

Lithium Manganese Dioxide Button Cell Product Specification

Model	CR2016
Doc No.	Q/YF1001
Version	P1
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1. Purpose

1.1 Give some standard on the specification and testing method of Kingway battery, to avoid any discrepancy because of different testing conditions.

1.2 Give some guidance for customers to choose and use Kingway battery correctly,

2. Descriptions and Model

Table 1

Description	Model
Lithium manganese dioxide button battery	CR2016

3. Technical parameters

Table 2

No.	Items	Characteristics
1	Nominal Capacity	90mAh (Continuously discharged under 15kΩ load till 2.0V end-point voltage at the temperature of 23°C ± 3°C).
2	Nominal Voltage	3V
3	Operating Temperature range	-20~+60°C
4	Self-discharge Rate Per year	≤3%
5	*Recommend Max. Pulse Current	10 mA
6	*Recommend Max. Continuous discharge Current	4mA
7	*Standard current	0.1mA
8	Max. Outline Dimensions	Diameter: 20mm, Height: 1.6mm
9	Structures	Manganese dioxide cathode, lithium anode, organic electrolyte, polypropylene separator and stainless steel cell can and cap, etc.
10	Weight for Reference	About 1.7g

Remarks:

* Recommend Max. Pulse Current:

The maximum pulse current refers to the maximum current corresponding to a battery load voltage higher than 2.0V after 15 seconds when the battery is discharged at 40% in a 23°C environment.

* Recommend Max. Continuous discharge Current

The maximum continuous discharge current refers to the continuous discharge of the battery with a constant current to 2.0V at 23°C to obtain the maximum current corresponding to 50% of the nominal capacity.

4. Characteristics and test method

4.1 Normal characteristics

Table 3

No.	Items	Standard		Test Method
1	Max. Outline Dimensions	Diameter : 20 mm, Height: 1.6mm		Measured by caliper with the precision of which is not less than 0.02mm or other equal precision instrument.
2	Appearance	The surfaces of the batteries are clean. The mark is clear. There should not be deformation、scratch or leakage.		Visual inspection
3	Off-load Voltage	3.2~3.6V		The battery in delivery state should be stored for 24hours at the temperature of 23°C ± 3°C, a relative humidity of 45% ~ 75%, and the voltage between the two terminals should be measured with a voltmeter at the same ambient environment.
4	Nominal Capacity	90mAh (or 450h)		The samples should be stored for 24hours at 23°C ± 3°C, 45%~75%RH. then be continuously discharged under 15kΩ load to 2.0V end-point voltage at the same ambient environment.
5	Terminals	The terminals should have good electro-conductibility. There is no rust、no leakage and no deformation.		Visual inspection
6	Temperature Characteristics	Discharged at lower temp.	60% of nominal capacity	The samples should be continuously discharged under 15kΩ load to 2.0V end-point voltage at -20°C ± 2°C.
		Discharged at high temp.	96% of nominal capacity	The samples should be continuously discharged under 15kΩ load to 2.0V end-point voltage at 60°C ± 2°C.

4.2 Capacity Inspection

4.2.1 Eight samples should be tested for service output.

4.2.2 If the average value is equal to or more than the value of table 3, and if the number of batteries showing a value less than 80% of the value of table 3 is 1 or less. The batteries are considered to conform to the requirement.

4.2.3 If the average value is less than the value of table 3 or if the number of batteries showing a value less than 80% is 2 or more, the test should be repeated with other 8 pieces. At the second test, if the

average value is equal to or more than the value of table 3 and if the number of batteries showing a value less than 80% of the value of table 3 is 1 or less, these batteries are considered to conform to the requirement.

4.2.4 At above second test, if the average value is less than the value of table 3 or if the number of batteries showing a value less than 80% of the value of table 3 is 2 or more, the batteries are considered not to conform to the requirement. A third test should not be performed.

