



Wuhan LiXing(Torch) Power Sources Co.,Ltd

Controlled document's No.

Q/LX.S.E. 08.003-2020

Edition/Status

B/0

Cylindrical Li/MnO₂ Battery

Specification

Model: CR2

Customer:

Customer's opinion:

signature:

Date:

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Page 1 Total 13

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Edition/Status

B/0

Contents

1. Purpose3

2. Description and Model3

3. Technical parameters3

4. Outline figure and dimension4

 4.1. Outline figure is shown as follow 4

 4.2. Outline dimensions 4

5. Appearance4

6. Characteristics and test method4

 6.1. Electronic characteristic: 4

 6.2 Performance Test 5

 6.3 Environment and safety performance 5

 6.3.1 Environment performance 5

 6.3.2 Safety performance 6

7. Test condition 8

 7.1 State of batteries: 8

 7.2 Normal testing environment: 8

 7.3 Test precision: 8

8. Packaging 8

9. Environment requirement9

10. Producing standard and certification9

11. Transportation9

12. Information for safety9

13. Storage10

14. Declaration 11



Controlled document's No.

Q/LX.S.E. 08.003-2020

Edition/Status

B/0

1. Purpose

1.1 In order to avoid errors and deviations by different testing method or condition, we established this specification to define the battery model and test method of lithium battery manufactured by Lixing.

1.2 Give some guidance for using our products.

2. Description and Model

Table 1

Description	Model
Lithium manganese dioxide cylindrical battery	CR2

3. Technical parameters

Table 2

No.	Items	Characteristics
1	Nominal Capacity*	850 mAh
2	Discharge capacity (continuously discharge under 10mA, till 2.0V end voltage)	800 ± 50 mAh
3	Nominal Voltage	3V
4	Operating Temperature range	-20~+60°C
5	Max. Pulse Current	2500 mA
6	Max. Continuous Discharge Current	1000 mA
7	Structures	Manganese dioxide cathode, lithium anode, organic electrolyte, polypropylene separator and stainless steel cell can and cap, etc.
8	Weight for Reference	About 11g

* Nominal Capacity: The nominal capacity means that when discharged at 10mA、20±2°C、end voltage 2.0V. (the nominal capacity may differ due to change of the discharge current, temperature and end voltage)

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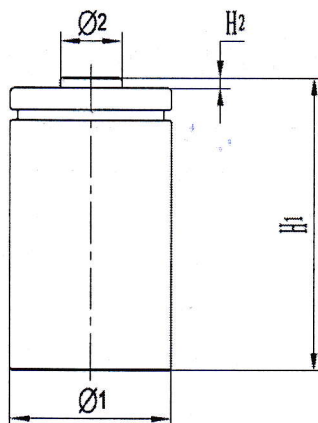
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4. Outline figure and dimension

4.1. Outline figure is shown as follow



4.2. Outline dimensions

Table 3

Model	Max. diameter Φ1 (mm)	Max. diameter Φ2 (mm)	Max. height H1 (mm)	Min. height H2 (mm)
CR2	15.6	6.5	27.0	0.7

5. Appearance

The surfaces of the batteries should be clean. The mark is clear. There should not be deformation、rust、stain or leakage.

6. Characteristics and test method

6.1. Electronic characteristic:



Table 4

No.	Item	Test condition	Performance within one year under room temperature	Performance after one year under room temperature
1	Open circuit voltage			
	Room temperature	20±2 °C	≥3.0V	≥3.0V
	Low temperature	-20±2 °C	≥3.0V	≥3.0V
	High temperature	60±2 °C	≥3.0V	≥3.0V
2	Close circuit voltage	Discharge load: 10Ω		
	Room temperature	20±2 °C	≥2.60V	≥2.55V
	Low temperature	-20±2 °C	≥2.45V	≥2.40V
	High temperature	60±2 °C	≥2.65V	≥2.60V
	Working life	Discharge load: 10mA		
	Room temperature	End voltage: 2.0V		
	Low temperature	20±2 °C	≥750mAh	≥700mAh
	High temperature	-20±2 °C	≥400mAh	≥350mAh
		60±2 °C	≥700mAh	≥650mAh
	Discharge capacity (Celerity test at room temperature)	Discharge load: 50mA		
	End voltage: 2.0V	≥700mAh	≥650mAh	

6.2 Performance Test

6.2.1 Six samples for each testing item

6.2.2 Samples should be placed for 24 hours under the requested temperature, which the test will be done.

6.3 Environment and safety performance

6.3.1 Environment performance



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Controlled document's No.

