

# Specifications

Model: LiNiCoMn 3.7V 2000mAh

Prepared	Checked	Approved

AA Portable Power Corp

Address: 860S 19th St #A, Richond. CA, 94804

Tel: ( 510) 525-2328

[http: //www.batteryspace.com](http://www.batteryspace.com)

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Revision History

VER.	Release Date	Amendments
1.0	2011/3/8	First release

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### Specifications for LiNiCoMn 3.7V 2000mAh

#### 1 Scope

This specification is applied to LiNiCoMn 3.7V 2000mAh Battery manufactured by AAPP

#### 2 Product and Model Name

2.1 Product: Lithium-ion Battery

2.2 Model Name: **INR18650HE-2000mAh**

#### 3 Ratings

Item		Rating	Note
3.1	Capacity	Minimum	Discharge:0.2CmA cut off Voltage:2.0V for cell
		Typical	
3.2	Nominal Voltage	3.6V	Discharge:0.2CmA cut off Voltage:3.0 for cell
3.3	AC Impedance Resistance	≤40m Ω	
3.4	Discharge Cut-off Voltage	3.0V	
3.5	Charge Current	0.5CmA	Standard charge 0.5CmA
3.6	Charge Voltage	4.2V	
3.7	Max. Charge Voltage	4.2V	
3.8	Charge Cut-off Current	20mA	0.01CmA
3.9	Charge Time	3h	Standard charge 0.5CmA
3.10	Max. Charge Current	2000mA	1.0CmA
3.11	Max. Discharge Current	6000mA	3.0CmA
3.12	Weight	≤50g	
3.13	Operating Temperature	Charge	0~+45℃
		Discharge	-20~+60℃
3.14	Storage Temperature	less than 1 month	Recommended storage temperature: 25℃,at the shipment state
		more than 1 months	

#### 4 Outline Dimensions and Appearance

##### 4.1 Outline Dimensions

Dia: ≤18.1mm (Measured with weighting 300gf at 25±2℃)

Length: ≤65.5mm (Measured with weighting 300gf at 25±2℃)

This thickness will be swelling when high temperature storage or operation in high temperature.

##### 4.2 Appearance

There shall be no such defect as scratch, flaw, crack, rust, leakage, which may adversely affect commercial value of battery

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#### 5 Performance

##### 5.1 Standard Test Conditions

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of  $25 \pm 2^\circ\text{C}$  and relative humidity of 45~85%. The test results are not affected evidently by such conditions of temperature  $25 \pm 2^\circ\text{C}$  or humidity 40~85%RH.

##### 5.2 Measuring Instrument or Apparatus

###### 5.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

###### 5.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than  $10\text{ M}\Omega$

###### 5.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than  $0.01\ \Omega$ .

###### 5.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

##### 5.3 Standard Charge

Test procedure and its criteria are referred as follows:

$0.5\text{CmA} = 1000\text{mA}$

In  $25 \pm 2^\circ\text{C}$ , Full charge condition: Constant current  $0.5\text{CmA}$ , Constant voltage  $4.2\text{V}$ , till the current fall to  $0.01\text{CmA}$ , then stop charge.

##### 5.4 Rest Period

Unless otherwise defined, 30min, rest period after charge and discharge.

##### 5.5 Initial Performance Test

Item	Measuring Procedure	Requirements
(1) Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	$\geq 4.15\text{V}$
(2) AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at $25 \pm 2^\circ\text{C}$ .	$\leq 40\text{m}\Omega$
(3) Nominal Capacity	The capacity on $0.2\text{CmA}$ discharge shall be measured after standard charge at $25 \pm 2^\circ\text{C}$ . (specified $C_5$ ).	$C_5 \geq 2000\text{mAh}$

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#### 5.6 Electrical Performance

##### 5.6.1 Temperature Dependence of Capacity (Discharge)

Cells should be standard charge at 25°C, then heating or cooling to the measured temperature within 30min. Keep the cell in the -20°C for 16h, before the Low temperature discharge, and keep the cell in the 55°C for 5h before the high temperature discharge. The capacities are to be measured with constant discharge current 0.2CmA (2.0V cut-off). The discharge capacity requirements listed in the below table under respective discharge temperatures.

Discharge Temperature	-20°C	25°C	55°C
Discharge Capacity	≥60%	100%	≥95%

##### 5.6.2 Cycle Life

30min rest period after standard charge, 1C discharge to a cut-off voltage of 3.0V, 30min rest period, the capacity shall be measured after 500 cycles of standard charge and discharge at 25±2°C. Capacity ≥1600mAh (80% of nominal capacity)

