**MSX – compact, high power**

**Extended customer benefits**

- Low LCC(1) and LCA(2) reliable service for 15 years,
  - no sudden death,
  - fully recyclable.

**Compact design**
- 30% weight and 42% volume saving over conventional H-type S/PBE Ni-Cd,
- basic concept for space optimization,
- reduces the total weight of a battery raft.

**High power performance**
- designed for 5 C/H continuous and 10 C/H 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 Brexit/PBE technology,
- resistant to heavy cycling applications, railway shocks and vibrations proven resistance.

**Low LCC(1) and LCA(2)**

<table>
<thead>
<tr>
<th>Physical properties</th>
<th>Dimensions</th>
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<tr>
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**Stringent quality standards**

- Electrical: Direct "H" type according to IEC 62 623
- Fire and smoke: NFF 16 121-16 132, DIN 5 510, UNI CEI 11 1 753-3, UL 94-V0
- Shock and vibration: IEC 61373
- Quality: ISO 9001, IRIS
- Environment: RoHS, fully recycled, ISO 14 001
- Management Process: World Class continuous improvement program

---

1. Life Cycle Cost
2. Life Cycle Assessment

---

**MSX – Ni-Cd battery**

**Compact high power for railways**
Advanced Ni-Cd batteries

For railway backup and starting...

MSX

...with enhanced electrical performance...

MSX

...to meet customers’ requirements

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, key market leader with high service levels and local support, assures totally reliable backup full range of railway batteries of service is essential. Saft’s Saft understands that continuity demand:

...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, trams, trains, high speed trains, DMUs, locomotives and DBMs.

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

Saft’s batteries deliver reliable high performance for both backup and starting on our trains.

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.

MSX versus standard M-type product

MSX delivers standard Mixtape product with equal capacity for a typical backup load profile

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

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

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MSX - compact, high power
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Compact design
- 30% weight and 40% volume saving over conventional H-type S/PBE Ni-Cd,
- basic concept for space optimization,
- reduces the total weight of a battery raft.

High power performance
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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,
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- railway shocks and vibrations proven resistance.

Low LCC(1) and LCA(2)
- reliable service for 15 years,
- no sudden death,
- fully recyclable.

Extended capacity range

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- Shock and vibration: IEC 61 373
- Quality: ISO 9 001, IRIS
- Environment: NH3, fully recycled, ISO 14 001
- Management Process: World Class continuous improvement program

MSX – Ni-Cd battery
Compact high power for railways

Safe Batteries
Industrial Battery Group
12, rue Sadi Carnot
93170 Bagnolet - France
Tel: +33 1 49 93 19 18
Fax: +33 1 49 93 19 64
www.saftbatteries.com

Copyright © 2009 Saft Batteries

MSX is compact, weight-saving and exceptionally reliable with low LCC – perfect for our project.
Advanced Ni-Cd batteries
For railway backup and starting...

MSX
...with enhanced electrical performance...

MSX
...to meet customers’ requirements

---

**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 railway applications is defined by long standing, high level relationships with key market leaders, and market driven innovation. 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, DMUs, locomotives and railcars. MSX provides high power energy for electric trains and trams to:

- cover demanding full load backup sequences
- feed magnetic braking, especially at low voltage
- cover very demanding full load backup sequences
- support short duration backup at low temperatures
- deliver the high power energy essential for electrical system backup
- improve the power capability of backup batteries

MSX provides reliable high performance for both backup and starting on our trains.

**Excellent discharge behaviour at various temperatures**

MSX discharge capacity at 2 C•5Ah at +20°C, +5°C and -18°C after charging according to IEC 60 623, 84 h rest.

**Efficient chargeability over an extended temperature window**

MSX chargeability at 1.47 V (and temperature compensation) at low temperature means we no longer oversize our batteries.

**Ideal electrical characteristics from 0.2 C•5Ah to 7 C•5Ah**

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

**High rate discharge for instant starting**

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

- 7 C•5Ah discharge rate during 10 s
- 9 C•5Ah discharge rate during 1 s

**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

**Saft’s Ni-Cd batteries deliver reliable high performance for both backup and starting on our trains.**

**MSX venture standard Migrate product with equal capacity for a typical backup load profile**

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

**Key to Saft’s success are: advanced battery technology, high service levels and local support**

**MSX discharges at 1.47 V (and temperature compensation) at low temperature means we no longer oversize our batteries.**

**Whatever the season, Saft’s batteries provide outstanding discharge capability for our backup needs.**

---

**For railway backup and starting...**

**Advanced Ni-Cd batteries**

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Advanced Ni-Cd batteries
For railway backup and starting...

As the world demands more from its railways...
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MSX improves the power capability of backup batteries
MSX delivers high power density and high reliability batteries to:
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As Saft’s Ni-Cd batteries ensure the instant engine starting we need, even at very low temperature.

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Low LCC(1) and LCA(2)
- reliable service for 15 years;
- no sudden death;
- fully recyclable.

Integrated water filling system
- high conductivity connections and terminals
- high power plates
- flame retardant plastic container

MSX – Ni-Cd battery
Compact high power for railways

Physical properties

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<tr>
<th>Block type</th>
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MSX – Extensive capacity range

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