Specification

Product	**Ni/MH Battery**
Type	**HX-D10-C**
Edition	**SP09(A.2)060X-10E**
Drafted By	**Liang Fu**
Approved By	**LiuPing Pang**
Date	**2009/6/10**
Total Pages	**5**

Client Materials No. _____

Client Confirm _____

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Note: This Approval Sheet (Version Number: SP09(A.2)060X-10E) prepared by Union Suppo Battery (Liaoning)Co., Ltd., is subject to be modified without prior notice.

1. MODEL: HX-D10-C

2.Product Description

HX is a new generation of Nickel Metal Hydride rechargeable battery which combines the advantage of both dry cells and rechargeable batteries,which has higher outpower, higher capacity retention and good discharge performance at low temperature compared with dry battery. It can be used right now after purchasing.

3. SPECIFICATION

·Chemistry:	Nickel Metal Hydride	
·Nominal voltage:	1.2	V
·Nominal capacity:	9500	mAh
·Standard charge:	950	mA×16 hrs
·Rapid charge:	3560	mA (controlled by at least 3 of following methods simultaneously);
	-Delta V = 0-5mV/cell (controlling voltage-decreasing while charging);	
	DT/ dt = 0.8-1 Celsius/min (controlling surface temperature increment);	
	TCO = 45-50 Celsius (controlling battery surface temperature);	
	160 mins (controlling charging time at constant current).	
·Discharge end-voltage:	1.0	V
·Max constant current of discharge:	13350	mA (at 20 Celsius)

·Ambient temperature range (humidity: 65±10%)

Standard charge:	0 -- 40 Celsius
Rapid charge:	10 -- 35 Celsius
Discharge:	-18 -- 55 Celsius

·Storage temperature range(humidity:65±10%)*

Within 12 months:	-20 -- 35 Celsius
Within 3 months:	-20 -- 45 Celsius
Within 1 month:	-20 -- 55 Celsius

*We recommend the best storage temperature is below 20 Celsius if the storage temperature is above 20 Celsius the capacity retention rate can be decreased compared with what we claimed. The battery should keep open. Any conductive connection no matter dircet or indirect will cause a bad effect. When the battery is not in use please put it in the holder, which appends with the battery.

4. Appearance & Dimension/Weight

As per attached drawing

5. Performance Testing

5.1 Test Requirement

Unless otherwise stipulated, all tests are carried out in ambient temperature 20±5 Celsius,humidity 65±10%;Tests should be made within one month after receipt of the battery, otherwise, 3-5 cycles with 0.1CA 16hrs charge and 0.2CA/1.0V discharge is needed to ensure full performance will be reached.

mportant: New batteries are delivered in a 90% charged state, discharge at 1900 mA to 1.0V/cell before any test!

5.2 Testing Procedure and Standard

Item	Measuring Procedure	Standard
1. Appearance	Visual check	Refusal of dust and oil contamination, ovbious scratch
2. Dimension	Measured by calipers	As per attached drawing
3. Weight	Weighed by balance with precision of 0.1g	Max 160.0 g
4. Open-circuit voltage	Measure open-circuit voltage 14 days after standard charge	Min 1.29 V
5. Capacity	Calculate capacity when discharge at 1900 mA to 1.0V /cell within one hour after standard charging	Typical 9500 mAh Min 8900 mAh
6. Impedance	Measure the impedance of battery by applying AC with frequency of 1000Hz within one hour after standard charging (by milliohm meter)	Max 6.0 mΩ
7.1.Capacity retention (180d)	Lay standard charged battery for 180 days at ambient temperature of 20±2 Celsius, then discharge at 1900 mA to 0.9V/cell, measure capacity	Typ.retention rate 85%*
7.2.Capacity retention (360d)	Lay standard charged battery for 360 days at ambient temperature of 20±2 Celsius, then discharge at 1900 mA to 0.9V/cell, measure capacity	Typ.retention rate 80%*
8. Over-charge	Charge at 950 mA for 28 days	NE,NF,ND,NL
9. Charge at high temperature	Put the battery in constant temperature box of 40±2 Celsius for 2 hours,charge at 950 mA, 16hrs . cut-off control, stand it in ambient temperature of 20±5 Celsius for 1 hour,discharge at 1900 mA to 1.0 V/ Cell	90% of C_5 initial capacity (min.)
10. Low-temperature discharge	Put the standard charged battery in Constant Temperature Box at 0±2 Celsius for 2 hours, discharge at 1900 mA to 1.0V / cell	80% of C_5 initial capacity (min.)
11. Over-discharge	Connect standard charged batteries with a resistor of 12Ω/ cell in series for 8 hrs	NE,NF,ND
12. Cycle life	As per IEC 61951-2(2003) 7.4.1.1 Standard, inspect the capacity at 500th cycle	60% of C_5 initial capacity (min.)
13. Humidity test	Put standard charged battery in ambient temperature: 33±3 Celsius humidity: 80±5% for 14 days	ND,NL
14. Vibration-proof	Lay the standard charged battery for 1 hour with open-circuit, vibrate the battery at Amplitude: 4mm Frequence: 1000Hz Direction: Any Time: 60min	Open circuit voltage variation below 0.02V/cell ND,NL
15. Impact-proof	Lay the standard charged battery for 1 hour with open-circuit,drop with the follow conditions: Height: 45cm Target: Hard wood plate Direction: Any direction Times: 3	Open circuit voltage variation below 0.03V/cell ND,NL
16. Safety	Short-circuit the positive and negative polarity for 1 hour using a leading wire of 0.75mm^2	NE but leakage or deformation allowed

