FNC®

Vented fibre structure Nickel Cadmium batteries for stationary systems

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FNC®

FNC® Vented Nickel Cadmium Batteries

the best solution for long, reliable battery life

FNC® Nickel Cadmium single cells are designed for general purpose applications, where maximum operating reliability is a key factor.

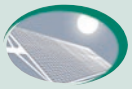
Fiber Nickel Cadmium (FNC®) technology provides the best solution for long reliable battery life in all applications. The electrochemical advantages of the FNC® Nickel Cadmium battery ensure undisturbed failsafe operation, without the risk of complete loss of power or sudden battery death. The FNC® solution is the only solution for applications requiring vital or reliable system operation.

FNC® batteries are used in a great variety of applications:


In power stations and transformer plants

In emergency power supply


In telecommunication installations


In off-the-line power supply plants and when using regenerative energy


In signalling and control systems


In starting emergency power units

4 types of batteries for your specific application

Four types of batteries are available with different performance characteristics for any application:

X-range
X-range uses ultra thin plates with very high power output for short durations.
Typical applications: Engine starting applications and UPS back up systems.

H-range
H-range is designed for applications where discharges are in the range of 30 minutes or less but higher capacities are required.
Typical applications: Engine starting, UPS and switchgear applications.

M-range
M-range is typically used in applications where the discharge is between 30 minutes and 2 hours, with variable or mixed load requirements.
Typical applications: Power back up and switchgear.

L-range
The plates in L-range are designed for general discharge characteristics with variable or mixed loads of high and low current discharges.
Typical applications: Power back up, switchgear and energy storage.

Typical application / Type of batteries	X-range	H-range	M-range	L-range
Engine start	X	X		
UPS	X	X	X	X
Switchgear		X	X	X
Power back up			X	X
Energy storage				X

X = Standard application

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High-quality parts and components

for top-quality batteries

Electrodes

The positive and negative electrodes consist of a nickel fibre structure with graphite-free active material. The three-dimensional fibre structure comprising a nickel fibre composite is extremely elastic. Mechanical stresses and volume changes during charge/discharge cycles are therefore absorbed by the electrodes.

Separators

The positive electrodes are enveloped in microporous separators. The separators are designed to ensure that the electrodes are properly separated and that they have low internal resistance corresponding to the applicable level of stress.

Electrolyte

The electrolyte comprises dilute potassium hydroxide with a density of 1.19 kg/l at 20°C. The cells are delivered in a filled and charged state. For sea or air transport, delivery in a dry, discharged condition is recommended. The electrolyte is then delivered separately packed and ready to fill or as dry electrolyte.

Container

The battery container is made of robust translucent polypropylene (PP), which facilitates checking of the electrolyte level. Material variations are possible. Container and lid are welded together to prevent gas and electrolyte escaping. Special O-rings ensure that the pole bushings are properly sealed.

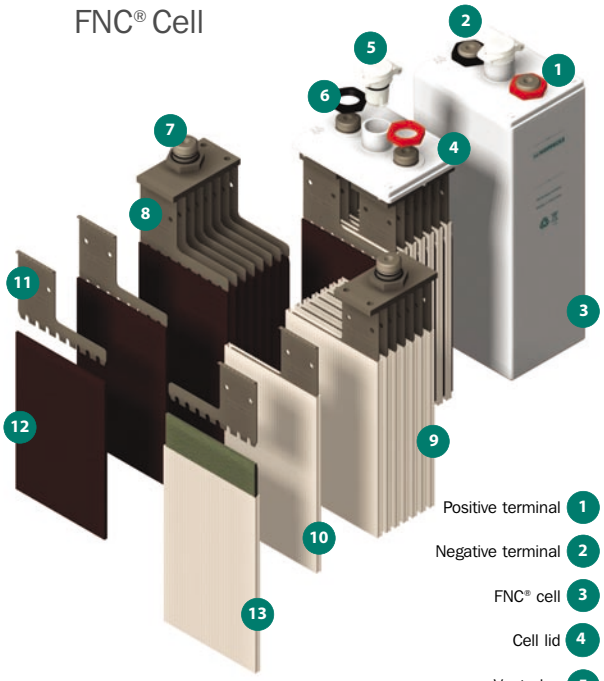
Vent plugs

Flip top vent plugs with flame arrestor make cell water refilling easy and protect the battery from external ignition.