##### 5.6.3 Shelf Life

Item	Measuring Procedure	Requirements
Storage Characteristics 1	1 The capacity on 0.2CmA discharge shall be measured after standard charge and then storage at 25±2°C for 28 days.	Remaining Capacity ≥90% C <sub>5</sub>
	2 After above measured Remaining capacity, the capacity on 0.2CmA discharge shall be measured after standard charge.	Recovery capacity ≥95% C <sub>5</sub>
Storage Characteristics 2	1 The capacity on 0.2CmA discharge shall be measured after standard charge and then storage at 55±2°C for 7 days.	Remaining Capacity ≥90% C <sub>5</sub>
	2 After above measured Remaining capacity, the capacity on 0.2CmA discharge shall be measured after standard charge.	Recovery capacity ≥95% C <sub>5</sub>

##### 5.6.4 Long Time Storage Characteristics

After about half charge after a period of storage at 25±2°C for one year(365 days). The remaining available capacity is ≥85% C<sub>5</sub>. The capacity is determined with the capacity of the most preceding three cycles by 0.2CmA

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**5.7 Mechanical Performance**

Item	Measuring Procedure	Requirements
Vibration test	After standard charge, the battery is to be tested as following conditions: Amplitude:0.8mm Frequency:10~55Hz(sweep:1Hz/min) Direction: X/Y/Z axis for 90~100min. The battery is to be tested in three mutually perpendicular to each axis.	No fire, no explosion, no smoking is obtained.
Drop Test	Drop the battery in the shipment condition(full-charge) from 1m height onto 5cm or thicker concrete with p-tile on it 6 times each of X , Y, and Z directions at $25 \pm 2^{\circ}\text{C}$	No fire, no explosion, no smoking is obtained.

**5.8 Safety Performance**

Item	Measuring Procedure	Requirements
Short-Circuit Test	After standard charge, the battery is to be short-circuited by connecting the positive and negative terminals of the battery with copper wire having a maximum resistance load of $0.2 \Omega$ .	No explosion, no fire. The temperature of the exterior cell casing shall not exceed $130^{\circ}\text{C}$ .
Heating Test	A battery is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of $5 \pm 2^{\circ}\text{C}/\text{min}$ to a temperature of $130 \pm 2^{\circ}\text{C}$ at which temperature the oven to remain for 10 minutes before the test is discontinued.	No explosion, no fire.
Over Charging Test	After standard charge, the battery is subjected to a charging current by connecting it to a DC-power supply. The beginning current is 3.0CmA, witch is to be obtained by connecting a resistor of specified size and rating in series with the battery, the voltage of the DC-power supply is 5V. The test time is 2.5 hours. This does not require that the initial $I_c$ be maintained for 2.5 hours.	No explosion, no fire.

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**6 Handling Instructions**

Read and observe the following warnings and precautions to ensure correct and safe use of Li-ion batteries.

**Danger!**

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.

- Do not immerse the battery in water or allow it to get wet.
- Do not use or store the battery near sources of heat such as a fire or heater.
- Do not use any chargers others than those recommended by infinity.
- Do not reverse the positive(+) and negative(-) terminals.
- Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
- Do not put the battery into a fire or apply direct heat to it.
- Do not short-circuit the battery by connecting wires or other metal objects to the positive(+) and negative(-) terminals.
- Do not carry or put the battery together with necklaces, hairpins or other metal objects.
- Do not strike, throw or subject the battery to severe physical shock.
- Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
- Do not directly solder the battery terminals.
- Do not attempt to disassemble or modify the battery in any way.
- Do not recharge the battery near a fire or in extremely hot conditions.

**Warning!**

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.

- Do not place the battery in a microwave oven or pressurized container.
- Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different capacity, type or brand.
- Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.
- Keep the batteries out of the reach of children. If a child somehow swallows a battery, seek medical attention immediately.
- If the battery leaks or emits an odor, immediately remove it from the proximity of any exposed flame. The leaking electrolyte can ignite and cause a fire or explosion.
- If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

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#### Caution!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce performance and/or shorten service life.

Use the battery only under the following environmental conditions. Failure to do so can result in reduced performance or a shorten service life. Recharging the battery outside of these temperatures can cause the battery to overheat, explode or catch fire.

Operating environment:

When charging the battery: 0°C~45°C

When discharging the battery: -20°C~60°C

When stored up to 30 days: -20°C~45°C

When stored up to 90 days: -20°C~35°C

In cases where children use the battery, instruct them on the contents of the user's guide and keep an eye on them to ensure that the battery is being used correctly.

If the battery leaks and electrolyte gets your skin or clothing, immediately rinse the affected area with clean running water. If left as is, skin inflammation can occur.

For directions on battery installation and removal, read the instruction manual that accompanies the equipment in which the battery will be used.

If a device is not used for an extended period, the battery should be removed and stored in a cool, dry place. Otherwise, resting or reduced performance may occur.

If the terminals of the battery are dirty, wipe them clean with dry cloth before use. Otherwise, solid electrical contact may not be charged with the equipment, and this can cause power outages or charging to fail.

#### 7 Period of Warranty

The period of warranty is 3 months from the date of shipment. AA Portable Power Corp.

guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer's abuse and/or misuse.

#### 8 Shipment

New Condition.

#### 9 Amendment of this Specification

This specification is subject to change with prior notice.