* if the ambient temprature is changed, the data may be different from the above value.

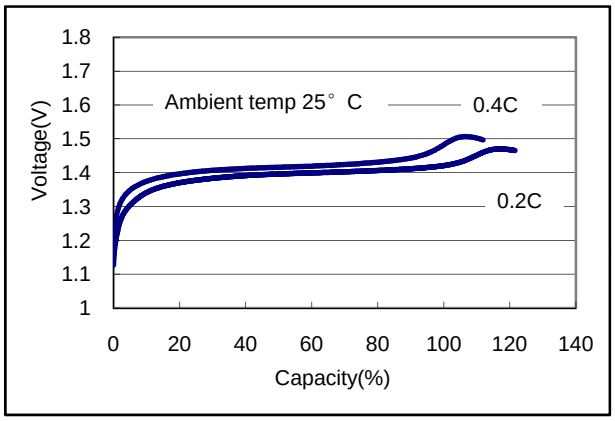
Note: If batteries are properly used, safety vent will remain in sealed status. But in case of abuse use such as long time over charge, short circuit, over-discharge etc., battery inner pressure will increase and lead to safety vent open. when the battery is not in use,turn off the equipment. Read instruction carefully before use.

Remark: ND = no deformation; NL = no leakage; NF = no fire; NE = no explosion

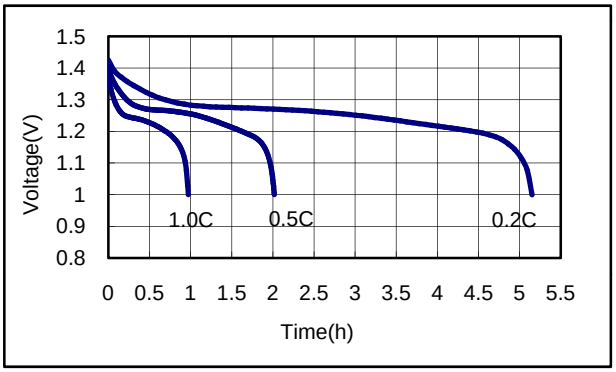
·Parameters

Nominal Voltage		1.2 V
Typical capacity (0.2C)		9500 mAh
Min. capacity (0.2C)		8900 mAh
Dimension	OD(mm)	33.0 (+0/-0.8)
	Height(mm)	Max 61.5
Weight (g)		Max 160
Impedance(1000Hz)		Max 6 mΩ
Charge	Standard Charge	950 mA×16hrs
	Rapid Charge (need control)	3560 mA×160mins
Ambient Temperature	Charge	Standard charge: 0-40 Deg.
		Rapid Charge: 10-35 Deg.
	Discharge	-18-55 Deg.
	Storage	12 months: -20-35 Deg.
		3 months: -20-45 Deg.
		1 month: -20-55 Deg.

