

NanoSafe™ Battery Datasheet

Altairnano, Inc., the leaders in innovative battery technology, have created NanoSafe™: a rechargeable, nano-titanate battery system that provides fundamental advantages over existing, traditional lithium ion batteries. With a very fast charge, long life, high power, an extremely wide operating temperature range, and inherently safe, NanoSafe batteries are cost effective with prices similar to that of other rechargeable batteries.

Fast Charge

The NanoSafe batteries are rechargeable in a few minutes, versus hours required for other rechargeable batteries. A NanoSafe cell can be charged to over 80% charge capacity in about one minute.

Long Life

NanoSafe batteries have a lifespan of 20+ years, versus the 3-5 year span on other batteries. NanoSafe battery cells have now achieved over 15,000 deep charge/discharge cycles (versus 1,000 cycles for conventional lithium batteries), and they still retain up to 85% of their original charge capacity.

High Power

With instantaneous power even at very cold temperatures, NanoSafe batteries deliver power per unit weight and unit volume several times that of conventional lithium ion batteries. Altairnano laboratory measurements indicate power density as high as 4000 W/Kg and over 5000W/litre.

Wide Operating Temperature Range

Altairnano batteries can operate at temperatures as low as -50°C and as high as $+75^{\circ}\text{C}$, with no unsafe characteristics. NanoSafe batteries can be charged to 90% of their room temperature charge even at -30°C and are safe at temperatures up to 250°C . These wide operating ranges make the batteries ideal for sub-zero conditions, desert environments, and high altitude temperatures.

Safety

Altairnano's batteries do not explode or exhibit thermal runaway. These thermally stable batteries are well suited for hostile environments.

Feature	Description
Life span	Over 20+ year life
Charge rate	Very fast; Rechargeable in < 10 minutes
Temperature range	Extremely wide operating range: From -50°C / -60°F to $+75^{\circ}\text{C}$ / $+165^{\circ}\text{F}$
Charge temperature range	-50°C to $+75^{\circ}\text{C}$
Discharge temperature range	-60°C to $+75^{\circ}\text{C}$
Discharge C rate	Up to 100+
Charge C rate	Up to 50+ (20C charge rate @ -30°C)
Cycle life	Over 15,000 full depth of charge and discharge cycles
Annual maintenance	None
Calendar life	20+ years
Safety	With no graphite anode, and thus no SEI layer, this battery is safe to over 200°C
Environmental	Green—no toxics or heavy metals



Customer Benefits

Modular design @ ~ 13.8 volts

- 1.20Kwh/88Ah packaging
- Application specific design
- Configuration flexibility
- Various cell sizes
- Energy or power performance

Status

- Introduced September 2006
- Commercially shipping to OEMs

NanoSafe™ Applications

- EV/PHEV/HEVs
- UPS
- Power tools
- Military
- Telecommunications
- Solar Energy Storage
- Hostile Environments

www.altairnano.com
for further information

