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**BATTERY  
APPLICATION GUIDE**

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Power/Full Solutions

RESERVE  
POWER

EnerSys® has optimised the very successful Thin Plate Pure Lead (TPPL) SuperSafe™ SBS battery range to create the revolutionary EON Technology™, a new concept that utilises highest purity materials and state of the art manufacturing processes to deliver energy storage solutions that can meet the requirements of emerging applications whilst offering the end user enhanced performance in existing applications. Historically, the useful service life of reserve power VRLA battery systems was measured by their float life but as applications evolve from pure standby to cyclic applications, some traditional VRLA technologies find that these new requirements push them beyond their scope of operation.

SuperSafe SBS EON Technology batteries retain the long float characteristics of standard SuperSafe SBS cells and monoblocs, with the added benefit of improved cyclic ability in both float voltage and fast charge applications.

### Interchangeability

SuperSafe SBS EON Technology monoblocs are fully interchangeable with standard SuperSafe SBS battery equivalents (where applicable). When used in conventional float applications the fit, form and function remain unchanged and their mixing will have no detrimental effect to either the performance or expected service life. However, where a SuperSafe SBS EON Technology monobloc is introduced as a replacement into an equivalent standard SuperSafe SBS battery it must be understood that the improved cyclic capability afforded by EON Technology will not be achieved.

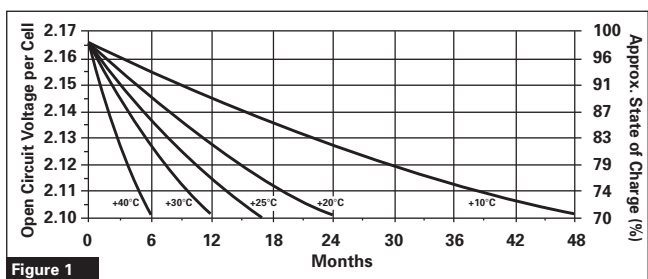
### Operating Temperature Range

The recommended operating temperature range for optimum life and performance is 20°C. However, SuperSafe SBS EON Technology batteries can be operated in the temperature range -40°C to +50°C. In order to maintain mechanical integrity of the plastic components, the battery temperature in operation should not exceed +50°C.

### Storage

Batteries lose capacity when standing on open-circuit because of parasitic chemical reactions. The self-discharge rate of SuperSafe SBS EON Technology monoblocs is very low because of the high purity of the grid lead and electrolyte. Batteries should be stored in a cool, dry area. High temperature increases the rate of self-discharge and reduces storage life.

Figure 1 shows the relationship between open-circuit voltage (OCV) and storage time at various temperatures.



The maximum storage times before a freshening charge is required and recommended open circuit voltage audit intervals are:

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

Monoblocs 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.

### Commissioning Charge

Before conducting a capacity discharge or fully loaded duty cycle test, the battery must be given a commissioning charge. The commissioning charge shall consist of 7 continuous days of float charge at the recommended float voltage (2.29Vpc at 20°C) with no load connected to the battery.

### Freshening Charge

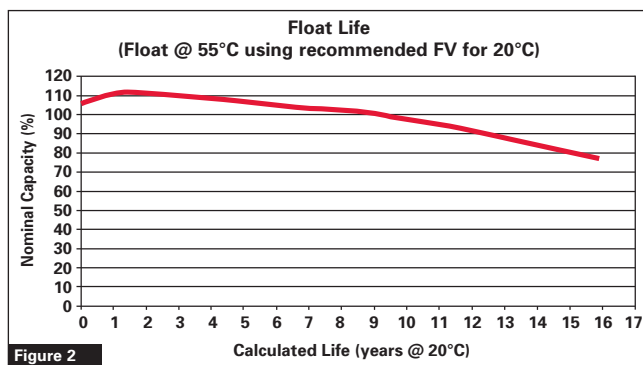
Charge the monoblocs or strings at a constant voltage equivalent to 2.29 to 2.4Vpc with 0.1C<sub>10</sub> Amps current for a period of 24 hours.

### Float Operation

EON Technology is designed for continuous float operation on constant voltage chargers. Constant voltage charging is the safest, most efficient and recommended method of charging VRLA batteries.

The recommended float voltage setting is 2.29Vpc at +20°C/+77°F. Therefore the system voltage setting equals the number of cells in series x 2.29Vpc.

