SMRX-F3 Ni-Cd batteries

Installation and operating instructions

Important recommendations

- **Never allow an exposed flame or spark near the batteries, particularly while charging.**
- **Never smoke while performing any operation on the battery.**
- **For protection, wear rubber gloves, long sleeves, and appropriate splash goggles or face shield.**
- **The electrolyte is harmful to skin and eyes. In the event of contact with skin or eyes, wash immediately with plenty of water. If eyes are affected, flush with water and obtain immediate medical attention.**
- **Remove all rings, watches and other items with metal parts before working on the battery.**
- **Use insulated tools.**
- **Avoid static electricity and take measures for protection against electric shocks.**
- **Discharge any possible static electricity from clothing and/or tools by touching an earth-connected part «ground» before working on the battery.**

1. Receiving the shipment

Unpack the battery immediately upon arrival. Do not overturn the package. SMRX-F3 batteries are usually shipped discharged and filled with electrolyte ready for installation.

- Make sure all items have been received by comparing with the packing list.
- Check for damage or electrolyte spillage. Report any irregularities to the carrier and to Saft.

A charged battery can be installed immediately. Refer to Section 4 for applicable Commissioning. Always refer to Section 2 for Storage conditions.

2. Storage

Store the battery indoors in a dry, clean, cool location (0°C/+32°F to +30°C/ +86°F).

- Do not expose the batteries to direct sunlight or excessive heat.
- A battery delivered discharged and filled may be stored for many years before it is installed.
- A battery charged (80 %) must not be stored more than 3 months up to +30°C (86°F), or more than 6 months up to +20°C (+68°F) including transport. If a charged battery has to be stored for more than the durations and associated temperatures mentioned above, discharge the cells at 0.2 C_5A down to an average 1V per cell.
- The battery is ready for immediate use within this 3-month period. Refer to Section 4 if stored beyond 3 months or at a temperature > +30°C (> +86°F).
- A battery delivered fully charged must not be stored more than 6 weeks (including transport) or at a temperature > +30°C (> +86°F). If beyond 6 weeks or > +30°C (> +86°F), contact Saft.

If storage is required prior to commercial service, clean and coat the metallic parts with a thin layer of neutral Vaseline or anti-corrosion oil (contact Saft for more information). Leave the battery in its transport container to protect from dust, moisture, and short circuits.

3. Installation

3.1. Verify that cells are correctly interconnected per Saft's documentation and that battery connection to the load is also correct.

3.2. Check tightness of terminal connecting nuts.

Torque applied must be:

- Top terminal nut (M12 terminal post; 12 mm / 19 mm (3/4") Top Nut): 15 ± 2 Nm (11 ± 1.5 ft. lb)

The solid connectors and terminal nuts must be corrosion-protected by applying a thin layer of neutral Vaseline or anti-corrosion oil (contact Saft for more information).

3.3. Electrolyte

The electrolyte used is Saft specified electrolyte.

Cells delivered filled:

- Check the level of electrolyte. The cells must have a level of electrolyte above the plates. If it is not the case, adjust the level of electrolyte to 5 mm (0.2 in) above the plate tops with distilled or deionized water.

4. Commissioning

Caution: During charging operations, the battery box must be open.

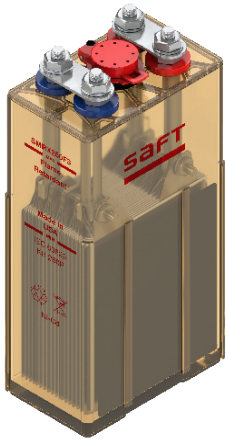
Charge at constant current is recommended. Refer to Table A for 0.2 C_5A charge or discharge currents. The charging equipment should be capable of at least 2 V/cell.

4.1. For a battery delivered discharged

Caution: Even if the battery is discharged, a residual charge may remain that may cause an electric shock.

4.1.1. Discharged cells placed into service immediately after delivery or after less than one year of storage and within 0°C (+32°F) to +30°C (+86°F).

- Preferred commissioning solution in battery shop: Constant current charge at 0.2 C_5A for 8 hours.
- Other solutions: Constant potential charge at 1.55 V/cell for 20 hours, with the current limited to 0.2 C_5A.



- On car commissioning: Constant potential charge for at least 24 hours without any interruption. Refer to Section 5 for charging voltage and current.

Top-up (refer to Section 6) and clean battery (refer to Section 7) if required. The battery is ready for use.

4.1.2. Discharged cells stored more than 1 year, or outside the range of 0˚C (+32˚F) to +30˚C (+86˚F).

- Charge with constant current at 0.2 C_5A for 10 hours.
- Discharge at 0.2 C_5A down to an average 1.0 V/cell or less.
- Charge with constant current at 0.2 C_5A for 8 hours.

Top-up (refer to Section 6) and clean battery (refer to Section 7). The battery is ready for use.

4.2. For a battery delivered 80% charged

4.2.1. Charged battery (80%) shipped and stored at temperatures ≤ +30°C (+86°F), less than 3 months from date of charge

The battery is ready for use.

