

BAO TONG USA dba TYSONIC BATTERIES

1. Scope: This specification applies to TYSONIC SC2100mAh High Power Ni-Cd

2. Specification:

*Model: TY-SC2100mAhHP Ni-Cd

*Nominal Voltage: 1.2V

*Nominal Capacity: 2100mAh (Standard Charge/Discharge)

*Standard Charge: 0.1CmA × 15(+1,0)h

*Fast Charge: 1CmA × 1.2h

$T_{max}=45^{\circ}\text{C}$ - $\Delta V=5\sim 10\text{mV/Cell}$ $\Delta T/\Delta t=1^{\circ}\text{C/min}$
(Control Condition Of Charge)

*Trickle Charge: 0.033CmA ~ 0.05CmA

*Nominal Discharge: 0.2CmA

*Discharge End Voltage: 1.0V

*Maximum Discharge Current(Single Cell): 10CmA(20 ± 5°C)

*Temperature range (for using):

standard charge: $0\sim +45^{\circ}\text{C}$ R.H. $65\pm 20\%$

fast charge: $+10\sim +40^{\circ}\text{C}$ R.H. $65\pm 20\%$

discharge: $-20\sim +60^{\circ}\text{C}$ R.H. $65\pm 20\%$

*Temperature range (for storage):

within 6 months $-20\sim +35^{\circ}\text{C}$ R.H. $65\pm 20\%$

within 1 months $-20\sim +45^{\circ}\text{C}$ R.H. $65\pm 20\%$

within 1 week $-20\sim +50^{\circ}\text{C}$ R.H. $65\pm 20\%$

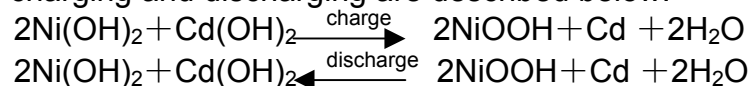
storage at discharged state: $-20\sim +35^{\circ}\text{C}$.

TYSONIC Ni-Cd battery is released from factory at discharge state, user must measure voltage of battery every 3 months, and charge and discharge once or twice for battery when its voltage fall to 0.8V, and then store it at discharge state.

3. Electrochemical Processes

TYSONIC nickel cadmium battery consists of positive and negative plate, separator, alkaline electrolyte, metal case and cover.

The active material of the positive electrode is nickel hydroxide and the negative is cadmium active material. The electrochemical processes of the battery during charging and discharging are described below:



4 Performance test

4.1 Test condition:

4.1.1 Batteries should be tested within 1 month of delivered.

4.1.2 Test term:

Temperature: $20\pm 5^{\circ}\text{C}$ R.H.: $65\pm 20\%$

4.2 Test method and standard:

Item	Test method	Standard
1.Appearance	Tested by eyes	No stain, deformation.
2.Size	Tested by venire caliper In order to avoiding short circuit, a piece of paper should be used to depart the positive and negative pole.	$\Phi=22.5\pm 0.5\text{mm}$ $H=42.5\pm 0.5\text{mm}$
3.Weight	Tested by balance	50g/cell or so
4.O.C.Voltage	Tested within 1 hour after charge	$\geq 1.25\text{V/cell}$
5.Inner resistance	The cell shall be discharged at 0.2C to a final voltage of 1.0V. then charged at 0.1C for 16h, test within 1h after charging.	$\leq 12\text{m}\Omega/\text{cell}$ (At a.c frequency 1000HZ)
6.High rate discharge	Discharge with 1C within 1 hour after charge and record discharge time.Store 15min ~ 30min after discharge,then can charge.	$\geq 54\text{min}$ Discharge End Voltage: <u>1.0V</u>
7.Super high rate discharge	Discharge with 10C within 1 hour after charge and record discharge time. The battery temperature is below to 45 $^{\circ}\text{C}$,then can charge.	$\geq 4.0\text{min}$ Discharge End Voltage: <u>0.7V</u>
8.Capacity maintenance	After discharge with standard method, charge with standard method and rest for 1 month, discharge with standard method.	Real capacity should be more than 65% of the nominal capacity.
9.Cycle life (for single cell)	At $25 \pm 2^{\circ}\text{C}$, Charge with 0.25CmA for 3h10min and discharge with 0.25CmA for 2h20min. (for more requirements, refer to IEC61951-1:2003)	500 cycles. Real capacity should be more than 60% of the nominal capacity.
10.Over-charge	Charge with 0.1C for 28 days at $25 \pm 2^{\circ}\text{C}$.After resting 1~4 hours, discharge with standard method.	Real capacity should be more than nominal capacity.
11.Vibration	Test conditions of full charged battery: -Harmonic motion with an amplitude of 0.76mm (maximum excursion of 1.52mm) -Frequency between 10Hz~55Hz, -Traverse time of 90min \pm 5min -Direction of vibration:three mutual perpendicular	No fire,no explosion,and no visible leakage.

12.Mechanical shock	Secure fully charged battery to the testing machine of a rigid mount.The battery is subjected to a total of three shocks of equal magnitude.The shocks are applied in each of three mutually perpendicular directions.At least one of them shall be perpendicular to a flat face. Test method: -During initial 3 millisecond,minimum average acceleration is $75g_n$,peak acceleration shall be between $125g_n$ and $175g_n$	No fire,no explosion,and no visible leakage.
13.External Short circuit	Short circuit fully charged battery with a total external resistance of less than $100m\Omega$, Remain the test until: -the test lasts 24 hours -case temperature declines by 20% of maximum temperature rise, Whichever is sooner.	No fire, no explosion.
14.Forced discharge	A discharged battery is subjected to a reverse charge at 1 CmA for 90 min.	No fire, no explosion.

Appendix:

1.Assembly drawing of SC2100mAh Ni-Cd

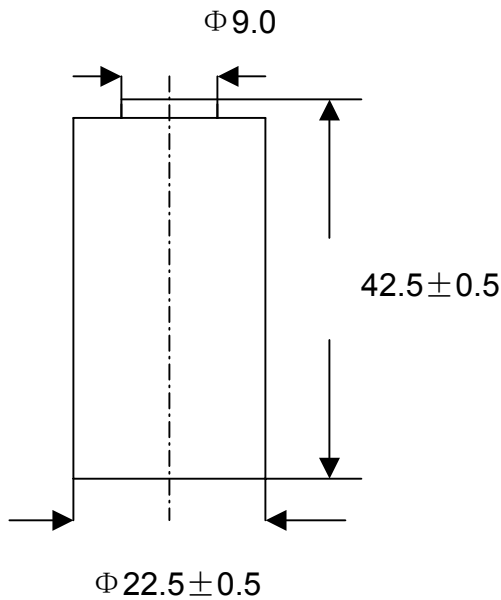


Figure of SC2100mAh cell (with tube)