



PowerSafe[®] Ni-Cd

VGM and VGL

Battery Installation and Quick Reference Guide



Ni-Cd batteries are safe when operated and handled properly. It is vitally important that you observe the precautions recommended in this installation sheet. **YOU SHOULD BE TRAINED IN HANDLING, INSTALLING, OPERATING AND MAINTAINING BATTERIES BEFORE YOU WORK ON ANY BATTERY SYSTEM.**



When working on batteries wear safety glasses with side shields, rubber gloves and protective clothing. All metallic personal objects, such as rings, watches, bracelets etc. shall be removed before starting work on the battery! Only use insulated tools!



Electrolyte is corrosive.



In case of **SKIN CONTACT** with electrolyte, **IMMEDIATELY**

1. **REMOVE** contaminated **CLOTHING**
2. **FLUSH** the area **THOROUGHLY** with **WATER**
3. Get **MEDICAL ATTENTION**



In case of **EYE CONTACT** with electrolyte, **IMMEDIATELY**

1. **FLUSH THOROUGHLY** for at least 15 minutes with large amounts of **WATER**.
2. Get **MEDICAL ATTENTION**.



In case of electrolyte **CONTACT WITH CLOTHING OR MATERIAL**, **IMMEDIATELY**

1. **REMOVE CONTAMINATED CLOTHING**
2. Apply large amounts of water to affected area.
3. Wash clothing as soon as possible.



Batteries can generate gases which, when released, can explode, causing blindness and other serious personal injury.



Warning: batteries remain live even though they are disconnected. No rings or metal bracelets should be worn during the assembly of the battery. Do not place electrically conductive objects such as tools etc. on top of the battery!

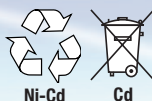
Warning: cells are heavy, use proper lifting technique.



Do not allow flames, embers or sparks near the battery due to the risk of explosion or fire!

The Battery Installation and Quick Reference Guide must be strictly observed. Non-compliance with the Battery Installation and Quick Reference Guide, use of non OEM spares or use of additives to the electrolyte or unauthorized tampering will void the warranty

Spent batteries with this symbol are reusable products and have to be put into a recycling system. Used batteries must be disposed of as special waste in accordance with all standards.



WARNING!

Never use sulfuric acid or acidic water for cleaning, this may damage the battery.

Never recycle in the same container as lead acid batteries.

1. Receiving the battery

The cells are not to be stored in packaging, therefore, unpack the battery immediately after arrival. Do not tilt the package or turn it upside down. The battery cells are equipped with a blue plastic transport plug. The battery will be delivered:

- Filled and charged: The battery is ready for installation. Replace the transport plug with the red vent cap included in the accessories just before use. The battery must not be charged with the transport plug in the cells as this can damage the battery.

2. Storage

The rooms provided for storing the batteries must be clean, dry, cool 50°F (10°C) to 86°F (30°C) and well ventilated. Cells are not to be stored in the transport packaging and must not be exposed to direct sunlight or UV-radiation

- If the cells are delivered in plywood boxes, open the boxes before storage and remove the packing material on the top of the cells. If the cells are delivered on pallets, also remove the packing material on the top of the cells.
- Cells can be stored up to 12 months from the day of delivery.
- Storage of cells at a temperature above 86°F (30°C) will result in a loss of capacity. This can be approximately 5% per 18°F (10°C)/year when the temperature exceeds 86°F (30°C). It is very important that the cells are sealed with the plastic transport plugs tightly in place. This is to be checked after receiving the goods. In case of electrolyte loss during transport, refill the cell up to the "MAX" mark with genuine electrolyte before storage.

3. Installation

It is recommended that Ni-Cd batteries not be operated or stored in the same room as lead acid batteries. In addition to this, the charging gases from lead acid batteries should be kept away from Ni-Cd batteries by suitable precautions such as ventilation or hermetic isolation of the rooms.

Tools for lead acid batteries must not be used for Ni-Cd batteries.

The installation should be carried out in accordance with the manufacturer's instructions.

- Location - Install the battery in a dry and clean room. Avoid in any case direct

sunlight and heat. The battery will give the optimal performance and maximum service life if the ambient temperature ranges between 50°F (10°C) to 86°F (30°C).

