

Solar Range

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

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.

2. Storage

The battery must be stored in a dry indoor location, on open, well ventilated shelves away from direct sunlight between 0°C and +30°C (+32°F and 86°F).

Solar Range batteries are supplied filled with electrolyte and charged. They can be stored in this condition for maximum 24 months from date of shipment in accordance with the recommendations set forth in this I&O.

Storage of a filled battery at temperatures above +30°C (+86°F) can result in permanent change and loss of product performance, depending on the duration of the storage above the maximum recommended temperature.

Never drain the electrolyte from the cells.

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 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:

- M6 = 11 ± 1.1 N.m (97.4 ± 9.8 lbf.in)
- M8 = 20 ± 2 N.m (177.0 ± 17.7 lbf.in)
- M10 = 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.

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

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. After commissioning, when the level is stabilized, it should be not less than 5 mm below the maximum level mark.

4. Commissioning

Verify that the ventilation is adequate during the operation.

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

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.

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

- **Constant current charge**

30 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 1.75 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**

1.55 V/cell for a minimum of 24 hours with current limited to 0.1 C₅ A (see the current in Table A).

- **Commissioning at ambient temperature above +30°C (+86°F)**

- **Only Constant current charge**

20 h at 0.1 C₅ recommended.

The electrolyte 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 electrolyte temperature drops below +40°C (+104°F).

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.

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).

Reliability inside

ALCAD

Table A

Cell Type	Rated Capacity 5 h - 1.00 V C ₅ Ah	Nominal Capacity 120 h - 1.00 V C ₁₂₀ Ah	Charging Current 0.1 C ₅ A	Max. quantity of water to be added cc	Cell Terminal
PV 100	95	100	9.5	280	M8
PV 150	140	150	14	380	M10
PV 200	185	200	19	500	M10
PV 250	235	250	24	590	M10
PV 305	280	305	28	700	M10
PV 355	325	355	33	880	2xM10
PV 405	375	405	38	1000	2xM10
PV 455	420	455	42	1100	2xM10
PV 505	470	505	47	1200	2xM10
PV 555	515	555	52	1300	2xM10
PV 610	560	610	56	1400	2xM10
PV 660	610	660	61	1600	3xM10
PV 710	650	710	65	1700	3xM10
PV 760	700	760	70	1800	3xM10
PV 810	750	810	75	1900	3xM10
PV 860	800	860	80	2000	3xM10
PV 910	840	910	84	2100	3xM10
PV 960	890	960	89	2300	4xM10
PV 1015	940	1015	94	2400	4xM10
PV 1065	980	1065	98	2500	4xM10
PV 1115	1030	1115	103	2600	4xM10
PV 1170	1080	1170	108	2700	4xM10
PV 1215	1120	1215	112	2800	4xM10
PV 1270	1170	1270	117	3000	5xM10
PV 1320	1220	1320	122	3100	5xM10
PV 1370	1260	1370	126	3200	5xM10
PV 1420	1300	1420	130	3300	5xM10
PV 1470	1350	1470	135	3400	5xM10
PV 1520	1400	1520	140	3500	5xM10
PV 1570	1450	1570	145	3700	5xM10
PV 1620	1500	1620	150	3800	6xM10
PV 1670	1550	1670	155	3900	6xM10
PV 1720	1600	1720	160	4000	6xM10
PV 1775	1650	1775	165	4100	6xM10
PV 1830	1700	1830	170	4200	6xM10

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.

- **Case of constant voltage limitation (PWM regulator system or similar):**
 - Float: 1.50 V/cell
 - Boost (not mandatory): 1.65 V/cell

- **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: $-3.0 \text{ mV}/^{\circ}\text{C}/\text{cell}$ ($-1.68 \text{ mV}/^{\circ}\text{F}/\text{cell}$) 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:

- 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.
- 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). Topping-up of Alcad Solar battery shall be carried out when battery is fully charged. Experience will tell the time interval between topping-up.
- Check every 2 years that all connections 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 improper voltage setting of the charger.

7. Environment

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

Alcad Limited

Sweden

Telephone : +46 491 68 100
Facsimile : +46 491 68 110

Alcad Sales Offices

United Kingdom

Telephone: +44 1279 772 555

Middle East

Telephone: +357 25 871 816
Facsimile: +357 25 343 542

Asia

Telephone: +65 6 7484 486
Facsimile: +65 6 7484 639

USA

Telephone: +1 203 985 2500
Facsimile: +1 203 985 2539