



Similar to the illustration,  
equipment is optional.

## grid | power FNC

Fibre Nickel Cadmium

Battery systems  
for stationary applications

## Power is our passion ...

You are looking at the results of 90 years' work. 90 years of passion for innovative solutions for stationary power supplies – 90 years of German engineering skill and the aim of never being satisfied with what we have already achieved.

This is only possible thanks to the employees, who continuously support us along this path. Together with our business partners, we have continued to push the limits forwards and ensure that the impossibilities of yesterday have now become a jointly achieved reality.

Only through our partnership with you, we are able to create the perfect symbiosis of economically optimised solutions and state-of-the-art technological products.

With our structure of nearly 2000 employees at more than 20 locations around the world, we are always close to you and keep our finger on the pulse of pioneering innovations. Flexibility in the design of your projects and extremely reliable products are our every day aims. With highly available local service we have ensured a thorough understanding of your special challenges for decades.

**If you expect more than just a product but a competent partner who is always at your side, HOPPECKE is the right choice for you.**





# Stationary power supplies

## The HOPPECKE FNC-Technology.

In 1983, HOPPECKE presented a nickel-cadmium battery, that is still unique today: the fibre structure technology, in short FNC-Technology. The dense three-dimensional woven structure is extremely porous. Through this 90 % of the volume of the fibre electrodes can be filled with the active material. This metallised polypropylene woven fibre structure was originally designed for such demanding applications as aviation and aerospace as well as electric and hybrid vehicles. The key features compared to other technologies:

- Discharge and charge allow high to very high currents
- It requires only a small nominal capacity for high currents
- Simultaneously, the volume and weight savings are significant

### Reduce your costs by using the FNC-Technology!

The FNC fibre structure electrodes have a conductive nickel matrix. It is filled with the active material using a specially developed process. No additives such as graphite or iron are used. Throughout the entire operating-life of the batteries, there is no formation of carbonate in the electrolyte. The consequence: the electrodes do not age. In contrary to conventional nickel-cadmium batteries, electrolyte replacement throughout the entire operating-life of the batteries is not necessary.

### The FNC advantages at a glance

- Advanced battery technology for high demands
- Long service life and life-cycles, even under extreme temperature conditions
- Wide product range in the area of high energy density or of high power density for optimal adjustment of the battery to the customers' needs
- Fulfils the highest demands for shock and vibration resistance

The FNC cells can be operated reliably with the standard electrolyte in a temperature range from -25 °C to +60 °C. Using a special electrolyte, temperatures of even -50 °C are possible.

### Typical areas of application:

- Power plants and transformer plants
- Emergency power supply
- Telecommunication systems
- Signal and control systems
- Starting emergency power units



# Maximum safety

## Universally applicable!

Whenever maximum battery capacity is required, the fibre structure nickel-cadmium technology (FNC) is the optimal solution. Their electrochemical advantages ensure uninterrupted, safe operation: without the danger of a complete power failure or the risk of sudden battery failure. With the highest security for all applications, when the reliable operation of a system is essential.

### Four FNC battery types: For your individual application

HOPPECKE offers you four FNC battery types with different performance classes. They cover all applications:

#### X-Types

X-types have ultra-thin electrodes. They provide a very high short-term output. Typical applications: starting of engines and UPS systems.

#### H-Types

H-types are specialised for applications with discharge times of 30 minutes and higher required capacity. Typical applications: starting of engines, UPS systems and switchboards.

#### M-Types

M-types are designed for varying load requirements or mixed loads for discharge times from 30 minutes to 2 hours. Typical applications: emergency power supplies and switchboards.

#### L-Types

L-types are designed for general discharge characteristic curves with varying requirements, or for mixed loads. Discharge with high and low current density. Typical applications: emergency power supplies, switchboards and energy storage.

All applications at a glance	X-Types	H-Types	M-Types	L-Types
Starting of engines	x	x		
UPS	x	x	x	x
Switchboards		x	x	x
Emergency power supply			x	x
Energy storage				x

x = Standard application



# Advantages that pay off

- world-wide!

## Service life up to 25 years

The FNC-Technology has the advantage that the electrolyte does not corrode the fibre structure plate. This increases the service life of the cells significantly.

## Minimum maintenance required and capable of high currents

The FNC electrode structure has an active fibre length of more than 300 m<sup>3</sup> per cm and a free volume of 90 % for the active material. The advantages: lower internal resistance, longer service intervals and high current capability.

## Lower operating costs

The graphite-free FNC electrodes consist of pure active material without additives. During the entire service life of the battery, therefore, no change of the electrolyte is necessary. This significantly reduces the operating costs and protects the environment.

## High cycle life

The high elasticity of the conductive material not only ensures a long service life, but also an excellent cycle life (over 3,000 cycles under EN-60623).

## Robust against external influences

A big advantage is its excellent resistance against electrical and mechanical abuse.

## Wide operating temperature range

HOPPECKE FNC-Cells can be operated reliably in a temperature range from -25 °C to +60 °C. Using a special electrolyte, temperatures of even -50 °C are possible.

## Easy maintenance in stationary applications

In addition to the easy to open hinged lid plugs, the translucent polypropylene containers also make servicing easier for stationary use: they allow an easy check and correction of the electrolyte level.

## No sudden failure

The decrease in capacity towards the end of service life is slow and gradual, without the danger of sudden failure of the battery.

## Long shelf-life

Long shelf-life without loss of performance after putting into service.

## Our contribution to environmental protection: our own recycling concept

HOPPECKE Battery Systems makes a contribution in accordance with the EU guidelines for responsible handling of industrial batteries by meeting the recycling quota. We guarantee our customers that they can return spent nickel-cadmium batteries - regardless of the technology, the manufacturer or age of the batteries. For this we have developed and implemented our own recycling concept.





# Security in every detail

The high-quality parts and components

## Electrodes

The positive and negative electrodes of the FNC batteries consist of a nickel fibre structure with graphite-free active material. The special feature of the three-dimensional matrix, made from a nickel/fibre composite material, is its high elasticity: mechanical stresses and volume changes during charging/discharging are entirely absorbed by the electrodes. All HOPPECKE FNC cell electrodes are manufactured exclusively at the German site in Brilon, which is certified according to ISO 9001, ISO 14001, IRIS and ISO/TS 22163 (IRIS Rev.03), OHSAS 18001 and ISO 50001.

## Separators

The positive electrodes are covered by microporous separators. They separate the electrodes properly from each other and warrant a low internal resistance, which corresponds to the given operational demand levels.

## Electrolyte

The electrolyte is made from diluted potassium hydroxide with a density of 1.19 kg/l at 20 °C. HOPPECKE delivers the cells filled and charged. Optionally, the cells can also be supplied in filled and dry preloaded, or unfilled and dry preloaded condition. In the case of unfilled cells, the electrolyte is packed separately and ready to fill or supplied as a dry electrolyte.

