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Installation, Operation  
and Maintenance  
Instructions

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## IMPORTANT

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

## CARE FOR YOUR SAFETY



Dispose at registered waste handling facility



Battery must be recycled



Protect eyes from electrolyte



Read instructions



Do not charge in sealed container

### Handling

PowerSafe VE batteries are supplied in a fully charged state and must be unpacked carefully to avoid very high short-circuit currents between terminals of opposite polarity. Use care when handling and moving batteries. Appropriate lifting equipment must be used.

### 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.

### Other safety precautions that need to be taken



No smoking, no naked flames, no sparks



Danger



Electrolyte is corrosive



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.



Risk of explosion or fire. Avoid any short circuit. Metallic parts under voltage on the battery, do not place tools or items on top of the battery.

## 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.

Batteries contain sulfuric acid in glass fiber separators.

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

## STORAGE

Store PowerSafe VE batteries in a dry, clean and preferably cool location.

Since the batteries are supplied charged, storage time is limited. In order to easily charge the batteries after prolonged storage, it is advised not to store it more than:

- 6 months at ambient temperature no warmer than 77°F, (25°C)
- 4 months at 22°F, (30°C)
- 2 months at 104°F, (40°C)

Give the battery a freshening charge before the end of the recommended storage interval.

A refreshing charge shall be performed at 2.26 V/cell at 77°F (25°C) for 96 hours or until the charge current does not vary for a 3 hour period.

The necessity of a charge can also be determined by measuring the open circuit voltage of a stored battery.

Charge is advised if the voltage drops below 2.07 V/cell.

Maximum total storage prior to installation is 2 years from date of shipment from factory to the customer. Freshening charges are required before the end of the storage time period or more frequently, as noted above.

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

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

## INSTALLATION

Install in clean, dry area. PowerSafe VE product releases minimal amounts of gas during normal operation (gas recombination efficiency  $\geq 95\%$ ). It can be installed near the main equipment. Batteries must be installed in accordance with local, state and federal regulations and manufacturers instructions.

### ■ Temperature

Avoid placing the battery in areas of high temperature or in direct sunlight. The battery will give the best performance and service life when working at a temperature between 68°F (20°C) and 77°F (25°C). The usual operating temperature is between 14°F (-10°C) and 113°F (+45°C). Limits are comprised between -22°F (-30°C) and 113°F (+45°C).

### ■ Ventilation

Under normal conditions gas release is very low and natural ventilation is sufficient for cooling purposes and inadvertent overcharge, enabling PowerSafe VE batteries to be used safely in offices and with main equipment.

However care must be taken to ensure adequate ventilation when placed in cabinets. Batteries must not be placed in sealed cabinets.

### ■ Security

All installation and ventilation must comply with the current local, state and federal regulations.

### ■ Mounting

EnerSys battery racks or cabinets are recommended for proper installation.

Assemble the rack according to instructions. Place the battery blocs or cells on the rack and arrange the positive and the negative terminals for connection according to the wiring diagram. Check that all contact surfaces are clean and apply the bloc or cell connectors and the terminal screws.

Tighten the screws securely. Follow the polarity to avoid short circuiting of cell groups. Finally connect the battery terminals. It is important that the battery is mounted firmly.

■ **Torque**

The maximum torque load of intercell connector bolts is 6.8 to 10 Nm (60 to 88 lb. in) for M6 screw. A loose connector can cause problems in charger adjustment, erratic battery performance, possible damage to the battery and/or personal injury. Finally, install the connector covers (optional).

**CELLS IN PARALLEL STRINGS**

When using constant voltage chargers, ensure that the connections between the charger and the end of each string within the battery have the same electrical resistance. Parallel strings must be limited to five strings.

**CHARGING**

■ **Float Voltage**

The float/charge voltage is 2.26 V per cell at 77°F (25°C).

When the average ambient temperature deviates more than ± 9°F (5°C) from the reference, it is necessary to adjust the float voltage as follows :

- 2.37 to 2.38 Vpc at 32°F, (0°C)
- 2.30 to 2.33 Vpc at 50°F, (10°C)
- 2.27 to 2.30 Vpc at 68°F, (20°C)
- 2.24 to 2.27 Vpc at 77°F, (25°C) (reference T°C)
- 2.23 to 2.26 Vpc at 86°F, (30°C)
- 2.21 to 2.24 Vpc at 95°F, (35°C)

Due to the phenomena of gas recombination a difference of ± 2% (earlier in float life ± 5% is common) for an individual cell voltage can be observed. However the total voltage of the battery shall be within the limits stated above.