4.3 Safety Characteristics

Table 4

No.	Items	Standard	Test Method	Sample State
T1	Altitude Simulation Test	NL, NV, ND, NR, NF	Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).	undischarged state
T2	Thermal test	NL, NV, ND, NR, NF	Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C).	undischarged state
T3	Vibration	NL, NV, ND, NR, NF	Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.	undischarged state
T4	Shock	NL, NV, ND, NR, NF	Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.	undischarged state

T5	External Short Circuit	ND, NR, NF	<p>The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 ° C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 ° C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.</p> <p>This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4 ° C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.</p> <p>The cell or battery must be observed for a further six hours for the test to be concluded.</p>	undischarged state
T6	Crush	ND, NF	<p>A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.</p> <p>(a)The applied force reaches $13 \text{ kN} \pm 0.78 \text{ kN}$; Example: The force shall be applied by a hydraulic ram with a 32 mm diameter piston until a pressure of 17 MPa is reached on the hydraulic ram.</p> <p>(b)The voltage of the cell drops by at least 100 mV; or</p> <p>(c)The cell is deformed by 50% or more of its original thickness.</p> <p>Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.</p> <p>A button/coin cell shall be crushed by applying the force on its flat surfaces.</p>	undischarged state
T7	Forced-discharge	ND, NF	<p>Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.</p> <p>The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).</p>	fully discharged state
T8	Free Drop	NL, NF	<p>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</p>	undischarged state

NL : no leakage NV: no venting ND: no disassembly NF: no fire NR: no rupture

4.4 Test condition

4.4.1 State of batteries:

The batteries should be in three months after the batteries been finished. The time when the batteries been finished is marked on the surface of batteries.

4.4.2 Normal testing environment:

If no special requirement, test should be made under the temperature of $23\text{ }^{\circ}\text{C} \pm 3\text{ }^{\circ}\text{C}$ and relative humidity of 45%-75%.

4.4.3 Test precision:

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

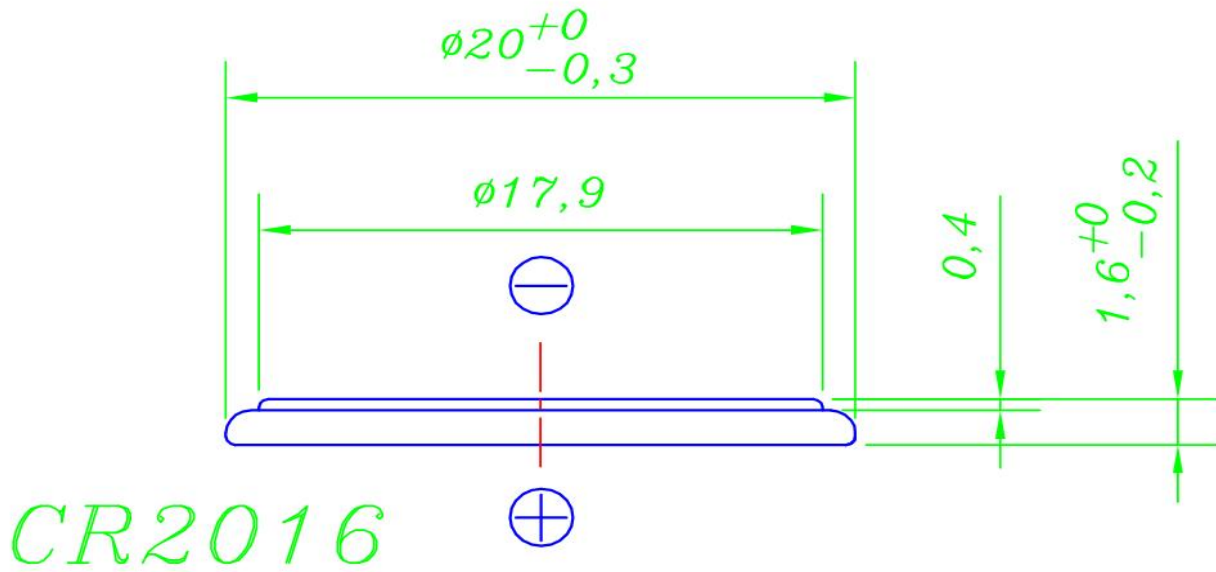
Voltage	Current	Capacity	Temperature	Time	Weight	Dimension
$\pm 0.03\text{V}$	$\pm 1\%$	$\pm 1\%$	$\pm 2\text{ }^{\circ}\text{C}$	$\pm 1\%$	$\pm 1\%$	$\pm 0.03\text{mm}$

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

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5. Battery Outline Dimensions and Packaging