Battery life and charging characteristics are affected by temperature. Optimum battery life will be achieved when the battery is operating between +20°C/+68°F and +25°C/+77°F (see figure 2).

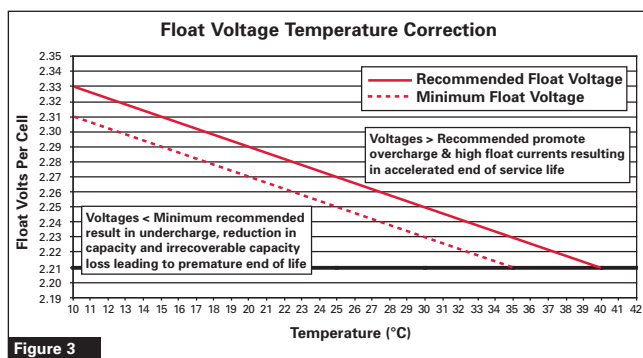


Battery life is reduced by 50% for every 10°C/18°F increase in temperature. Float voltage compensation reduces the charging current as battery temperature increases and partially negates the adverse effect of high temperature.

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 (refer to figure 3 for further details)

Temperature compensation is capped at +40°C/+104°F as at this temperature the compensated charge voltage approaches the natural open circuit voltage of the battery and there is insufficient overvoltage to keep the battery in a fully charged condition.



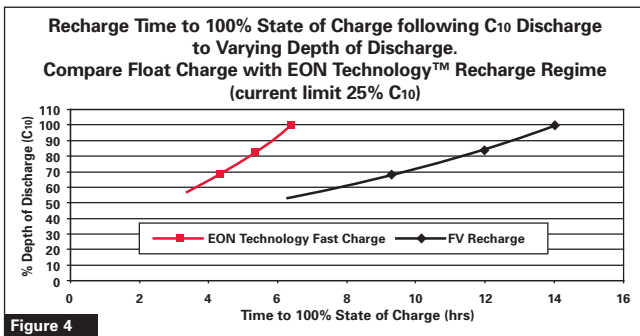
### Charging Current

Recharge time is a function of the charging voltage and current. In float applications where time to repeat duty is not so critical to recharge in an acceptable time it is recommended that the current limit should be a minimum level equalling the standing load plus 0.1C<sub>10</sub> Amps.

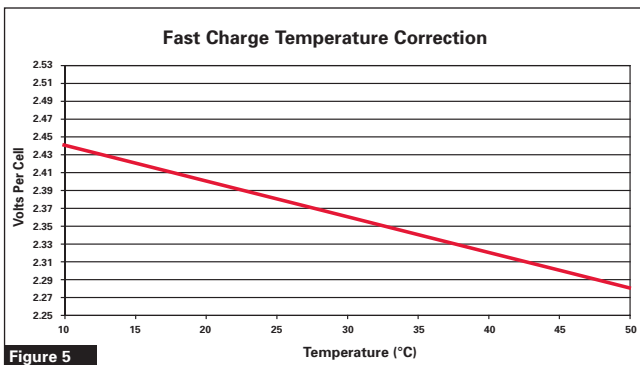
## Fast Charging

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

Fast charge techniques are best utilised for frequent discharge cyclic applications. The high charge acceptance of EON Technology is suited for applications which require a faster recharge with reduced time to repeat duty. In such applications the rectifier voltage should be set at 2.40Vpc at 20°C. Figure 4 illustrates the time to full state of charge from varying depths of discharge (C<sub>10</sub>) as a function of charge voltage.



As with float charge, temperature compensation for voltage is applicable to fast charge techniques. The profile below (figure 5) gives the recommended compensation to charge voltage for temperature.



In cyclic applications, optimal life and performance are obtained by limiting recharge at 2.40Vpc to the time taken to return 103% of discharged Ah before disconnecting the battery from the rectifier or switching to float voltage. In systems where control of charge factor is not possible, the battery will be returned to full state of charge (from 100% depth of discharge C<sub>10</sub>) in 6.5 hours at 2.40Vpc with 0.25C<sub>10</sub> Amps available. Higher charge currents will reduce charge time, lower currents will increase charge time.

Where rectifier voltage cannot be adjusted to values >2.40Vpc to compensate for lower temperatures, the time to reach full state of charge will be increased. For additional information and guidance on this, please contact your EnerSys® representative.

