

Ni-Cd Rechargeable Battery

# Specification

Sunrise Power Source Co., Ltd

## 1 APPLICATIONS

The specification applies to the following sealed Ni-CD rechargeable battery made by SUNRISE.

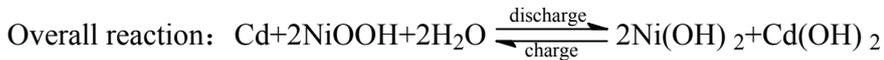
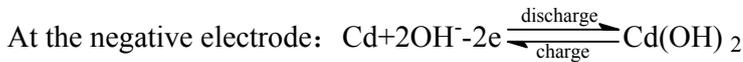
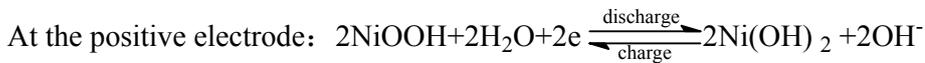
TYPE:NI-CD \_APPLICATION : Electric Tools and Electric toys Etc.

## 2 WORKING THEORY

The negative of Sunrise Nickel-Cadmium cylindrical battery is metal of Cadmium, the positive is

NiOOH, The electrolyte is NaOH of high purity. The electrochemical process are represented by

the following reactions:



During discharge, Cadmium of negative is oxidized to  $\text{Cd(OH)}_2$ . The free electrons flow into the positive through the external circuit, NiOOH of positive receive the electrons and be deoxidized to  $\text{Ni(OH)}_2$ . Charge process is just the opposition of discharge.

## 3 BATTER SIZE

3.1 Type: sealed Ni-CD rechargeable battery made by SUNRISE

## 4 ELECTRICAL PERFORMANCE

4.1 Nominal voltage : 1.2 V。

4.2 Nominal Capacity:  $0.2C_5A$

4.3 Battery Weight: 17.6G

4.4 Charging conditions

Before it is charged, the battery should be discharged at  $0.2C_5A$  to an end of voltage of 1.0V/cell under test conditions.

The following conditions are charge conditions:

4.4.1 Standard charge :  $(0.2C_5A) \times 7.5\text{hours}$

4.4.2 Normal charge :  $(0.4C_5A) \times 3.5\text{hours}$

4.4.3 Trickle charge :  $(0.03C_5A \sim 0.05C_5A)$

4.4.4 Quick charge :  $(1C_5A) \times 75\text{min}$

4.5 Charging control

When battery is charged, cutting off the charging current depending on one of the following factors:

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-ΔV: 15mV/cell  
 Duration: Input 120%-130% of rated capacity

## 4.6 Operate temperature range :( Max relative humidity:85%)

Standard charge : - 10~+50°C  
 Quick charge : 0~+55°C  
 Trickle charge : 0~+50°C  
 Discharge : 0~+65°C

## 4.7 Storage temperature range (Max relative humidity:85%)

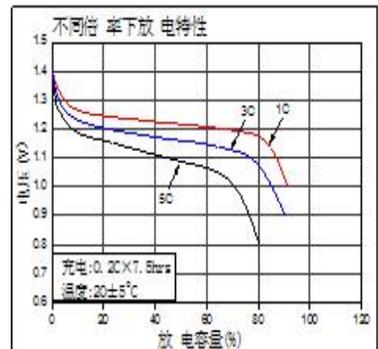
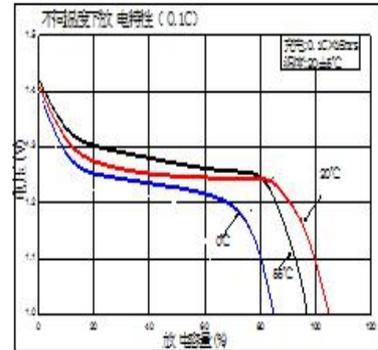
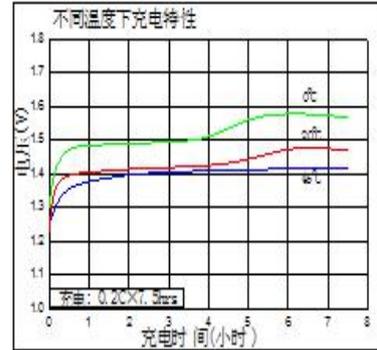
Within six months: - 20~+45°C  
 Within two years: - 20~+35°C  
 Within a month: - 20~+55°C  
 Within a week: - 20~+65°C

