

# MSX – Ni-Cd battery

## Compact high power for railways

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September 2009



# Advanced Ni-Cd batteries

## For railway backup and starting...

### As the world demands more from its railways...

To consolidate their leadership positions and plan for a strong future, railway manufacturers and operators aim to maximise train availability, improve safety and comfort, increase passenger numbers and simultaneously rationalise overall costs.

Saft's expertise in on-board applications is defined by long standing, high level relationships with key market leaders who demand:

- reliable power solutions,
- reduced weight and volume of on-board components,
- low maintenance and improved battery efficiency.

Saft understands that continuity of service is essential. Saft's full range of railway batteries assures totally reliable backup as well as high power for diesel engine starting.

### ...MSX provides high power in a compact package

MSX is Saft's direct response to the ever increasing demands of the rail industry.

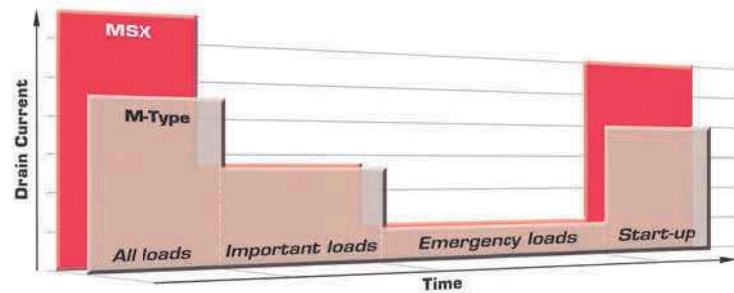
It delivers the high power energy essential for electrical system backup, including magnetic braking and diesel engine starting.

MSX is designed to offer a high power battery within a lightweight, space saving and low maintenance module that is ideally suited for tram-trains, tramways, high speed trains, EMUs, locomotives and DMUs.

#### MSX provides high power energy for electric trains and trams to:

- cover demanding full load backup sequences
- feed magnetic braking, especially at low voltage
- support short duration backup at low temperatures.

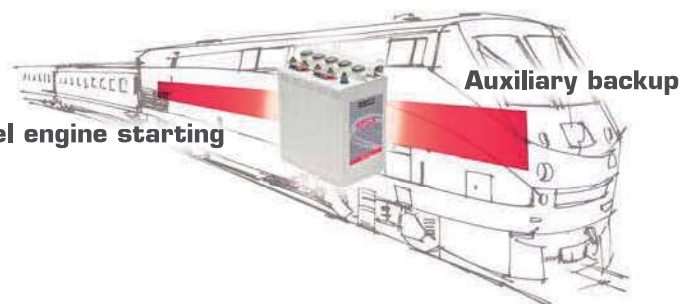
#### MSX improves the power capability of backup batteries



MSX versus standard M-type product with equal capacity for a typical backup load profile

#### MSX delivers high power energy for DMUs and Diesel locomotives to:

- save volume and weight with a compact starting battery,
- ensure both starting and backup with a single battery.



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“ Key to Saft's success are advanced battery technology, high service levels and local support. ”

# MSX – compact, high power

## Extended customer benefits

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### Compact design

- 30% weight and 40% volume saving over conventional H-type S/PBE Ni-Cd,
- block concept for space optimization,
- reduces the total weight of a battery raft.

### High power performance

- designed for 5 C<sub>5</sub>Ah continuous and 10 C<sub>5</sub>Ah peak discharges,
- wide operating temperature range: - 30°C to + 50°C,
- resistant to extreme temperatures from - 50°C to + 70°C.

### Minimal and easy maintenance

- 2 years topping up interval,
- integrated water filling system,
- maintenance-free storage.

### Field-proven reliability and safety

- robust Sintered/PBE technology,
- resistant to heavy cycling applications,
- railway shocks and vibrations proven resistance.

### Low LCC<sup>(1)</sup> and LCA<sup>(2)</sup>

- reliable service for 15 years,
- no sudden death,
- fully recyclable.

