



PowerSafe OPzV Battery
Installation, Operation and Maintenance Instructions

Important

Please read this manual immediately on receipt of the battery before unpacking and installing. Failure to comply with these instructions will render any warranties null and void.



No smoking,
no open flames,
no sparks



Shield
eyes



Read
instructions



Electrical
hazard



Electrolyte is
corrosive



Danger



Clean all acid splash in eyes or on skin
with plenty of clean water. Then seek
medical help. Acid on clothing is to be
washed with water



Warning: Risk of fire, explosion, or burns. Do not
disassemble, heat above 60°C (140°F), or incinerate.
Avoid any short circuit. Metallic parts under voltage on the
battery, do not place tools or items on top of the battery



Recycle scrap
batteries.
Contains lead.

Handling

Vented lead acid batteries are supplied in a fully charged state
and must be unpacked carefully to avoid short-circuit between
terminals of opposite polarity. The cells are heavy and must be
lifted with appropriate equipment.

Keep flames away

In case of accidental overcharge a flammable gas
can leak off the safety vent.
Discharge any possible static electricity from clothes
by touching an earth connected part.

Tools

Use tools with insulated handles.
Do not place or drop metal objects on the battery.
Remove rings, wristwatch and articles of clothing with metal
parts that may come into contact with the battery terminals.

California Proposition 65 Warning - Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

1. Receiving the Shipment

Carefully examine the battery shipment upon arrival for any signs of transit
damage and that it agrees with the materials list or packing slip. Be very careful
not to inadvertently discard any accessories contained in the packing material.

Use rubber gloves when handling broken or damaged containers in case of
acid leakage.

2. Storage

Store **PowerSafe® OPzV** batteries in a dry, clean and preferably cool location.

Do not expose the cells to direct sunlight as damage to the container and
cover may occur.

Although batteries are supplied charged, their storage time is limited. The
maximum storage intervals prior to a required refreshing charge, based on
the battery's date code label, are as follows:

- 12 months at 68°F (20°C)
- 6 months at 86°F (30°C)
- 3 months at 104°F (40°C)

A refreshing charge shall be performed after this time or if the open circuit
voltage is below 2.07 Vpc.

Failure to observe these conditions may result in greatly reduced capacity and
service life.

The necessity of a charge can also be determined by measuring the open
The refreshing charge shall be carried out according to clause a) of the
commissioning charge paragraph below. Alternatively, the cells can be float
charged at 2.25 Vpc during storage.

FAILURE TO CHARGE AS NOTED VOIDS THE BATTERY'S WARRANTY.

3. Installation

The electrical protective measures and the accommodation and ventilation of
the battery installation must be in accordance with the applicable rules and
regulations. Specifically, IEC 62485-2 applies.

Do not use terminal posts to lift or handle cells.

The battery should be installed in a clean, dry area. It will not emit corrosive
gases in normal operation and can be installed together with other electrical
equipment. Under normal conditions the gas release is negligible and natural
ventilation is sufficient for cooling purposes and inadvertent overcharge,
enabling OPzV batteries to be used safely in offices or within equipment.

However, care must be taken to ensure adequate ventilation when placed
in cabinets. They must not be placed in sealed cabinets without ventilation
openings at the top and bottom. Avoid placing the battery in a warm place or
in direct sunlight.

Approved battery racks are recommended for proper installation. Place the
cells on the rack and arrange the positive and the negative terminals for
connection according to the wiring diagram.

Horizontal Installation

Do not use terminal posts to lift or handle cells.

	2 Terminals	4 Terminals
Correct		
Incorrect		

Do not install the cells in such a way that the box-lid bond is resting on a
runner. Always ensure that the arrow on the lid of each unit is pointing in
vertical orientation.

Do not invert cells (vents upside down) or allow the front of the cells to be
positioned lower than the base of the cell as it might block the safety valve and
damage pillars.

Check that all contact surfaces are clean. If required clean with a brass brush.
Tighten the terminal screws, taking care to use the correct torque loading
(Table 1). To avoid damage to the plastic materials, do not use grease. Fit the
covers supplied for protection against inadvertent contact.