## 5. THE BATTERY ASSEMBLY AND SIZE

Performance (monomer battery)

Nominal voltage		1.2V		
Capacity (mAh)		0.2C <sup>[1]</sup>	1C <sup>[2]</sup>	
	Minimum			
resistance (1000Hz.)		≤35mΩ (After charging)		
charging	standard	0.2 C <sub>5</sub> A		
	fast	1C <sub>5</sub> A		
	purling	MAX	0.05C <sub>5</sub> A	
		MIN	0.03C <sub>5</sub> A	
Environment temperature	charging	standard <sup>[4]</sup>	0°C~55°C	32~131°F
		fast <sup>[5]</sup>	0°C~55°C	32~131°F
	discharge <sup>[6]</sup>		-18°C~55°C	-0.4~131°F
	storage	Six months	-18°C~45°C	-0.4~113°F
Two years		-18°C~30°C	-0.4~86°F	

Characteristic curve



Note:

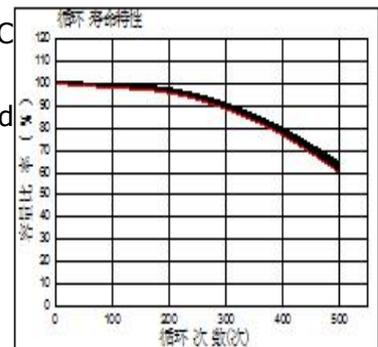
[1] 20 °C condition 0.2 C charging 7.5 hour, 1 hour aside, 0.2 C Electricity to 1.0 V/piece.

[2] 20 °C condition 0.2 C charging 7.5 hour, 1 hour aside, 1 C d To 1.0 V/piece.

[3] weight for reference

[4] 0.2 C charging 7.5 hours

[5] 1.0 C charging 80 minutes,-Δ V = 15 mV, TOC = 45 °C



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[6] 0.2 C discharge to 1.0 V/piece

## 6. BATTERY PERFORMANCE

### 6.1 Test condition

The following test conditions for new battery apply (within one month after the shipment), before charging the battery should be in first test conditions with 0.2 C<sub>5A</sub> constant exile to terminate electric voltage of 1.0 V/only;

Test conditions:

Temperature: + 20 ± 5 °C

Humidity: 45% ~ 85%

Note: standard charging methods: (0.2 C<sub>5A</sub>) charging 7.5 hours

Normal charging methods: (0.4 C<sub>5A</sub>) charging 3.5 hours

Standard discharge methods: (0.2 C<sub>5A</sub>) put to 1.0 V/only

### 6.2 Test method & performance

Test	Unit	Specificatio n	Conditions	remarks
capacity	mAh		Standard charge/discharge standard	Allow three times cycle
Shipment Voltage	V/cell	≥0.8		AQL II =0.65%
Open Circuit Voltage (OCV)	V/cell	≥1.3	After 1 hour standard charge	
Internal impedance	mΩ/cell	≤16	Charge at 0.1C <sub>5A</sub> for 80mins, Rest for 1h, and measure the impedance with LCR instrument (AC 1KHz)	
Discharge (0.2C <sub>5A</sub> )	minute	≥300	Charge at 0.1C <sub>5A</sub> for 16hrs,And rest for 1h, then discharge at 0.2C <sub>5A</sub>	End Voltage is 1.0V/cell
Discharge (1C <sub>5A</sub> )	minute	≥54	Before discharge standard charging methods charge	End Voltage is 1.0V/cell
High rate Discharge (5C <sub>5A</sub> )	minute	≥9	Before discharge standard charging methods charge	End Voltage is 0.8V/cell
High rate Discharge (10C <sub>5A</sub> )	minute	≥4	Before discharge standard charging methods charge	End Voltage is 0.7V/cell

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Over charge	hour	≥5 No leakage or deformation	0.05C <sub>5</sub> A charge for 48 days, then discharge at 0.2C <sub>5</sub> A	End Voltage is 0.8V/cell
Charge retention	mAh	≥(65%CN)	Standard charge; Storage of 28 days; Standard discharge	Ambient Temperature: 20±2°C
Cycle life	Cycle	≥500	IEC61951-2(7.4.1.1.1)	Refer .to Note
Leakage		No leakage or deformation	Fully charge at 1200mA(1C <sub>5</sub> A), then storage of 14 days	