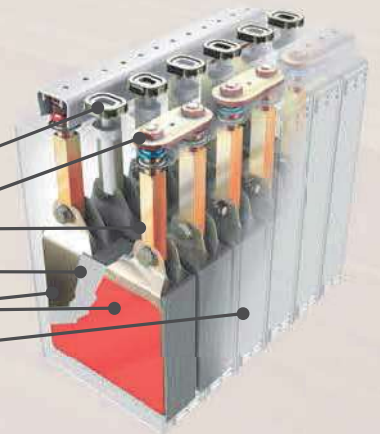
Integrated water filling system

High conductivity connectors and terminals

Ultra thin membrane separator

High power plates

Flame retardant plastic container



<sup>(1)</sup> Life Cycle Cost <sup>(2)</sup> Life Cycle Assessment



MSX is **compact**, **weight-saving** and exceptionally **reliable** with **low LCC** – perfect for our project.



# MSX

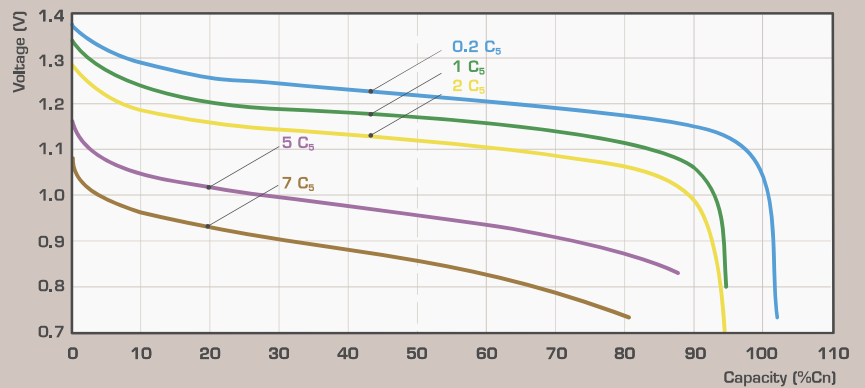
...with enhanced electrical performance...



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## Ideal electrical characteristics from 0.2 C<sub>5</sub>Ah to 7 C<sub>5</sub>Ah

MSX discharge capacity at 0.2 C<sub>5</sub>Ah, 1 C<sub>5</sub>Ah, 2 C<sub>5</sub>Ah, 5 C<sub>5</sub>Ah and 7 C<sub>5</sub>Ah at 20°C after charging according to IEC 60 623, 1 h rest



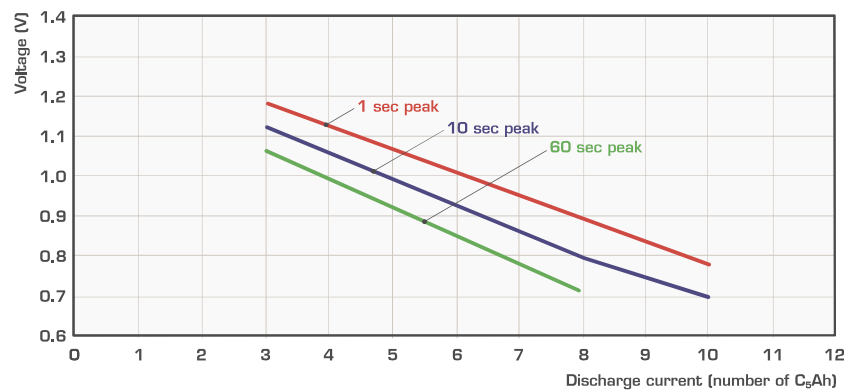
- Cell voltage: 0.85 V at 50% SOC under 7 C<sub>5</sub>Ah discharge current (IEC 60 623 rated capacity; temperature at + 20°C)
- At 0.85 V and 20°C: 85% of IEC 60 623 capacity at 5 C<sub>5</sub>Ah discharge, and 50% of IEC capacity at 7 C<sub>5</sub>Ah discharge

“ Saft's batteries deliver **reliable high performance** for both **backup** and **starting** on our trains. ”