- Ventilation - During the last phase of charging, a mixture of oxygen and hydrogen is released. Ventilation is necessary, even if the generation of gas is very low during float charging. Ventilation should be carried out in accordance with the manufacturer's instructions.
- Setup - Always follow assembly drawings, circuit diagrams and other separate instructions. The transport plugs have to be replaced with the red vent caps included with the accessories.
 - Cell connectors and/or flexible cables should be checked to ensure they are tightly seated.
 - Terminal nuts, screws and connectors must be tightly seated.
 - Torque loading for:
 - M10: 71 in-Lb_t
 - Female thread:
 - M8: 177 – 221 in-Lb_t
 - M10: 221 – 265 in-Lb_t
 - Connectors and terminals should be protected by a thin coating of the anti-corrosion grease, NO-OX.
 - The electrolyte for Ni-Cd batteries consists of a diluted potassium hydroxide (KOH) and lithium hydroxide solution with specific gravity of 1.200 ± 0.01 kg/litre. The potassium hydroxide solution is prepared in accordance with factory regulations. The specific gravity of the electrolyte does not indicate the state-of-charge of the battery. It changes insignificantly during charging and discharging and is only minimally related to the temperature.

When checking the electrolyte levels, a variation in level between cells is not abnormal and is due to the different amounts of gas held in the separators of each cell. Before the battery is put into service for the first time, check that the electrolyte level is not lower than 0.4 in (10 mm) below the "MAX" mark. There is normally no need to adjust it. Do not open or remove the low pressure vents during normal operation.

If the electrolyte level is lower than the upper edge of the plate block during service, the battery should not be disconnected from the charger for more than 24 hours.

4. Commissioning

The following instructions are valid for commissioning between 68°F (20°C) and 86°F (30°C). For different conditions please contact EnerSys®. Charging with constant current is the preferred method.

According to IEC 62259, 0.1 C₅A is also expressed as 0.1 I_tA. The reference test current I_t is expressed as:

$$I_t A = \frac{C_n Ah}{1 h}$$

Example:

0.1I_t A means:

10 A for a 100 Ah battery or

50 A for a 500 Ah battery

- Commissioning with constant current

Cells stored up to 6 months:

A commissioning charge is required prior to putting the cells in service. If full performance is necessary immediately, a commissioning charge of 10 hours at 0.1 I_tA is required.

- This procedure is carried out without the low-pressure red vents installed (no vent in place).

- **During the charge the temperature should be checked (section 6).**

Cells stored more than 6 months and up to 1 year:

A commissioning charge of 15 hours at 0.1 I_tA is necessary.

- This procedure is carried out without the low-pressure red vents installed (no vent in place).

- **During the charge the temperature should be monitored (section 6).**

- Commissioning with constant voltage

If the charger's maximum voltage setting is too low to supply constant current charging, divide the battery into two parts and charge them individually.

Cells stored up to 6 months:

A commissioning charge is recommended prior to putting the cells in service. If full performance is necessary immediately, a commissioning charge of 20 hours at 1.65 V/cell with current limited to 0.1 I_tA is required.

- This procedure is carried out without the low-pressure red vents installed (no vent in place).

- **During the charge the temperature should be checked (section 6).**

Cells stored more than 6 months and up to 1 year:

A commissioning charge of 30 hours at 1.65 V/cell with current limited to 0.1 I_tA is necessary.

- This procedure is carried out without the low-pressure red vents installed (no vent in place).

- **During the charging the temperature should be checked (refer to the periodic maintenance section of this document for details).**

- In case of variable charging conditions, please consult your EnerSys representative.

5. Charging in Operation

Do not open or remove the low pressure vent caps during operation. The charging current limit should be 0.1 I_tA maximum in general.

To reduce water consumption it is recommended to compensate using the coefficient of -1.7mV per cell per degree F (-1.7mV/°F) if the ambient temperature is at or above 95°F (35°C).

For operation at low temperatures, i.e. below 68°F (20°C), there is a risk of poor charging and it is recommended to adjust the charging voltage (-1.7mV/°F).

