

**PowerSafe<sup>®</sup>**  
**SBSXC+**

Installation, Operation  
and Maintenance Manual












Visit us at [www.enersys.com](http://www.enersys.com)

**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.

**Care for your safety**

 No smoking, no naked 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. Metallic parts under voltage are present on the battery, avoid short circuit. Do not place tools or items on top of the battery.			 Recycle scrap batteries. Contains lead Pb	

**Handling**

PowerSafe SBS XC+ batteries are supplied in a charged condition and are capable of extremely high short circuit currents. Take care to avoid short-circuiting terminals of opposite polarity.

**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**

Upon receipt of the shipment, check the contents against the packing slip and for damage. Immediately inform EnerSys® of any missing or damaged items. EnerSys is not responsible for shipment damage or shortages that the receiver does not report to the carrier.

**2. Storage**

**2.1. Storage Conditions and Time**

If a battery cannot be installed immediately it should be stored in a clean, cool and dry area. During storage cells/monoblocs lose capacity through self-discharge. High temperatures increase the rate of self-discharge and reduce the storage life.

**2.1.1.** The maximum storage time before a refresh charge is required, and the recommended OCV audit intervals are:

Temperature (°C / °F)	Storage Time (Months)	OCV Audit Interval (Months)
+10 / +50	48	12
+15 / +59	34	12
+20 / +68	24	12
+25 / +77	17	6
+30 / +96	12	6
+35 / +95	8.5	3
+40 / +104	6	3

**2.1.2.** Cells/monoblocs must be given a refresh charge when the OCV approaches the equivalent of 2.10 Volts per cell or when the maximum storage time is reached, whichever occurs first.

**2.2. Refresh Charge**

Charge at a constant voltage equivalent to 2.29 - 2.40Vpc with a minimum 0.1C<sub>10</sub> Amps available for a period of 24 hours.

**2.3. Commissioning Charge**

Before commencing operation, the battery must be given a commissioning charge. The batteries should be charged using constant voltage with a minimum charge current of 0.1C<sub>10</sub> Amps with no load connected to the battery.

Either of the following methods can be used:

- Charge for 7 days at the recommended float voltage of 2.29Vpc at 20°C, or
- Charge for 24 hours at the recommended boost charge voltage of 2.40Vpc at 20°C.

Note: in the event that a routine discharge test will be performed following commissioning, the battery should be charged in float mode for 24 hours beforehand.

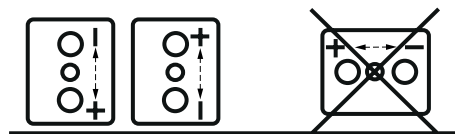
**3. Battery Location**

The battery compartment/room must have adequate ventilation to limit hydrogen accumulation. Batteries must be installed in accordance with the IEC 62485-2 standard and any other local/national laws and regulations.

**4. Installation**

Products can be mounted in any orientation except inverted.

- 12V blocs: it is recommended that blocs are installed on their base. Please consult your EnerSys representative about any other installation orientations.
- 2V cells: in cyclic applications the recommended orientation is horizontal. In such configuration the instructions below must be complied with.
  - Do not use terminal posts to lift or handle cells.
  - Do not install the cells in such a way that the box-lid seal is resting on a runner.
  - Always ensure that the arrow on the lid of each cell is pointing in vertical orientation.



Each cell/monobloc is supplied with terminal/connector fasteners.

The positive terminal is identified by a "+" symbol on each cell/monobloc. Install the batteries in accordance with the instructions and/or layout drawing, taking care to ensure correct terminal location and polarity.

Connect the monoblocs/cells with the connectors and fasteners provided. The fastener torque value is indicated on the product label.

Place the insulating covers in position immediately after tightening the fasteners.

**5. Operation**

PowerSafe SBS XC+ cells and monoblocs are designed for a multitude of operating modes. From controlled hybrid partial state of charge operation (PSoC) to unreliable grid and renewable energy applications where, due to the demands on the battery, there is a risk of uncontrolled partial state of charge operation.

The battery will give the best performance and service life when working at a temperature of 20°C. The maximum operating temperature range is -40°C to +50°C. 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.

**5.1. Standby / Float Operation**

Constant voltage chargers are recommended. The charging voltage should be set at the equivalent of 2.29Vpc at 20°C (68°F) or 2.27Vpc at 25°C (77°F).

The recommended float voltage temperature compensation is:

- 2.29Vpc +3mV per cell per °C below 20°C (68°F)
- 2.29Vpc -3mV per cell per °C above 20°C (68°F)

The charging voltage, at 46°C (115°F) and above, is 2.21Vpc.

**5.2. Fast Charge Operation**

The inherently high charge acceptance of the TPPL technology used in PowerSafe SBS XC+ is suited for applications which require a fast time to repeat duty.