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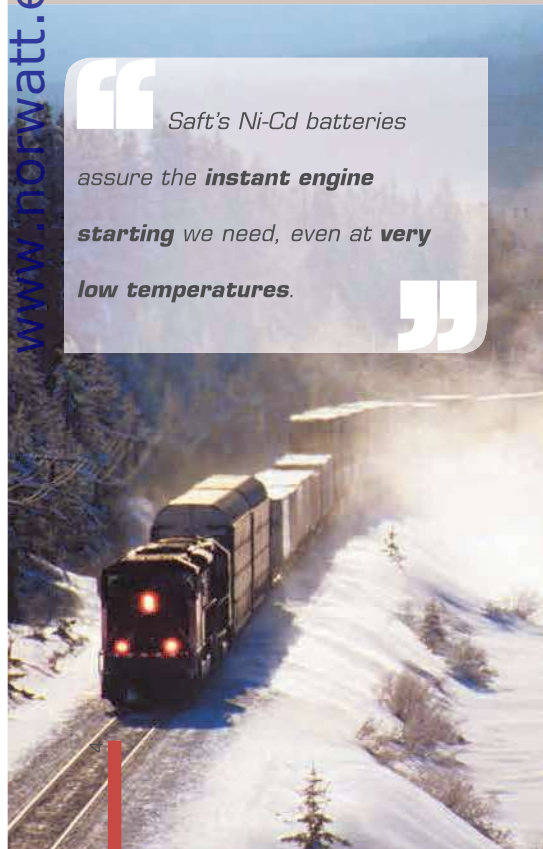
## High rate discharge for instant starting

MSX peak discharge during 1 s, 10 s and 60 s at - 20°C after IEC 60 623 charge, 16 h rest



For a fully charged battery at - 20°C and voltage at 0.85 V:

- 7 C<sub>5</sub>Ah discharge rate during 10 s
- 9 C<sub>5</sub>Ah discharge rate during 1 s



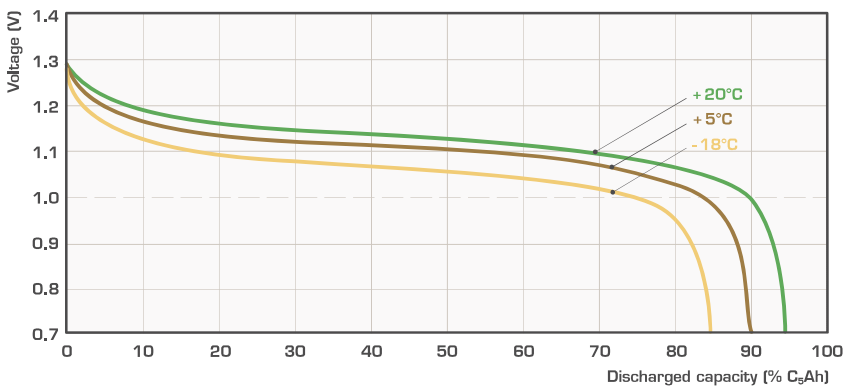
“ Saft's Ni-Cd batteries assure the **instant engine starting** we need, even at **very low temperatures**. ”

# MSX

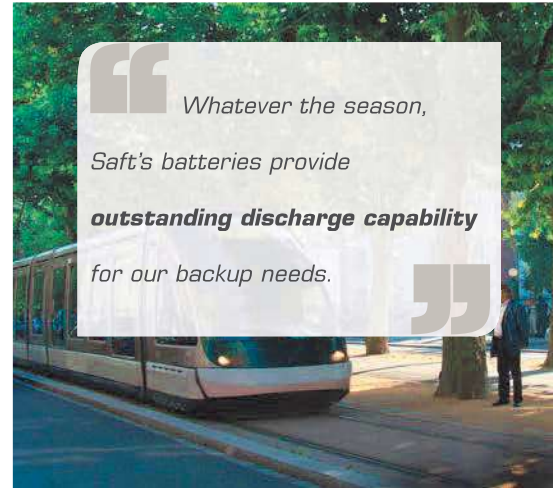
...to meet customers' requirements

## Excellent discharge behaviour at various temperatures

MSX discharge capacity at 2 C<sub>5</sub>Ah at + 20°C, + 5°C, and - 18°C after charging according to IEC 60 623, 24 h rest

