

Ni-Zn Battery Technology Specification

Customer _____

Part name Ni-Zn Battery

Model No Ni-Zn AA2500mWh 1.6V

Serial No _____

Produce No _____

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1. APPLICATION

The applicable range: This specification is available only for the testing within one month since receipt of batteries. It's not a standard for stored goods.

Model: NI-ZN AA2500mWh

2. RATINGS

Nominal Voltage	<u>1.6</u> V
Nominal	<u>1500mAh</u> /300mA
Minimum	<u>1375mAh</u> /300mA
Standard charge rate	Constant current charge 300 minutes to 1.9 V at 300mA; Constant voltage charge 90 minutes at 1.9V to 50mA current.
Rapid charge rate	Constant current charge 120 minutes to 1.9 V at 750mA; Constant voltage charge 90 minutes at 1.9V to 50mA current.
Discharge Terminal Voltage	Discharge terminal voltage to 1.3V at below 750 mA; Discharge terminal voltage to 1.2V at 750mA to 1500mA current.
Operating temperature range	Humidity: +65%± 20%
Standard charge	0 to +45°C
Rapid charge	10 to +45°C
Floating charge	-10 to +45°C
Discharge	-20 to +65°C
Storage temperature range	Humidity: +65%±20%
Within 1 year	-20 to +35°C
Within 6 months	-20 to +45°C
Within 1 month	-20 to +55°C
Within 1 week	-20 to +65°C

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Note : (1) All rapid charge methods should be discussed with our engineers.

(2) We stipulate to charge below 50% fully power for delivery considering risk, if customer requires charged power to exceed what we stipulated, then happen risky problem because of charge , BetterPower won't be responsible for this during delivery and storage.

(3) Warranty time : 6 months.

(4) It requires with 50% charge for storage when batch batteries in stock , we suggest charge battery once every 3 months if battery had been stocked over 3 months.

(5) The outer case of battery , after tin-plated processing, the place is a little soft, coating brightness is not high, the color is non-uniform. The naked eye seems likely the outward

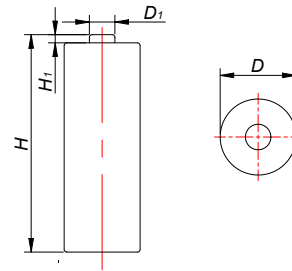
appearance bad or the shell body sully, which is really normal, and the determination standard should be taken the bilateral consultation as a standard .

(6) The outer case of battery , after tin-plated processing, the place is a little soft . For example, in the battery use process, it is normal that the battery shell base presents the scratch. The determination standard should be taken the bilateral consultation as a standard.

3. Measurement & Dimensions

to see the drawing:

D	14.5-0.7 mm
H	51.0-1.0 mm



4. TEST

4.1 Test conditions:

4.1.1 The battery to be tested is the product within one month after being received by customer.

4.1.2 Ambient conditions:

Temperature $+20^{\circ}\text{C} \pm 5^{\circ}\text{C}$

Humidity $+65\% \pm 20\%$

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4.2 Testing Tools

4.2.1 Voltage meter:

0.5 level or higher as required in IEC51/IEC485. Internal impedance exceeds $10\text{K}\Omega/\text{V}$.

4.2.2 Current meter:

0.5 level or higher as required in IEC51/IEC485. Internal impedance should be less than $0.01\Omega/\text{V}$ (including wires).

4.2.3. Micrometer caliper:

With precision of 0.02mm.

4.2.4. Internal impedance meter:

Alternating current of 1000HZ, connector measuring equipment with sin wave of 4.

4.2.5: Impedance loaded meter:

Value of impedance is with $\pm 5\%$ error allowed (including external wires).

