



Installation, Operations
and Maintenance
Instructions



Important information	2
Care for your safety	2
Unpacking	2
Storage	3
Installation	3
Cell strings connected in parallel	3
Charging	4
Discharging	4
Technical specifications of bloc	6
Typical assembly drawing	6
Battery record sheet	7

Important information

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

Care for your safety



No smoking, no naked flames, no sparks



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.



Electrical hazard



Read instructions



Electrolyte is corrosive



Re-cycle scrap batteries. Contains lead



Shield eyes



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.



Danger

Handling

PowerSafe VX 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.

Keep flames away

In case of accidental overcharge a flammable gas may be emitted from 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.

Unpacking

It is advisable to unpack the monoblocs and accessories before commencing assembly and erection and not to unpack and erect monobloc by monobloc.

All monobloc/units should be handled carefully as the plastic container can be damaged or broken if dropped. Under no circumstances should the batteries be lifted by their terminal pillars.

All items should be carefully checked against the accompanying advice notes to ascertain if any are missing or damaged.

In this event contact your Enersys representative.

A rigid plastic insulating cover is provided which protects the unit terminals. These are factory fitted and there is no need to remove them until access to the terminals is required.

Storage

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

As the batteries are supplied charged it is advised not to store batteries without a refreshing charge for more than:

- 6 months at 20°C
- 3 months at 30°C
- 6 weeks at 40°C
- 3 weeks at 50°C

The refreshing charge needs to be at 2.27-2.30Vpc at 20°C for 48 to 96 hours. A current limit is not essential, but for optimum charge efficiency the current output of the charger can be limited to 10% of the 3 hour capacity rating. The need for a refreshing charge can also be determined by measuring the open circuit voltage of the stored battery. Refreshing charge is advised if the voltage drops below 2.10Vpc. Failure to observe these conditions may result in greatly reduced capacity and service life.

■ Temperature

Avoid placing the battery in a hot environment or in front of a window. The battery will give the best performance and service life when working at a temperature between 20°C and 25°C. Operating temperatures should not exceed +45°C or fall below -30°C.

■ Ventilation

Under normal conditions gas release is very low and natural ventilation is sufficient for cooling purposes and inadvertent overcharge, enabling PowerSafe VX 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.

Installation

Install batteries in a clean and dry area. PowerSafe VX products release minimal amounts of gas during normal operation (gas recombination efficiency $\geq 95\%$). Batteries must be installed in accordance with national standards

(for instance EN 50272-2), otherwise in accordance with the manufacturer's instructions.

Please note that each monobloc is supplied complete with a fastener set, i.e. nut, spring washer and plain washer. These are fitted to the threaded stud of each terminal pillar prior to despatch from the factory.

Energys battery racks or cabinets are recommended when installing the monoblocs. Assemble the rack according to instructions. Place the battery blocs on the rack at their correct cell centres (as indicated on the connection drawing) and arrange the positive and the negative terminals for connection according to the wiring diagram.

■ Connection of monoblocs

When all monoblocs have been placed on the stands/in the cabinets, connect them together by means of the connecting straps and fastener set, in sequence, pillar, connecting strap, plain washer, spring washer and nut.

Tighten the fastener set nut(s) to a level of fastening torque of 5 ± 0.5 Nm. Never use a standard spanner, use insulated tools only.

A loose connector can cause problems in charger adjustment, erratic battery performance, possible damage to the battery and/or personal injury.

Single solid sleeved copper strap connector type SUB5176 is used to connect units located on the same tier of the stand (or on the same shelf of a cabinet). A single flexible insulated cable connector is used for inter-tier (or inter-shelf) connection which is provided when the stand is supplied by Energys.

■ Putting the terminal cover back

Insulating terminal covers have been designed to be fitted on completion of the connecting up sequence of the battery. Where inter-tier flexible insulated cable connectors are used, it will be necessary to remove the corner of the cover by simply snapping it off.

Cell strings connected in parallel

Using constant voltage chargers and ensuring that the connections made between the charger and the batteries have the same electrical resistance, no special arrangements have to be made for batteries in parallel.

Although no special circuit arrangements are required, where the parallel connection is made at the charger or distribution board, to avoid out of step conditions, the bus bar run length and the area of cross section should be designed so that the circuit resistance value for each of the strings is equal within limits $\pm 5\%$.

Charging

■ Float voltage

The recommended float charge voltage is 2.28 volts per cell at 20°C.

