

SPL+ Ni-Cd batteries

Installation & operating instructions

Safety precautions

- **WARNING: Risk of fire, explosion, or burns. Do not disassemble, heat above +70°C (+158°F), or incinerate.**
- **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.**
- **Ventilation, in accordance with the IEC 62485-2 standard, is mandatory during commissioning and operation.**

1. Receiving the shipment

Do not overturn the package. Upon receipt of the goods, any transportation damage, electrolyte spillage or irregularities must be reported to the carrier and to Saft.

The battery is shipped filled and charged, ready for immediate use or filled and discharged for easy commissioning. Storage of cells must not exceed the maximum storage time indicated on the packing case.

2. Storage

Cells shall never be stored for a period exceeding 24 months from the date of manufacture.

The battery must be stored in a dry, clean and well-ventilated indoor location, away from sunlight and other UV-sources at an ambient temperature between 0°C and +30°C (+32°F and +86°F).

Storage of battery at temperatures above +30°C (+86°F) and/or above 24 months can result in permanent change and loss of product performance.

To ensure maximum protection of the cells, always store the product in its original packaging.

3. Installation

3.1. Location

Install the battery in a dry and clean room. Avoid heat, direct sunlight and other UV-source.

The battery will give the best performance when the ambient temperature is between +10°C to +30°C (+50°F to +86°F).

3.2. Mounting

For cells with handles, both must be used when lifting and moving. To prevent electrolyte spillage, do not tip cells.

Verify that cells are correctly interconnected with the appropriate polarity and that the connectors are correctly torqued.

Connections between the battery and the load shall be made with nickel plated cable lugs. Tightening torque for the terminals must be:

- M 10 = 30 ± 3.0 N.m (265.0 ± 26.6 lbf.in)

The connectors and terminals should be corrosion-protected by coating with a thin layer of anti-corrosion oil, anti-corrosion grease (NO-OX), or approved equal.

If a central water filling system is used as an option, refer to the corresponding installation and operating instructions sheet.

3.3. Ventilation

During operation the battery emits a gas mixture of oxygen and hydrogen.

Ventilation inside the battery room must be adequately managed, comply with IEC 62485-2 and local regulations.

To calculate the required ventilation, contact your local Saft representative or use Saft sizing tool, BaSiCs.

3.4. Electrolyte

Do not top up with deionized or distilled water prior to initial charge to avoid overfilling a cell.

When checking electrolyte levels, a fluctuation in level between cells is normal. This is caused by a small difference in internal pressure and due to the varying amounts of gas held in the separators of each cell. The level is normally at least 15 mm (5/8") above the minimum level mark (lower) and there should be no need to adjust it.

If electrolyte is ever spilled from a cell and the level is 30 mm (1.2") below the minimum level mark (lower), then refilling with E23 electrolyte is required. Contact your local Saft representative for more details.

4. Commissioning

Verify that ventilation, in accordance with the IEC 62485-2 standard, is provided during this operation.

A good commissioning is important and mandatory. After commissioning, the battery must be charged permanently according to section 5.

Prior and during commissioning charge, record all data requested in the commissioning report available on saft4u.saft.com.



It is mandatory to send the commissioning report to commissioning@saft.com to activate the warranty.

When full battery performance is required for capacity test purposes, the cells shall be charged in accordance with IEC 62259 section 7 (7.1 & 7.2).

4.1. Cells delivered filled and charged stored up to 6 months

A commissioning charge is normally not required and the cells are ready for immediate use. However, the product's full performance will be achievable after 1 to 3 months of float charge in service.

If the published performance is required immediately, please refer to Section 4.2.

4.2 Cells delivered filled and charged stored for more than 6 months and up to 2 years or filled and deep discharged stored up to 2 years

Always conduct a commissioning charge before use in service.

Commissioning at ambient temperature between + 10°C to + 30°C (+ 50°F to + 86°F).

4.2.1. Constant current charge

Charge for 10 h at 0.2 C₅ A (see Table A).

If the current limit is lower than indicated in the table A, extend the charge time proportionally.

Note: At the end of charge, the cell voltage will reach about 1.80 V/cell, thus the charger shall be able to supply such a voltage.

When the charger maximum voltage setting is too low to supply constant current charging, divide the battery into two parts to be charged individually at constant current.

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4.2.2. Constant potential charge

• Filled and charged/deep discharged

Charge at 1.55 V/cell for a minimum of 24 h with current limit of 0.2 C₅ A (see the current in Table A).

If this voltage level is not available, then charge at 1.50 V/cell for a minimum of 36 h with current limited to 0.2 C₅ A (see the current in Table A).

• Filled and deep discharged (option)

Commissioning at ambient temperature between + 10°C to + 30°C (+ 50°F to + 86°F)

Constant voltage charge at a low voltage level:

Charge at 1.45 V/cell for a minimum of 72 h with current limit of 0.2 C₅ A (see the current in Table A).