4.3 Test methods and benchmarks

Items	Test Methods	Benchmarks
1. Appearance:	✧ eyeballing	✧ batteries shall be free from any stains; scratches or deformations, which may reduce the commercial value when visually inspected

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2. Size:	✧ caliper measurement.	✧ The size shall comply with the specified size as the attached drawing
3. Insulate impedance	✧ measured with a Megger overpack and battery electrode between the degree of insulation.	✧ outer sleeve shall exceed <u>10</u> MΩ.
4. Weight	✧ using disk-scale measurement.	✧ approximate <u>25.0</u> g.
5. Charge Voltage	✧ Following a period of discharge at 300mA down to a terminal voltage , then standard charge, the cell voltage shall be tested at 5 minutes before finishing charging.	✧ The voltage shall be less than <u>2.0</u> V.
6. Open circuit voltage: (O.C.V.)	✧ After finished a standard charge period, the open circuit voltage of the cell shall be tested within 1 hour.	✧ The O.C.V. shall exceed <u>1.8</u> V .
7. Closed circuit voltage: (C.C.V.)	✧ After finished a standard charge period, the closed circuit voltage of the cell shall be tested with a 0.86 Ω Impedance loaded within 1hour.	✧ The C.C.V. shall exceed <u>1.6</u> V.
8. Internal impedance	✧ After finished a standard charge period, the internal impedance of the cell shall be tested within 1 hour.	✧ The internal impedance shall not be more than <u>30</u> mΩ .
9. capacity	✧ After finished a standard charge period, the cell shall be tested within 1 hour based discharged at <u>300</u> mA down to a terminal voltage of 1.3V;	✧ The capacity is equal or above the minimum capacity.
10. High Drain Discharge	✧ To discharge at <u>1500mA</u> to 1.2V within 1 hour after finished standard charge.	✧ The Capacity is equal or above 54 min.
11. Self-discharge	✧ Discharge at <u>300</u> mA to a terminal voltage of 1.3V, then standard charge to put aside for 28 days , after discharge again at <u>300mA</u> to 1.3V to test capacity.	✧ The subsequent capacity shall not be less than <u>60%</u> of initial capacity.
12. Over-charge	✧ Following a period of discharge at <u>300</u> mA down to a terminal voltage of <u>1.3V</u> , first standard charge and then charge for 48hrs at <u>100</u> mA by a constant voltage holding at 1.9V. Then discharge at <u>300mA</u> h to test capacity .	✧ No deformation , no leakage ✧ Capacity not be less than minimum capacity

13. Over-discharge	✧ Following a period of discharge at <u>300</u> mA down to a terminal voltage of 1.3V, combine the cells with a <u>0.86</u> Ω per cell load. After stored for a period of 24 hours, standard charged and then discharge at <u>300</u> mA.	✧ No deformation ✧ The subsequent capacity shall not be less than <u>80%</u> of rated capacity.
14. Cycle Life	① Discharge to 1.3V at 300mA; ② Charge 120 minutes at 750mA constant current with a voltage holding at 1.9V; ③ Constant voltage holding at 1.9V to charge 90 minutes until current drops to 50mA; ④ Rest for 15 minutes; ⑤ Discharge to 1.2V at a constant current at 1500mA; ⑥ Repeat steps from ② to ⑤ until the capacity drops to 60%.	✧ The cycles life shall exceed <u>200</u> times.
15. Leak-proof test	✧ Standard charge and store for 14 days under the following storage conditions: $33^{\circ}\text{C} \pm 3^{\circ}\text{C}$, Relative humidity: $80\% \pm 5\%$.	✧ No leakage of electrolyte in liquid form shall be observed.
16. Vibration test	✧ Store the cell more than 24 hours after standard charge, following vibration tests over an amplitude of 4 mm (0.1575 inches) at a frequency of 16.7 Hz (1000 cycles per minute) and repeated through any axes during 60mins.	✧ The subsequent fluctuation of open circuit voltage and internal impedance shall be less than <u>0.02</u> V and <u>5</u> $\text{m}\Omega$ respectively, and the surface of cell has no obvious change.
17. Free falling: (Drop)	✧ Store the cell more than 24 hours after standard charge, following a drop test from 450mm (17.717 inches) on to a hard-wood board in a vertical axis 3 times.	✧ The subsequent fluctuation of open circuit voltage and internal impedance shall be less than <u>0.02</u> V and <u>5</u> $\text{m}\Omega$ respectively, and the surface of cell has no obvious change.
18. Safety testing	✧ to store it for 1 hour after standard charged, and to make positive and negative electrode short-circuit with a wire with the section 0.75mm^2 min and shortest length, the short-circuit time is 1 hour	✧ It shall not explode. However, leakage of electrolyte, external deformation or outer sleeve cracking is permitted.
19. Safety Valve Start Performance (Over discharging)	✧ to be charged with <u>1500</u> mA for 5 hours	✧ safety valve can work normally, no breakage, leakage, distortion and out package breakage are allowed