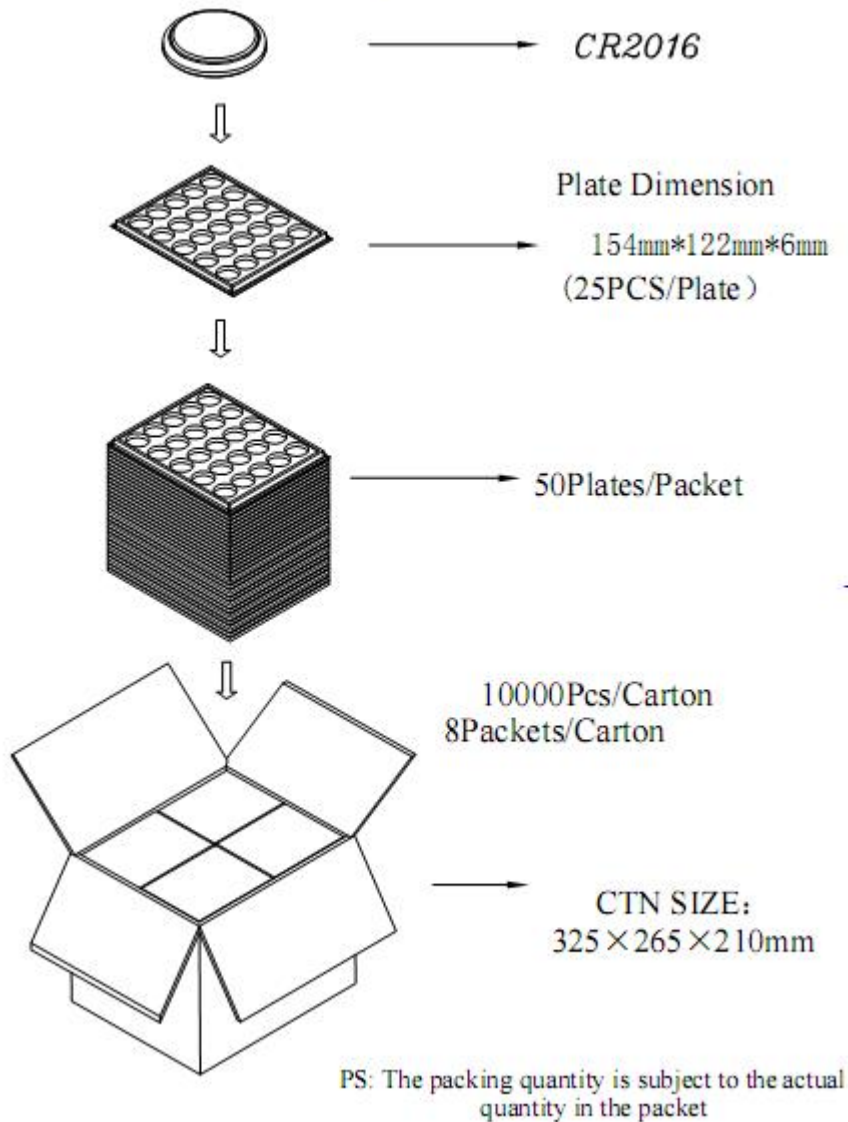
5.1 Battery Outline Dimensions



5.2 Packaging and Marking

Dimension of box	Net weight	Gross weight
32.5 × 26.5 × 21 cm	18.5 KG	21KG

Normal package: 10000 pcs per box.



6. Environment requirement

The product does not contain controlled substances of level 1.

7. Producing standard and certification

Our batteries are produced according to the IEC standard, and have passed RoHS, UL safety test and UN38.3 transportation test.

8. Transportation

- The Batteries should be stored away from polarization, 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.

9 Caution

When using batteries, pls read and note the following cautions carefully.

- Do not overheat batteries or dispose of batteries in fire; Do not put batteries in water or moisten them.
- Do not short-circuit batteries; Do not put batteries together with metalwork such as necklace, coins, etc in one bag, or store them together.
- 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.
- Do not use the battery together with different kinds of or different types of battery.
- Do not recharge the battery; Do not force-discharge the battery.
- Take the battery out of the device timely if the battery capacity is used up.
- Stop using when the battery become heat, emit smell or appear other abnormality during use, or storing.
- Do not swallow the battery. If swallowed, contact the physician immediately or the local poison control centre.
- If your skin or clothes contacts with the electrolyte, wash them immediately.
- If your eyes contact with the electrolyte, do not rub eyes with hand, flush eyes with running water and get the medical attention immediately.
- Take out of the battery and keep it under the condition of low temperature and low humidity if the battery is not used for a long time.
- 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.