The rectifier output voltage should be set at between 2.35Vpc to 2.40Vpc (at 20°C), with appropriate temperature compensation applied as per Section 5.1. Note, charging using 2.35Vpc will result in a longer recharge time.

Where the rectifier voltage cannot be adjusted to values >2.40Vpc to compensate for temperatures below 20°C, the time for recharge will be increased as a consequence.

Once fully charged the voltage can be reverted to float voltage, with temperature compensation as required.

Further details can be found in the **PowerSafe SBS XC+ Operation Guide for Hybrid Applications**.

**5.3. Charging Current**

Due to their very low internal resistance PowerSafe SBS XC+ batteries will accept unlimited current during recharge.

**5.3.1. Unreliable Grid and Renewable Energy Applications**

For cost and practicality purposes in float applications, where minimizing recharge time to support repeat duty is not critical, the rectifier current can be limited to the load plus 0.1C<sub>10</sub> Amps (minimum).

**5.3.2. Hybrid Controlled Full & Partial State of Charge (PSoC)**

For these applications, the rectifier current should be limited to the load plus 0.2C<sub>10</sub> Amps (minimum).

Further details can be found in the **PowerSafe SBS XC+ Operation Guide for Renewable Energy Applications or Operation Guide for Hybrid Applications** respectively.

**5.4. Discharging**

Batteries must not be left in a discharged condition after supplying the load but must immediately return to recharge mode.

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

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

Duty	Minimum End Voltage
t ≤ 1h	1.65V
1h ≤ t ≤ 5h	1.70V
5h ≤ t ≤ 8h	1.75V
8h ≤ t ≤ 20h	1.80V
t ≥ 20h	1.85V

**5.5. Accidental Deep Discharging**

To protect the battery in cyclic applications, it is advisable to have system monitoring and low voltage cut-off. A low voltage disconnect of 1.93 Vpc (80% DoD) should be applied to protect the battery from abusive over discharge. Abusive deep discharge can result in premature deterioration of the battery and a noticeable reduction in the life expectancy.

**5.6. Operation in Hybrid Controlled Partial State of Charge (PSoC) Applications**

The PowerSafe SBS XC+ range has been specifically designed for hybrid applications. It provides users with an outstanding cyclic performance and the ability to operate the battery in a controlled partial state of charge (PSoC) operation for off-grid hybrid applications. For advice on operating in this application, please refer to the **PowerSafe SBS XC+ Operation Guide for Hybrid Applications**.

**5.7. Operation in Unreliable Grid Applications with Risk of Uncontrolled Partial State of Charge**

The high charge acceptance capability of PowerSafe SBS XC+ cells and monoblocs allows the use of fast charge techniques. This enables the battery to be brought towards full state of charge quicker and having greater battery capacity available in the event of further power outages. Where power outages are frequent, PowerSafe SBS XC+ can be operated in partial state of charge conditions. It's very important to return the battery to full state charge to ensure it doesn't suffer from reduced performance due to the build-up of irreversible sulphation.

Once the battery is brought to full state of charge the voltage setting should be reverted to float voltage; with temperature compensation applied, to prevent prolonged periods of overcharge.

Further details can be found in our **PowerSafe SBS XC+ Operation Guide for Hybrid Applications**.

**5.8. Operation in Renewable Energy Applications**

PowerSafe SBS XC+ are designed for renewable energy applications where the battery must undergo repeated cycling with daily depths of discharge of up to 35% of capacity C<sub>120'</sub>; such as rural settlements, communications systems, and lighting systems.

For advice on operating in this application, please refer to the **PowerSafe SBS XC+ Operation Guide for Renewal Energy Applications**.

**6. Data Recording**

It is recommended that as a minimum, the following information be recorded by means of regular data logging. The user must make this available to EnerSys in order to validate any warranty claim.

- 1) Records of the commission charge.
- 2) The number of cycles performed and the depth of discharge ("DoD") of each cycle.
- 3) The duration of each discharge and charge cycle, and the Ah in and out (Wh in and out).
- 4) Full details of the recharge voltage/current profile for the last 50 cycles.
- 5) A full history of the ambient and battery surface temperatures, recorded at regular intervals throughout battery operation and life.
- 6) The time and date of each event (an event is defined as the start/stop of the battery discharge, the start/stop of the battery recharge, the stop/start of any generator input power or other input power source, etc).

Contact your EnerSys representative if you have any questions regarding maintenance.

**7. Disposal**

PowerSafe SBS XC+ batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing transportation rules and regulations. Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.



**EnerSys World Headquarters**  
2366 Bernville Road  
Reading, PA 19605, USA  
Tel: +1-610-208-1991 /  
+1-800-538-3627

**EnerSys EMEA**  
EH Europe GmbH  
Baarerstrasse 18  
6300 Zug  
Switzerland

**EnerSys Asia**  
152 Beach Road  
Gateway East Building #11-08  
Singapore 189721  
Tel: +65 6416 4800

Contact: