



# ENERGYSTORE

Remote Area Power Systems

Installation, Operation and Maintenance

**ENERGYSTORE SOLAR**

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## Safety Instructions

**Carefully read this manual in all its parts upon receipt of ENERGYSTORE SOLAR Batteries.**

Lead-acid Solar Batteries are components of a system and although they are maintenance free, they require suitable precautions and behavioural norms to guarantee safe working conditions and to ensure maximum performance of the battery during its entire life. The Installation, Operation and Maintenance instruction manual supplies the necessary instructions for the correct care, handling, installation, use and maintenance of ENERGYSTORE ESPV Solar Batteries.

The non compliance with the instructions given herein may cause injury to personnel and damage to equipment as well as poor operation and performance of the battery. Any repairs made without authorisation, for example, opening the valves, may render the warranty void.

Store this manual in close proximity to the batteries at all times and ensure it is accessible to the relevant personnel.



No naked flames



Corrosive



Wear safety goggles



Read instructions



First aid /  
medical assistance



Keep away from children



Explosive



Caution



Electric shock risk

### Observe the following precautions at all times

Observe the operating instructions - work on the battery should be carried out by qualified personnel only.

Exposed metal parts of the battery carry a voltage and are electrically live with the risk of short circuits.

Avoid any electrostatic charge; before starting work on the battery, first discharge any possible electricity from yourself by touching an earth-connected part; repeat this action occasionally until work is complete.

Use protective equipment, such as protective clothing, rubber gloves and goggles.

Use insulated tools.

DO NOT place or drop metal objects on top of the battery.

DO NOT wear rings or bracelets.

Remove any articles of clothing with metal parts that might come into contact with the battery terminals.

DO NOT smoke and DO NOT use open flames or create electric sparks.

Observe the accident prevention rules along side EN50272-2 and EN50110-1.

Take all precaution when using the main supply.

Make sure that the first aid kits and fire extinguishers are easily accessible.

Used batteries contain recyclable materials. They must not be disposed with household waste but as a special waste. Methods of return and recycling must conform to the regulations in operation at the site where battery is located. If in doubt please contact ENERGYSTORE.



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## 1. Delivery, unpacking and storage

Unpack the batteries as soon as they are delivered. Verify that the equipment has been delivered in good condition. Any damage must be reported immediately to the carrier and the damaged items retained for inspection by the carrier's representative.

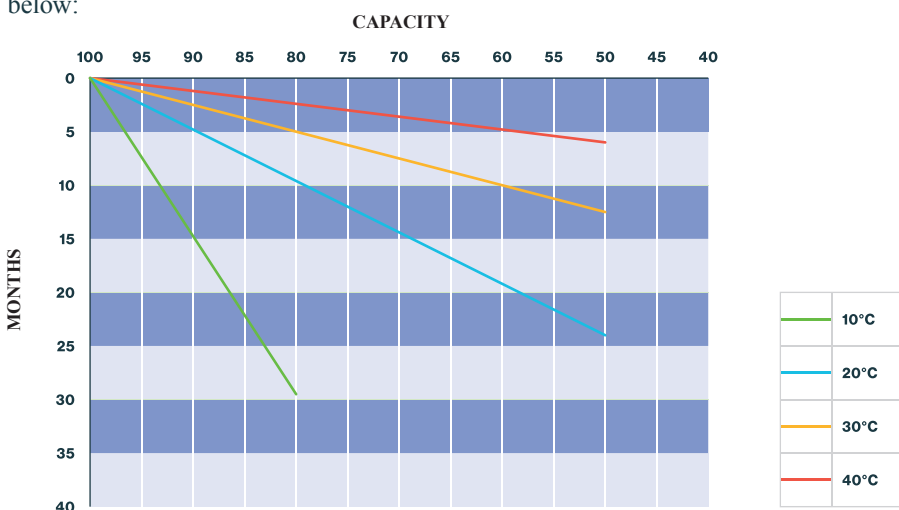
The details on the label should be read carefully and the following points to be observed:

Cell Type  
Cell Voltage  
Capacity  
Float charge voltage  
Operating Temperature

If the battery cannot be immediately installed, store it in a dry, cool and clean place.

Do not expose the battery to direct sunlight, to avoid any damage to containers and lids.

**IMPORTANT NOTE** Storage time for charged cells is limited. Please see the self discharge rates at various temperatures below:



During the storage time, the open circuit voltage (OCV) must periodically be checked.

