

Installation, Operation, and Maintenance Manual



Important

Read these instructions immediately upon receipt. PowerSafe® SBS batteries are safe when operated and handled properly. It is vitally important that you observe the precautions recommended in this instruction sheet. **YOU SHOULD BE TRAINED IN HANDLING, INSTALLING, OPERATING AND MAINTAINING BATTERIES BEFORE YOU WORK ON ANY BATTERY SYSTEM.**

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.



When working on batteries wear safety glasses with side shields, rubber gloves and protective clothing. All metallic personal objects, such as rings, watches, bracelets, etc., should be removed before starting work on the battery! Only use insulated tools!



Electrolyte is corrosive



In case of **SKIN CONTACT** with electrolyte, **IMMEDIATELY**

1. **REMOVE** contaminated **CLOTHING**
2. **FLUSH** the area **THOROUGHLY** with **WATER**
3. Get **MEDICAL ATTENTION**



In case of **EYE CONTACT** with electrolyte, **IMMEDIATELY**

1. **FLUSH THOROUGHLY** for at least 15 minutes with large amounts of **WATER**
2. Get **MEDICAL ATTENTION**



In case of electrolyte **CONTACT WITH CLOTHING OR MATERIAL**, **IMMEDIATELY**

1. **REMOVE CONTAMINATED CLOTHING**
2. Apply large amounts of water to affected area.
3. Wash clothing as soon as possible.



Batteries can generate gases which, when released, can explode, causing blindness and other serious personal injury.



Do not allow flames, embers or sparks near the battery due to the risk of explosion or fire!



Warning: batteries remain live even though they are disconnected. No rings or metal bracelets should be worn during the assembly of the battery. Do not place electrically conductive objects such as tools etc. on top of the battery! Warning: cells are heavy, use proper lifting technique.

The Instruction Sheet must be strictly observed. Non-compliance with the Instruction Sheet, use of non OEM spares or use of additives to the electrolyte or unauthorized tampering will void the warranty.



Spent batteries with this symbol are reusable products and have to be put into a recycling system. Used batteries must be disposed of as special waste in accordance with all standards.

PowerSafe® SBS batteries are supplied in a charged state and are capable of extremely high short circuit currents. Take care to avoid short-circuiting terminals of opposite polarity. Warning: cells are heavy, use proper lifting technique.

1. Receiving the battery

1.1 In-Transit Damage or Short Shipments

Upon receipt of a shipment, check that the items delivered are undamaged and match the carrier's Bill of Lading. Report any damage or shortages to the carrier. EnerSys® is not responsible for shipment damage or shortages that the receiver does not report to the carrier.

1.2 Shipment Damage or Shortages

Open the shipping containers and check the contents for damage and against the packing slip. Immediately inform EnerSys® of any damaged or missing items. EnerSys® is not responsible for damaged or missing items after a shipment has been in storage.

2. Storage

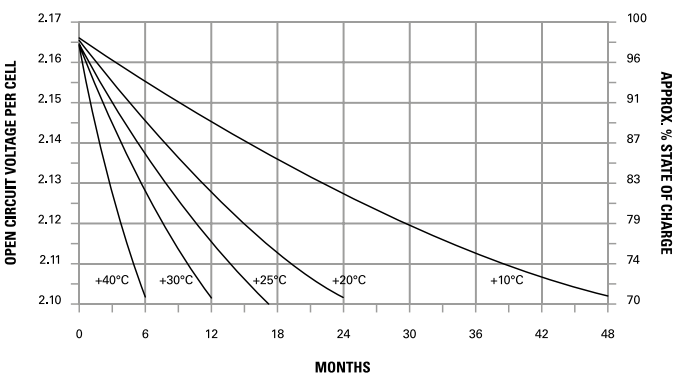
2.1. Storage Conditions and Time

If a battery cannot be immediately installed it should be stored in a clean, cool, dry area.

During storage, the battery's state of charge is reduced due to self-discharge.

High temperature increases the rate of self-discharge and reduces the storage life.

The chart below shows the relationship between Open-Circuit Voltage (OCV) and storage time at various temperatures. While the batteries are in storage, OCV should be measured according to the OCV audit intervals.



Do not store below -40°F (-40°C)

Temperature °F (°C)	Storage Time (Months)*	OCV Audit Intervals (Months)**
50 (10) and less	48	6
59 (15)	34	6
68 (20)	24	4
77 (25)	17	4
86 (30)	12	3
95 (35)	8.5	2
104 (40)	6	2

*Storage values indicated are based on constant temperatures.

**Recommended OCV audit interval.

Cells must be given a freshening charge when bloc voltages approach the equivalent of 2.10 volts per cell or when the maximum storage time is reached, whichever occurs first.