Following a commission charge and after 6 months continuous charge at the recommended float voltage, individual cell voltages will stabilise 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 or monobloc show a continuing reduction or increase in voltage outside the above limits over 3 successive monthly periods, Enersys should be contacted for advice.

When the average ambient temperature deviates more than $\pm 5^\circ\text{C}$ from the reference temperature (20°C), it is necessary to adjust the float voltage as follows:

Temperature	Float voltage range per cell
0°C	2.33-2.36V
10°C	2.30-2.33V
20°C	2.27-2.30V
25°C	2.25-2.28V
30°C	2.24-2.27V
35°C	2.22-2.25V
40°C	2.21-2.24V
45°C	2.19-2.22V
50°C	2.18-2.21V

If the charger does not permit an adjustment of float voltage in relation to the temperature, it is possible to set a float voltage value according to the temperature ranges as indicated in the last table of this publication.

■ Charging current

A discharged VRLA battery will accept a high recharge current, but for those seeking a more economical charging system a current limit of 0.08 C₁₀ or 0.1 C₃ (A) is adequate.

■ Fast recharge

Increasing the charge voltage to 2.40Vpc with a current limited to 0.1 C₁₀ or 0.125 C₃ (A) can reduce recharge times. Fast charge should be stopped after approximately 10 to 15 hours. In order to achieve a normal service life, this charge regime must not be used more than once per month.

■ Float charge ripple

Excessive ripple on the D.C. supply across a battery has the effect of reducing life and performance.

It is therefore recommended that voltage regulation across the system, including the load but without the battery connected, under steady state conditions, shall be better than $\pm 1\%$ between 5% and 100% load.

■ 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 20°C.

Voltage	State of charge
2.14Vpc	100%
2.10Vpc	80%
2.07Vpc	60%
2.04Vpc	40%
2.00Vpc	20%

Open circuit voltage variation with temperature is 2.5mV per 10°C.

Discharging

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

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

■ Accidental deep discharging

For optimum operation the minimum voltage of the system should be related to the duty as follows:

Duty	Minimum end voltage
$5 \text{ min} \leq t \leq 1\text{h}$	1.65V
$1\text{h} \leq t \leq 5\text{h}$	1.70V
$5\text{h} \leq t \leq 8\text{h}$	1.75V
$8\text{h} \leq t \leq 20\text{h}$	1.80V

In order to protect the battery it is advisable to have system monitoring and low voltage cut-out.

Deep discharge will produce a premature deterioration of the battery and a noticeable reduction in the life expectancy of the battery.

■ The effect of temperature

- on capacity

Correction factors for capacity, according to the temperature, are as follows:

Discharge Time	0°C	5°C	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C
5 mins to 59 mins	0.80	0.86	0.91	0.96	1	1.04	1.06	1.09	1.1	1.12	1.13
1h to 24h	0.86	0.90	0.94	0.97	1	1.03	1.05	1.06	1.07	1.08	1.09

- on life

Operation of valve regulated batteries at temperatures higher than 20°C will reduce life expectancy. Life is reduced by 50% for every 10°C rise in temperature.

Maintenance/Checks

PowerSafe VX 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 carried out with a damp cotton cloth only. Check monthly that total voltage at battery terminals is $(N \times 2.28 \text{ V})$ for a temperature at 20°C. (N = the number of cells in the battery). Take annual readings of the voltages of cells making up the battery.

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

An autonomy test is recommended once a year.

Technical data when charging with a constant voltage

If the charger does not permit an adjustment of the float voltage in relation to the temperature, it is possible to set a float voltage value and a recharging voltage value according to the temperature ranges indicated in the table below:

Temperature	Float Voltage	Recharging Voltage
0°C to 10°C	2.34Vpc	2.45Vpc
10°C to 20°C	2.31Vpc	2.40Vpc
20°C to 30°C	2.28Vpc	2.35Vpc
30°C to 40°C	2.25Vpc	2.30Vpc
40°C to 50°C	2.22Vpc	2.25Vpc