Cells with OCV below 2.07 Vpc must be recharged providing constant voltage of 2.35 Vpc with current limitation of 0.15 C10 (A), for 24 hours.

The OCV of a fully charged battery should result between 2.12-2.15 Vpc.

Failure to observe the above conditions may result in a greatly reduced capacity and service life or in permanent damage to the cells.



## 2. Installation

### Battery Room

#### WARNING

The cells are already charged when delivered and should be unpacked with care. Avoid short circuiting terminals of opposite polarity.

Before installing the cells, clean all parts. Remove the short circuit ABS protectors from the terminal posts and clean them with a soft clean cloth.

Before replacing old batteries ensure all electrical loads are switched off.

Please refer to the latest edition of the battery room standards, effective at the moment of the installation of the battery.  
NORM REF. EN 50272-2

Check that local regulations are also being complied with.

### Battery Room - Points to Consider

Ensure the floor is structurally capable of carrying the battery load.  
The floor should be resistant to Electrolyte (diluted sulphuric acid).  
There should be no ignitable sources near to the cells.  
Ensure there are no unauthorised access points to the battery room.  
All rooms should have the correct fire fighting equipment fitted in case of emergency.

### Vertical Installation ONLY

#### WARNING

Never lift cells by the terminal posts. Always use appropriated devices (such as lifting straps and suitable mechanical lifting devices) to prevent personal injury or damage to the cells.

Place the cells on the rack (or cabinet) and make sure that the spacing allows for the accommodation of a 10mm gap between cells. Most batteries have cells connected in a simple series arrangement, so the cells should be arranged to preserve the sequence: positive (+), negative (-), positive (+), negative (-) throughout the whole battery.

For batteries to be installed on multiple tiers, start by placing the cells on the lower tier on either side of the frame where the stand sections meet. Any unused stand spaces should be on the upper tier.

For batteries on stepped racks, leave any unused space on the back (top) step.

Where multiple racks are arranged end-to-end, adjust the position of the adjacent end cells to accommodate the flexible inter-rack connectors supplied.

Take particular care to preserve the positive to negative sequence when using flexible inter-tier, inter-step or inter-rack connectors between rows of cells. Leave the main positive and negative terminals of the battery free for connection to the charging source.

### Check cell alignment

Fit the inter-cell and inter-tier connectors using approved, insulated bolts and nuts. Ensure all bolts, connectors and cell terminals are free from dust or debris before connecting.

Use insulated wrenches to tighten the parts firmly together, with torque setting of 23 Nm.

Pay special attention to avoid short-circuiting the cells with any of the battery hardware.

## Check tightness and cleanliness

When all cells have been connected up check the terminal voltage, this should equal to the sum of all the individual cell voltages. If the total voltage is different to the calculated figure, some cells may have been installed incorrectly.

Connect the positive terminal of the battery to the positive terminal of the charger and the battery negative to the charger negative.

Number the cells by using a set of numbering stickers. It is common practice to number the cells beginning with #1 at the positive end of the battery and following the sequence of electrical connection of the cells, through to the negative end of the battery.

If the total voltage is different to the calculated figure, some cells may have been installed incorrectly.

## 3. Commissioning

Batteries lose charge while in transit or during storage. For this reason, a refresh charge should be given before putting the battery into service.

Recommended charge settings, at the ambient temperature range of 20 °C to 25 °C, are as follows:

12 hours at constant voltage of 2.35 Vpc at 20°C

{Current limitation 0.15 C10 Amps}

Temperature compensation;

0°C 2,45 Vpc

10°C 2,40 Vpc

20°C 2,35 Vpc

30°C 2,32 Vpc

35°C 2,30 Vpc

Once put into service, ENERGYSTORE ESPV VRLA Solar Batteries should be charged as follows:

### (a) Float Charge

To maintain the battery in fully charged condition during normal battery operation or, after a discharge, to recover 90% of nominal capacity within 20 hours, a recommended float charge has to be applied.

Recommended float voltage settings are as follows:

**Constant voltage 2.25 Vpc at 20°C ±1%**

{Current limitation 0.2 C10 Amps}

With the method described above, the effecting charging current is limited to very low values; such current increases as a function of temperature and age of the battery.



### **(b) Equalizing / Boost charge 2.35 – 2.4V**

Chargers usually have two adjustable charging voltages: one for the “floating” charge and one for the “equalizing” charge (also known as “boost”, “high rate” or “recharge”).