2.2. Freshening Charge

Charge the module or string of modules at a constant voltage equivalent to 2.27Vpc with current limited to 10A per 100Ah nominal capacity for a period of at least 24 hours, but with a maximum of 48 hours. Use temperature compensation as indicated in Section 5. Start monitoring the charging current 21 hours after initiating the freshening charge. The charge is complete when the current stabilizes. Current stabilization is defined as 3 current readings at least 1 hour apart within five percent of each other. Do not charge in an airtight enclosure.

Completing a freshening charge according to the instruction will reset the storage OCV audit interval and suggested maximum storage time. If voltage drops below 2.10 Vpc contact EnerSys® for instruction.

3. Ventilation

The battery compartment/room must have adequate ventilation to limit hydrogen accumulation to a maximum of 1% by volume. The following shows Hydrogen Evolution.

Hydrogen Evolution per bloc		
PowerSafe® SBS Battery	Cells per bloc	Float Charge 2.27 Vpc ml/hr
SBS 8	6	0.27
SBS 15	6	0.53
SBS 30	6	0.99
SBS HB30	6	0.99
SBS 40	6	1.45
SBS 60	6	1.94
SBS 110	3	2.21
SBS 130	3	2.53
SBS 300	3	5.84
SBS 390	3	6.86
SBS J13	6	0.46
SBS J16	6	0.57
SBS J30	6	0.99
SBS J40	6	1.48
SBS J70	6	2.43
SBS B8	6	1.18
SBS B10	6	1.45
SBS B14	6	2.36
SBS C11	6	3.46
SBS 100	6	3.80
SBS 145	6	5.51
SBS B8F	6	1.18
SBS B10F	6	1.45
SBS B14F	6	2.36
SBS C11F	6	3.46
SBS 100F	6	3.80
SBS 112F	6	4.26
SBS 145F	6	5.51
SBS 165F	6	6.28
SBS 170F	6	6.47
SBS 190F	6	7.23

Values double for every 18°F (10°C) above 77°F (25°C) and half for every 18°F (10°C) below 77°F (25°C).
Contact EnerSys® for product not listed.

4. Installation

Install the batteries in accordance with instructions below:

1. Refer to layout drawing at the end of this manual.
2. Position batteries into the location required by the application. Do not handle the batteries by terminals as this can damage terminal seals.
3. Ensure the battery terminals, interconnect straps and cable lugs are clean and free of electrolyte corrosion. If the environment is corrosive, a light coating of NO-OX can be applied to the battery terminals prior to installing the connectors on to the terminals. Install connectors to battery terminals with the specified torque.
4. Recheck the torque on the installed connectors to ensure secure connections.

PowerSafe® SBS Battery	Fastener Size	Torque in lb/Nm
SBS 8	M4	9 / 1.0
SBS 15 - 60	M6	35 / 3.9
SBS 110 - 390	M8	44 / 5.0
SBS J13 - J16	M6	50 / 5.6
SBS J30 - J70	M6	60 / 6.8
SBS B8 - B14(F)	M6	44 / 5.0
SBS B8 - B14	M8	44 / 5.0
SBS C11(F)	M8	44 / 5.0
SBS C11	M6	44 / 5.0
SBS 145	M8	44 / 5.0
SBS C11	M6	44 / 5.0
SBS 145F	M6	44 / 5.0
SBS 165F	M6	44 / 5.0
SBS 170F - 190F	M6	80 / 9.0
SBS 100	M8	44 / 5.0
SBS 100F	M6	44 / 5.0
SBS 112F	M6	44 / 5.0

5. Operation

Constant voltage chargers are recommended. The acceptable float voltage range is 2.27-2.29Vpc at 68°F (20°C) and 2.25-2.27Vpc at 77°F (25°C).

The temperature compensated voltage should not go below 2.21Vpc.

The recommended float voltage temperature compensation is:

	Temperature °F / °C						
	50/10	59/15	68/20	77/25	86/30	95/35	104/40
Recommended	2.33	2.31	2.29	2.27	2.25	2.23	2.21 Vpc
Minimum	2.31	2.29	2.27	2.25	2.23	2.21	2.21 Vpc

The float voltage must be applied as soon as possible after termination of the discharge, and not later than seven days after any discharge.

Includes the following:

SBS B8, SBS B10, SBS B14, SBS C11, SBS 145, SBS 165F, SBS 170F, SBS 190F, SBS 100, SBS 100F and SBS 112F

Do not discharge the battery beyond the voltage cut-off limit for the given discharge rates:

1.80Vpc @ 10 hr rate	1.75Vpc @ 8 hr rate
1.75Vpc @ 5 hr rate	1.70Vpc @ 3 hr rate
1.60Vpc @ 1 hr rate	1.60Vpc @ 15 min rate

Discharging to voltages below these values can result in irrecoverable capacity loss and premature end of life. The float voltage must be applied to the battery as soon as possible, and no later than seven days after any discharge. If it is not, contact EnerSys® for more information.