## Container

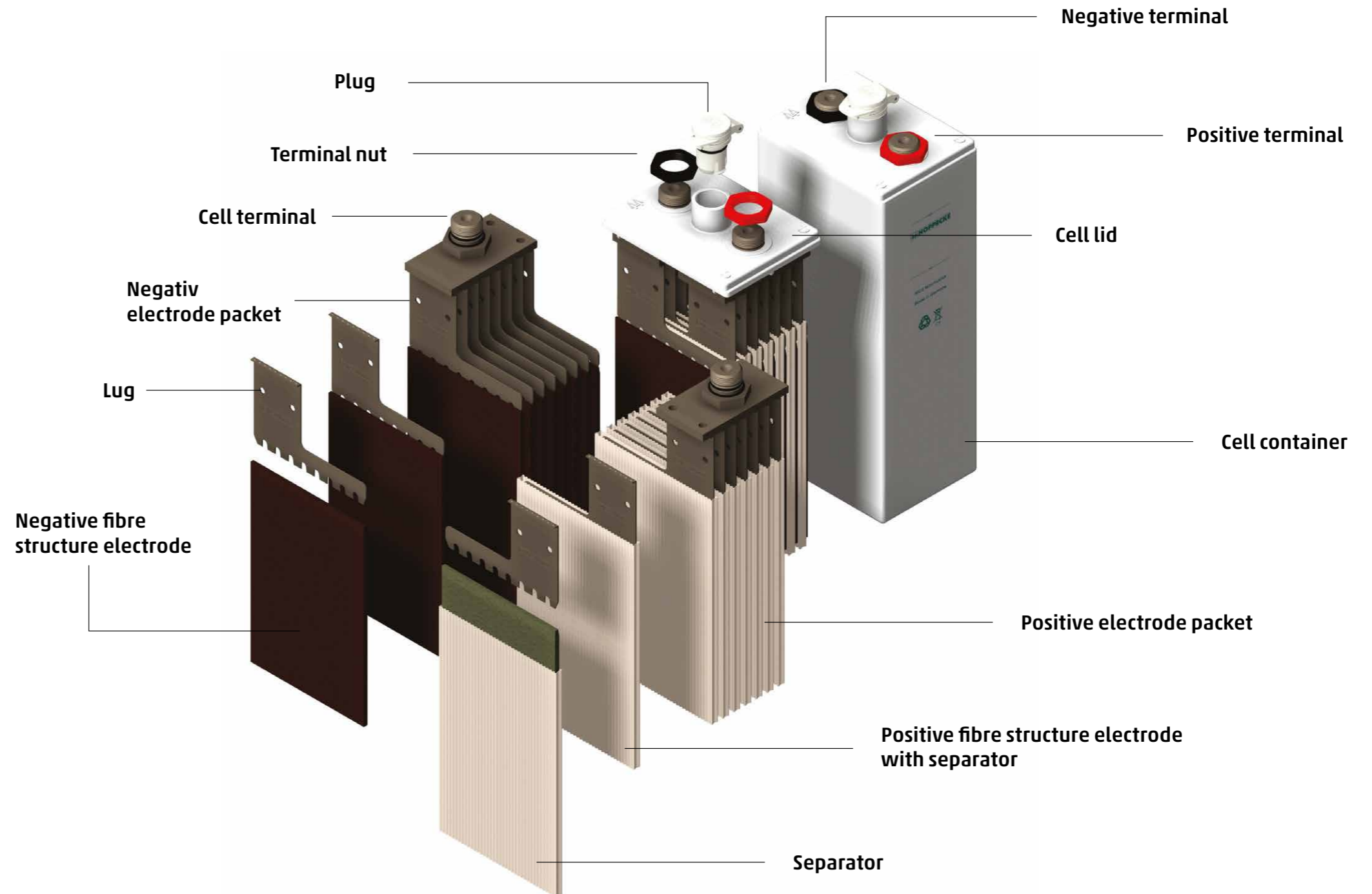
The battery container is made of robust, translucent polypropylene, which facilitates the checking of the electrolyte levels. Flame retardant material variants are also available on request. The containers and lids are welded together, ensuring that no gas or electrolyte can leak out. Double o-rings ensure good sealing at the terminal feedthroughs.

## Vent Plug

The hinged lid vent plugs and re-ignition protection make it easy to refill the cell. Furthermore, they protect the battery from external re-ignition.

## Connectors

The connectors are made of nickel-plated copper with extremely low resistance. For fitting they are simply screwed onto the cells. Insulated connectors are provided on request.





# Operational and technical characteristics

## Operating instructions

- Operating temperature range -25 °C to +60 °C (with special electrolyte up to -50 °C)
- Floating charge: 1.40 to 1.45 V/cell
- Boost charge: 1.50 to 1.60 V/cell
- Recharge time to 90 % of the available capacity: less than 5 hours at normal boost charge
- Typical recharge current 0.1 x C5 to 0.4 x C5 (Higher charge currents of up to 2.5 x C5 - details available on request)
- Cell container and lid made of translucent polypropylene
- Container and lid seal: welded shut
- Terminal: nickel plated steel
- Electrode design: contact lug out of nickel-plated steel welded to the fibre structure electrode
- Electrolyte: potassium hydroxide (density 1.19 kg/l at 20 °C)
- Microporous separators
- Designed and tested in accordance with IEC EN 60623

## Technical characteristics

### Nominal capacity

The nominal capacity of the nickel-cadmium battery is given in ampere-hours (Ah). It denotes the amount of electricity at +20 °C, which can be removed from the battery after a full charge with a 5-hour discharge to 1.0 V /cell.

### Cell voltage

The nominal voltage for nickel-cadmium batteries is 1.2 V, which corresponds to the average voltage during discharge at the rated current 0.2 C5.