Cell connectors

The cell connectors are made of nickel-plated copper with very low resistance and are screwed onto the cells so that they are easy to fit. Fully insulated connectors are supplied on request.

FNC® Cell



1 Positive terminal
2 Negative terminal
3 FNC® cell
4 Cell lid
5 Vent plug
6 Terminal screw
7 Terminal
8 Negative electrode package
9 Positive electrode package
10 Positive fibre structure electrode
11 Welding tab
12 Negative fibre structure electrode
13 Positive fibre structure electrode with separator

HOPPECKE FNC® is ideal for all standby applications from the Arctic to the desert as well as offshore installations

Operating and technical features

for FNC® batteries

Operating features

- Operating temperature range -50°C to +60°C
- Float charge: 1.40 to 1.45vpc
- Boost charge: 1.50 to 1.70vpc
- Recharge time to 90% available capacity: 7 – 8 hours at normal boost voltage
- Typical recharge currents 0.1xC_5A to 0.4xC_5A (higher charge currents are possible up to 10xC_5A – consult HOPPECKE Batterie Systeme for details)
- Cell jar / lid: translucent polypropylene
- Jar / lid seal: welded, leak proof
- Terminals: Nickel-plated steel
- Electrode design: Nickel-plated steel tab welded to the fibre structure
- Electrolyte: potassium hydroxide (density 1.19 kg/l)
- Charge factor of 1.2
- Microporous separators
- Designed and tested in accordance with IEC 60623

Technical features

Rated capacity
The rated capacity of the nickel cadmium battery is given in ampere-hours (Ah). It shows the amount of electricity which may be withdrawn from the battery after full charging, over a 5 hour discharge at 1.0vpc and at a temperature of +20ºC.

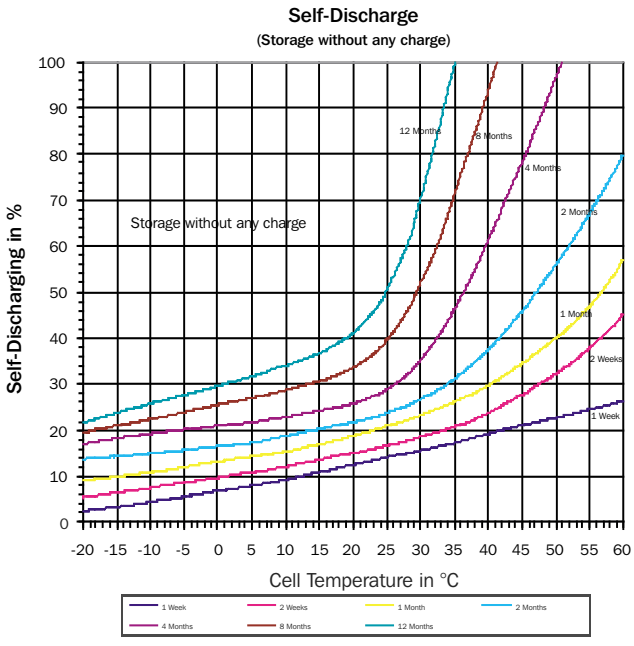
Cell voltage
The rated voltage for nickel cadmium batteries of 1.2 V is also the average voltage during discharge at the rated current of 0.2 C_5A.

Internal resistance and short-circuit current
The internal resistance of a cell depends on temperature and state of charge. For standard applications it is determined from the change in discharge voltage during a change in discharge current. The short-circuit current of a battery may be determined from the internal resistance.

The short-circuit current of a fully-charged FNC® battery varies between 10 times (L types) and 45 times (X types) the rated capacity in amperes.

Ambient temperature and output
The ambient temperature affects the efficiency of a battery. Temperature must therefore be taken into account in the design of a battery installation. Available capacity is reduced at low temperatures, while very high temperatures lower the efficiency of charging.