Recommended charging voltages for ambient temperatures from 68°F (20°C) to 95°F (35°C) are:

Two step charge:

Float charge: 1.40 - 1.42 V/cell

Boost charge: 1.45 - 1.46 V/ cell

Current limit: 0.1 I_tA

Single step charge: 1.42 - 1.44 V/ cell

Current limit: 0.1 I_tA

6. Periodic Maintenance

Powersafe® VGL and VGM batteries are extreme low maintenance batteries

The following is recommended:

- The battery must be kept clean using only water. Do not use a wire brush or solvents of any kind.
- Visually check the electrolyte level. Refilling is recommended when the filling level reaches the "MIN" mark. However it must never drop below the "WARNING LEVEL" mark. Use only distilled or deionized water to top-up the cells.

NOTE: Once the battery has been filled with the correct electrolyte at the factory, there is no need to regularly check the electrolyte density.

- Check regularly (approximately every 24 months) that all connectors, nuts and screws are correctly torqued. All metal parts of the battery should be corrosion-protected by a thin layer coating of anti-corrosion grease. **Do not coat any plastic part of the battery.**
- It is required that the recommended charging voltage remains unchanged. If a single-cell voltage of below 1.35 V is detected during float charging, it is recommend to charge the cell(s) separately pursuant to the information provided in Commissioning section of this document.
- High water consumption of the battery is usually caused by improper voltage setting of the charger.
- The temperature of the electrolyte should never exceed 114°F (45°C), as higher temperatures have a detrimental effect on the performance and lifetime of the cells. During charging, an electrolyte temperature of ≤95°F (≤35°C) should be aimed for. On exceeding 114°F (45°C) the charging should be temporarily interrupted until the electrolyte temperature drops to 95°F (35°C).

The temperature measurements are to be made at one cell in the middle of the battery. Low ambient or electrolyte temperatures down to -13°F (-25°C) do not have any detrimental effect on the battery; they just cause a temporary reduction of capacity.

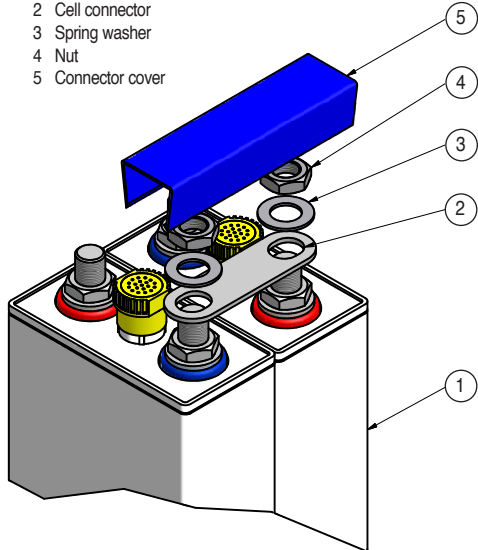
7. Capacity testing

If capacity testing is required it must be carried out according to the IEC procedure 62259.

8. Layout details: inter unit connection

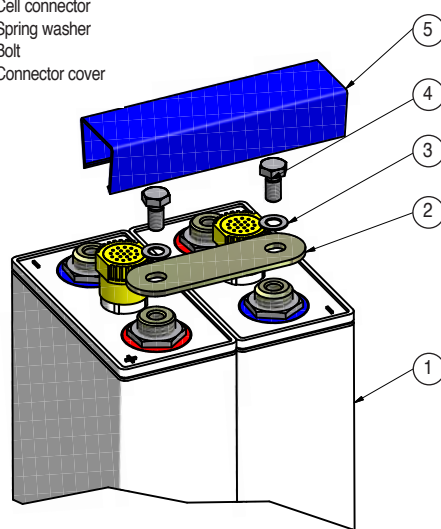
A. Nut connection

- 1 Cell container
- 2 Cell connector
- 3 Spring washer
- 4 Nut
- 5 Connector cover



B. Bolt connection

- 1 Cell container
- 2 Cell connector
- 3 Spring washer
- 4 Bolt
- 5 Connector cover



Bolt connections

- 1 Cell case
- 2 Cell connector
- 3 Terminator connector
- 4 Spring washer
- 5 Bolt
- 6 Cover
- 7 Angle terminal connector
- 8 End terminal cover

