

Nickel-cadmium 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. Check the packages and cells for transport damage.

The battery is shipped filled and charged, and is ready for immediate use.

Transport seals are located under the lid of each vent, they must be removed prior to mounting.

The battery must never be charged with the plastic transport seals in place as this is dangerous and can cause permanent damage.

2. Storage

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

Storage of a filled battery at temperatures above +30°C (+86°F) can result in loss of capacity. This can be as much as 5% per 10°C (18°F) above +30°C (+86°F) per year.

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

Alcad Solar Range batteries are supplied filled with electrolyte and charged, **they can be stored in this condition for a maximum of 2 years.**

Never drain the electrolyte from the cells.

- When deliveries are made in cardboard boxes, store without opening the boxes.
- When deliveries are made in plywood boxes, open the boxes before the storage. The lid and the packing material on top of the cells must be removed.

3. Installation

3.1. 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 +10°C to +30°C / +50°F to +86°F.

3.2. 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.

3.3. Mounting

Verify that cells are correctly interconnected with the appropriate polarity. The battery connection to load should be with nickel plated cable lugs.

Recommended torques for terminal bolts are :

- M 6 = 11 ± 1.1 N.m
- M 8 = 20 ± 2 N.m
- M 10 = 30 ± 3 N.m

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 caps.

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

Solar Range

3.4. Electrolyte

When checking the electrolyte levels, a fluctuation in level between cells is not abnormal and is due to the different amounts of gas held in the separators of each cell. The level should be at least 15 mm above the minimum level mark and there is normally no need to adjust it.

Do not top-up prior to initial charge.

4. Commissioning

Verify that the transport seals are removed and the ventilation is adequate during the operation.

A good commissioning charge is important. Charge at constant current is preferable.

4.1. Cells stored up to 6 months :

A commissioning charge is normally not required and the cells are ready for immediate use. If full performances are necessary immediately, a commissioning charge as mentioned in section 4.2. is recommended.

4.2. Cells stored more than 6 months and up to 2 years :

A commissioning charge is necessary.

• Constant current charge:

16 h at 0.1 C₅ A recommended (see table A).

Note: At the end of the charge, the cell voltage will reach the level of 1.85 V/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 in two parts to be charged individually.

• Constant potential charge:

1.65 V/cell for a minimum of 30 hours with current limited to 0.1 C₅ A (see the current in Table A).

In the case of remote areas, where the only charger available is the photovoltaic array, the battery should be connected to the system with no connected load and no voltage limit. The battery should then be charged in good sunshine conditions. During this operation, the Ah charged shall be in the magnitude of 1.6 times the rated capacity, and, in order to limit the risk of electrolyte overflow, it is recommended not to exceed the charge current value specified in Table A.

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4.3. Cell electrolyte after prolonged float charge:

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

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

5. Charging in service

The photovoltaic array converts solar irradiance into DC electrical power at a pre-determined range of voltages whenever sufficient solar radiation is available. Unlike a main connected system, the output from a photovoltaic array is variable and, to obtain the best efficiency from the system, it is quite normal to have some form of charge control.

Two main techniques for charging the batteries are generally used in photovoltaic systems.

These are those which have a constant voltage limitation based on the PWM techniques and those with several voltage steps charging where the battery, by switching means, is charging up to a high pre-set voltage (boost or float threshold), then drops to a lower voltage level (battery reconnect threshold) and then back to the high pre-set voltage and so on.

Recommended charging voltages for a typical photovoltaic application sized for 5 days or more back-up time :

a) case of constant voltage limitation (PWM regulator system or similar) :

- float : 1.50 V/cell
- boost (not mandatory) : 1.65 V/cell

b) case of regulators based on the switching principle :

- boost threshold (not mandatory) : 1.65 V/cell
- float threshold : 1.55 V/cell
- battery reconnect threshold : 1.45 V/cell

For lower back-up time, the values have to be increased depending on the load requirement. Consult the manufacturer.

For use in warm areas, a temperature compensation on the charge voltage is not recommended.

For use in cold areas, a temperature compensation is recommended to increase the charge acceptance. The recommended value is : $-2.5 \text{ mV}/^\circ\text{C}/\text{cell}$ ($-1.4 \text{ mV}/^\circ\text{F}/\text{cell}$) starting from $+20^\circ\text{C}$ ($+68^\circ\text{F}$).

6. Periodic maintenance

In a correctly designed standby application, Alcad Solar Range batteries require the minimum of attention.

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.

When this system service is carried out, it is recommended that the following actions should be taken :

Table A

Cell Type	Rated Capacity 5 h - 1.00 V C ₅ Ah	Nominal Capacity 120 h - 1.00 V C ₁₂₀ Ah Ah	Charging Current 0.1 C ₅ A A	Max. quantity of water to be added in cc	Cell Terminal
PV 45	43	45	4.3	190	M 6
PV 90	85	90	8.5	280	M 8
PV 105	100	105	10	380	M 10
PV 140	128	140	13	380	M 10
PV 185	171	185	17	500	M 10
PV 230	213	230	21	590	M 10
PV 275	256	275	26	700	M 10
PV 320	300	320	30	860	2 x M10
PV 370	341	370	34	1000	2 x M10
PV 415	384	415	38	1100	2 x M10
PV 460	427	460	43	1200	2 x M10
PV 505	469	505	47	1300	2 x M10
PV 555	512	555	51	1400	2 x M10
PV 645	597	645	60	1700	3 x M10
PV 735	682	735	68	1900	3 x M10
PV 830	768	830	77	2100	3 x M10
PV 920	853	920	85	2400	4 x M10
PV 1110	1024	1110	102	2800	4 x M10

- cell electrolyte levels should be checked visually to ensure that the level is above the minimum and if necessary the cells should be topped-up. Use only distilled or deionized water (see Table A for the quantity of water per cell).
- the batteries should also be checked for external cleanliness, and if necessary cleaned with a damp brush using water. Do not use a wire brush or solvents of any kind. Vent plugs can be rinsed in clean water if necessary.
- all the connectors must be tight. The connectors and terminal bolts should be corrosion-protected by coating with a thin layer of anti-corrosion oil.

7. Environment

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

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