Self-discharge
During storage without float charging, all cells undergo self-discharge, which rises sharply at high temperatures. In the first weeks, self-discharge is relatively high, and then slows down over the duration of storage. The typical self-discharge of FNC® batteries is shown in the diagram below.



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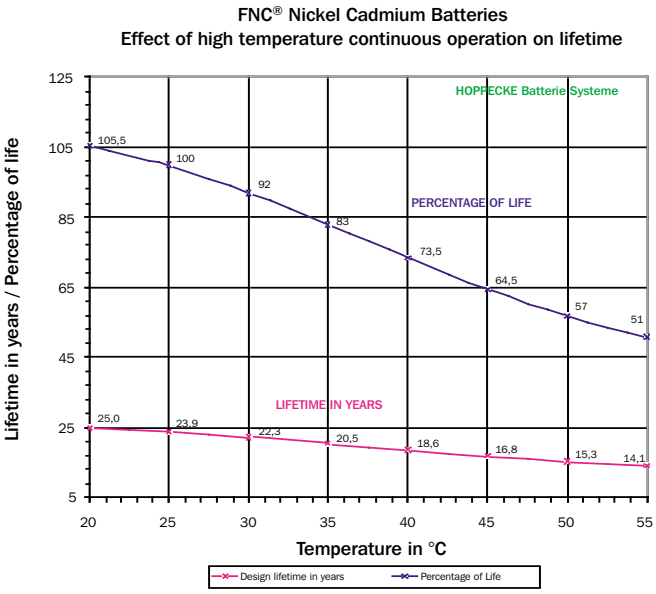
FNC®

FNC® batteries

give more power

FNC® Nickel Cadmium batteries have a better resistance to high temperature range



The HOPPECKE FNC® battery will usually give you more than 20 years of useful life. As with all battery systems, life expectancy is shortened by high temperatures. For a rise in temperature of 10ºC above the normal operating temperature of +20ºC, the life expectancy of an FNC® nickel cadmium battery is reduced by less than 10%. Conclusion: even at high temperatures, the HOPPECKE FNC® battery brings real economic benefits.

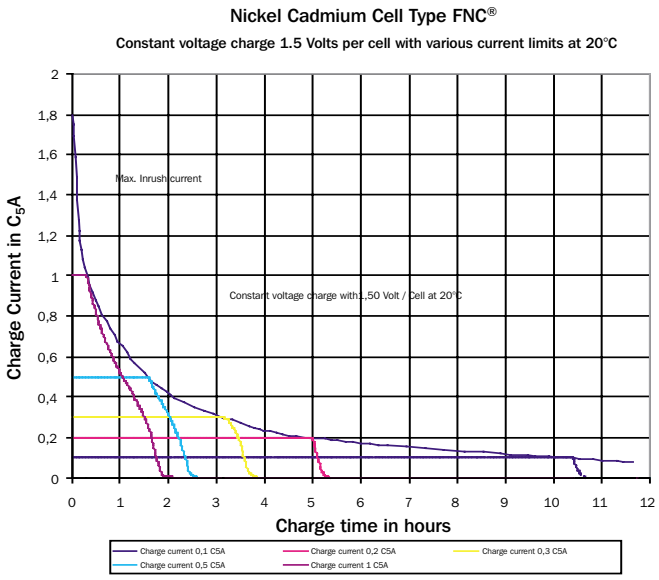
FNC® batteries may be charged at high current ratings

HOPPECKE FNC® batteries may be recharged at very high current levels, so that the battery is quickly available for further service. Boost charging or overcharging will not damage the battery, but only lead to slightly higher water consumption.

All common charging procedures may be used with HOPPECKE FNC® batteries. If the battery is charged separately, constant current may be used. Since in stationary applications the load is usually connected in parallel to the battery, charging in such cases is at constant voltage. At the same time a distinction is made between single-stage and two-stage charging. In the two-stage process, charging is initially at a high constant voltage, so that rapid charging of the battery takes place. The battery is then charged for a further period at a low float charging voltage, in order to minimise water consumption and the associated maintenance costs.

In single-stage charging, a single level of voltage is used. This is chosen so as to recharge the battery while minimising water consumption.

