

EXIDE TECHNOLOGIES NETWORK POWER

INSTALLATION GUIDE

&

HEALTH AND SAFETY NOTICE

FOR

SEALED LEAD ACID BATTERIES

HEALTH AND SAFETY NOTICE

FOR

SEALED LEAD ACID BATTERY TYPES S300, S500, P300, P500, SP300, L400, SCP AND T400

In accordance with Section 6, Health and Safety at Work Act 1974, as amended by the Consumer Protection Act 1987.

MANUFACTURER

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GENERAL DESCRIPTION

Lead acid standby power batteries type S300, S500, P300, P500, SP300, L400, SCP and T400.

COMPOSITION

- i) Outer box and lid – fire resistant polypropylene talc material.
- ii) Terminals - lead alloy with low percentages of antimony, arsenic and tin.
- iii) Plates, i.e., grid and active material.
 - a) Grid - pure lead alloy with low <1% of calcium (ca) tin (Sn) and aluminium (al).
 - b) Active material
Negative electrode
Pure lead
Positive electrode
Pure lead oxide

- iv) Electrolyte - dilute sulphuric acid absorbed on glass micro fibre separator.
- v) Separator - proprietary glass micro - fibre mat.

DETAILS OF HAZARDS

If the battery is intact and handling instructions are followed, there are no risks.

1. Lead and Lead Compounds

Can be toxic if ingested or if dusts containing them are inhaled. Within the cells and batteries the lead compounds are in a wet, dust free condition contained within the cell box.

2. Sulphuric Acid

Dilute sulphuric acid is corrosive and can cause burns to body tissues in the unlikely event it is released from within the cell or battery.

- a) by accidental fracture
- or
- b) in a mist from in the event of 'BOOST' or 'OVER-CHARGING'.

Action in Emergency

i) Ingestion:

This is highly unlikely but in the event it should occur copious amounts of water plus milk of magnesia should be drunk. **Do Not Give An Emetic.**

ii) Eyes:

Irrigate with copious amounts of clean water or use an eye wash solution.

iii) Skin:

Drench with water.

iv) Inhalation of vapour:

Wash **immediately** with clean water

ALWAYS OBTAIN IMMEDIATE MEDICAL ATTENTION

v) Acid on clothing:

Wash immediately with clean water.

Neutralise as quickly as possible using an alkali e.g. soda ash, sodium carbonate, sodium bicarbonate.

3. Battery Charging - Gas Emissions

Explosion Risk

Under normal use in accordance with the SONNENSCHEIN recommended method of operation, there is negligible risk of gas or acid spray evolution.

Over charging, however, may result in emission of:

Hydrogen gas

Oxygen gas

Sulphuric acid in the form of a spray mist

Carbon dioxide gas - trace amount

If the gas pressure within the cell exceeds 150 mbar, an acid spray arrester in the cell relief valve limits the release of acid mist in those circumstances.

Hydrogen at a concentration in air of 3.8% by volume is explosive. Adequate ventilation in accordance with BS6133 must be met.

Sparks, flames and lighted cigarettes **MUST** be kept well away from batteries/cells.

4. FIRE HAZARD

- i) In the event of the battery/cell terminals being short circuited by a metal object, both the metal object and the terminals may get very hot due to the very high currents flowing through them. Battery and cell tops must be kept clean and free from any "foreign" combustible material.

To avoid sparks:

- a) Ensure all connections are fully tightened before switching on
- b) Switch off the battery before attempting connection or dis-connection of the cells or batteries.
- c) Only use insulated tools and open ended spanners to make the connections.
- d) Before working on the battery, remove all personal jewellery, rings, watches, bracelets, necklaces, etc.
- e) Do not place tools or any other metallic objects on top of the cells/batteries.

- ii) In the event of general fire:

Extinguisher type - CO₂ Halon

Cell containers and lids are made from flame resistant polypropylene. Although normally inert, decomposition would occur at high enough temperatures to give off carbon dioxide.