**Note:** Cycle life { IEC61951-1(7.4.1. 1.1)}:

Cycle number	Charge	Stand in charged condition	Discharge
1	0.10I <sub>t</sub> A for 16h	none	0.25I <sub>t</sub> A for 2h 20min <sup>a</sup>
2-48	0.25I <sub>t</sub> A for 3h 10 min	none	0.25I <sub>t</sub> A for 2h 20min <sup>a</sup>
49	0.25I <sub>t</sub> A for 3h 10 min	none	0.25I <sub>t</sub> A to 1.0V
50	0.10I <sub>t</sub> A for 16h	1h to 4h	0.20I <sub>t</sub> A to 1.0V <sup>b</sup>

a) If the cell voltage drops below 1.0V, discharge may be discontinued.  
b) It is permissible to allow sufficient open-circuit rest time after the completion of discharge at cycle 50, so as to start cycle 51 at a convenient time .A similar procedure may be adopted at cycles 100,150 and 200.

Cycles 1 to 50 shall be repeated until the discharge duration on any 50<sup>th</sup> cycle become less than 3h. At this stage, a repeat capacity measurement as specified for cycle 50 shall be carried out.

The endurance test is considered complete when two such successive capacity cycles give a discharge duration of less than 3h, The total number of cycles obtained when the test is completed shall be not less than 50.

### 6.3 Storage

After a open-circuit storage of 12 months, the battery can be charged and discharged at 0.2C<sub>5</sub>A ~ 0.5C<sub>5</sub>A immediately (this cycle allowed in five times). the battery 0.2 C discharge capacity is not less than 80% of the initial capacity.

### 6.4 Vibration

The battery shall not cause damage to its performances when tested with the amplitude at 4 mm (0.158 inch) and the frequency at 1000Hz.

### 6.5 Drop test

The battery shall not cause damage to its performances when dropped to the wooden

board at a height of 450mm(17.716 inch).

## 6.6 Safety performance

### 6.6.1 Over discharge

External resistance, make the battery a discharge 24 hours (external resistance ( $m \Omega$ ) =  $1.2 V \times n \times 1000/2 C5A$ ), battery no leakage deformation.

### 6.6.2 safety valve

Test method: 0.2 C5A discharge battery to 0 V, then increase the discharge current to 1.0 C5A, and keep the 1 hour. The battery not burst, no explosion, allowing the liquid leakage and deformation.

### 6.6.3 Short circuit

Test methods: 1 C5A charging the battery 80 minutes, and then will of anode and direct short circuit 1.0 hours. The battery not burst, no explosion, allowing the liquid leakage and deformation.

## 7. OTHER

7.1 the battery recommended termination voltage of 1.0 V/only;

7.2 if the battery discharge in 1.1 V above termination voltage, it will lead to not effective use of battery capacity;

7.3 if the battery discharge in 1.0 V the following termination voltage, it will lead to a discharge or the battery charge.

## 8 SUGGESTION & ADVICE

8.1 Do not reverse charge batteries.

8.2 Do not incinerate or mutilate batteries, may burst or release toxic material.

8.3 Do not solder directly to cells or batteries.

8.4 Do not mix new batteries in use with semi-used batteries, over-discharge may occur.

8.5 If find any noise, excessive temperature or leakage from a battery, please stop its use.

8.6 When find battery power down during use, please switch off the device to avoid over-discharge.

8.7 When not using a battery, disconnect it from the device.

8.8 Never put a battery into water or seawater.

8.9 Do not attempt to take batteries apart or subject them to pressure or impact. Heat may be generated or fire may result. The alkaline electrolyte is harmful to eyes and skin. And it may damage clothing upon contact.

8.10 Keep away from children. If swallowed, contact a physician at once.

8.11 in 5 minutes don't start charging with- $\Delta V$  control

8.12 The battery may go fail when shorted if over-charged or charged with an incorrect way.

8.13 Store batteries in a cool dry place.

8.14 Use the correct charger for batteries.

8.15 this specification statement of both parties shall come into force after confirmation.

8.16 shall not be reproduced without permission.

8.17 the company do not inform party in use of the specification of the revised rights.

8.18 **If necessary, please contact Sunrise for detailed information.**