohm
6.3	Dimension	0.02 mm accuracy vernier calipers



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### 7. ELECTRICAL CHEMISTRY PERFORMANCE

#### 7.1. Rate discharge performance(23°C)

Standard charge followed by a discharge at the specified discharge rate.

If under any discharge test conditions, the cell reaches 70°C, test should be interrupted, cooled to 40°C and the discharge resumed.

Current	%Capacity	Energy
1C	100%	≥4.8Wh
5A	≥96%	≥4.6Wh
10A	≥94%	≥4.4Wh
15A	≥92%	≥4.2Wh
20A	≥90%	≥4.0Wh

#### 7.2. Cycle Life

##### 7.2.1. 1C Charge, 10A discharge cycle life(23°C)

1C Charge  
 Rest for 10 min  
 Discharge on 10A continuous until 2.0V  
 Rest for 45 min  
 Repeat

	100 Cycles	200 Cycles	250 Cycles
% Capacity@1st	≥85%	≥75%	≥70%

##### 7.2.2. 1C Charge, 15A discharge cycle life(23°C)

1C Charge  
 Rest for 10 min  
 Discharge on 15A continuous until 2.0V  
 Rest for 45 min  
 Repeat

	100 Cycles	150 Cycles
% Capacity@1st	≥85%	≥60%

#### 7.3. Storage Characteristics

1C charge and 1C discharge at 23 °C, record the discharge capacity, and storage the cell at the specified temperature, after finished storage , 1C discharge the cell and record the discharge capacity as residual capacity, and then 1C charged the cell and 1C discharge ,record the discharge capacity as recoverable capacity.



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SOC(%)	Storage temperature(oC)	Duration of storage	%Residual Capacity	%Recoverable Capacity
100%	45°C	28days	>80%	>85%
100%	60°C	7days	>80%	>85%

### 7.4. Low Temperature Characteristics

Cells shall be 1C charge at 23°C. after 4 hours temperature soaking, then 6C discharge . The capacity of a cell at each temperature shall be compared to the capacity achieved at 23 °C and the percentage shall be calculated.

Temperature(°C)	%Capacity	%Energy
23°C	100%	≥4.8Wh
0°C	≥ 90%	≥4.0 Wh
-20°C	≥ 80%	≥3.0Wh

## 8. SAFETY PEROMANCE

No.	item	Criteria	condition
1	Overcharge [1C,5V]	no fire, no explosion	Overcharge from fully discharged
2	Heating [130 ,1h]	no fire, no explosion	Temperature rise 5°C/min to 130°C, and Keep 60min at 130°C
3	Short-Circuit [60 ]	no fire, no explosion	Storage 30~45min before Short Circuit with <30 mOhm resistance
4	Crush	no fire, no explosion	UL1642
5	Impact	no fire, no explosion	UL1642

## 9. SHIPING CELL FOR STORAGE

Cell storage in 50%SOC , the voltage, impdedance and capacity should meet the SPEC.



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Storage Time	Voltage (V)	Impedance (mohm)	Capacity(mAh)
0-1 months	3.80-3.90	10-18	1350
1-6 months	3.76	10-18	1300

Storage time 0 days was one month after the date indicated by the date code on the cell

### 10. GUARANTEE

Cells are guaranteed to be free from defects in workmanship and materials for a period of half a year provided that the manufacturer can confirm such defects are coming from manufacturing abnormality and not from abusive usage, or else manufacturer will solve the quality problem.

### 11. OTHERS

Any matter not included in this specification shall be conferred between the both parties.

### 12. SHIPPING

The capacity of delivery battery is approximately at 50% of charging. During transportation , keep the battery from acutely vibration, impacting, solarization, drenching.

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# HANDLING INSTRUCTIONS FOR LITHIUM ION RECHARGEABLE BATTERY

## 1. **WARNING**

2.1 Don't heat or disposed in fire or water .Don't modify or disassemble the battery. It will be dangerous, and may cause ignition, heating, leakage or explosion.

2.2 Don't short-circuit positive(+) and negative(-) terminals. Keep away from metal or other conductive materials. Jumbling the batteries of direct contact with positive(+) and negative(-) terminals or other conductive materials may cause short-circuit.

2.3 Don't reverse the positive (+) and negative (-) terminals.

2.4 If the battery gives off an odor, generates heat, becomes discolored, or in any way appears abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using it.

2.5 Don't solder the battery directly. Excessive heating may cause deformation of the battery components such as the gasket, which may lead to the battery swelling,leakage, explosion,or ignition.

2.6 Don't use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.