

MOTOMA®

Power into the Future

TECHNICAL SPECIFICATION FOR NIMH RECHARGEABLE BATTERY

NH-9V220

FILE NO. : DSE-NH-9V220-V14A

EDITION : V14A

DATE : 2014/10/17

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Manufacturer reserves the right to alter or amend the design, model and specification without prior notice.

1. SCOPE

This specification applies to MOTOMA sealed nickel metal-hydride cylindrical rechargeable single battery and stack-up battery packs. All the data involving voltage and weight of stack-up battery packs equal to the value of single cell times the number of single cell in the battery packs.

2. BATTERY MODEL

Ni-MH 9V220mAh

3. NOMINAL SPECIFICATION

3.1 Nominal voltage	8.4V
3.2 Nominal capacity	220mAh
3.3 Minimum capacity	220mAh
3.4 Charging	
Standard charging	22mA for 18 hours
Quick charging	110mA for 2.4hours, – $\Delta V=5mV$
3.5 End voltage of discharge	7.0V
3.6 Operate temperature range (relative humidity: 45%~85%)	
Standard charge	0~45°C
Quick charge	10~40°C
Rapid charge	10~30°C
Discharge:	-10~50°C
3.7 Storage (relative humidity: 45%~85%)	
Less than 30 days	-20~50°C
Less than 90 days	-20~40°C
Less than 1 year	-20~30°C
3.8 Weight	Approx. 45g
3.9 Dimensions	Shown in the page 7

※Note:

Discharge capacity: When the battery is discharged at 44mA to 7.0V after being standard charged.

Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle when it reaches the nominal capacity.

Unless otherwise stated in these specifications, the battery should be discharged to 7.0V with 44mA before charging.

4. APPEARANCE PERFORMANCE

There shall be no practical damage such as conspicuous liquid electrolyte leakage, flow and dirt under conditions of storage or operation as specified herein.

5. ELECTRICAL CHARACTERISTICS

5.1 Testing conditions

The battery shall be evaluated within 1 month from the arrival date.

Unless otherwise stated in these specifications, the battery to be tested shall be stored for not more than 1 hour at an ambient temperature of 20±5°C and relative humidity of 65±20%.

5.2 Charging procedure for test purpose

The battery shall be charged at an ambient temperature of 20±5°C at a constant current of 22mA (0.1C) for 15 hours.

5.3 Terminal voltage (O.C.V)

Open circuit voltage shall be a minimum voltage of 8.75V within 14 days after being standard charged.

5.4 Internal resistance

Within 1 hour after being standard charged, the internal resistance is not greater than 800mΩ, as tested by 1000Hz AC source.

5.5 Discharging performance

TABLE 1: Discharging performance at 20°C

Constant Discharge Current Rate	Constant Discharge Current	End Point Voltage	Discharge Duration	Available Capacity
0.2C	44mA	7.0V	300min	100%
0.5C	110mA	7.0V	110min	92%
1.0C	220mA	7.0V	54min	90%

※**Note:** All the testing should be done within 1 hour after being standard charged.

5.6 Temperature characteristics

TABLE 2: Temperature Characteristics

Standard Charge Temperature	Discharge Temperature	Constant Discharge Current	End Point Voltage	Discharge Duration	Available Capacity
40°C	20°C	44mA	7.0V	210min	70%
20°C	0°C	44mA	7.0V	210min	70%

5.7 Charge retention

In the charge retention test, the cell shall be standard charged as 5.2, and shall be stored in open circuit for 28 days at 20±5°C (RH=65±20%), and the battery shall be discharged at the same condition at a current of 44mA to 7.0V, discharge time shall be a minimum of 180 minutes.

5.8 Overcharge

The test should be done within 1 hour after charged at a current of 44mA for 48 hours, the battery shall be discharged at 20°C, at a current of 44mA to 7.0V, discharge time shall be a minimum of 300 minutes.

5.9 Endurance in cycles

Prior to the endurance in cycles test, the battery shall be discharged at 44mA to 7.0V. The battery shall be capable of 500 minimum cycles under the conditions as follows.

TABLE 3: Cycle Life Test

Cycle	Charge	Rest	Discharge
1	0.1C for 16hours	none	0.25C×140mins
2-48	0.25C for 190minutes	none	0.25C×140mins
49	0.25C for 190minutes	none	0.25C to 1.0V/ cell
50	0.1C for 16hours	1-4hr(s)	0.2C to 1.0V/cell

Cycles 1 to 50 shall be repeated until the discharge time on any 50th cycle becomes less than 3 hours. At this stage, repeat 50th cycle, if the discharge time is less than 3 hours again the test is terminated.

※**Note:** If battery unit voltage drops below 7.0V, discharge shall be discontinued.

5.10 Safety

5.10.1 Continuous low-rate charging

After standard charged, charge battery at 6.6mA~11mA for 28 days, no fire or no explosion.

5.10.2 Forced discharge

The discharged battery is subjected to a reverse charge at 220mA for 90 minutes, no fire or explode.

5.11 Vibration

The battery shall be no fire, leakage or explode , when it is tested under the following conditions after being standard charged.

