

PRODUCT: 3,6V, industrial use lithium batteries

PROBATTERY CODE: 1ICPN₁/N₂/N₃-X & 4ICPN₁/N₂/N₃-2X

CLIENT: GENERIC INDUSTRIAL USE

Revision	Date	Person Responsible	Details
01	12/10/06	LC	Initial specification

Reference	Associated documents	Details

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1.- General

This specification describes the Lith ion batteries from the 1ICPN₁/N₂/N₃-N₄ X y 1ICPN₁/N₂/N₃-2X series, intended for generic industrial use

N₁: Thickness of the cell used, stated in millimetres

N₂: Width of the cell used, stated in millimetres

N₃: Height of the cell used, stated in millimetres

X: The last identification letter of the pack depends on its geometric design.

2.- Product description

The battery is made up of four rows of series/parallel Lith ion prismatic cells, which have a variable capacity of between 100mAh & 1800mAh. In the case of the 2X models each row can be made up of 2 cells in parallel per row. The standard pack comes equipped with the CPR-LI34-NG3 protection set.

3.- Battery's electrical specification

3.1.- Nominal Tension

Measurement after a discharge at $I = 1/2C$ up to D.O.D. of 50%:

$$V_{\text{nominal}} = 3,6 \text{ V}$$

- Taking C as the pack's nominal capacity. This means that a discharge of a C= 1.8Ah pack at 1/2C implies a 0.9A current.
- D.O.D: Extent of discharge. This means to which percentage of the nominal capacity the battery has discharged.

3.2.- Capacity

Charging condition for measurement: $I = 0,2C$ with a voltage of 4,3V until the charge current lowers 0.02C. Temperature 25°C (CCCV charge).

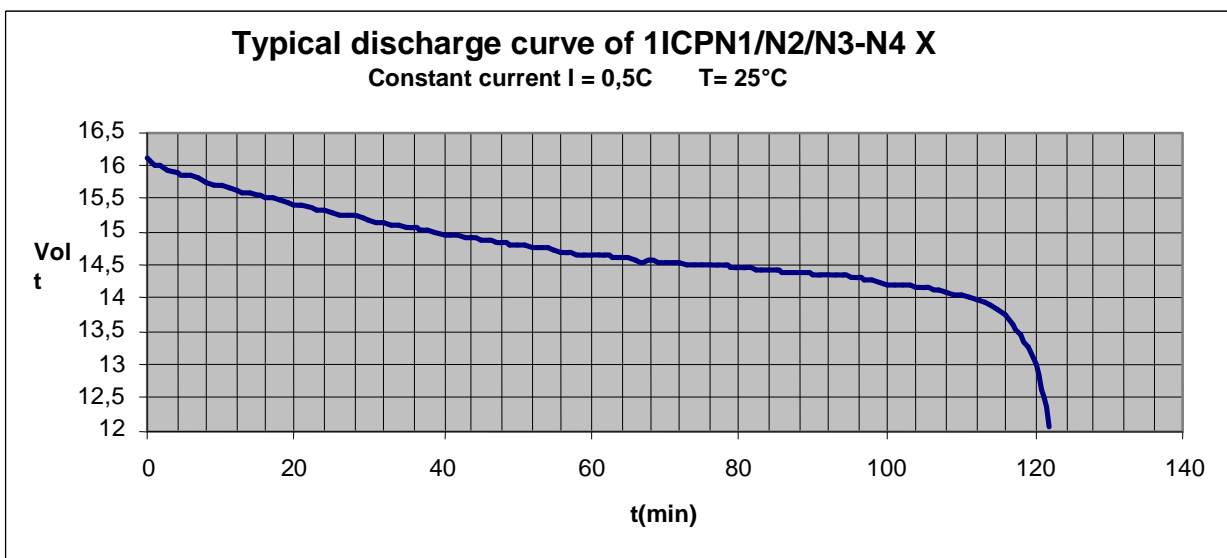
Charging conditions for measurement: $I = 0,2C$ to a minimum voltage of 2,7V.

PACK CODE	C (Ah)	Cells per set
1ICPN ₁ /N ₂ /N ₃ -X	0,1 to 1,8	one
1ICPN ₁ /N ₂ /N ₃ -2X	1,8 to 3,6	two

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Capacity dependency with temperature for cells charged at 25°C and discharged at the temperatures indicated in accordance with the aforementioned conditions.