■ **Charging Current**

The charging current is self limiting.

■ **Fast Recharge**

Occasionally (4 or 5 times a year) the battery may be recharged at 2.40 V per cell with a current limited to the values listed in the Table 2. Fast charging should be stopped after approx. 10 or 15 hour.

■ **Ripple Current**

Unacceptable levels of ripple current from the charger or the load can cause permanent damage and a reduction in service life. It is recommended to limit the continuous ripple current to the values of the Table 2 (in amperes).

■ **State of Charge**

The battery state of charge can be determined approximately by measuring the open circuit voltage after the battery has been at rest for a minimum of 24 hours at 77°F (25°C).

State of charge	Voltage
100%	2.13 to 2.14 V/Cell
80%	2.09 to 2.11 V/Cell
60%	2.06 to 2.08 V/Cell
40%	2.02 to 2.04 V/Cell
20%	1.97 to 2.00 V/Cell

**DISCHARGING**

■ **End of Discharge Voltage**

The end of discharge voltage must be limited to 1.60 V per cell.

A protecting system shall have to be installed to prevent deep discharge.

■ **Discharged Cells**

PowerSafe VE batteries must not be left in a discharged condition after supplying the load, but must be immediately returned to float recharge mode.

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

■ **Accidental Deep Discharge**

When the battery is completely discharged, the sulfuric acid is completely absorbed and the remaining electrolyte consists only of water.

At this point, the sulfation of the plates is at its maximum, considerably increasing the cell's internal resistance.

- **Important notice** : this type of deep discharge will provoke a premature deterioration of the battery and a noticeable effect on life expectancy.

■ **The effect of temperature**

- **on capacity**

Correction factor of the capacity, according to temperature.

Time of discharge	1 hour to 24 hours
41°F, (5°C)	0.89
50°F, (10°C)	0.91
59°F, (15°C)	0.95
68°F, (20°C)	0.98
77°F, (25°C)	1.00
86°F, (30°C)	1.01
95°F, (35°C)	1.02
104°, (40°C)	1.03

Table 1

**MAINTENANCE/CHECKS**

PowerSafe VE are maintenance free, sealed, lead acid batteries and need no water addition.

The containers and lids shall be kept dry and free from dust. Cleaning must be done only with a damp cotton cloth. Check monthly that total voltage at battery terminals is (N x 2.24 to 2.27 V) for a temperature of 77°F (25°C). (N being the number of cells in the battery).

Every 12 months, read and record the following:

- Individual cell or unit voltages (volts)
- Cell-to-cell connection resistance (ohms)
- Terminal connection resistance (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.