Pressure build up within the cells at temperatures high enough to cause the sulphuric acid electrolyte to vaporise would lead to containers bursting. At temperatures above 300°C (approximately) some molten lead alloys could exist.

Above 500°C lead fumes would be produced as well as trace amount of antimony, arsenic, tin and aluminium as fine particulate oxides.

If a fire is fierce enough, all the ingredients exist to produce lead calcium alloy 'drosses' mixed with antimonial/arsenic lead alloy in a melt down condition. There is a highly unlikely but rare risk that poisonous stibene or arsine could be liberated with these ingredients in contact with water or dilute sulphuric acid.

5. ELECTRICAL

High DC voltages can be very dangerous even lethal.

Precautions, according to the "ELECTRICITY AT WORKS REGULATION - 1989" must be adhered to.

6. SPILLAGE

In case of spillage, the acid has to be neutralised with soda or lime, do not pour into soft ground or drainage.

7. DISPOSAL AND REPAIRS OF CELLS/BATTERIES

Repairs Should Not Be Attempted On Those Cells and Batteries

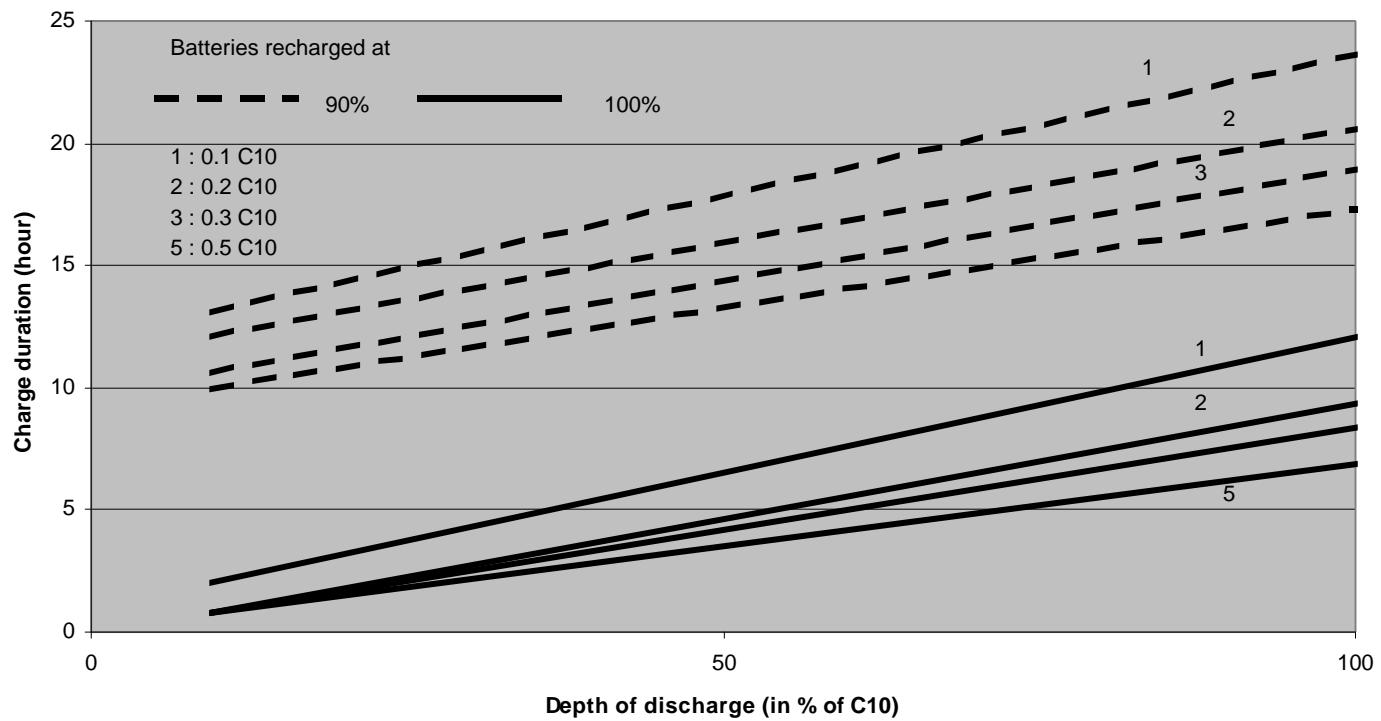
Cells and batteries must be properly disposed of through an authorised lead disposal centre, on **NO ACCOUNT** must they be disposed of in general wastes.