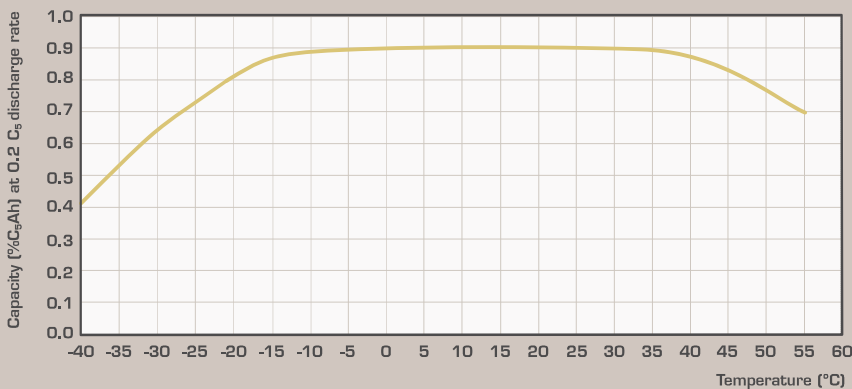


- 90% of rated capacity available at 2 C<sub>5</sub>Ah discharge rate (temperature at + 20°C and cut-off voltage of 1 V)
- Over 80% of this capacity level available at - 18°C



## Efficient chargeability over an extended temperature window

MSX chargeability at 1.47 V (and temperature compensation)



- Constant voltage full charge reference: 90% from - 10°C to + 30°C
- 80% of this level of charge reached at - 25°C



Excellent chargeability at low temperatures means we no longer oversize our batteries.

# MSX

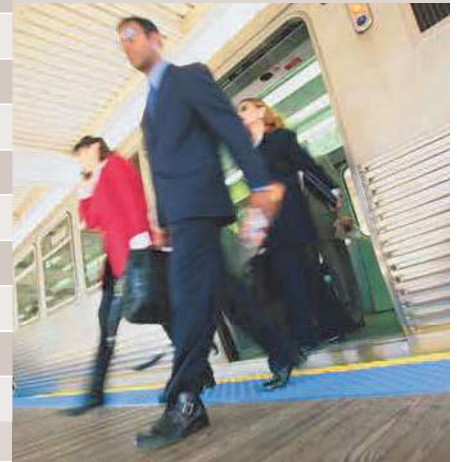
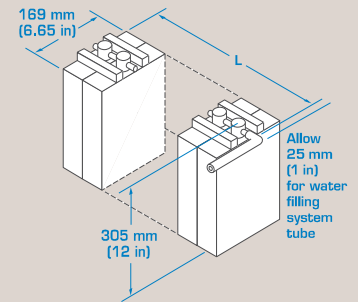
## Extensive capacity range

### Physical properties

Inner dimensions for assembly in tray

Block type	Ah	Reserve (cm <sup>3</sup> )	Length (mm)				Weight (kg)			
			3 cells	4 cells	5 cells	10 cells	3 cells	4 cells	5 cells	10 cells
MSX 70	70	375		158	196	384		13	16	32
MSX 80	80	375		158	196	384		13	16	33
MSX 90	90	370		158	196	384		14	18	35
MSX 100	100	465		189	234			16	20	
MSX 115	115	460		189	234			18	21	
MSX 130	130	520		209	259			19	23	
MSX 145	145	750		309	384			27	32	
MSX 160	160	750		309	384			27	33	
MSX 180	180	740		309	384			29	35	
MSX 200	200	930	279	370			24	32		
MSX 230	230	920	279	370			25	34		
MSX 260	260	1040	310	411			28	37		

### Dimensions



### Stringent quality standards

Electrical	Over "H" type according to IEC 60 623
Fire and smoke	NFF 16 101-16 102, DIN 5 510, UNI CEI 11 170-3, UL 94-V0
Shock and vibration	IEC 61 373
Quality	ISO 9 001, IRIS
Environment	RoHS, fully recycled, ISO 14 001
Management Process	World Class continuous improvement program



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Doc N° 21783-2-0909  
Edition: September 2009

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Published by the Communications Department.

Photo credit: Bombardier Transportation, J.Isenmann, Photodisc, Reflexstock, Saft, Stockbyte/Datacraft/imagenavi/Getty Images, VIA.

Société anonyme au capital de 31 944 000 €  
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