20. Safty Valve Start Performanc e (over charging)	✧ to be charged with <u>1500</u> mA for 5 hours	✧ No explosion, but leakage, distortion and out package breakage are allowed
21. To discharge at low temperature	✧ to be stored for 24 hours at 0℃±2℃, and discharged at <u>300</u> mA at 0℃±2℃。	✧ discharge duration shall exceed <u>3</u> hour(s) <u>30</u> min(s)。

5. The transportation and storage

- 5-1 During transportation, it should be prevented from fierce vibration, impact ,extrusion, insulating or drenching under clean, dry and ventilated place. Applicable in transportation by automobile, train, steamboat and airplane.
- 5-2. It must be stored at -5 ℃ ~ +35 ℃, and put in the clean, dry and ventilated place with relative humidity 75% max.. It must be kept away from corrodent substance, fire hazard and heat resource.

6.0 PKCELL Ni-Zn battery must be charged by PKCELL special Ni-Zn Charger , if it happens accident when you charge PKCELL Ni-Zn battery with other battery charger , PKCELL can not take any responsibility .

7. Warning and Security

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To prevent the impact of equipment failure caused by the battery, and to make sure the security of circuit and battery set, please consider below things when design and produce the production equipment. Please put it into your instruction.

▲ Danger !

- ★ Violation of the following matters will result in Ni-Zn battery leakage, heat, explosion, fire and serious personal injury!
- ★ Prohibited to throw the PKCELL Ni-Zn battery into fire or heat!
- ★ Prohibited to collide or throw PKCELL Ni-Zn battery!
- ★ Don't weld the lead on the PKCELL Ni-Zn battery directly.
- ★ Don't put the PKCELL Ni-Zn battery on a place which is more than 1.5 meter in case of dropping. Don't drop it at the height of more than 1.5 meter.
- ★ Don't connect the positive pole and electrode pole directly of PKCELL Ni-Zn battery, such as leading wire. If the tab terminal of poles doesn't set insulation covering, please don't transport or store. Please don't touch the metal necklace, key or any other conductive material. Please use special carton when transport or store.
- ★ Must use the charger appointed by PKCELL to charge PKCELL Ni-Zn batteries, and follow the instructors of PKCELL.
- ★ Prohibited to disassemble PKCELL Ni-Zn batteries. It will cause external or internal short circuit, and the exposed parts will have chemical reaction then result in very dangerous heat, explosion, fire or splash of electrolyte.

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▲ Warning! !

- ★ Don't contact Ni-Zn batteries with water, sea water or other oxidation reagents, which will cause rustiness and heat. If batteries get rusty, explosive decompression valve won't work and will lead to explosion.
- ★ Don't over-charge PKCELL Ni-Zn batteries, that is, don't continually charge Ni-Zn batteries despite the designed charging time. If the Ni-Zn batteries are not fully charged within the designed charging time, please stop to charge. The delay of charging time will lead to leakage, heat and explosion.
- ★ It is forbidden for more than 10 pcs batteries in series.
- ★ Don't disassemble the Ni-Zn battery, as it will result in short-circuit, leakage, giving off heat, catching fire and explosion.
- ★ Don't use the Ni-Zn batteries when they are leakage, any color deterioration, distortion or other changes are found. Otherwise it will get hot, catching fire or explosion may happen.
- ★ Please keep the Ni-Zn batteries and other electronic products related to Ni-Zn battery away from baby, children, to avoid accident of swallowing of Ni-Zn battery. If there is any accident, please go to doctor's.
- ★ To use new Ni-Zn battery when the working time of the battery is far short from the initial working time, as the cycle life of this Ni-Zn battery is finished.

8. Others:

- 8-1. BetterPower reserve right to revise the specification without notification;
- 8-2. Anything not mentioned in this specifications, customer and BetterPower should discuss to get a solution;
- 8-3. BetterPower does not undertake any responsibility for the accidents caused by actions not matching with specifications.

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