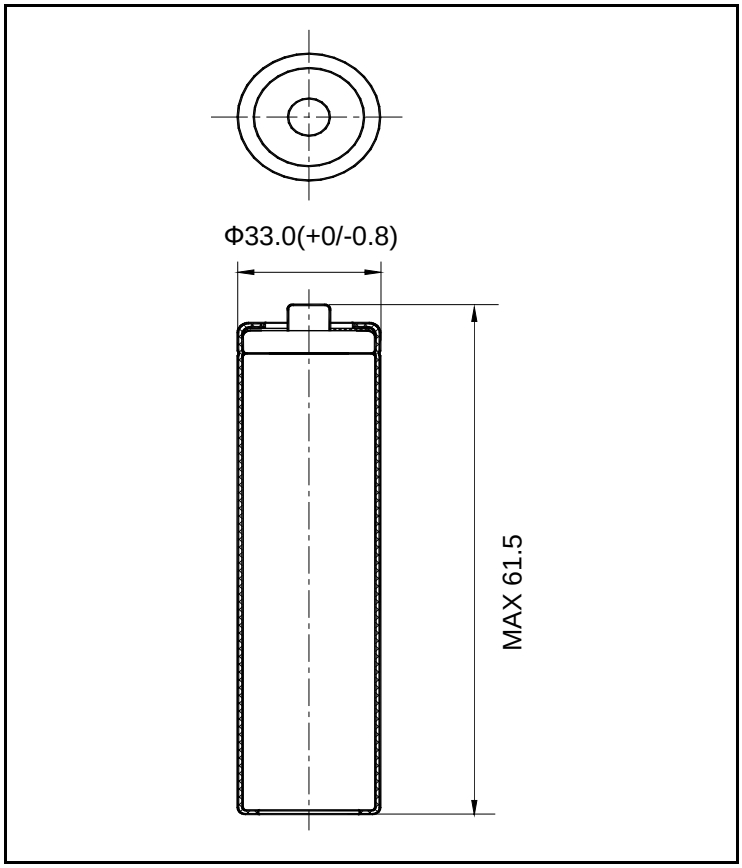
·Charge characteristics



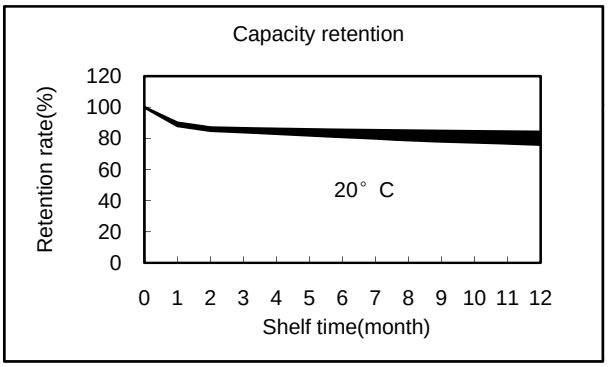
·Discharge characteristics



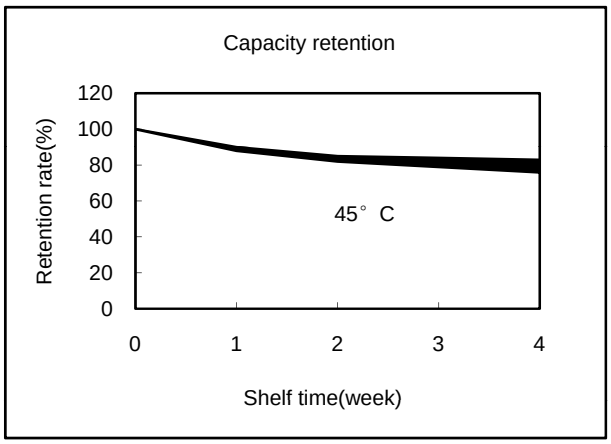
·Dimension(with tube)mm



·Capacity retention characteristics



·Capacity retention characteristics



•Cautions

1. We recommend to use SUPPO specified NI-MH battery charger equipped with rapid charge control in case if quick charge is necessary. Do not overcharge batteries by exceeding the predetermined charging period specified. Prolonged charging may cause over heating and damage the battery.DO not detect -Delta V for 5min of charging.
2. Please recharge the battery before using.
3. Charge/discharge current should not exceed the current stipulated by SUPPO.
4. The end voltage of the battery is1.0V/Cell,do not over-discharge the battery , or it will damage the performance of battery .
5. If battery will be stored for more than 3 months, we suggest charging the battery once every 3 months. The battery should charge 30-50% before storage.
6. Do not reverse-charge the battery .
7. Do not immerse the battery into water.
8. Do not disassemble batteries or throw the batteries into fire.
9. Do not solder any lead wires directly to the batteries.
10. Make sure terminals are correctly positioned when charging.
11. Trickle charge brand new batteries or batteries being stored for a long time before using.
12. Keep the batteries out of the reach of children, see a doctor when any accidents happen.
13. Do not touch overheated batteries,recharge the battery when temperature returns to normal.
14. Battery will heat after using, please put the battery on a ventilated place to make it cool before charge it again. Avoid direct sunshine.
15. Do not mix different size of batteries; do not mix SUPPO battery with other brand batteries.
16. When use the battery at too high or too low temperature, deeply charge/discharge, over-charge and over-discharge will decrease the cycle life of batteries.
17. It will cause internal air pressure increase when over-charge, short circuit or over-discharge, when such accidents happen, safety vent will open and release the air to ensure safety. Therefore, the battery should avoid airtight structure. The housing of battery should be ventilated, or other fire-source may ignite the Oxygen and Hydrogen released from the batteries.
18. The battery should have short-circuit protection device to prevent short-circuit. Do not short-circuit batteries, or it will cause permanent damage.
19. Store with load is forbidden, it will cause capacity of battery irreversible loose if store battery with loaded for a long time.
20. Please stop using if abnormal phenomenon happens.