Technical specifications of bloc

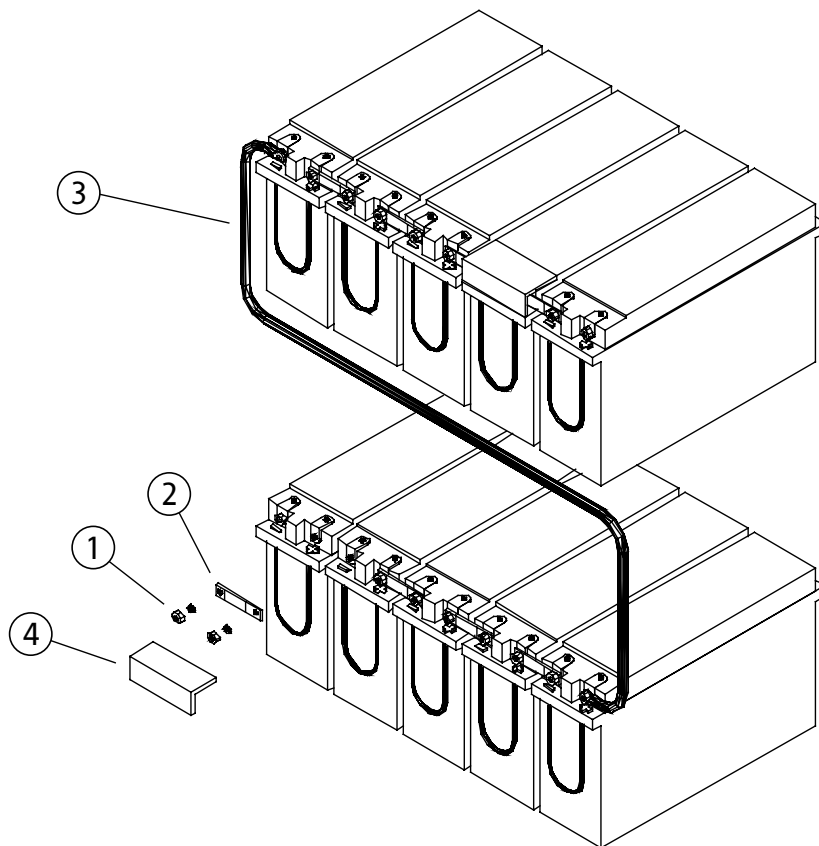
Type	Length	Width	Height	Cell Centres	Weight (kg)
8VX100F	384	125	228	135	32
12VX100F	384	125	228	135	48

All dimensions in millimetres

Typical connection assembly

Item No.	Description	Cat No.
1	Fastener set M6	-
2	Inter-unit connector	SUB5176
3	Inter-tier connector (35 mm ² max.)	-
4	Insulating terminal cover	SPH0571B

Typical assembly drawing



Battery record sheet

Works Order No:		Customer Ref:	
Installed At:		Battery Type:	
No. of Monoblocs:		Date Installed:	
Battery Float Voltage:	V	Ambient Temperature:	°C
Battery Charging Current:	A	Average Vpc:	
Comments:			
Engineer in Charge:		Date of Service:	

	Volts per cell	Volts per Monobloc		Volts per cell	Volts per Monobloc		Volts per cell	Volts per Monobloc		Volts per cell	Volts per Monobloc		Volts per cell	Volts per Monobloc		Volts per cell	Volts per Monobloc
1			34			67			100			133			166		
2			35			68			101			134			167		
3			36			69			102			135			168		
4			37			70			103			136			169		
5			38			71			104			137			170		
6			39			72			105			138			171		
7			40			73			106			139			172		
8			41			74			107			140			173		
9			42			75			108			141			174		
10			43			76			109			142			175		
11			44			77			110			143			176		
12			45			78			111			144			177		
13			46			79			112			145			178		
14			47			80			113			146			179		
15			48			81			114			147			180		
16			49			82			115			148			181		
17			50			83			116			149			182		
18			51			84			117			150			183		
19			52			85			118			151			184		
20			53			86			119			152			185		
21			54			87			120			153			186		
22			55			88			121			154			187		
23			56			89			122			155			188		
24			57			90			123			156			189		
25			58			91			124			157			190		
26			59			92			125			158			191		
27			60			93			126			159			192		
28			61			94			127			160			193		
29			62			95			128			161			194		
30			63			96			129			162			195		
31			64			97			130			163			196		
32			65			98			131			164			197		
33			66			99			132			165			198		

Global Headquarters
P.O. Box 14145 Reading,
PA 196212-4145
USA
Tel: +1-610-208-1991
+1-800-538-3627
Fax: +1-610-372-8613

EnerSys EMEA
Houtweg 26
1140 Brussels
Belgium
Tel: +32 (0)2 247 94 47
Fax: +32 (0)2 247 94 49

EnerSys Asia
No. 49, Yanshan Road
Shekou, Shenzhen
518066, China
Tel: +86-755-2689 3639
Fax: +86-755-2689 8013



Contact: