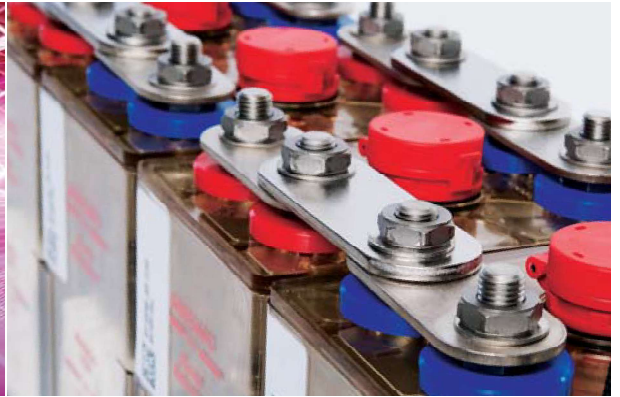


SMRX-F3 Ni-Cd battery

Clearly the superior compact high-power railway battery

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Saft: Moving ahead with North America's railway industry

Saft has worked in close cooperation with North America's leading railway OEMs and operators for over 50 years. Through its Valdosta (USA) factory it designs, develops and manufactures leading-edge battery technologies and fully integrated systems that meet the complex and evolving demands of modern rail networks for reliable, safe and cost-effective on-board power.

SMRX-F3: the clear choice

The SMRX-F3 combines the reliability and long-life of Saft's Ni-Cd technology with the proven performance of Sintered/Plastic Bonded Electrode (S/PBE) construction. The result is an ultra-light and compact cell housed in a transparent and flame retardant polysulfone container. At 30% lighter and more compact than other Ni-Cd batteries, the SMRX-F3 offers significant increases in passenger carrying capacity, while ensuring enhanced comfort and safety.

Saft nickel-based technology – the first choice for railway applications

Saft's legendary nickel-based technology is used by the vast majority of the US transit authorities due to its robustness, reliability and service life. It is the benchmark technology for difficult and demanding applications, such as those found in the railway industry, where it delivers long life, excellent cycling capability and low maintenance.

SMRX-F3: Purpose-designed for backup and diesel engine starting



Saft has engineered the SMRX-F3 cell to meet the specific needs of North America's OEMs and railway operators for reliable onboard backup power and instant diesel engine starting.

Dependable backup for regular and high energy applications

SMRX-F3 is a highly compact, lightweight and adaptable Ni-Cd Sintered/Plastic Bonded Electrode (S/PBE) cell developed to support on-board electrical systems on a wide variety of modern rolling stock from light-rail and metros to high-speed intercity trains.

SMRX-F3 battery systems deliver reliable, high-energy backup power that ensures:

- Passenger safety and comfort: lighting, door control, ventilation, communication and WiFi systems
- Fail-safe train start-up: pantograph lifting, computer and electronic systems

Totally reliable diesel engine starting

SMRX-F3 delivers excellent high-power performance for engine starting on DMUs (Diesel Multiple Units) and locomotives. For railway operators it ensures:

- Totally reliable engine starting - even at very low temperatures
- The capability for frequent starting operations within a daily schedule. This meets the growing demand to stop the engine whenever possible, such as when waiting at a station, to reduce fuel consumption, noise and emissions



SMRX-F3 Ni-Cd battery - Clearly the superior compact high-power railway battery

SMRX-F3: The ideal choice for compact high-power applications



Reduced installation footprint and lower weight

Compared to a conventional Ni-Cd battery, the compact SMRX-F3 design offers an overall 30% reduction in volume and weight due to:

- Compact and lightweight S/PBE plate technology
- An ultra-thin separator

This enables OEMs and railway operators to specify the ideal onboard battery system to make optimum use of their available installation envelope.

Reduced maintenance and replacement costs

SMRX-F3 batteries deliver an exceptional return on investment thanks to their very low Life Cycle Cost (LCC), based on a superior design that outlasts all other types of batteries while drastically reducing maintenance.

- Saft S/PBE Ni-Cd technology is field-proven to last over 15 years, with no risk of 'sudden death' failure
- Transparent plastic containers make electrolyte levels immediately visible
- Topping-up with water every two years

Delivering high-power performance in demanding applications

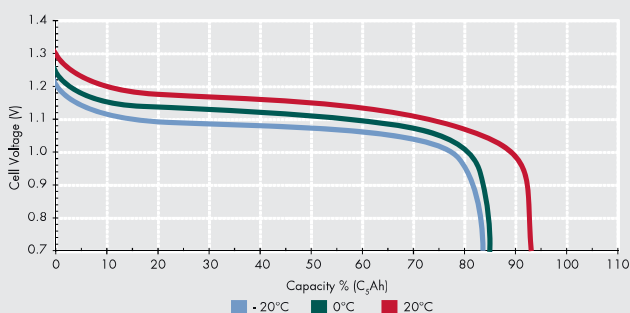
SMRX-F3 has been developed to deliver an exceptional performance in demanding rail applications:

- For instant diesel engine starting - high current discharges up to 8 times the capacity for up to 1 minute at -20°C
- For peak power backup - discharges up to 5 times the capacity for 3 minutes
- Operating temperatures from -30°C to +50°C and resisting extremes from -50°C to +70°C