TABLE 4: Vibration Test Conditions

Frequency	10~55Hz
Amplitude	0.76mm
Rate of frequency variety	1 Hz/minute
Duration	90 minutes /axis (axis: X,Y,Z) 270 minutes in all

5.12 Short Circuit

After standard charged, short the battery until the battery's temperature returns to ambient temperature (20±5°C), no fire or no explosion. (Cross section of the wire or connector should be more than 0.75mm²)

5.13 Impact Resistance

After standard charged, leave the battery for 24hrs, then check it before / after the following test: Change of voltage: $\Delta V < 0.02V/cell$; Change of internal Impedance: $\Delta Ri < 5 \% / cell$.

TABLE 5: Impact Resistance Test Conditions

Standard Charged	Drop Height	Thickness of wooden board	Direction	Test Times
0.1C for 16hrs	50 cm	30mm	Not specified	3

5.14 Leakage

After standard charged, and stand for 14 days, No leakage nor deformation.

5.15 Humidity Test

After Standard charged, then stand for 14 days at 33±3°C and RH=80±5%, No leakage.

5.16 Storage Recommendation

The battery can be stored at a temperature range of -20~30°C for normal storage or prolonged storage, and at a maximum relative humidity of 85%.

One recovery charging (ref to 5.2) is recommended for every 6 months of storage, in order to protect the battery quality performance.

6. ENVIRONMENTAL PROTECTION REQUIREMENT

6.1 The requirement on Hazardous Substances in the materials should comply with MOTOMA standard on HSR (Hazardous Substance Free).

6.2 The requirement on Hazardous Substances in the Products should comply with 2006/66/EC and MOTOMA standard on HSF.

7. TRANSPORT

7.1 To ensure battery safety during delivery, SOC (State of charge) must be below 30% , inside temperature of container could not be over 35°C. Product holder should be responsible for any possible loss during delivery if above conditions cannot be met completely.

7.2 Inside temperature of container must be below 20°C if any client requires SOC above 35%,the distance between battery master cartons not less than 10cm in container, and coercive air cross ventilation system is required in container to ensure even temperature for each master carton. Product holder should be responsible for any possibly accidental loss if above conditions cannot be met completely.

8. WARNING !

- ◆ Do not apply water, seawater or other oxidizing reagents to MOTOMA batteries, as this can caused rust and heat generation. If a battery becomes rusted, the gas release vent may no longer operate, and can result in explosion.
- ◆ Do not over-charge MOTOMA batteries, If MOTOMA batteries are not fully charged after the battery charger's predetermined charging period has clasped, stop the charging process. Prolonged charging may cause leakage of battery fluid, heat generation, and explosion. Be sure to handle recharged batteries carefully as they may be not.
- ◆ MOTOMA batteries contain a strong alkaline solution (electrolyte).If the skin or clothing comes in contact with fluid from a MOTOMA battery; thoroughly wash the area immediately with clean water from the tap or another source. Battery fluid can irritate the skin.

- ◆ Do not connect more than 21pcs MOTOMA batteries in series, as this may cause electrical shocks, leakage of battery fluid and heat generation.
- ◆ Do not remove the outer tube from a battery or damage it. Doing so will expose the battery to the risk of a short circuit, and may cause leakage of battery fluid, heat generation, explosion and fire.
- ◆ If MOTOMA batteries leak fluid, change color, change shape, or change in any other way, do not use them, otherwise they may cause heat generation, explosion and fire.
- ◆ Keep MOTOMA batteries and the equipment using them out of the reach of babies and small children, in order to avoid accidental swallowing of the batteries. In the event the batteries are swallowed, consult a doctor immediately.
- ◆ If the operating time of a MOTOMA battery becomes much shorter than its initial operating time even after recharged, it should be replaced to a new battery as its battery life has ended.

9. CAUTION !

- ◆ Never dispose of MOTOMA batteries in a fire or heat them.
- ◆ Store MOTOMA batteries out of the reach of babies and small children. When charging or Using battery, do not let babies or small children remove the battery from the charger or the equipment during used.
- ◆ Be sure to use the recommended charging method for MOTOMA batteries read the battery charger's instruction manual carefully.
- ◆ Do not use old and new batteries mixed together, or batteries at different charge levels. Do not use the MOTOMA battery mixed with a dry cell or other batteries of different capacity, type, or brand name. This may cause leakage of battery fluid and heat generation.
- ◆ If the MOTOMA battery terminals become dirty, clean up them with a soft dry cloth prior to use. Dirt on the terminals can result in poor contact with the equipment, loss of power, or inability to charge.
- ◆ After long term storage, there is a possibility that the battery could not be fully charged. In order to fully charge it, please charge and discharge battery for a few times.
- ◆ Only charge MOTOMA batteries using those specific chargers that satisfy MOTOMA specifications. Only charge batteries under the conditions specified by MOTOMA.
- ◆ Never solder lead wires directly on to MOTOMA batteries
- ◆ Do not directly connect MOTOMA batteries to a direct power source or the cigarette lighter socket in a car.
- ◆ When MOTOMA batteries are to be incorporated in equipment or housed within a case, avoid air-tight structures, as this may lead to the equipment or the case being damaged or may be harmful to users.
- ◆ Any other problems caused by malfunction of the equipment or misuse of the battery are not