The graph below gives the charging times for various current limits. Clearly, if a lower value is set for the current, e.g. 0.1 C_5 amperes, then the battery will take longer to charge. If a higher current is used then it will charge more rapidly but less efficiently so that this is not a linear relationship.



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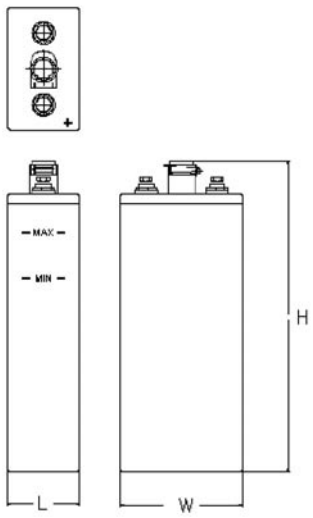
FNC® cell types available

Capacities, dimensions and weights

Type	Capacity C_5	Dimensions			Cell weight with electrolyte	Cell weight without electrolyte	Electrolyte quantity
		Lenghth L	Width W	Height H			
	[Ah]	[mm]	[mm]	[mm]	[kg]	[kg]	[litres]
FNC® L type							
FNC® 12 L	12	30	122	250	1.3	0.8	0.38
FNC® 37 L	37	47	122	250	2.1	1.6	0.42
FNC® 48 L	48	72	122	250	3.0	1.9	0.92
FNC® 60 L	60	72	122	250	3.2	2.2	0.84
FNC® 72 L	72	92	122	250	3.9	2.6	1.09
FNC® 22 L	22	30	122	309	1.5	1.0	0.42
FNC® 45 L	45	47	122	309	2.5	1.5	0.84
FNC® 66 L	66	47	122	309	2.7	1.8	0.76
FNC® 90 L	90	72	122	309	3.0	2.3	0.59
FNC® 110 L	110	72	122	309	4.1	2.9	1.01
FNC® 132 L	132	92	122	309	5.1	3.3	1.51
FNC® 154 L	154	92	122	309	5.4	3.7	1.43
FNC® 176 L	176	115	122	309	6.4	4.3	1.76
FNC® 198 L	198	115	122	309	6.9	5.2	1.43
FNC® 222 L	222	92	194	309	8.5	5.8	2.27
FNC® 259 L	259	92	194	309	8.8	6.4	2.02
FNC® 296 L	296	115	194	309	10.6	7.3	2.77
FNC® 333 L	333	115	194	309	10.9	7.9	2.52
FNC® 370 L	370	115	194	309	11.2	8.8	2.02
FNC® 407 L	407	155	198	309	14.1	10.1	3.36
FNC® 444 L	444	155	198	309	14.5	10.8	3.11
FNC® 481 L	481	155	198	309	14.8	11.5	2.77
FNC® 518 L	518	155	198	309	15.2	12.1	2.61
FNC® 560 L	560	157	157	405	18.5	13.9	3.87
FNC® 605 L	605	202	209	405	23.8	16.2	6.39
FNC® 660 L	660	202	209	405	24.3	17.2	5.97
FNC® 715 L	715	202	209	405	24.8	18.2	5.55
FNC® 770 L	770	202	209	405	25.3	19.3	5.04
FNC® 825 L	825	202	209	405	25.7	20.2	4.62
FNC® 880 L	880	202	209	405	26.2	21.2	4.20
FNC® 935 L	935	238	209	405	29.8	22.7	5.97
FNC® 990 L	990	238	209	405	29.6	23.0	5.55
FNC® 1045 L	1045	238	209	405	30.1	24.1	5.04
FNC® 1100 L	1100	238	209	405	30.6	25.1	4.62
FNC® M type							
FNC® 20 M	20	30	122	309	1.5	1.0	0.44
FNC® 40 M	40	47	122	309	2.6	1.7	0.76
FNC® 60 M	60	47	122	309	2.8	2.2	0.54
FNC® 80 M	80	72	122	309	4.2	2.9	1.09
FNC® 100 M	100	72	122	309	4.5	3.5	0.80
FNC® 120 M	120	92	122	309	5.6	4.1	1.24
FNC® 140 M	140	92	122	309	5.9	4.5	1.18
FNC® 160 M	160	115	122	309	7.1	5.2	1.64
FNC® 180 M	180	115	122	309	7.4	5.8	1.34
FNC® 200 M	200	92	194	309	8.5	6.0	2.10
FNC® 235 M	235	92	194	309	9.2	7.4	1.56
FNC® 265 M	265	115	194	309	10.0	7.1	2.44
FNC® 300 M	300	115	194	309	10.9	8.4	2.05
FNC® 340 M	340	157	157	405	15.5	10.0	4.62
FNC® 375 M	375	157	157	405	16.0	11.0	4.20
FNC® 415 M	415	157	157	405	16.3	11.6	3.87
FNC® 450 M	450	157	157	405	16.8	12.6	3.53

