

ESP SPECIAL BATTERIES LTD

SPECIFICATION

DESC: NI-CD D ESP4000DHT

DATE: 2010-5-4

PART NO: _____

Performance and Quality Assurance

1. Scope

This Spec. Governs the performance of Nickel Cadmium Cylindrical cell and its stacked-up batteries. The nominal voltage of this type unit cell is 1.2V, and the voltage of the stacked-up batteries shall be equal to the value of the unit cell multiplied by the number of cells in the batteries, and the capacity shall be the capacity of the unit cell:

For example: ESP4000DHT, Batteries of 1 cell

Nominal voltage of unit cell: 1.2V

Voltage of the batteries: $1.2 \times 1 = 1.2V$, Capacity of the battery: 4000mAh

2. Ratings

The following is the basic item to rating a cell. May test the cell under demand.

Description	Unit	Specification	Conditions
Nominal Voltage	V/cell	1.2	Unit cell
Nominal Capacity	mAh	4000	Standard charge and discharge
Standard Charge	mA	400(0.1C)	Ambient temperature 0~70°C
	hrs	16	
Fast Charge	mA	2000(0.5C)	- $\Delta V = 5 \sim 10mV$, ambient temperature 0~70°C Timer = 110% nominal input TCO: 45~70°C -dT/dt=0.8~1.0°C/min
	hrs	2.4	
Internal Resistance	mΩ/cell	≤ 15	at 1 kHz, fully charged, 20°C
Cut-off Voltage	V/cell	1.0	Discharge current ≤ 1.0C
Max. Discharge Current	mA	12000(3C)	Ambient temperature -20 ~70°C
Storage Temperature	°C	-20 ~70	Charges 80% nominal input
Average weight	g/cell	119±5	

3. Performance

Except for special notice, the test should be carried out with a month after delivery under the following conditions:

The ambient temperature is: 0-70 °C

The ambient humidity is: 65±20%

The testing instrument must meet the following:

Voltmeter : IEC 485 prescribed 0.5 grade or more, resistance must be more than 10KΩ/V

Galvanometer : IEC 51/IEC 485 prescribed 0.5 grade or more, total resistance must be less than 0.01Ω

Ri ohmmeter: AC sine 1KHz, 4 terminal

Test	Unit	Specification	Conditions	Remarks
OCV	V/cell	≥ 1.25	With in 1hrs after standard charge	
Capacity	mAh	≥ 90%	Standard charge and discharge	Allow 3 cycles
Internal Impedance	mΩ/cell	≤ 15		
High Rate Discharge	min	≥ 108	Standard charge, rest 1hrs 0.5C discharge to 1.0V/cell	Allow 3 cycles
Discharge at Low Temperature	mAh	≥60% Nominal Capacity	Standard charge at 0-70 °C 0.5C discharge to 1.0V/cell	
Charge at High Temperature	mAh	≥80% Nominal Capacity	1.0C charge , - ΔV=10mV /cell Standard discharge at 0-70 °C	
Self-discharge	mAh	≥60% Nominal Capacity	Standard charge, storage 28 day at 20 °C, Standard discharge	
Humidity		Deformation	1C fully charged, 33±3 °C , 80±5%R.H., storage 14 day	
The Resistance to Vibration		The change of voltage: ≤0.02V/cell The change of Ri: ≤5 mΩ/cell	Charge: 16hrs at 0.1C Rest: 24hrs Inspect the cell before and after vibration Vibration conditions: Amplitude: 1.5mm Frequency: 3000CPM at random orientation for 60 min	
The Resistance to Shock		The change of voltage: ≤0.02V/cell The change of Ri: ≤5 mΩ/cell	Charge: 16hrs at 0.1C Rest: 24hrs Inspect the cell before and after shock Shock condition: Drop 3 times onto solid wood (10mm thickness) from 1.5m height at random orientation.	
Over Charge		No rupture	1C for 5hrs	
Over Discharge		No rupture	Standard charge Short circuit: 1h Conductor: 0.75mm ² ×20mm (Cu line)	
IEC Cycles Life	cycle	≥500	IEC61951-2 (2001) 4.4.1	See note 1

Accelerated Cycles Life	cycle	≥300	0.5C charged, rest 30min, 0.5C discharge to 1.0V/cell, capacity ≥60% Nominal Capacity	Cycling charge /cutoff condition: $-\Delta V=10\text{mV/cell}$ ortimer cutoff =110% of input capacity
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4. Appearance

Cell should be without any cracking、rupture、dirt、shading、leakage and deformation.

5. Standard of quality assurance (AQL)

All tests should be done according the following methods (ref.MIL-STD-105E)

Number	Item of test	Sampling criteria	Standard of quality assurance
1.	Cosmetic	I grade	1.5
2.	Dimension	I grade	0.65
3.	Performance	I grade	0.4

Including: capacity、performance of charge and discharge at 1C、open current voltage、Internal resistance.

6. Warranty

One year's guarantee is valid for the defects caused by processing and materials.