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4.2.2. Charged battery (80%) shipped and stored at temperatures > +30°C (+86°F), or more than 3 months from date of charge

- Discharge the battery at 0.2 C_5A down to an average of 1.0 V per cell.
- Rest for 1 to 4 hours in open circuit.
- Charge with constant current at 0.2 C_5A for 8 hours.

Top-up (refer to Section 6) and clean battery (refer to Section 7) if required. The battery is ready for use.

5. Charging in service

- 1.47 V/cell at +20°C (+68°F) with temperature compensated voltage control: -3 mV/°C/cell (-1.7 mV/°F/ cell).
- For improved chargeability use: -5 mV/°C/cell (-2.8 mV/°F/cell) for battery temperature < +20°C (+68°F) and -2 mV/°C/cell (-1.1 mV/°F/cell) for battery temperature > +20°C (+68°F).
- For charging method requirements refer to Table 1 of IEC 62973-2.
- For boost charge refer to Table 2 of IEC 62973-2.
- For higher charging voltages, consult your local Saft representative.
- Preferred charging current upper limit is between 0.2 C_5A and 1 C_5A.

6. Topping-up

Frequency of topping-up must be determined for each battery. Topping-up shall be performed after the first year in order to determine the ideal topping-up interval which depends on the charging voltage and actual use of the battery.

Never let the electrolyte level fall below the minimum level mark. Use only distilled or deionized water to top-up.
If charging at constant current: Topping-up must be carried on charged cells with a rest time of minimum of 2 hours.
If charging at constant voltage on the train, the topping-up can be carried out at any time.

No electrolyte level measurement is required if a Saft Celltopper Plus is used which allows the correct level to be obtained by a simple nozzle setting when fitted with the correct spacer tube. Refer to Table A for cell type and corresponding spacer tube type.
If a filling pistol is not available, a clean plastic filling bottle can be used for topping-up. Do not fill above the maximum (upper line) level.
All topping-up equipment shall be dedicated to Ni-Cd batteries.

Batteries equipped with water filling system (typical frequency of topping-up is every 12 months):
Remove transport seals and connect hydraulic tubing between cells up to a maximum of 50 cells.

- Make sure that the tubes are completely inserted for a good seal.
- The hydraulic connection of cells must be in parallel to the electrical connection, in order to avoid voltage differences of more than 1.2V between two hydraulically connected cells.
- The hydraulic connection must be horizontal in order to avoid siphoning.
- The water filling circuit output must not be close to electrical equipment, electrical circuit and metallic structure.
- Water filling equipment output must be connected to the self-closing inlet of the battery.
- After the first year of use, topping-up can be performed every 6 years (if the annual average cell temperature is below +30°C and the battery is used as a back-up battery) by gravity or using adapted pump with a flow rate of 0.7 l/min at a relative pressure of 0.3 bar maximum.

Topping-up frequencies need to be confirmed with real application conditions (temperature, number of cycles, DOD, real charger dispersion).

Cell Type	Capacity (Ah)	Current 0.2 C_5A	Max/Min Electrolyte reserve (cm^3)	Spacer tube type
SMRX80F3	80	16	473	B
SMRX100F3	100	20	458	B
SMRX120F3	120	24	443	B
SMRX130F3	130	26	435	B
SMRX145F3	145	29	595	B
SMRX160F3	160	32	580	B
SMRX180F3	180	36	560	B
SMRX200F3	200	40	685	B
SMRX230F3	230	46	650	B
SMRX260F3	260	52	877	B
SMRX290F3	290	58	841	B
SMRX320F3	320	64	1055	A
SMRX360F3	360	72	900	A

Table A: Cell Data and Spacer Tube for Celltopper Plus Topping-up Equipment*

**Refer to separate instructions for further information on Celltopper Plus.*

7. Preventive maintenance

Maintenance operations (not including the topping-up operation):

- Periodic maintenance should be carried out at least every 5 years. For detailed maintenance, please refer to the maintenance manual of the battery.
- Keep the battery clean using only water. Do not use a wire brush or solvents of any kind. Vent plugs can be rinsed in clean water when dirty.
- Check the electrolyte level. Never let the level fall below the minimum (lower line) level. Use only distilled or deionized water for topping-up.
- Frequency of topping-up must be determined for each battery.
- It depends on charging voltage, temperature and actual utilization of the battery. Refer to Section 6 for topping-up.
- Check torque of all upper nuts. Refer to Section 3.
- Apply a thin layer of neutral Vaseline or anti-corrosion coating agreed by Saft to all connectors and terminal nuts (if applicable).
- Check charger settings. It is very important that the recommended charging voltage remains unchanged. High water consumption of the battery is usually caused by improper voltage setting of the charger.

8. Electrolyte

Due to the sintered electrode / plastic bonded technology, it is not necessary to change the electrolyte during the life-time of the cells.

9. Battery service and recycling

Contact your Saft representative concerning battery testing.
To protect the environment, all used batteries must be recycled. Contact your local Saft representative for information.

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