Type	Capacity C_5	Dimensions			Cell weight with electrolyte	Cell weight without electrolyte	Electrolyte quantity
		Lenghth L	Width W	Height H			
	[Ah]	[mm]	[mm]	[mm]	[kg]	[kg]	[litres]
FNC® H type							
FNC® 12 H	12	30	122	309	1.5	1.0	0.48
FNC® 23 H	23	30	122	309	1.8	1.3	0.37
FNC® 35 H	35	47	122	309	2.7	1.8	0.76
FNC® 46 H	46	47	122	309	3.0	2.3	0.64
FNC® 58 H	58	72	122	309	4.2	2.8	1.18
FNC® 69 H	69	72	122	309	4.4	3.1	1.09
FNC® 80 H	80	72	122	309	4.6	3.5	0.92
FNC® 93 H	93	92	122	309	5.6	4.0	1.43
FNC® 104 H	104	92	122	309	5.8	4.4	1.34
FNC® 115 H	115	115	122	309	6.6	4.5	1.81
FNC® 125 H	125	115	122	309	6.9	4.9	1.64
FNC® 135 H	135	115	122	309	7.0	5.3	1.51
FNC® 140 H	140	92	194	309	8.4	5.7	2.31
FNC® 160 H	160	92	194	309	8.7	6.3	2.10
FNC® 180 H	180	92	194	309	9.0	6.8	1.89
FNC® 200 H	200	115	194	309	10.5	7.5	2.82
FNC® 220 H	220	115	194	309	11.1	8.0	2.56
FNC® 240 H	240	115	194	309	11.4	8.6	2.44
FNC® X type							
FNC® 14 X	14	30	122	250	1.4	1.1	0.25
FNC® 28 X	28	47	122	250	2.5	1.9	0.48
FNC® 47 X	47	72	122	250	3.7	2.9	0.75
FNC® 66 X	66	92	122	250	5.0	3.9	0.99
FNC® 85 X	85	115	122	250	6.2	4.8	1.18
FNC® 20 X	20	30	122	309	1.8	1.3	0.40
FNC® 39 X	39	47	122	309	3.0	2.2	0.63
FNC® 65 X	65	72	122	309	4.6	3.4	0.97
FNC® 91 X	91	92	122	309	6.0	4.6	1.18
FNC® 117 X	117	115	122	309	7.5	5.7	1.51
FNC® 130 X	130	92	194	309	9.0	6.4	2.18
FNC® 142 X	142	92	194	309	9.3	6.9	2.06
FNC® 153 X	153	92	194	309	9.6	7.3	1.89
FNC® 165 X	165	115	194	309	11.2	8.0	2.73
FNC® 177 X	177	115	194	309	11.5	8.4	2.61
FNC® 189 X	189	115	194	309	11.8	8.8	2.48
FNC® 200 X	200	115	194	309	12.1	9.3	2.35



Tolerance:
Dimension: ± 1.5 mm
Weight/Volume: ± 3%

Subject to change without notice.

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Benefits that convince

worldwide

Long service life up to 25 years
Long service life can be achieved in standby operation because the electrolyte does not corrode the fibre plate as would occur in a lead acid system. Because of this, ageing effects at higher temperatures are significantly less than for other battery systems, resulting in lower life cycle costs.

