

INSTALLATION & 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 the 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 shock.
- 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 cells immediately upon arrival. Do not over turn the package. Transport seals are located under the cover of the vent plug.

- If the cells are shipped filled and charged, the cells are ready for assembly.
- If the cells are shipped empty and discharged, do not remove the plastic transport seals until ready to fill the cells.

2 - Storage

Store the battery indoors in a dry clean, cool location (0oC to +30oC / =32oF to +86oF) and well ventilated space on open shelves.

Do not store in direct sunlight or expose to excessive heat.

- Cells filled and charged
 - If cells are stored filled, they must be fully charged prior to storage.
 - Cells maybe stored filled and charged for a period not exceeding 12 months from date of dispatch from factory.

Storage of filled battery at temperature above +30oC (+86oC) can result in loss of capacity. This can be as much as 5% per 10oC (18oF) above 30oC (+86oC) per year.

- Cells empty and discharged
 - It is recommended to store cells empty and discharged. This ensures compliance with IEC 60623 section 4.9 (storage).
 - Cells can be stored like this for many years.
- When deliveries are made in cardboard boxes, store without opening the boxes.
- When deliveries are mad in plywood boxes, open the boxes before the storage. The lid and the packing material on top of the cells must be removed.

INSTALLATION & OPERATING INSTRUCTIONS**3 - Electrolyte / cell oil****■ Cells delivered filled and charged**

- Check the level of electrolyte. It should not be more than 20mm below the maximum level mark (upper). If this is not the case, adjust the level with distilled or deionized water. Cells delivered filled have already cell oil in place.
- In case of the spillage of electrolyte during the transport, the cells have to be topped-up with E22 electrolyte. Fill the cells 20mm above the minimum level mark (lower) with electrolyte. Wait 4 hours and adjust if necessary before commissioning.

■ Cells delivered empty and discharged

- If the electrolyte is supplied dry, prepare it according to its separate instructions sheet. The electrolyte to be used is E22. Remove the transport seals just before filling. Fill the cell about 20mm above the minimum level mark (lower) with electrolyte. Wait 4 hours and adjust if necessary before commissioning. It is recommended to add the cell oil after the commissioning charge, with the syringe, according to the quantity indicated in the Tables A or B.

4- Installation**■ Location**

Install the battery in a dry and clean room. Avoid direct sunlight and heat. The battery will give the best performance and maximum service life when the ambient temperature is between +10oC to +30oC (+50oF to +86oF).

■ Ventilation

During the last part of charging, the battery is emitting gases (oxygen and hydrogen mixture). At normal float-charge the gas evolution is very small but some ventilation is necessary.

Note that special regulations for ventilation may be valid in your area depending on the application.

■ Mounting

Verify that the cells are correctly interconnected with the appropriate polarity. The battery connection to lead should be with nickel plated cable lugs. Recommendation torques for terminal bolts are:

- M 6 = 11 ± 1.1 n.M (97.4 ± 9.8 lbf.in)
- M 8 = 20 ± 2 N.m (177.0 ± 17.7 blf.in)
- M 10 = 30 ± 3 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.

Remove the transport seals and close the vent plugs.

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5 - Commissioning

- Verify that the transport cells are removed, the vents are closed and the ventilation is adequate during this operation.

A good commissioning is important. Charge at constant current is preferable. If the current limit is lower than indicated in the Tables A or B, charge for a proportionally longer time.

- ***For cells filled and charged by the factory and stored less than 6 months:***

- **Constant current Charge:**

- Charge for 10 hours at 0.2 C5 A recommended (see Tables A or B).

Note: At the end of the charge, the cell voltage may reach the level of 1.85 V per cell, thus the charger shall be able to supply such 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.

- **Constant voltage charge:**

- Charge for 24 hours at 1.65 V/cell, current limited to 0.2 C5 A or charge for 48 hours at 1.55 V/cell, current limited to 0.2 C5 A (see Tables A or B)

- ***For cells filled on location or for filled cells which have been stored more than 6 months:***

- **Constant current Charge:**

- Charge for 10 hours at 0.2 C5 A recommended (see Tables A or B).
- Discharge at 0.2 C5 A to 1.0 V/cell
- Charge for 10 hours at 0.2 C5 A recommended (see Tables A or B).

Note: At the end of the charge, the cell voltage may reach the level of 1.85 V per cell, thus the charger shall be able to supply such 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.

- **Constant voltage charge:**

- Charge for 30 hours at 1.65 V/cell with current limited to 0.2 C5 A.
- Discharge at 0.2 C5 A to 1.0 V/cell
- Charge for 30 hours at 1.65 V/cell with current limited to 0.2 C5 A or charge for 48 hours at 1.55 V/cell current limited to 0.2 C5 A (see Tables A or B).

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5 - Commissioning

- **Cell oil & electrolyte after commissioning: wait for 4 hours after commissioning.**
 - **For cells delivered filled by the factory:**
 - Cell oil is already in place.
 - Check the electrolyte level and adjust it to the maximum level mark (upper) by adding distilled or deionized water.
 - **For cells filled on location:**
 - Add the cell oil with the syringe, according to the quantity indicated in the Tables A or B.
 - Check the electrolyte level and adjust it the maximum level mark (upper) by adding electrolyte.

The battery is ready for use.

For capacity test purpose, the battery has to be charged in accordance with IEC 60623, section 4.

6 - Charging in service

- Continuous parallel operation, with the occasional battery discharge.

For two level charge:

- | | |
|--|--|
| ▫ Float level | High level |
| = 1.42 ± 0.01 V/cell for L cells | = 1.47 - 1.70 V/cell for L cells |
| = 1.40 ± 0.01 V/cell for M and H cells | = 1.45 - 1.70 V/cell for M and H cells |
| = 1.40 ± 0.01 V/cell | |

A high voltage will increase the speed and efficiency of the recharging.

For single charge:

- Float level: 1.43 – 1.50 V/cel
- Buffer operation, where the load exceeds the charger rating.

Recommended charging voltage (+20oC to +25oC / +68oF to +77oF): 1.50 – 1.60 V/cell

7 - Periodic Maintenance

- 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 electrolyte level. Never let the level fall below the maximum level mark (lower). Use only distilled or deionized water to top-up.

Experience will tell the time interval between topping-up.

Note: Once the battery has been filled with the correct electrolyte either at the battery factory or during the battery commissioning, there is no need to check the electrolyte density periodically. Interpretation of density measurements is difficult and could be misleading.

INSTALLATION & OPERATING INSTRUCTIONS**7 - Periodic Maintenance**

- Check the charging voltage. If a battery is parallel connected, it is important that the recommended charging voltage remains unchanged.

The charging voltage should be checked and recorded at least once yearly.

If a cell float voltage is found below 1.35 V, high-rate charge is recommended to apply to the cell concerned.

- Check every two years that all connectors are tight. The connectors and terminal bolts should be corrosion-protected by coating with a thin layer of anti-corrosion oil.
- High water consumption is usually caused by high improper voltage setting of the charger.

8 – Changing Electrolyte

In most stationary battery applications, the electrolyte will retain its effectiveness for the life of battery. However, under special battery operating conditions, if the electrolyte is found to be carbonated, the battery performance can be restored by replacing the electrolyte.

The electrolyte type to be used for replacement in these cells is E13.
Please refer to “Electrolyte Instructions”.

9 – Environment

To protect the environment all used batteries must be recycled.

Contact us for further information:

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