



Installation, Operations
and Maintenance
Manual



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English

Important

Please read this manual immediately on receipt of 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



Danger



Re-cycle scrap batteries.
Contains lead

Pb



Electrolyte is corrosive



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, or incinerate. Avoid any short circuit. Metallic parts under voltage on the battery, do not place tools or items on top of the battery

Handling

SuperSafe® T 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. Use lifting hooks compatible with the plastic handles on the cell/monobloc.

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.

Unpacking

It is advisable to unpack all the cells or monoblocs and accessories before commencing to erect and not to unpack and erect cell by cell.

All cells/units should be handled carefully, as the plastic container can be damaged or broken if allowed to fall. Under no circumstances should they be lifted by their terminal pillars.

All items should be carefully checked against the accompanying advice notes to ascertain if any are missing and also inspected to see whether any are damaged or broken. Should this happen the Sales Department should be consulted.

Transit insulation covers are fitted to one pole or a one rigid plastic insulating cover is provided which totally protects the unit terminals. These are factory fitted to all products of the range 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, storage time is limited. In order to easily charge the batteries after prolonged storage, it is advised not to store batteries for more than:

- 6 months at 20°C
- 3 months at 30°C
- 1.5 month at 40°C

A refreshing charge shall be performed after this time 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 necessity of a refreshing charge can also be determined by measuring the open circuit voltage of a 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.

Installation

Install batteries in a clean and dry area. SuperSafe T battery 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.

Temperature

Avoid placing the battery in a hot place 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. The usual operating temperature is between -10°C and +45°C. Limits are comprised between -30°C and +45°C.

Ventilation

Under normal conditions gas release is very low and natural ventilation is sufficient for cooling purposes and inadvertent overcharge, enabling SuperSafe T 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 close cabinets.

Mounting

Energys' battery racks or cabinets are recommended when installing the cells. Assemble the rack according to instructions. Place the battery blocks or cells on the rack and arrange the positive and the negative terminals for connection according to the wiring diagram. Check that all contact surfaces are clean and apply the block or cell connectors and the terminal screws. Tighten the screws securely. Finally connect the battery terminals. It is important that the battery is mounted firmly.

Torque

Tighten the nuts or bolts to the recommended levels of fastening torque as specified on the product label. A loose connector can cause problems in charger adjustment, erratic battery performance, possible damage to the battery and/or personal injury. Finally fix the connector covers.

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

□ Commissioning charge

Before use, the batteries should be charged at a constant charging voltage (with a charging current limited to $0.1C_{10}$) with one of the following method:

- Charge during 96 hours with the floating voltage between 2.27 and 2.30Vpc in ambient temperature range between 15 to 25°C.
- or charge with the 2.40Vpc boost charge voltage during minimum 24 to 48 hours maximum to reduce the commissioning charging period (the battery will then be switched over to float charging, maintain the battery under floating voltage for 24 hours before any discharge test, see hereafter).

If the battery is to be subjected to a discharge test, in this case the test will be performed imperatively after that the commissioning charge has been carried out. Check that the battery is fully charged.

□ 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

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 $0.08 C_{10} : 0.1 C_3$ (A) is adequate.

□ Fast recharge

Increasing the charge voltage to 2.40Vpc with a current limited to $0.1 C_{10} : 0.125 C_3$ (A) can reduce recharge times. Fast charge should be stopped after approximately 10 to 15 hours. This charge regime, in order to achieve a normal service life, 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 $\pm 1\%$ through 5% to 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

SuperSafe® T batteries must not be left in a discharged condition after supplying the load, but must immediately return 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 of the 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
5 mins to 59 mins	0.80	0.86	0.91	0.96	1	1.04	1.06	1.09	1.1
1h to 24h	0.86	0.90	0.94	0.97	1	1.03	1.05	1.06	1.07

- 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

SuperSafe® T are maintenance free, sealed, lead acid batteries and need no water addition.

The containers and lids shall be kept dry and and free from dust. Cleaning must be done only with a damp cotton cloth without man-made fibres.

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.

Check monthly that total voltage at battery terminals is $(N \times 2.28 \text{ V})$ for a temperature at 20°C. (N being the number of cells in the battery). Make annual readings of the voltages of cells making up the battery.

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

An autonomy control can be done 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 with the temperature, it is possible to set a float voltage value and a recharging voltage value according to the temperature ranges as 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



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