Minimal maintenance requirements and high-current capability
The FNC® electrode structure, with an active fibre length of more than 300 m per cm^3 and a free volume of 90% for the active material, leads to low internal resistance and thus longer maintenance free intervals, high current loads and the option of applying lower capacities in comparison with other systems.

Lower operating costs
The graphite-free electrodes comprise pure active materials without any additives, so that no electrolyte change is needed during the entire service life. This leads to a significant reduction in operating costs and is more friendly to the environment.

High cycle resistance
The high elasticity of the conducting material ensures an excellent cycle resistance (over 3,000 cycles under EN) as well as a long service life. The thickness of the electrodes can be varied in a wide range, so that all types of batteries (X, H, M, L according to IEC EN 60623) can be made based on the fibre structured electrode. The FNC® cell is therefore the ideal choice of battery for every application.

Outstanding resistance to electrical and mechanical abuse

Excellent charge retention

Wide operating temperature range of -50°C to + 60°C
Ease of maintenance in stationary applications
Translucent polypropylene containers allow visibility of the electrolyte level, hence facilitating maintenance in stationary applications. Flip top vents assure an easy maintenance.

Predictable aging
Slow gradual decline in capacity with no sudden death near end of life

Meets High-quality standards
The products conform to IEC EN 60 623

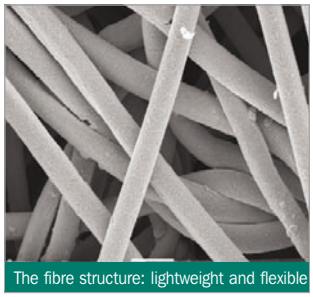
Extended storage capability


FNC® stationary battery system

FNC® technology: Enhanced performance compared with pocket plate technology

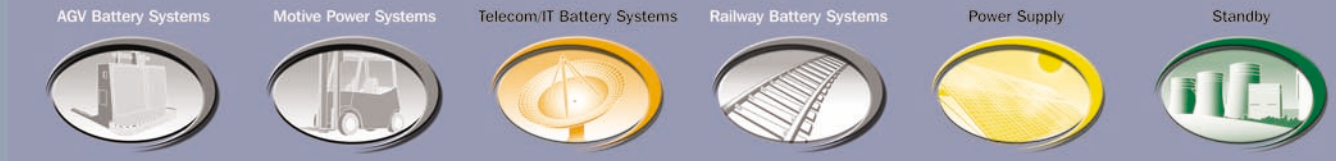
Low temperature tolerance
The FNC® battery electrode is highly conductive due to the active material being in direct contact with the current-carrying fibre substrate, which ensures a lower internal resistance. This results in considerably less derating of the battery in cold temperatures (90% of rated capacity are available at -20°C) compared to other battery technologies

Higher recharge efficiency
Because of the lower internal resistance enabling faster recharges to higher states of charge, the FNC® battery is 83% efficient on recharge as opposed to pocket plate batteries at 72%. The recharge factor for pocket plate is 1.4 times the capacity removed while for the FNC® cell it is only 1.2. The reduced current on both float and high rate charge also reduces the electrolysis of water, allowing extended watering intervals – up to 5 years on float service.


The fibre structure: lightweight and flexible

Extensive cycle life

The FNC® battery will produce app. 3,000 deep discharge cycles with a capacity loss of less than 20% of its nominal capacity. Because of the unique flexible fibre design, cycle life is extended three to four times as compared with other battery technologies. This extended cycle life makes the FNC® battery ideal for true cyclic applications.



HOPPECKE Batterie Systeme - worldwide

Products and services - the complete solution...

- Low-maintenance and no-maintenance batteries
- Innovative battery chargers based on the latest technology
- Battery accessoires • Battery management systems and software
- Battery changeover systems • Battery/charger servicing
- Battery recycling • Applications engineering and technology
- Battery room design • Technical training and seminars
- Leasing • Power by the hour

Your local Partner:

one name says it all!

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Form FNC® NiCd Battery EN/04.06/1 K Printed in Germany
All details in this brochure are based on state-of-the-art technology. Our products are subject to constant development. We therefore reserve the right to make changes.