



Installation, Operation
and Maintenance Manual



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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

Handling

PowerSafe SBS EON 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

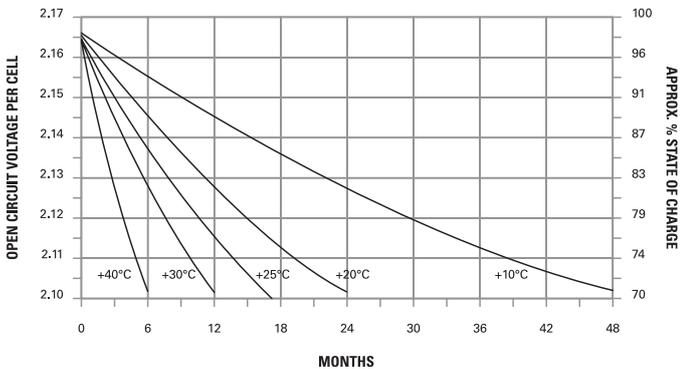
Upon the receipt of the shipment, check the contents against the packing slip and for damage. Immediately inform EnerSys® of any missing or damaged items. EnerSys is not responsible for shipment damage or shortages that the receiver does not report to the carrier.

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 monoblocs / cells lose capacity through self-discharge. High temperatures increase the rate of self-discharge and reduce the storage life.

2.1.1. The graph below shows the relationship between open-circuit voltage (OCV) and storage time at various temperatures.



2.1.2. 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 |

2.1.3. Monoblocs and cells 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 the monoblocs / cells or strings at a constant voltage equivalent to 2.29 - 2.40Vpc (20°C) with a minimum 0.1C₁₀ 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 0.1C₁₀ 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. The battery will then be switched over to float charging, maintaining the battery at floating voltage for 24 hours before any discharge test.

3. Battery Location

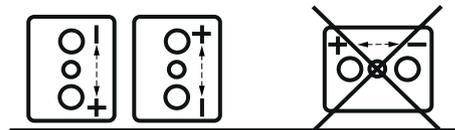
The battery compartment/room must have adequate ventilation to limit hydrogen accumulation. Batteries must be installed in accordance with the IEC 62485-2 standard and any other local/national laws and regulations.

4. Installation

Whatever your application, PowerSafe SBS EON batteries can be mounted in any orientation except inverted.

However, in cyclic applications, EnerSys recommend to install 2 Volt DIN-size cells in horizontal orientation. 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 unit is pointing in vertical orientation.



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

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

Connect the blocs / 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 EON Technology monoblocs and cells retain the long float life and storage characteristics of traditional PowerSafe SBS monoblocs and cells with the added benefit of improved cyclic ability in both float voltage and fast charge modes.

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.

5.1. Float Voltage 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 minimum charging voltage, at any temperature, is 2.21Vpc.

The recommended float voltage temperature compensation is:

- 2.29Vpc +4mV per cell per °C below 20°C
- 2.29Vpc -4mV per cell per °C above 20°C

| | Temperature (°C / °F) | | | | | | | | |
|-------------|-----------------------|-------|-------|-------|-------|-------|--------|--------|--------|
| | 10/50 | 15/59 | 20/68 | 25/77 | 30/86 | 35/95 | 40/104 | 45/113 | 50/122 |
| Recommended | 2.33 | 2.31 | 2.29 | 2.27 | 2.25 | 2.23 | 2.21 | 2.21 | 2.21 |

5.2. Fast Charge Operation

The inherently high charge acceptance of TPPL Technology used in the PowerSafe SBS EON series is suited for applications which require a fast time to repeat duty. In such applications the rectifier voltage should be set at 2.35Vpc to 2.40Vpc at 20°C.

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

Further details can be found in our PowerSafe SBS EON application guide.

5.3. Charging Current

Due to their very low internal resistance PowerSafe SBS EON batteries will accept unlimited current during recharge. However, 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 0.1C₁₀ Amps (minimum).

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 |
|----------------|---------------------|
| 5 min ≤ t ≤ 1h | 1.65V |
| 1h ≤ t ≤ 5h | 1.70V |
| 5h ≤ t ≤ 8h | 1.75V |
| 8h ≤ t ≤ 20h | 1.80V |

5.5. Accidental Deep Discharging

In cyclic applications, in order to protect the battery, it is advisable to have system monitoring and low voltage cut-out. 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. Effect of Temperature

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.

Battery performance according to various temperatures can be calculated in EnerSys® Battery Sizing program (BSP).

5.7. Hybrid Operation

In addition to the long life characteristics inherent in traditional PowerSafe SBS TPPL designs, EON Technology has been developed to provide high performance in applications where the battery is subjected to repeated cyclic duty or where power reliability is tested by high temperatures and harsh conditions combined with remote locations.

In cyclic applications, the charging voltage should be set at the equivalent of 2.40Vpc cell at 20°C / 68°F, with the rectifier current limit set to a minimum of 0.1C₁₀ A (EON Technology is designed to accept unlimited in rush currents without causing damage to the internal electro-chemistry).

The optimal cyclic performance is achieved by returning the battery to full state of charge between discharge cycles. It is possible to operate SBS EON Technology monoblocs and cells in partial state of charge condition, however, in such situations, it is very important to ensure that the battery is periodically returned to full state charge to maintain battery state of health.

Further details can be found in our PowerSafe SBS EON Operation Guide for Hybrid Applications guide.

It is recommended to contact your EnerSys representative to obtain additional information and guidance for such psoc applications.

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.

- Monthly (record all readings)
Measure the battery string voltage. If necessary, adjust the float voltage to the correct value.
- Every six months (record all readings)
Measure the battery string voltage. If necessary, adjust the float voltage to the correct value.
Measure individual bloc voltages. The blocs should be within 5% of the average.

Inspect for contamination by dust, loose or corroded connections. If necessary isolate the string/bloc and clean with a damp soft cloth. Warning - Do NOT use any type of oil, solvent, detergent, petroleum-based solvent or ammonia solution to clean the battery containers or lids. These materials will cause permanent damage to the battery container and lid and will invalidate the warranty.

Contact EnerSys if you have any questions regarding maintenance.

7. Data Recording

It is recommended that as a minimum, the following information be recorded by means of regular data logging. The user must make available to EnerSys 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 start stop of any generator input power or other input power source, etc).

Contact EnerSys if you have any questions regarding maintenance.

8. Disposal

PowerSafe SBS EON 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.