7. Caution

7.1 Do not dispose of cell into a fire or dismantled under any condition

7.2 Do not mix different cell types and capacities in the same battery assembly

7.3 Charge and discharge under specified current recommend to the specification

7.4 Short circuit leading to cell venting must be avoided

7.5 Never solder onto cell directly

7.6 Cell reversal should be avoided

7.7 Use batteries in extreme condition may affect the service life, such as: extreme temperature、deep cycle、extreme overcharge and over discharge

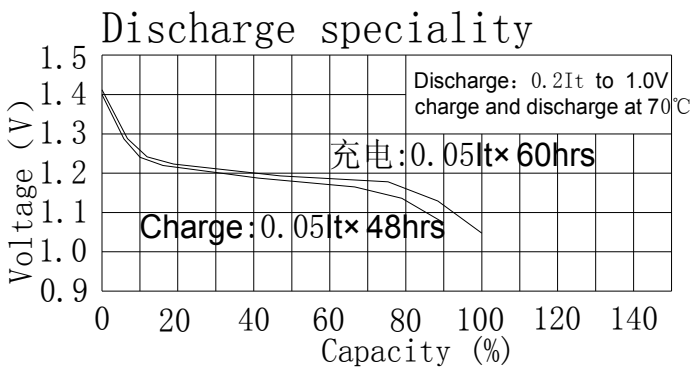
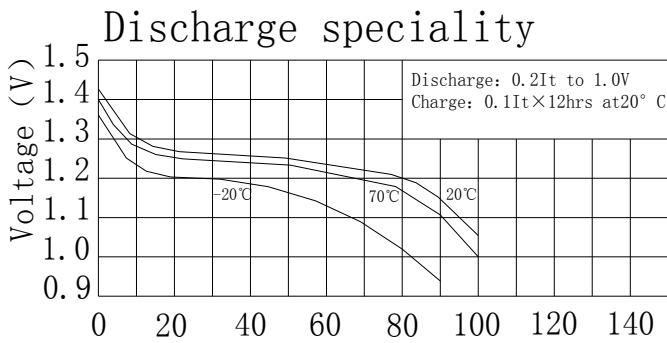
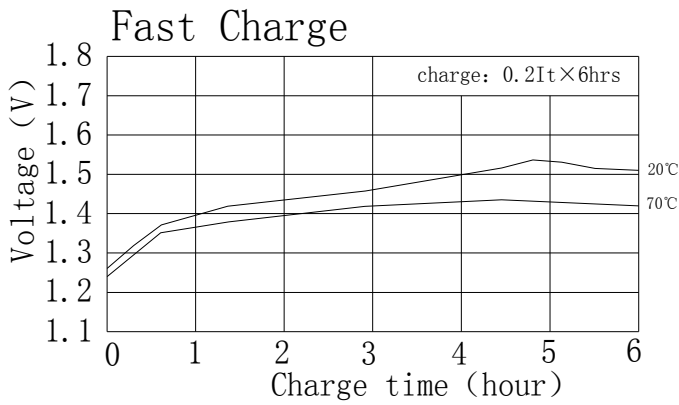
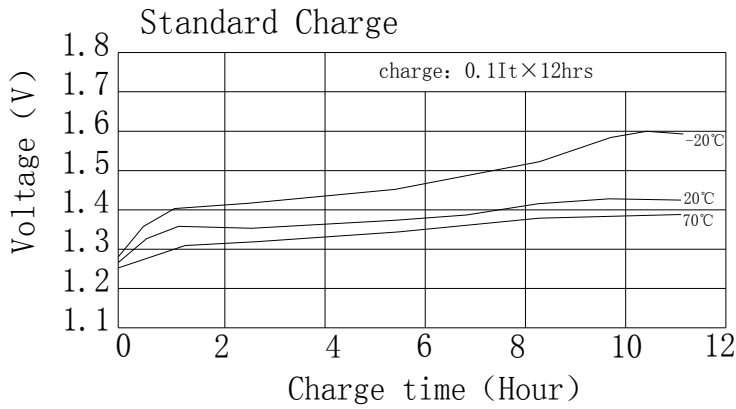
7.8 Batteries should be stored in a cool, dry place, Please discharge before mass storage or transportation

7.9 Once problems be found, stop using, send batteries to local agent

7.10 Because the limit of the electrochemical system, charged the cell of 80%~100% nominal input under long storage is recommended

7.11 To maintain the performance of the cell stored for about 6 months, cycling(charging and discharging) the cell for several times is recommended

General Characteristics



Specifications

Nominal Voltage		1.2V
Capacity (mAh)		0.2It
	nominal	4000
	typical	3950
Dimension (Cell)	Thick /cell	32.3±0.2mm
	wide (cell)	60±0.5mm
Approx		119±5g
Internal Resistance (at 1KHz)		≤15mΩ
charge	standard	400mA×12hrs
	fast	800mA×6hrs
	trickle	135--225mA
discharge		1.0V
Trickle charge life		≥4years
Ambient Temperature	standard charge	-20°C--70°C
	fast charge	-20°C--45°C
	trickle charge	-20°C--70°C
	discharge	-20°C--70°C
	storage	-20°C--70°C
Relative Humidity		65±20%