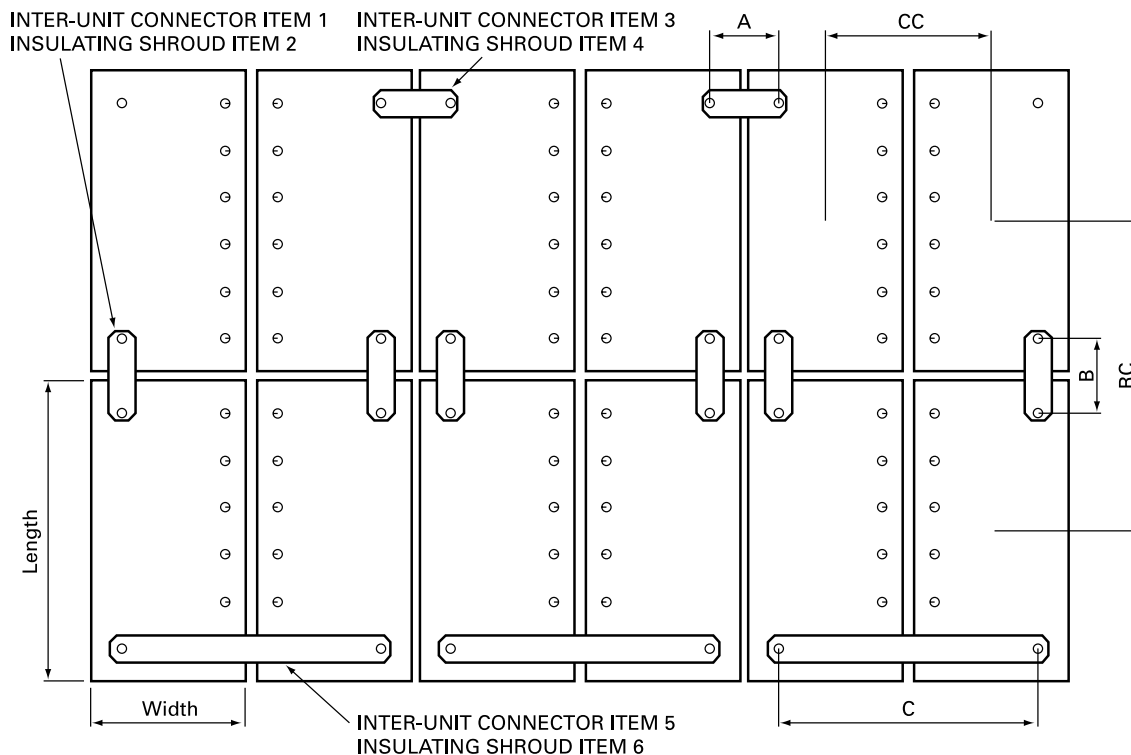
The above record taking is the absolute minimum to protect the warranty. This data will be required for any warranty claim made on the battery.

**RECOMMENDED CURRENT LIMIT VALUES WHEN RECHARGING WITH CONSTANT VOLTAGE RECHARGING METHOD**

Type	Maximum charging current (A)	Max recommended rms value of the alternating component (A)
12VE45	4.0	2.0
12VE70	7.0	3.5
12VE85	7.0	3.5
12VE95	8.5	4.25
12VE125	10.0	5.0

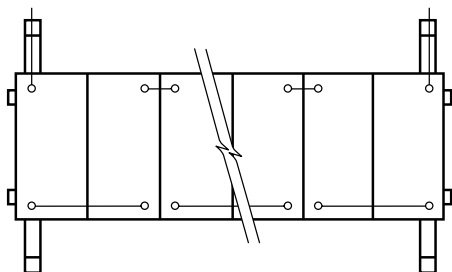
Table 2

## INTER-UNIT CONNECTOR LAYOUT

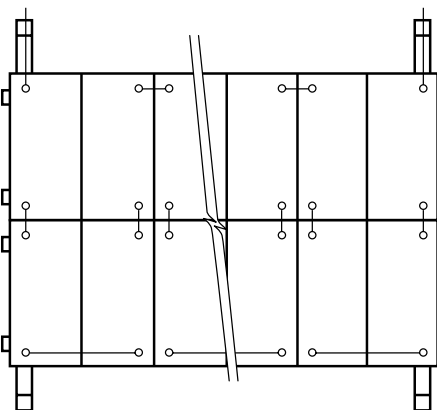


## TYPICAL LAYOUTS ON STEEL STANDS

### SINGLE ROW STAND



### DOUBLE ROW STAND



Note! End terminal position will depend upon number of units in row, ie. whether "ODD" or "EVEN" number

Type	Length	Width	CC	RC	A	B	C	1	2	3	4	5	6
12VE45	8.9	5.5	5.6	9.1	2.1	1.9	9.0	866880	HRD2328	866881	HRD2328	866885	HRD2329
12VE70	10.1	6.9	6.9	10.3	2.7	2.2	11.2	866881	HRD2328	866883	HRD2327	866886	HRD2330
12VE85	11.9	6.9	6.9	12.1	2.7	2.5	11.2	866882	HRD2327	866883	HRD2327	866886	HRD2330
12VE95	13.3	6.8	6.8	13.5	2.6	3.0	11.1	866884	HRD2327	866883	HRD2327	866886	HRD2330
12VE125	13.3	6.8	6.8	13.5	2.6	3.0	11.1	866884	HRD2327	866883	HRD2327	866886	HRD2330

All measurements are in inches



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