10 Storage

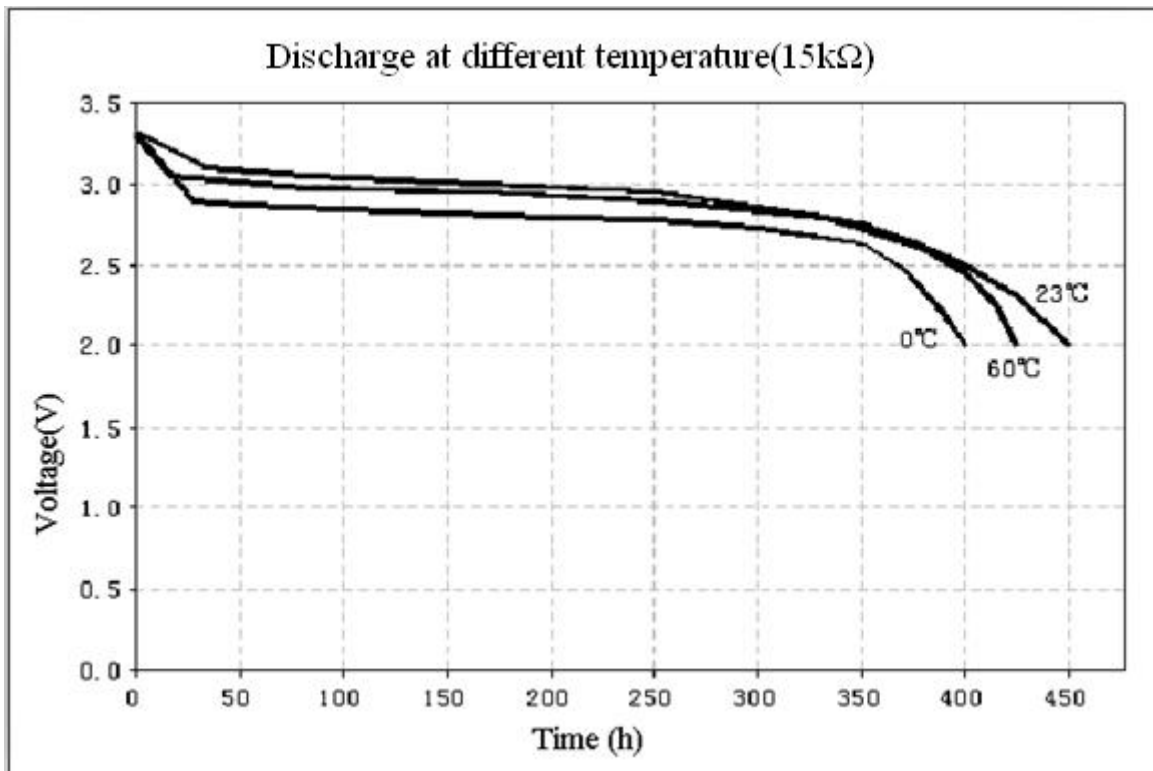
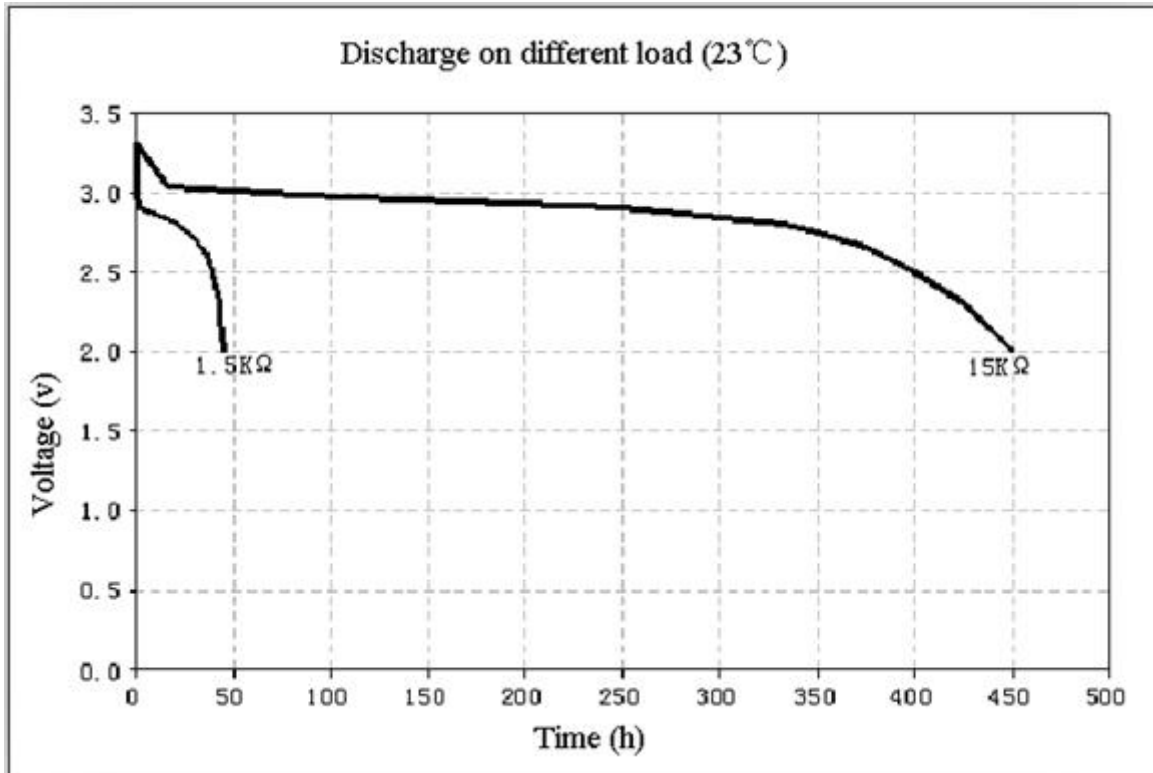
- The batteries should be stored at 10°C ~ 25°C, 45%~75%RH.
- The batteries should not be stored next to heat sources nor in direct sunlight. The storage area should be clean, cool, dry, ventilated and weatherproof.
- The height to which batteries may be stacked is clearly dependent on the strength of the packaging. As a general rule, this height should not exceed 1.5m for cardboard packages nor 3m for wooden cases.
- Store and display batteries in their original package. The batteries may be short-circuited or damaged if been unpacked and stacked messily.

11 Statement

11.1 If you have any doubts or discrepancies on this specification, pls try to contact Kingway.

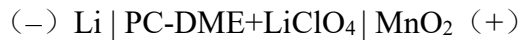
11.2 Kingway reserves the right to modify this specification.

Appendix 1: CR2016 discharge curves



Appendix 2: Product Configuration:

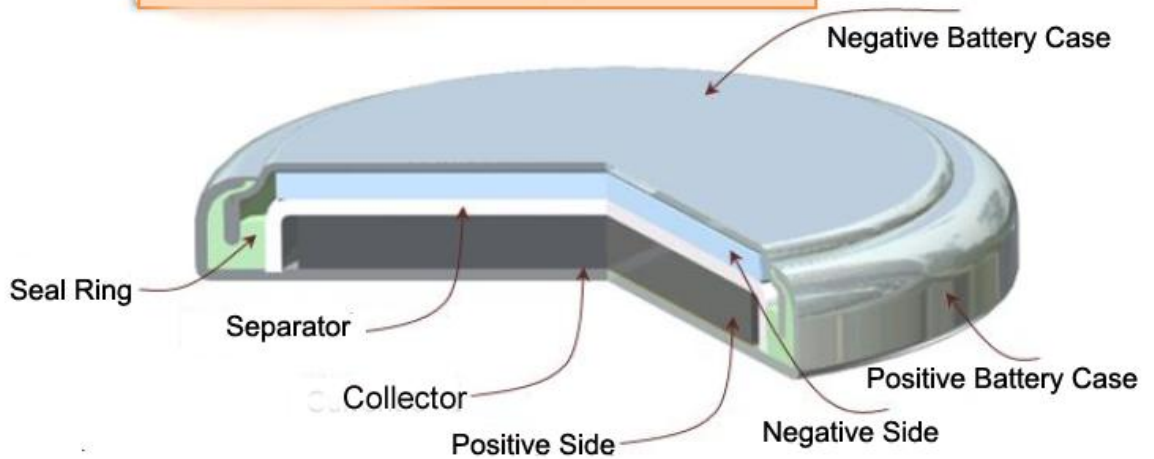
The battery system is as follows:



code “CR”, the battery construction is:

Battery Structure

Negative Side: Lithium Metal
 Positive Side: Manganese Dioxide(MnO₂)
 Elletrolyte: Lithium Salt in Organic Solvent
 Battery Case: Stainless Steel



Chemical System: The coin type lithium manganese dioxide battery uses lithium as the negative active material, MnO₂ as the positive active material, and an organic electrolyte solution.