Q/LX.S.E. 08.003-2020

Edition/Status

B/0

Table 5

No.	item	requirement	method
A	Altitude Simulation Test	NM、NL、NV、NC、NR、NE、NF	At 20°C±5°C, the batteries should be stored at the pressure of 11.6 KPa or less for at least six hours.
B	Temperature Cycling	NM、NL、NV、NC、NR、NE、NF	The batteries should be stored at least 6 hours at 75±2°C, then be stored at least six hours at -40±2°C. The interval between the two temperatures should be maximum 30 minutes. Repeat this process for 10 times. Then store batteries 24hours at 20±5°C,
C	Vibration	NM、NL、NV、NC、NR、NE、NF	The batteries should be subjected to a simple harmonic motion with an amplitude of 0.8mm(1.6mm total maximum excursion). The frequency is to be varied at the rate of 1Hz per minute between 10 and 55Hz.The test should be last 90min~100min and the cell should be tested in two mutually perpendicular direction.
D	Shock	NM、NL、NV、NC、NR、NE、NF	The batteries should be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each battery should be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of the three mutually perpendicular directions. Each shock is to be applied in a direction perpendicular to the face of the battery. For each shock the battery is to be accelerated in such a manner that, during the initial 3ms, the minimum average acceleration is 75×9.8m/s ² . The peak acceleration should be between 125×9.8 m/s ² ~175×9.8 m/s ² .

NM: no weight loss NL: no leakage NV: no venting NC: no short circuit (OCV after testing is not less than 90% of its voltage prior to this procedure) NR: no rupture NE: no explosion

NF: no fire NT: no overheating (the temperature at the surface of battery not exceed 170°C)

6.3.2 Safety performance

Table 6

No.	item	requirement	method
E	External Short Circuit	NT、NR、NE、NF	The batteries to be tested should be temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the batteries should be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after the

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			battery external case temperature has returned to $55 \pm 2^{\circ}\text{C}$. The battery must be observed for a further six hours for the test to be concluded. The battery to be tested should have endured vibration and shock test.
F	Impact	NT、NE、NF	The test sample battery is to be placed on a flat surface. A 15.8 mm diameter bar is to be placed across the centre of the sample. A 9.1 kg mass is to be dropped from a height of 610 ± 25 mm onto the sample. The battery is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8 mm diameter curved surface lying across its centre. The battery should be impacted for one time.
G	Crush	NE、NF	The cell or battery is crushed between two plates through the vise or 32mm diameter hydraulic piston arm with the pressure of about 13KN.
H	Forced-discharge 1	NE、NF	Each battery should be forced discharged at ambient temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current * specified by the manufacturer. Each battery should be forced discharged for a time equal to the time in which a new cell is discharged to 2.0V .
I	Abnormal Charge	NE、NF	Sample batteries are to be connected reversely with a D.C. power supply , and subjected to a constant charging current at 3 times the I_c Charge time $t_d = 2.5 \times C_n / (3 \times I_c)$ **
J	Free Drop	NV、NE、NF	The not-discharged battery is to be dropped from a height of 1m onto a concrete surface. Each sample is to be dropped six times, two times in each direction. The sample should be examined 1 hours after testing
K	Heating Test	NE、NF	The battery should be placed in an oven. The oven temperature should be increased at a rate of $5^{\circ}\text{C} \pm 2^{\circ}\text{C}$ per minute until the oven reached $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$.The oven should be maintained at $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 10min.
L	Forced-discharge 2	NE、NF	The cell or battery to be tested is discharged of 50% DOD, 75% DOD, and then connect it with fresh cells at qty of n-1 pieces and resistance R, of which n and R is specified by manufacturer.
M	Incorrect installation	NE、NF	Connect a test battery with three fresh cells of same model in series, but with cells reversal. The hydraulic resistance of the circuit is less than or equal to 0.1Ω . Test should be under $(20 \pm 5)^{\circ}\text{C}$ for continuous 24hours.

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NM: no weight loss NL: no leakage NV: no venting NC: no short circuit (OCV after testing is not less than 90% of its voltage prior to this procedure) NF: no fire NR: no rupture
 NE: no explosion
 NT: no overheating (the temperature at the surface of battery not exceed 170°C)

* Max discharge current: in table 2 means maximum continuous discharge current 1000mA .

** $t_d=2.5 \times C_n / (3 \times I_c)$

t_d —test time, Ours t_d is 28h

C_n —nominal capacity, Ours C_n is 850mAh

I_c —the abnormal charge current for the tests provided by battery supplier. Ours I_c is 25mA

7. Test condition

7.1 State of batteries:

The batteries should be marked with manufacture date(year, month, date)

7.2 Normal testing environment:

If no special requirement, test should be made under the temperature of $(20 \pm 5)^\circ\text{C}$ and relative humidity of 45%-75%.

7.3 Test precision:

The measuring tolerances relative to the specified or actual values should be within these range:

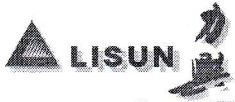
Voltage	Current	Capacity	Temperature	Time	Weight	Dimension
±1%	±1%	±1%	±3°C	±0.1%	±0.1%	±0.1%

These tolerances include all errors caused by precision of testing instrument, testing method and testing process.

8. Packaging

Dimension of box	Net weight	Gross weight
355mm×285mm×275mm	12KG	14KG

Normal package: 1080 pcs per box.



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Q/LX.S.E. 08.003-2020

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9. Environment requirement

The product meets ROHS standard.

10. Producing standard and certification

Our batteries are produced according to the IEC-60086 standard, UL1642 safety authentication (MH26236) and UN38.3 shipment authentication.

11. Transportation

- The Batteries should be stored away from solarization, fire, rain, water, and never put together with corrosive during transportation.
- Vibration and shock during transportation and load-and-unload should be restrict to a minimum level.
- The height should not exceed 1.5m for cardboard packages.
- The batteries if transported by sea should be stored away from ship engines during prolonged transit, and not left for long periods in unventilated environment during summer.

12. Information for safety

! Dangerous

- Do not overheat batteries or dispose of batteries in fire.
- Do not put batteries together with metalwork such as necklace, coins, etc in one bag, or store them together
- Do not short-circuit batteries.
- Do not inset batteries in reverse. Observe the + and - markings on battery and equipment.
- Do not disassemble batteries.
- Do not weld or solder directly to batteries.
- Do not use deformed batteries or batteries with serious scar.
- Read the guide carefully before using batteries. Unsuitable operation will make batteries overheat, fire, explode, destroy or reduce battery's capacity.

! Warning

- Do not place the battery in heater, washer or high-pressure container.
- Do not use the battery together with different kind of or different type of



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Q/LX.S.E. 08.003-2020

Edition/Status

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battery.

- Stop using when the battery become heat, emit smell or appear other abnormality during use, or storing.
- Do not recharge the battery.
- Do not force-discharge the battery.
- Keep away from the battery when the battery is leakage or emit abnormal smell.
- Wash yourself quickly when the electrolyte infiltrate to your skin or clothes.
- Wash your eyes with clean water quickly and go to hospital for further check if the electrolyte infiltrate to your eyes.
- Please contact with us in advance If two or more batteries are to be connected in a series and / or placed in a parallel arrangement.

! Caution

- Keep the battery away from the children, avoid being swallowed.
- Read the guide carefully and pay attention to the guide when using the battery.
- Read the instrument guide carefully before installing the battery or uninstalling the battery from the instrument.
- Take out of the battery when the life of the battery is over.
- Take out of the battery and keep it under the condition of low temperature and low humidity when the battery is not used for a long time.
- Clean the battery with dry cloth before use if the connection of the battery is dirty.
- Battery should be used and stored far from the electrostatic place.

13. Storage

- The batteries should be stored at 10°C ~ 25°C (never exceed 30°C) , 45%~75%RH.
- The batteries should not be stored next to heat sources nor in direct sunlight. The storage area should be clean, cool, dry, ventilated and weatherproof.
- The height to which batteries may be stacked is clearly dependent on the strength of the packaging. As a general rule, this height should not exceed 1.5m for cardboard packages nor 3m for wooden cases.



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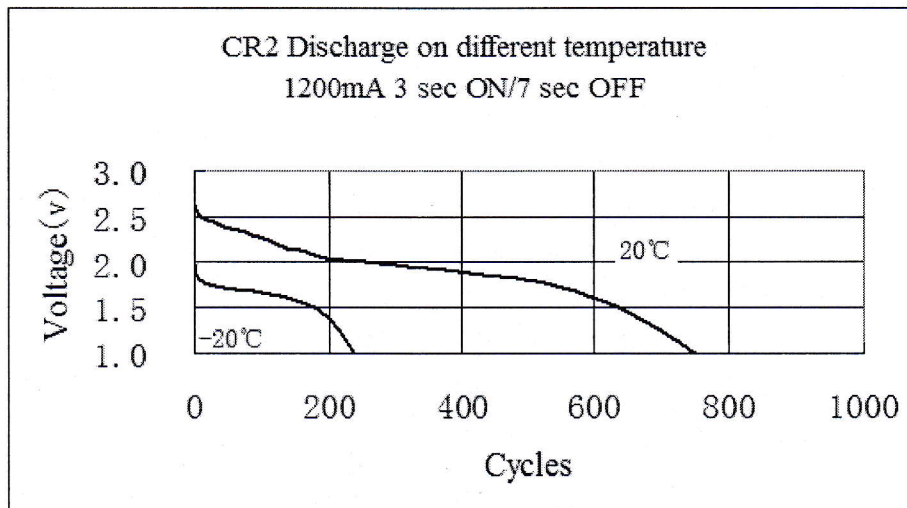
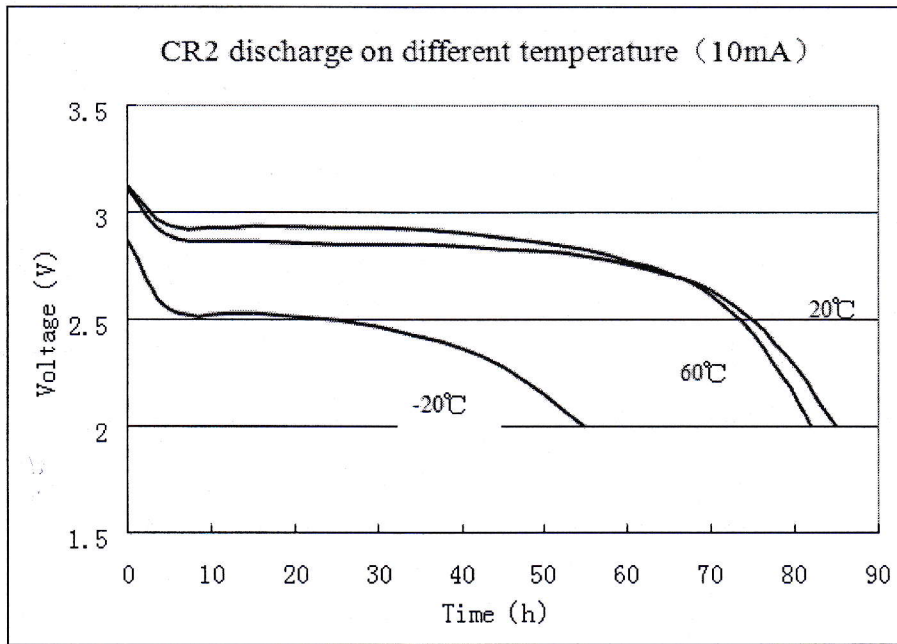
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-Store and display batteries in their original package. The batteries may be short-circuited or damaged if been unpacked and stacked mussily.

14. Declaration

- Please contact with Wuhan Lixing (Torch) Power Source Co., Ltd. If you have any question with this specification.
- Wuhan Lixing (Torch) Power Source Co., Ltd keep the right to change the specification.

Appendix 1:



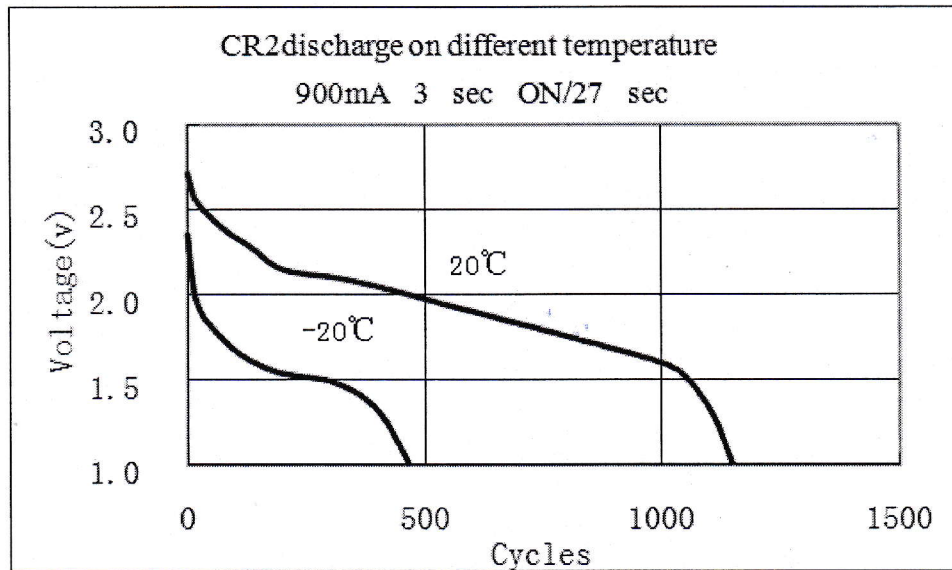


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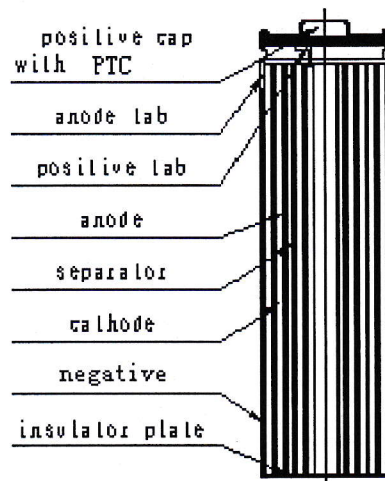
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Appendix 2:

Battery structural drawing (CR cylindrical)

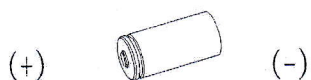




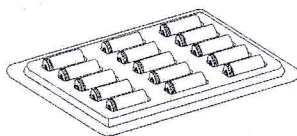
Appendix 3:

Structure Figure of Package
CR2 720 Pcs Per Box

1. Battery

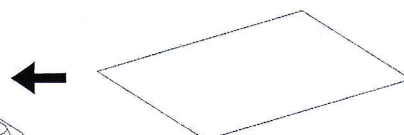
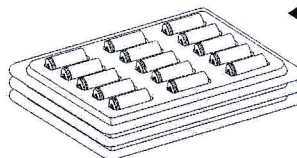


2. 15 Pcs Pre Plate



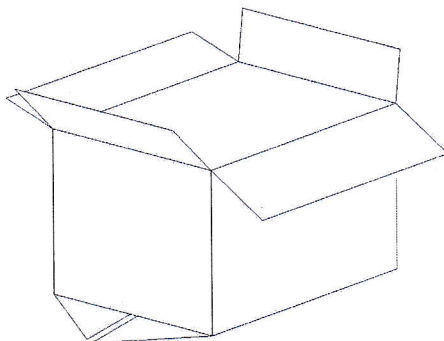
Outline Dimensions Of
Plate: 146×128×20

3. 3 Plates Per Min Package



a cardboard on each min package
dimension 106*123

4. 16 Min Package Per Box



Outline Dimensions Of
Box: 406×287×165
Net: 8.5kg Gross: 10.0 kg