The equalizing charge is generally required:

When the total voltage spread between cells is greater than 0.04V under float charging conditions.

After exhaustive discharges.

For fast recharging after a discharge.

When charging cells in standby applications with frequent power outages.

For float charge using voltages below 2.23 Vpc.

Boost charge voltage is 2.35 – 2.4V per cells for a maximum duration of 48 hours. It can be turned off earlier though if the current has decreased to a value lower than  $0.05 \cdot C_{10}$ .

Temperature should not exceed 40°C.

### **(c) Photovoltaic application**

Maximum voltage should be 2.40V per cell for a maximum of 5 hours before charging is turned off or the battery is switched to float charge mode.

### **(d) Hybrid application**

Maximum voltage should be 2.35V per cell with a maximum charge current of  $0.5 \cdot C_{10}$ .

When short charging times are used then equalisation charges are required at frequent intervals, preferably for 24hrs at 2.35V every month.

### **(e) Charging current in general should not exceed 30A/100Ah**

## **4. Discharge Low Voltage Disconnect**

Discharging too much capacity from the battery will lead to early failure so the user must ensure that measures are in place to prevent this. The recommended low voltage disconnect settings are mentioned below:

<b>Back up time (h)</b>	<b>U(V) per cell</b>
0,5-1,5	1,70
1,5-3	1,75
>3-24	1,80
24-240	1,85

## **5. Operating Temperature**

The battery is designed to perform optimally at temperatures between 15-30°C. At lower temperatures the battery capacity is lower and at elevated temperatures the life is reduced. Short periods outside of these temperatures will not have a detrimental effect on the battery.

## 6. Battery Maintenance

ENERGYSTORE ESPV are sealed, maintenance-free, lead-acid batteries and need no water addition.

The containers and lids must be kept dry and free from dust.

Cleaning must be done only with a damp cotton cloth.

Avoid static discharges generated during cleaning.

### Every 6 months

Check for any evidence of damage to the battery and equipment.

Check and record the total battery floating voltage, the voltage on pilot cells\* and temperature.

### Once a year

Check and record individual cell voltages.

Perform a discharge test according to IEC 60896-21 Standards until the battery shows signs of degradation and every six months thereafter.

Keep a log book to record all maintenance and inspection operations, which will be helpful to monitor long-term changes of the battery condition.

Do not attempt to open the safety valve. Opening could cause damage to the battery.

### \*Pilot Cell

For regular monitoring of the battery condition, select one cell near the middle of the battery string as a “pilot” cell (for batteries consisting of more than 60 cells, it is advisable to select one pilot cell out of 60).

## 7. Transport

Cells must be transported in an upright position. Batteries without any visible damage are not defined as dangerous goods.

## CAPACITIES C10-C240

Cell Type U <sub>e</sub> (100%) / VPC Ref Temp	C10 1.80 20°C	C24 1.80 20°C	C48 1.80 20°C	C72 1.80 20°C	C100 1.85 20°C	C120 1.85 20°C	C240 1.85 20°C
4 ESPV-280SOLAR	214	244	255	270	266	274	282
5 ESPV-350SOLAR	270	308	321	340	336	345	355
6 ESPV-400SOLAR	316	360	376	398	394	405	417
5 ESPV-500SOLAR	391	450	454	485	487	500	515
6 ESPV-600SOLAR	468	538	543	580	583	599	617
7 ESPV-700SOLAR	543	624	630	673	676	695	716
6 ESPV-900SOLAR	670	718	773	842	830	852	888
8 ESPV-1200SOLAR	895	958	1027	1131	1110	1140	1176
10 ESPV-1500SOLAR	1115	1215	1282	1380	1380	1428	1464
12 ESPV-1800SOLAR	1340	1462	1541	1660	1660	1716	1776
12 ESPV-2000SOLAR	1516	1713	1895	1986	1904	1940	1998
16 ESPV-2600SOLAR	2027	2270	2453	2574	2529	2595	2673
20 ESPV-3300SOLAR	2558	2865	3095	3249	3192	3274	3372
22 ESPV-3600SOLAR	2813	3151	3404	3573	3511	3601	3709
24 ESPV-3950SOLAR	3069	3437	3713	3898	3830	3928	4046
26 ESPV-4250SOLAR	3325	3791	4023	4223	4149	4255	4383