Table 1: Torque loadings for terminal screws

Type	Terminal screw	Torque Nm	Torque in - lbs
OPzV	M10	23 – 25	203 - 221

Carefully follow the polarity sequence to avoid short circuiting cell groups.

A loose connector can make adjusting the charger difficult, create erratic
performance and possible damage to the battery and/or even personal injury.

Finally, with the charger switched off, the battery fuses removed, and the load
disconnected, connect the battery to the D.C. power supply.

Ensure that the polarity is correct- positive terminal of the battery to the
positive terminal of the charger. Switch on the charger and charge according to
the commissioning charge paragraph below.

The first charge must be monitored to ensure that the limits are not exceeded
and that no unacceptable temperatures occur.

■ Cells or monoblocs in parallel strings

OPzV cells may be connected in parallel to give higher current capability. In the case of parallel connected strings, use batteries of the same capacity, design, and age only with a maximum of 4 parallel strings. The resistance of the cables in each string must be the same, e.g., same cross-section, same length. Connect the battery strings in parallel at the charger terminals.

4. Commissioning charge

When commissioning a new battery (first charge), follow one of the recommended procedures:

- IU method (boost charge):**
At a raised voltage of 2.33 – 2.40Vpc. The charging time will be 12 to 24 hours depending on the initial charge conditions. The current must be limited to $4 \times I_{10}$. Boost charging must be switched off or switched over to float charging as soon as the fully charged state is reached.
- Float charge:**
With a voltage of 2.25Vpc, full capacity will be obtained after a longer period of 4 to 6 weeks depending on the state of charge.

5. Standby/ Float Charge

■ Float Voltage

The recommended float / charge voltage is 2.25 Vpc at 68 °F (20°C) (tolerance 2.23 – 2.25 Vpc). The charger voltage amounts to 2.25 Vpc x no. of cells.

If the average ambient temperature deviates more than 50 °F (10°C) from the reference temperature of 68 °F (20°C), it is recommended to adjust the float voltage the following temperature compensation curve:

Table 2: Temperature Compensation

Temperature	Float Voltage
14 °F / -10 °C	2.37 Vpc
32 °F / 0 °C	2.33 Vpc
50 °F / 10 °C	2.29 Vpc
68 °F / 20 °C	2.25 Vpc
86 °F / 30 °C	2.23 Vpc
104 °F / 40 °C	2.21 Vpc

In the case that the average temperature deviates less than 41 °F (5 °C), no temperature compensation has to be applied.

The recommended float charge voltage is 2.25 Vpc at 68 °F (20°C). Following a commission charge and after 6 months continuous charge at the recommended float voltage, individual cell voltages will stabilize within $\pm 4.5\%$ of the mean applied voltage.

However, immediately following commissioning and for the initial 6 months of continuous float charge, individual cell voltage values outside the above tolerance may be observed without adverse effect. There is no relationship between a cell's float voltage and its discharge capacity. Cells are perfectly capable of giving their discharge capacity even when outside the $\pm 4.5\%$ range.

After 6 months service, should any individual cell show a continuing reduction or increase in voltage outside the above limits over 3 successive monthly periods, our sales department should be contacted for advice.

■ Charging Current

Limitation of the charging current is not required under float charge condition at 2.25 Vpc. At higher charge voltages the charge current shall be limited to $4 \times I_{10}$.

■ Boost Charge

To reduce the recharge time the battery may be recharged at 2.33 – 2.40 Vpc with a current limited to $4 \times I_{10}$. Fast charging must be switched over to float charging when the fully charged state is reached.

■ Ripple Current

In the standby operation mode, the effective value of the A.C. ripple current must not exceed 5 A/100Ah C_{10} , otherwise reduced operational life must be expected.

6. Temperature

The recommended operating temperature range is 13 °F (-10 °C) to 113 °F (+45 °C). The battery will give the best performance and service life when working in the temperature range of 14 °F (+10 °C) to 86 °F (+30 °C).

Higher temperatures reduce the operational life. Lower temperatures reduce the available capacity. Temporary peak temperatures shall not exceed -22 °F (-30°C) and 131 °F (+55°C). Consideration must be given to depth of discharge (low temperatures) and ventilation (high temperatures). All technical data relates to the rated temperature of 68 °F (+20 °C).