If capacity is not needed directly it is also possible to charge 1.42 V/cell for a minimum of 1 month with current limited to 0.2 C₅ A (see the current in Table A).

4.2.3. Commissioning at ambient temperature above + 30°C (+ 86°F)

Only constant current charge.

10 h at 0.2 C₅ A recommended.

20 h at 0.1 C₅ A possible.

Notice: At the end of charge, the cell voltage will reach about 1.80 V, thus the charger shall be able to supply such a voltage.

When the charger maximum voltage setting is too low to supply constant current charging, divide the battery into two parts to be charged individually at constant current. It must be stopped to reduce the temperature.

The battery container temperature is to be monitored during charge. If the temperature exceeds + 45°C (+113°F) during charging, then it must be stopped to reduce the temperature. The charging can be resumed when battery container temperature drops below + 40°C (+ 104°F).

4.3. Electrolyte adjustment

Check the electrolyte level and adjust it to the maximum level mark (upper) by adding distilled or deionized water.

5. Charging in service

The recommended charging voltages for continuous parallel operation, with occasional battery discharges, are:

• Single level charge:

1.42 ± 0.01 V/cell

• Two level charge:

Float level

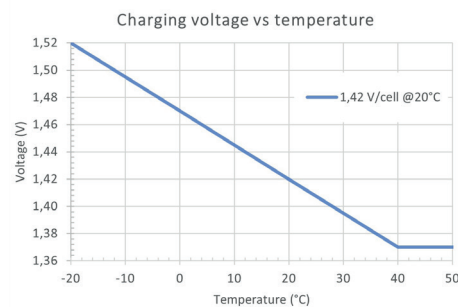
1.42 ± 0.01 V/cell

High rate (boost) level

1.45 ± 0.01 V/cell

To achieve low maintenance operation (in term of water topping-up), it is necessary to control the charge input to the battery to minimize water consumption during the entire life of the battery. Temperature Compensated Voltage (TCV) is generally mandatory. The conditions to apply TCV depend on charge voltage and ambient operating temperature.

1.42 V/cell: TCV is mandatory, from -20°C to +20°C (-4°F to +68°F) increase the charge voltage by 2.5 mV/°C/cell (+1.4 mV/°F/cell) and from +20°C to +40°C (+68°F to +104°F) decrease the charge voltage by 2.5 mV/°C/cell (-1.4 mV/°F/cell).



6. Preventive maintenance

SPL+ is ultra-low maintenance battery which requires little preventive maintenance.

However, it is good practice with any system to carry out an inspection of the system once per year or at the recommended topping-up interval period to ensure that the charging system, the battery and the ancillary electronics are all functioning correctly. Additionally, follow your standard preventative maintenance procedures.

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 if necessary.

Check the charging voltage, should be checked and recorded at least once yearly. Individual cells with voltages measured below 1.30 V/cell during float charge, high rate charge is recommended to apply to the cell concerned.

Under normal operating conditions there is no need for topping up. High water consumption is usually caused by an improper voltage setting or voltage drift that is above the recommended in service charging voltages. To maximise the topping-up interval check the charging voltage and adjust as required.

Visually check the electrolyte level. Never let the level fall below the minimum level mark. Use only distilled or deionized water to top-up. Topping up of the SPL+ battery shall be carried out when battery is fully charged.

Note: There is no need to check the electrolyte density. Electrolyte density measurements do not indicate state of charge or state of health.

Ensure all terminals and connectors are coated with a thin layer of anti-corrosion oil, anti-corrosion grease (NO-OX) or approved equal.

Note: All these maintenance recommendations followed the IEEE 1106 standard 'Recommended Practice for Installation, Maintenance, Testing and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications'.

We offer battery training, for more information look in our service brochure.



7. Environment

To protect the environment all used batteries must be recycled. Contact your local Saft representative for further information.

Table A

Cell type	Capacity C ₅ Ah	Charging current 0,2 C ₅ A	Charging current 0,1 C ₅ A	Cell connection per pole
SPL+ 80	80	16	8	M 10
SPL+ 100	100	20	10	M 10
SPL+ 130	130	26	13	M 10
SPL+ 165	165	33	16,5	M 10
SPL+ 200	200	40	20	M 10
SPL+ 250	250	50	25	M 10
SPL+ 290	290	58	29	2 x M 10
SPL+ 340	340	68	34	2 x M 10
SPL+ 380	380	76	38	2 x M 10
SPL+ 420	420	84	42	2 x M 10
SPL+ 470	470	94	47	2 x M 10
SPL+ 510	510	102	51	2 x M 10

Saft

26 quai Charles Pasqua
92300 Levallois-Perret - FRANCE
Tel. : +33 (0)1 58 63 16 00
www.saftbatteries.com