SMRX-F3 Ni-Cd battery

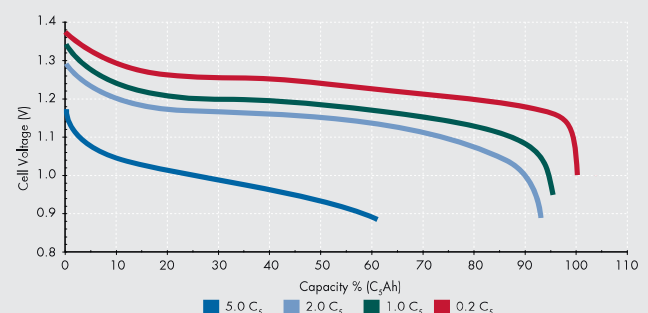
Excellent discharge behaviour at various temperatures

SMRX-F3 discharge capacity at 2 C₅Ah at +20°C, 0°C, and -20°C after charging according to IEC 60623 and a 24h rest



Electrical characteristics from 0.2 C₅Ah to 5 C₅Ah

SMRX-F3 discharge capacity at 20°C after charging according to IEC 60623 and a 1h rest



SMRX-F3: Clearly visible quality

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▶ SMRX-F3 cells are housed in transparent polysulfone containers and are assembled in stainless steel crates with lifting handles creating a rugged battery system that has proven itself over many decades of utilization in the railway industry.

Full conformity with quality, safety and environmental standards

Electrical: IEC 60623 (cells exceed H type performance levels), UIC 854 R

Flammability, smoke emission and toxicity: NFPA130 (ASTM E 162, ASTM E 662), Boeing BSS7239

Shock & vibration: IEC 61373

Quality: ISO 9001, Saft world class continuous program

Environment: Fully recyclable, RoHS



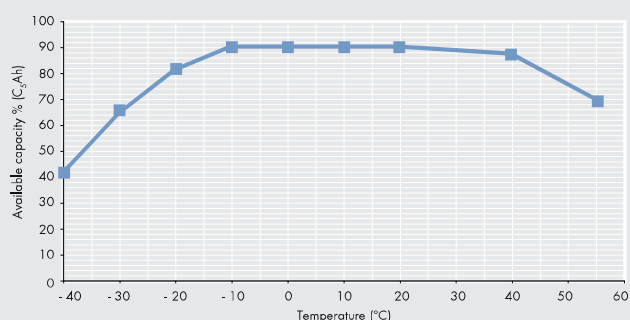
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Physical Characteristics

Cell type	Capacity (Ah)	Electrolyte reserve (cm ³)	Weight of cell (kg)	Width including crate (mm)	Height including crate (mm)	Length including crate (mm)			Weight including crate (kg)		
						2 cells	3 cells	5 cells	2 cells	3 cells	5 cells
SMRX160 F3	160	668	7	167	337	170	251	414	16	24	40
SMRX180 F3	180	668	7	167	337	170	251	414	16	24	40
SMRX200 F3	200	792	8	167	337	199	295	485	19	28	46
SMRX230 F3	230	792	9	167	337	199	295	485	20	29	48
SMRX260 F3	260	1041	10	167	337	239	355	590	23	34	56
SMRX290 F3	290	1040	11	167	337	239	355	590	23	37	61
SMRX320 F3	320	1206	12	171	326	286	426	704	27	40	66
SMRX360 F3	360	1187	13	171	326	286	426	704	28	42	69

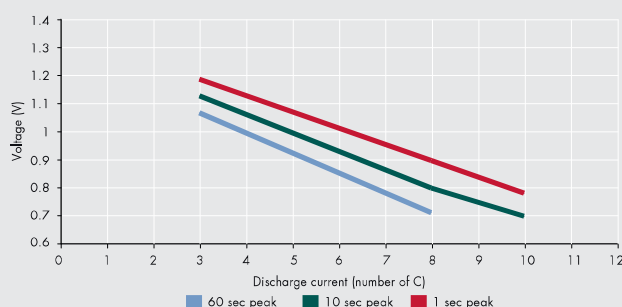
Efficient chargeability over an extended temperature range

SMRX-F3 chargeability at 1.47 V (with temperature compensation)



High rate discharge for instant starting

SMRX-F3 peak discharge during 1 s, 10 s and 60 s at -20°C after IEC 60623 charge and a 16 h rest



Saft is committed to the highest standards of environmental stewardship

As part of its environmental commitment, Saft gives priority to recycled raw materials over virgin raw materials, reduces its plants' air and water releases year after year, minimizes water usage, reduces fossil energy consumption and associated CO₂ emissions, and ensures that its customers have recycling solutions for their spent batteries.

Regarding industrial Ni-Cd batteries, Saft maintains long standing partnerships with collection companies in most EU countries, in North America and in other countries. This collection network receives and dispatches our customers' batteries at the end of their lives to fully approved recycling facilities, in compliance with the laws governing trans-boundary waste shipments.

This collection network is undergoing minor adaptations to meet the requirements of the EU batteries directive. A list of our collection points is available on our web site. In other countries, Saft assists users of its batteries in finding environmentally sound recycling solutions. Please contact your sales representative for further information.



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