**Warning!** Continuous charge at 2.40Vpc will significantly reduce battery life.

## Current Limit

In addition to the influence of charge voltage, the available charge current will impact on time to repeat duty. The low internal resistance of SuperSafe SBS EON Technology batteries lends itself to absorption of in rush currents as high as 6C<sub>10</sub> Amps but is equally capable of operating with current limits as low as 0.1C<sub>10</sub> Amps. Figure 6 below illustrates the typical time to full state of charge (2.40Vpc) as a function of available charge current from varying depths of discharge.

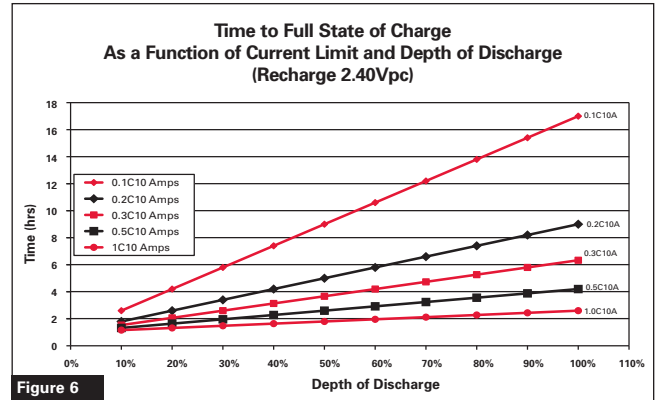


Figure 6

## Cycling

EON Technology has been developed to retain the long float life characteristics associated with standard SuperSafe SBS technology and has the added capability to deliver high performance in harsh applications where cyclic duty predominates.

Extensive testing has shown that in traditional float cyclic applications SuperSafe SBS EON Technology surpasses the excellent performance of standard SuperSafe SBS battery designs, typically delivering a 33% increase in the number of cycles during evaluation to international benchmark standards (figure 7).

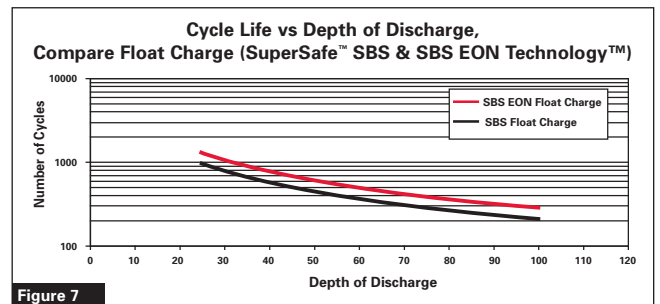


Figure 7

Where it is not always economically viable to use higher charge currents it has been demonstrated that increasing the charge voltage at a given current limit, the time to full state of charge can be radically reduced.

The electrochemical designs of SuperSafe SBS EON Technology batteries have been developed to take advantage of this characteristic. The low internal resistance ensures that SuperSafe SBS EON Technology batteries can operate with charge current limits ranging from 0.1C<sub>10</sub> Amps to 6C<sub>10</sub> Amps affording a high degree of operating flexibility encompassing a wide range of operating scenarios. It should be remembered that lower current limits increase time to full state of charge, regardless of charge voltage (shown in figure 8 below).

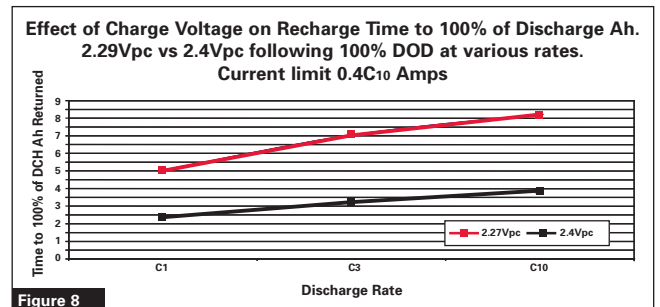
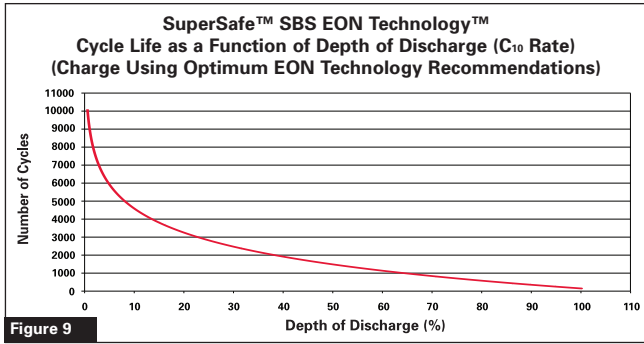