Discharge temperatures				
	-10°C	0°C	25°C	60°C
Relative capacity	70%	90%	100%	95%



3.3.- Impedance

Measurement at 3,6V tension and at a frequency of 1kHz:

Z between 30 & 70 mΩ (each cell) in accordance to the cell being used

3.4.- Operating environment

Temperature and humidity limits within which the battery can be used:

Condition	Temperature min / max	Details
Charge	0°C to 45°C	
Discharge	-20°C to 60°C	
Storage	-20°C to 60°C	Less than 1 month
Storage	-20°C to 45°C	Less than 3 months
Storage	-20°C to 20°C	Less than 1 year

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Note 1: In the storage conditions mentioned in the table above, the percentage of recoverable capacity of $C_{rec} > 80\%$ is guaranteed, on the understanding that C_{rec} :

C_{rec} = time after storage/initial discharge time

In all cases the relative operating environment humidity should be between 0 and 90% (without submerging the battery)

3.5.- Charging and discharging conditions

3.5.1.- Charge

The pack should be charged using a CC/CV (Constant current/Constant Volt). This means that during the first part of the charge the current should be limited to a value inferior to I_{Cmax} until the tension reaches a value at which the current reduces itself from I_{Cmax} . From this moment on the tension should be limited to a value inferior or equal to V_{Cmax} . The I_{Cmax} and V_{Cmax} values for the pack referred to in this specification are:

$$I_{Cmax} = 1C$$
$$V_{Cmax} = 4,3 V$$

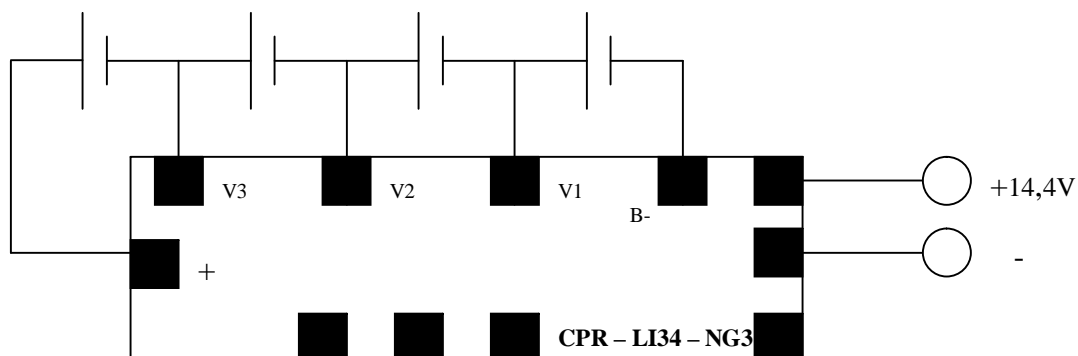
3.5.2.- Discharge

The maximum discharge current for I_{Dmax} is:

$$I_{Dmax} = 1C \text{ continuous between } 0^{\circ}C \text{ \& } 50^{\circ}C$$

3.6.- Battery diagram

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4.- Description of battery's components

4.1.- Cells

Below are the typical values of some of the prismatic cells used:

Parameter	Cell 043450	Cell 053048	Cell 103450
Nominal Tension	3,7V	3,7V	3,7V
Nominal Capacity	720mAh	650mAh	1800mAh
Tension at end of discharge	2,75V	2,7V	2,7V
Standard charge current	360mA	325mA	900mA
Maximum charge current	720mA	650mA	1800mA
Maximum discharge current	720mA continuous	650mA	1800mA
Internal resistance	< 60mΩ	<60mΩ	<90mΩ

4.2.- Protection set

4.2.1- Protection set's electrical circuit

The CPR-LI34-NG3 protection set is a monitoring and control circuit, which permits the measuring, and management of up to 4 Lith ion cells so that the charge and discharge parameters remain within the manufacturers specified values. At the same time, it controls the flow of current

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through the system, differentiating peaks in demand from stable demand, and sets a protection threshold so as to avoid excesses in current, which could damage the circuit.

4.2.2.- Protection set's electrical specifications (@ 25°C)

4.2.2.1- Maximum electrical operating limits

- Maximum input voltage: Max 7VDC
- Maximum charge current: Max 3 A continuous
- Maximum discharge current: Max 3 A continuous

4.2.2.2 – Environmental conditions

- Operation: Temperature: -20°C to +70°C
Humidity: 0 to 90% (without submerging in water)
- Storage: Temperature: -40°C to +85°C
Humidity: 0 to 90% (without submerging in water)

4.2.2.3 – Circuit protector's operating limits

- Over voltage protection (OVP): 4,25V ± 0,025V
- Hysteresis voltage protection relay (HVPR): 200mV ± 50mV
- Over voltage protection delay (OVP): 0,5 to 1,5 sec
- Under-voltage protection (UVP): 2,7V ± 0,1V
- Under-voltage power recuperation (UVPR): 3V ± 0,1V
- Response time of (UVPR): 0,5 to 1,5 msec
- Over current protection (OCP): 5 A
- Short-circuit relay delay: 1,5msec

4.2.2.4 – Power consumption

- In operation: Maximum 5µA
- In cut mode: Maximum 1µA

4.2.3.- Protection set's mechanical specifications

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A self-contained PCB with double layer fibreglass and epoxy resin, mounted using SMD technology. It is fixed to the pack using the metallic tabs used to solder the cells' electrodes. The size of the PCB is 55mm X 18mm.

4.3.- Battery's mechanical structure

The battery pack as well as its control accessories, intelligence and communication, can come with a **thermocontractil/shrink wrap** cover or a plastic or metal cabinet, depending on the clients specifications.

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