Do not expose cells to direct sunlight.

7. Discharging

■ End of Discharge Voltage

The battery must not be discharged more than the capacity specified in the performance tables. Deeper discharges may damage the battery and shorten its operational life. As a general rule the end of discharge voltage shall be limited to the values listed below:

Table 3: End Voltages

Discharge Time	End Voltage
1h < t < 5h	1.70 Vpc
5h < t < 8h	1.75 Vpc
8h < t < 24h	1.80 Vpc

Individual cell voltages may fall below UE by not more than 0.2 Vpc. A low voltage disconnect is recommended to prevent deep discharge.

Special attention should be given to small loads that are not automatically disconnected at the end of discharge.

■ Discharged Cells and monoblocs

OPzV batteries must not be left in a discharged condition after supplying the load but must be immediately returned to recharge mode. Failure to observe these conditions may result in greatly reduced service life and unreliability.

■ Accidental Deep Discharge

Following accidental deep discharge, the battery must be recharged at 2.25 Vpc followed by an equalizing charge. As the internal resistance is high at first, the initial charge current is low.

Important notice: Each deep discharge is abusive and could affect the life expectancy of the battery.

8. Testing

Check that the battery is fully charged. Before testing new batteries, it must be ensured that a sufficient commissioning charge has been applied.

■ Temperature correction factor

The temperature has an effect on the battery capacity. The following table shows the correction factors for temperatures other than the reference temperature of 68 °F (20°C). Every 12 months, read and record the following:

- Cell-to-cell connection resistance (in ohms)
- Terminal connection resistance (in ohms)
- Ambient temperature in the immediate battery environment

Keep a logbook to record values, power outages, discharge tests, etc.

An autonomy check can be carried out once or twice a year.

The above record taking is the absolute minimum to protect the warranty. This data will be required for any warranty claim made on the battery.

Table 4: Temperature Correction Factor

Discharge time	Temperature in °F/°C					
	14/-10	32/0	50/+10	68/+20	86/+30	104/+40
5-12 hours	0.60	0.78	0.90	1.00	1.05	1.07
1-4 hours	0.55	0.74	0.88	1.00	1.06	1.08

Example : A battery with a capacity of 200 Ah at 20°C (68°F) for a 5-hour discharge will have a capacity of 180 Ah when discharged at 10°C (50°F) (200×0.90).

9. Recharge

After a discharge, the battery can be recharged at the operating voltage (float charge voltage).

Depending on the depth of discharge this may take up to 3 days.

To reduce the charging time the recharging can be carried out with a boost charge voltage of 2.33 to 2.40 Vpc (fast charge). The recharging times are dependent on the depth of discharge and on the charging current available. Generally, 10 to 20 hours duration can be expected at charging currents between 5A and 40A per 100Ah C_{10} .

■ Equalizing charge

Under exceptional circumstances only, e.g. after deep discharges or after repeated inadequate recharging, an equalizing charge shall be carried out according to clause a) of the commissioning charge paragraph or with the following IUI characteristic:

Charge at increased voltage of 2.33 – 2.40 Vpc, then continue with a constant current of 1.5 A per 100 Ah C_{10} during which individual cell voltages can be allowed to rise to 2.60 – 2.65 Vpc maximum. The charging must be monitored. The charging time at constant current shall be 5 to 10 hours.

10. Maintenance / Checks

OPzV batteries are maintenance free, sealed, lead acid batteries and do not have to be topped up with water or electrolyte. The containers and lids should be kept dry and free from dust. Cleaning must be undertaken with a damp cotton cloth without man-made fibers or addition of cleaning agents. Avoid static discharges generated during cleaning.

Every 6 months, check the total voltage at the battery terminals, the cell voltages of pilot cells and the temperature. Once a year, in addition to the above, take readings of individual cell voltages. Keep a logbook in which the measured values can be noted as well as power cuts, discharge tests, etc. Do not attempt to open the safety valve. Opening could cause lasting damage to the battery and is prohibited.

10. Special Applications

Whenever OPzV batteries are to be used for special applications such as repeated cycling or under extreme ambient conditions please contact your SALES OFFICE.

For further information please visit our website: www.enersys.com



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