6. Maintenance

In practice the user usually specifies the maintenance schedule based on site criticality, location, and manpower.

The following is a suggested maintenance schedule.

Every Six Months (Record All Readings)

Measure the battery string voltage, temperature, float current, inter-module resistances and internal ohmic values. If necessary, adjust the float voltage to the correct value. Measure individual module voltages.

The individual module voltages must be within ± 0.30V of the nominal float voltage. Inspect for contamination of dust and loose or corroded connections. Corrosion can be caused by environmental factors and/or battery electrolyte. Batteries and interconnect straps with electrolyte corrosion should be replaced. Corrosion due to electrolyte typically originates at the base of the battery terminal with a wet appearance and propagates outward while being localized to the terminal(s). Light corrosion that is dry in appearance and relatively uniform across all connections may be environmental corrosion. Batteries with light environmental corrosion do not need to be replaced if connection surfaces were protected from corrosion with NO-OX. If environmental corrosion is suspected, clean with a water dampened clean cloth and cover metal conductors with NO-OX. Do not use solvents or scouring powders to clean the modules.

The recommended practice is to replace the battery if its capacity is below 80% of the manufacturer's rating.

7. Disposal

PowerSafe® SBS batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing transportation rules and regulations.

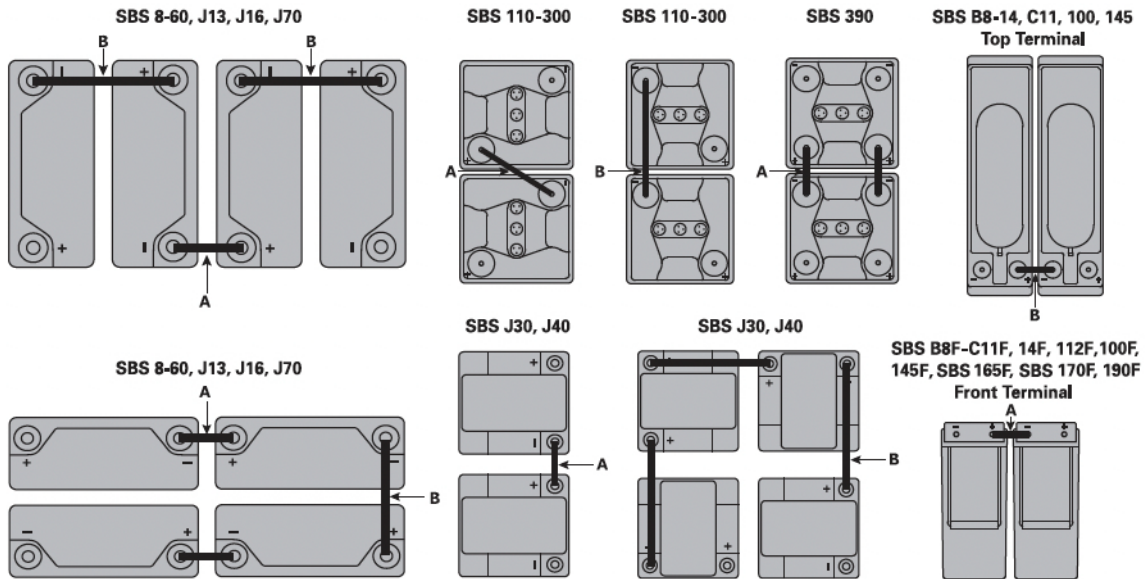
Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.

8. Shipping

PowerSafe® SBS batteries are approved as non-hazardous cargo for ground, sea, and air transportation in accordance with US DOT Regulation 49 and ICAO & IATA Packing Instruction 806. Please see our MSDS for complete details at: www.enersys.com.

PowerSafe® SBS Battery	Connector Part No.	
	A	B
SBS 8*	2205-8982	2205-8981
SBS 15	2205-9851	2205-9850
SBS 30, 40	2204-1123	2204-1124
SBS 60	2204-1123	2205-4260
SBS 110 - 300	2205-9887	2205-8865
SBS 390	2205-9759	N/A
SBS J13, J16	2205-9851	2205-9850
SBS J30, J40	2204-1123	2205-4260
SBS J70	2204-1123	2205-4260
SBS B8 - B14*	N/A	2205-8919
SBS C11*	N/A	2205-8919
SBS 145	N/A	2205-0163
SBS B8F - B14F*	C11CONN	N/A
SBS C11F*	C11CONN	N/A
SBS 145F*	2205-0162	N/A
SBS 165F*	2205-1062	N/A
SBS 170F - 190F*	VFCOONN	N/A
SBS 100*	N/A	2205-8919
SBS 100F*	907052	N/A
SBS 112F*	VFCOONN	N/A

*NEBS Compliant GR63-Core



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