PRODUCT SPECIFICATION

Primary Lithium/Manganese Dioxide BATTERY

Type Designation: CR-P2

Prepared by :

Checked by :

Approved by :

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Change Description

No.	Date	Issue

1 APPLICABILITY

1.1 This specification only applicable to primary lithium manganese batteries from NINGBO GP ENERGY CO., LTD.

2 GENERAL

2.1 Name Primary Lithium Manganese Batteries
2.2 Model CR-P2
2.3 Nominal Voltage 6.0 V
2.4 Standard Capacity 1500 mAh
(load:10mA(23℃,4.0V cut-off Voltage))
2.5 Weight Approximate 37g
2.6 Operating Temperature -40℃～+ 60℃
2.7 Self Discharge Below 1%/year(23℃)
2.8 The max continuous discharge current 1500mA(23℃)

3 Shape and Dimension and Material

3.1 Shape and Dimension See figure-1

4 Appearance

Should not be observed any major scratches, stains deformation, crack, corrosion, creeping and leakage which may adversely affect actual use or performance of batteries.

5 Electrical Characteristics

5.1 Open Circuit Voltage

Test Item	Temperature	Initial	After 12 months Storage at 23℃
Open Circuit Voltage	23℃	Max. 6.80V Min. 6.20V	Max. 6.80V Min. 6.20V

5.2 Closed Circuit Voltage
(load of 100 ohm)

Test Item	Temperature	Initial	After 12 months Storage at 23℃
Closed Circuit Voltage	23℃	Max. 6.70V Min. 5.80V	Max. 6.70V Min. 5.80V

5.3 Duration Time

Load	Temperature	Test mode	End voltage	Initial (MAD)	Storage 1 year(MAD)
200Ω	23℃	24h/d	4.0V	50h	49.5h

6 Reliability Test

6.1 High Temperature Test

6.1.1 Store the cells in the temperature chamber at 60℃ for 30 days, any defects should not be observed in appearance and dimensions.

6.1.2 Store the cells in the temperature chamber at 70℃ for 10 days, any defects should not be observed in appearance and dimensions.

6.2 Low Temperature Test

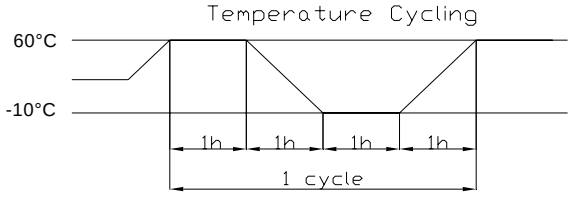
Store the cells in the temperature chamber at -30℃ for 10 days, any defects should not be observed in appearance and dimensions.

6.3 Humidity Test

Store the cells in the temperature & humidity chamber at 60℃,90%RH for 30 days, any defects should not be observed in appearance and dimensions.

6.4 Temperature Cycling Test

Store the cells in the temperature chamber at temperature cycling for 10 cycles, any defects should not be observed in appearance and dimensions.



7 Standard Test Conditions and Instrument

7.1 If it is not specified particularly, all test should be performed at 23±2℃, 55±20%RH. All cell should be kept in the above conditions for at least 8hours prior to test.

7.2 If temperature tolerance and humidity tolerance are not written down, the temperature tolerance shall be +2℃, and the humidity tolerance shall be +5%.

7.3 Load Resistance

Load resistance should include any external resistance of a

cell and tolerance should be within +0.5% even during discharge.

7.4 Time for Test

Any tests should be started within 3days after the specified storage period.

7.5 Initial Test

Initial test should be started within 1month after manufacturing.

8 Others

8.1 The Cells cover UL and IEC requirements.

8.2 The lithium content of this cell is within the limit for judgment of dangerous goods in regulations of transportation such as IATA, IMO, DOT, so it is permitted to be carried normally as non-dangerous goods. For more information on transportation of this cell, please refer to the UN recommendations.

8.3 The cells all meet Directive of 2006/66/EC.

9 Precautions in Handling

Lithium batteries contain lithium active material, organic solvents and reactive metals. Erroneous handling of lithium batteries may result in heat generation, explosion or fire possibly leading to injury. To ensure safety and to avoid any possibilities of any accidents, please observe the following precautions.

9.1 Do not cause short-circuiting

If connection is made between the positive (+) and negative (-) terminals directly or via accidental contact with metallic objects, the batteries will short circuit and an intense current will flow causing heat generation which may lead to rupture or fire. To prevent any possibility of inadvertent short circuiting, do not stack or jumble batteries and always use designated containers for transport and storage.

9.2 Do not heat

If batteries are heated to above 100℃ sealing and insulting separators and other polymer components may be damaged resulting in electrolyte leakage and or internal short circuiting leading to heat generation, causing rupture or fire. Moreover do not dispose the batteries in fire, explosion and or intense burning may result.

9.3 Do not weld or solder directly to batteries

The heat from welding or soldering directly to a battery may cause leakage, venting, explosion, or fire.

9.4 Do not charge batteries

Attempting to charge a primary battery may cause internal gas and/or heat generation resulting in venting, explosion and possibly fire.

9.5 Do not force-discharge

When a battery is force-discharge by an external power source, the voltage drops to 0 or less (reversal voltage) and gas is generated inside the battery. This may cause fire, heat generation, leakage or bursting.

9.6 Do not disassemble nor deform

If batteries are disassembled, irritant gases may be released and exposed lithium metal may react leading to fire.

If batteries are deformed by pressure or impact, sealing may be damaged leading to leakage or internal insulation may be damaged leading to internal short circuiting. Internal short circuiting will result in heat generation which may lead to rupture or fire.

9.7 Do not mix different types of batteries

In case the plurality of batteries are used, the mixture of different type of batteries, the mixture of new and old batteries of the same type, or the mixture of different manufacture of the same type of batteries, may make the batteries over discharged by the differences of characteristics such as the voltage of the batteries, and it may cause swelling, rapture or fire.

9.8 Ensure correct polarity

If positive (+) and negative (-) terminals of batteries are reversed during installation the batteries may become short circuited in some equipment. Such short circuiting will cause heat generation and may lead to rupture or fire.

9.9 In case of leakage or an abnormal odor keep away from fire to prevent ignition of any leaked electrolyte.

9.10 Do not damage nor peel off the resin film (label) on the surface of the battery.

9.11 Do not put into conducting liquid (such as solder baths) whose conductivity is more than 350μS/cm.

If batteries are put into the conducting liquid, then electric corrosion may occur and inflammable gases may be released.

9.12 Please do not batteries if any deformation or damages to label after dropping.

9.13 Do not mix collected batteries with other materials. Used batteries may contain residual charge. If they are short-circuited, abnormally charged or force discharged the generated heated may ignite flammable wastes such as oily rags, paper or wood and cause a fire.

9.14 Remove batteries from equipment if it is not to be used for an extended period of time.

10 Storage Precautions

10.1 Batteries should be stored in a dry place with minimal temperature variation.

10.2 Do not expose batteries to direct sunlight or expose them to moisture to avoid deterioration of performance.

10.3 For normal storage, the temperature should be between +10℃ and +25℃ and should never exceed +30℃. while the relative humidity being below 60%. Extremes of humidity (over 95% and below 40% relative humidity) for sustained

periods should be avoided.

10.4 The height to which batteries may be stacked is clearly depended on the strength of the packaging. As a general rule, this height should not exceed 1.5m for cardboard packages or 3m for wooden cases.

11 Precautions in the event of swallowing a lithium battery

Please keep away from children and infants to avoid the possibility of swallowing by mistake. Furthermore, it is strongly recommended that careful attention should be paid to the method of fixing batteries into products to avoid the chance of them being readily removed. In the event of swallowing a lithium battery seek immediate medical attention.

12 Guidelines for designers of equipment using lithium batteries

12.1 When a lithium battery is used as main power source

12.1.1 Select most suitable battery for the equipment, taking note of its electrical characteristics.

12.1.2 Number of batteries (series connection or parallel connection) to be used and method or use:

12.1.2.1 Multicell batteries (2CR5, CR-P2, CR-V9 and others), one piece only;

12.1.2.2 Cylindrical batteries (CR123A, CR2 and other), less than three pieces;

12.1.2.3 When more than one battery is used ,different types should not be used in the same battery compartment;

12.1.2.4 When batteries are used in parallel protection against charging should be provided.

12.1.3 Design of battery circuit:

12.1.3.1 Battery circuit shall be isolated from any other power source;

12.1.3.2 Protective devices such as fuses shall be incorporated in the circuit.

12.2 When a lithium battery is used as back-up power source

12.2.1 Design of battery circuit:

12.2.1.1 The battery should be used in separate circuit so that it is not force discharged or charged by the main power source.

12.2.2 Design of battery circuit for memory back-up application:

12.2.2.1 When a battery is connected to the circuit of a main power source with the possibility of being charged, a protective circuit must be provided with a combination of diode and resistor.

12.3 Design of battery holder and battery compartment

12.3.1 Battery compartment should be designed so that if a battery is reversed, open circuit is achieved;

12.3.2 Battery compartments should be designed so that batteries other than the specified size cannot be inserted and make contact;

12.3.3 Battery compartments should be designed to allow generated gases to escape. Battery compartments may be damaged when internal pressure of the

battery becomes too high due to gas generation;
12.3.4 Battery compartments should be designed to be water proof;
12.3.5 Battery compartments should be designed to be explosion proof when tightly sealed;
12.3.6 Battery compartments should be isolated from heat generated by the equipment;
12.3.7 Battery compartments should be designed so that they cannot easily be opened by children.
12.4 Design of contacts and terminals
12.4.1 Material and shape of contacts and terminals should be selected so that effective electric contact is maintained;
12.4.2 Auxiliary circuit should be designed to prevent reverse installation of batteries;
12.4.3 Contact and terminal should be designed to prevent reverse installation of batteries.
12.5 Indication of necessary precautions
12.5.1 Orientation of batteries (polarity) should be clearly indicated at the battery compartment on the equipment;
12.5.2 Precautions for the proper handling of batteries should be indicated in the instruction manual.

13 Guarantee of product

13.1 We certify that the battery shall comply with the specification defined in this document for 1 year after shipping from our factory. We will supply only substitute or replacement battery immediately with free of charge, in case the defects and problems are caused by our fault apparently in this period, and we do not bear any further liabilities.
13.2 Confirmation of the matching and reliability of batteries into customer's actual sets or units is customer's own responsibilities.
13.3 We can not accept any responsibility if you handle, apply, amount, test, service, or check of batteries with improper or incorrect manner, and if you did not obey guidance, caution, warning, or information which defined in this document, our rational instruction or suggestion.
13.4 We will regard this specification is accepted and approved by you and we apply it as a valid specification if your approved document was not returned before either earlier time the first delivery date of this product or after 6 mounts from issued date.

Figure-1 SHAPE AND DIMENSION