### Internal resistance and short circuit current

The internal resistance of a cell depends on the temperature and state of charge. The short circuit current of a battery can be determined from the internal resistance. The short circuit current of a fully charged FNC battery is between the 10-fold (L-types) and the 40-fold (X-types) of the rated capacity in ampere.

### Ambient temperature and output

The ambient temperature affects the performance of a battery. The temperature therefore must be considered when designing a battery system. At low temperatures the available capacity is reduced. Charging at very high temperatures reduces the degree of charging efficiency.

### Self-discharge

If stored without charging all the cells are subjected to a self-discharge, which rises sharply at high temperatures. During the first weeks the self-discharge is relatively high and slows down over the storage period.

# Capacities, dimensions and weights

## Performance L

Model	Capacity C <sub>5</sub> (Ah)	Length (mm)	Width (mm)	Height (mm)	Weight of cell with electrolyte (kg)	Weight of cell without electrolyte (kg)	Filling capacity (l)
FNC 35 L	35	39	122	250	1.70	1.25	0.38
FNC 50 L	50	47	122	250	2.15	1.60	0.46
FNC 70 L	70	58	122	250	2.60	1.95	0.55
FNC 45 L	45	47	122	309	2.50	1.50	0.84
FNC 66 L	66	47	122	309	2.65	1.90	0.63
FNC 90 L	90	72	122	309	3.85	2.45	1.18
FNC 110 L	110	72	122	309	4.10	2.90	1.01
FNC 132 L	132	92	122	309	5.15	3.30	1.55
FNC 154 L	154	92	122	309	5.40	3.80	1.34
FNC 176 L	176	115	122	309	6.40	4.30	1.76
FNC 198 L	198	115	122	309	6.50	4.90	1.34
FNC 222 L	222	92	194	309	8.50	5.85	2.23
FNC 259 L	259	92	194	309	8.80	6.50	1.93
FNC 296 L	296	115	194	309	10.60	7.30	2.77
FNC 333 L	333	115	194	309	11.00	8.00	2.52
FNC 370 L	370	115	194	309	11.10	8.50	2.18
FNC 407 L	407	155	198	309	14.10	10.10	3.36
FNC 444 L	444	155	198	309	14.50	10.80	3.11
FNC 481 L	481	155	198	309	14.80	11.50	2.77
FNC 518 L	518	155	198	309	15.20	12.10	2.61
FNC 560 L	560	157	158	405	16.90	12.85	3.40
FNC 605 L	605	202	209	405	24.20	15.70	7.50
FNC 660 L	660	202	209	405	24.70	16.70	7.06
FNC 715 L	715	202	209	405	25.20	17.60	6.71
FNC 770 L	770	202	209	405	25.80	18.70	6.26
FNC 825 L	825	202	209	405	26.30	19.60	5.91
FNC 880 L	880	202	209	405	26.80	20.60	5.47
FNC 935 L	935	238	209	405	30.50	22.00	7.5
FNC 990 L	990	238	209	405	31.00	23.00	7.06
FNC 1045 L	1045	238	209	405	31.50	24.00	6.62
FNC 1100 L	1100	238	209	405	32.10	25.00	6.26