Figure 8

The high charge acceptance of SuperSafe SBS EON Technology batteries that enables the use of fast charge techniques provides the user with the advantage of reduced time to repeat duty and further extends the number of cycles available during service life to unparalleled levels (figure 9).



## 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. Do not use solvents or scouring powders to clean the blocs.

Contact EnerSys® if you have any questions regarding maintenance.

## Disposal

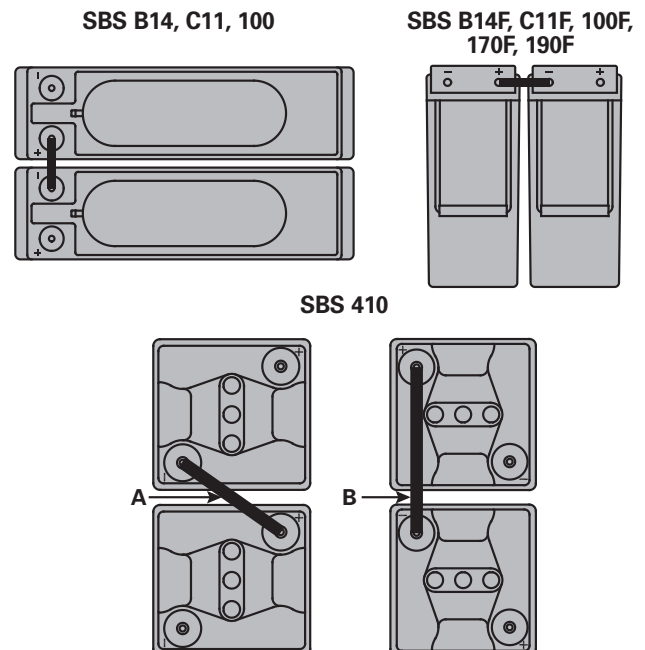
SuperSafe® SBS EON Technology™ batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing transportation rules and regulations. Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.

## General Specifications

SuperSafe™ SBS Battery Type	Nominal Voltage (V)	Nominal Capacity (Ah)		Nominal Dimensions						Typical Weight kg	Typical Weight lbs	Short Circuit Current (A)	Internal Resistance (mΩ)	Terminals
		10 hr rate to 1.80Vpc @ 20°C	8 hr rate to 1.75Vpc @ 77°F	Length mm	Length in	Width mm	Width in	Height mm	Height in					
SBS B14	12	62	62	280	11.0	97	3.8	264	10.4	19.1	42.0	1800	7.0	M8 F
SBS B14F	12	62	62	303	11.9	97	3.8	264	10.4	19.1	42.0	1800	7.0	M6 M
SBS C11	12	92	91	395	15.6	105	4.1	264	10.4	28.0	61.6	2300	5.5	M8 F
SBS C11F	12	92	91	417	16.4	105	4.1	256	10.1	28.0	61.6	2300	5.5	M6 M
SBS 100	12	100	100	395	15.6	108	4.3	287	11.3	32.6	71.9	2210	5.6	M8 F
SBS 100F	12	100	100	395	15.6	108	4.3	287	11.3	32.6	71.9	2210	5.6	M6 M
SBS 170F	12	170	170	561	22.1	125	4.9	283	11.1	52.5	115.7	3400	4.0	M6 M
SBS 190F	12	190	190	561	22.1	125	4.9	316	12.4	60.0	132.3	3800	3.3	M6 M
SBS 410	2	410	410	200	7.9	208	8.2	239	9.4	23.2	51.1	4725	1.3	M8 M

## Connectors

SuperSafe™ SBS Battery Type	Connector Part No.
SBS B14, C11	2205-8919
SBS B14F, C11F	2205-8891
SBS 100	2205-8750
SBS 100F	2205-8749
SBS 170F & 190F	2205-8769
SBS 410	2205-9887 (A)
SBS 410	2205-8865 (B)



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