## Performance M

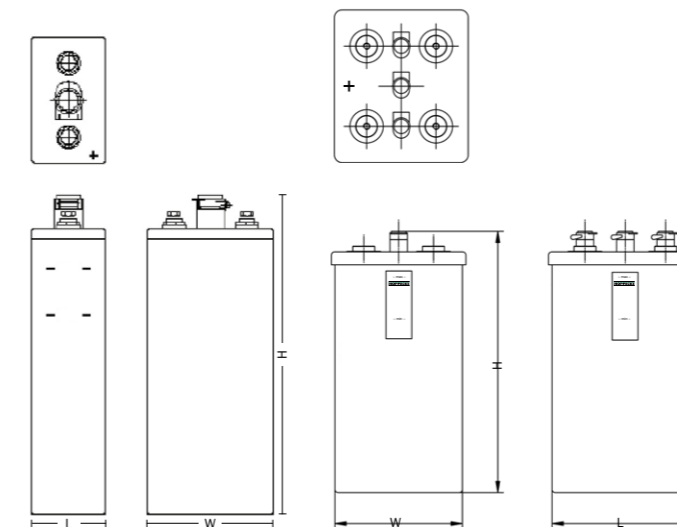
Model	Capacity C <sub>5</sub> (Ah)	Length (mm)	Width (mm)	Height (mm)	Weight of cell with electrolyte (kg)	Weight of cell without electrolyte (kg)	Filling capacity (l)
FNC 40 M	40	47	122	309	2.60	1.60	0.84
FNC 60 M	60	47	122	309	2.80	2.15	0.55
FNC 80 M	80	72	122	309	3.95	2.70	1.05
FNC 100 M	100	72	122	309	4.15	3.10	0.88
FNC 120 M	120	92	122	309	5.35	3.65	1.43
FNC 140 M	140	92	122	309	5.60	4.15	1.22
FNC 160 M	160	115	122	309	6.65	4.75	1.60
FNC 180 M	180	115	122	309	6.90	5.20	1.43
FNC 200 M	200	92	194	309	8.70	6.25	2.06
FNC 235 M	235	92	194	309	8.85	6.75	1.76
FNC 265 M	265	115	194	309	10.50	8.00	2.10
FNC 300 M	300	115	194	309	11.20	8.90	1.93
FNC 340 M	340	157	158	405	15.05	9.60	4.58
FNC 375 M	375	157	158	405	15.55	10.40	4.33
FNC 415 M	415	157	158	405	16.05	11.20	4.08
FNC 450 M	450	157	158	405	16.55	12.00	3.82

## Performance H

Model	Capacity C <sub>5</sub> (Ah)	Length (mm)	Width (mm)	Height (mm)	Weight of cell with electrolyte (kg)	Weight of cell without electrolyte (kg)	Filling capacity (l)
FNC 35 H	35	47	122	309	2.60	1.70	0.76
FNC 46 H	46	47	122	309	2.80	2.00	0.67
FNC 58 H	58	72	122	309	3.95	2.55	1.18
FNC 69 H	69	72	122	309	4.15	2.85	1.09
FNC 80 H	80	72	122	309	4.30	3.20	0.92
FNC 93 H	93	92	122	309	5.40	3.70	1.43
FNC 104 H	104	92	122	309	5.55	3.95	1.34
FNC 115 H	115	115	122	309	6.60	4.45	1.81
FNC 125 H	125	115	122	309	6.90	4.95	1.64
FNC 135 H	135	115	122	309	7.05	5.25	1.51
FNC 140 H	140	92	194	309	8.45	5.70	2.31
FNC 160 H	160	92	194	309	8.75	6.25	2.10
FNC 180 H	180	92	194	309	9.00	6.75	1.89
FNC 200 H	200	115	194	309	10.85	7.50	2.82
FNC 220 H	220	115	194	309	11.10	8.05	2.56
FNC 240 H	240	115	194	309	11.45	8.55	2.44

## Performance X

Model	Capacity C <sub>5</sub> (Ah)	Length (mm)	Width (mm)	Height (mm)	Weight of cell with electrolyte (kg)	Weight of cell without electrolyte (kg)	Filling capacity (l)
FNC 28 X	28	47	122	250	2.50	1.90	0.50
FNC 47 X	47	72	122	250	3.70	2.90	0.67
FNC 66 X	66	92	122	250	5.00	3.90	0.92
FNC 85 X	85	115	122	250	6.20	4.80	1.18
FNC 39 X	39	47	122	309	2.95	2.20	0.63
FNC 65 X	65	72	122	309	4.55	3.40	0.97
FNC 91 X	91	92	122	309	6.00	4.60	1.18
FNC 117 X	117	115	122	309	7.50	5.70	1.51
FNC 130 X	130	92	194	309	9.00	6.40	2.18
FNC 142 X	142	92	194	309	9.30	6.85	2.06
FNC 153 X	153	92	194	309	9.55	7.30	1.89
FNC 165 X	165	115	194	309	11.20	7.95	2.73
FNC 177 X	177	115	194	309	11.50	8.40	2.61
FNC 189 X	189	115	194	309	11.75	8.80	2.48
FNC 200 X	200	115	194	309	12.10	9.30	2.35



Technical changes reserved.

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