Refer to the CONTROL OF POLLUTION ACT 1974 Special Waste Regulations 1980.

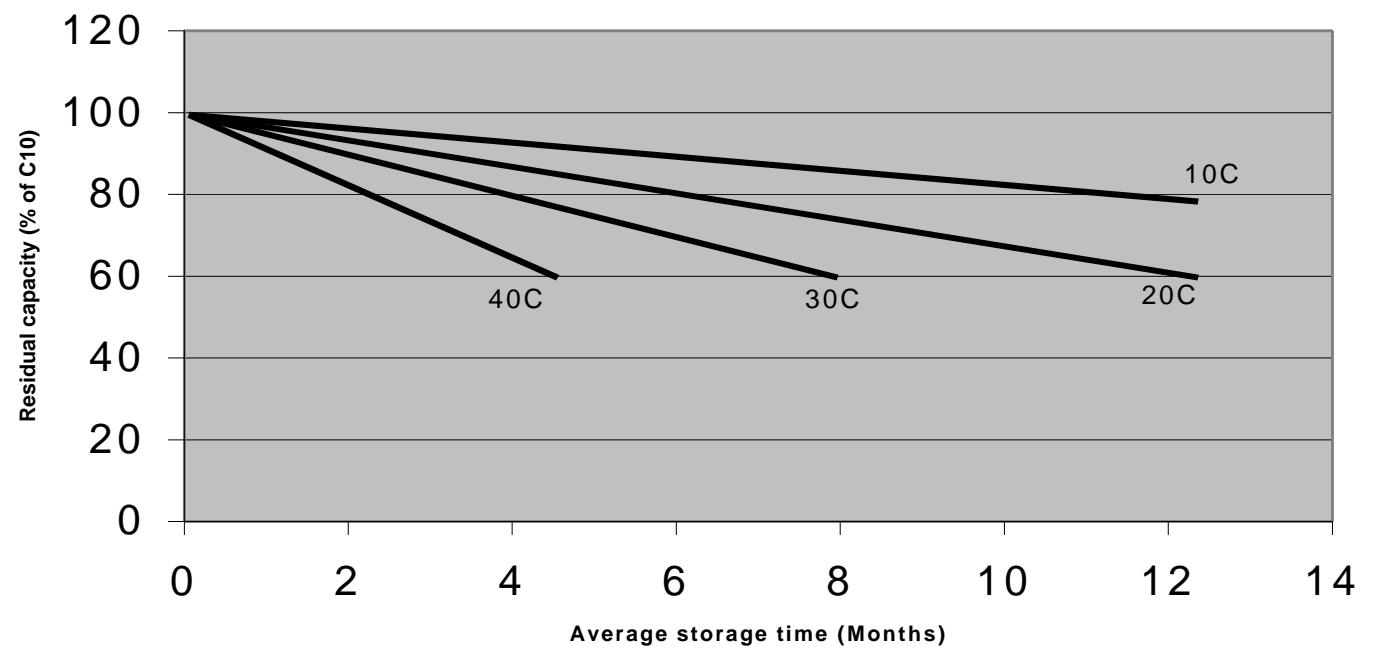
If in doubt, consult EXIDE TECHNOLOGIES NETWORK POWER

Telephone: 01438 359090
Telefax: 01438 727684
E-mail: sales@exidenetworkpower.co.uk

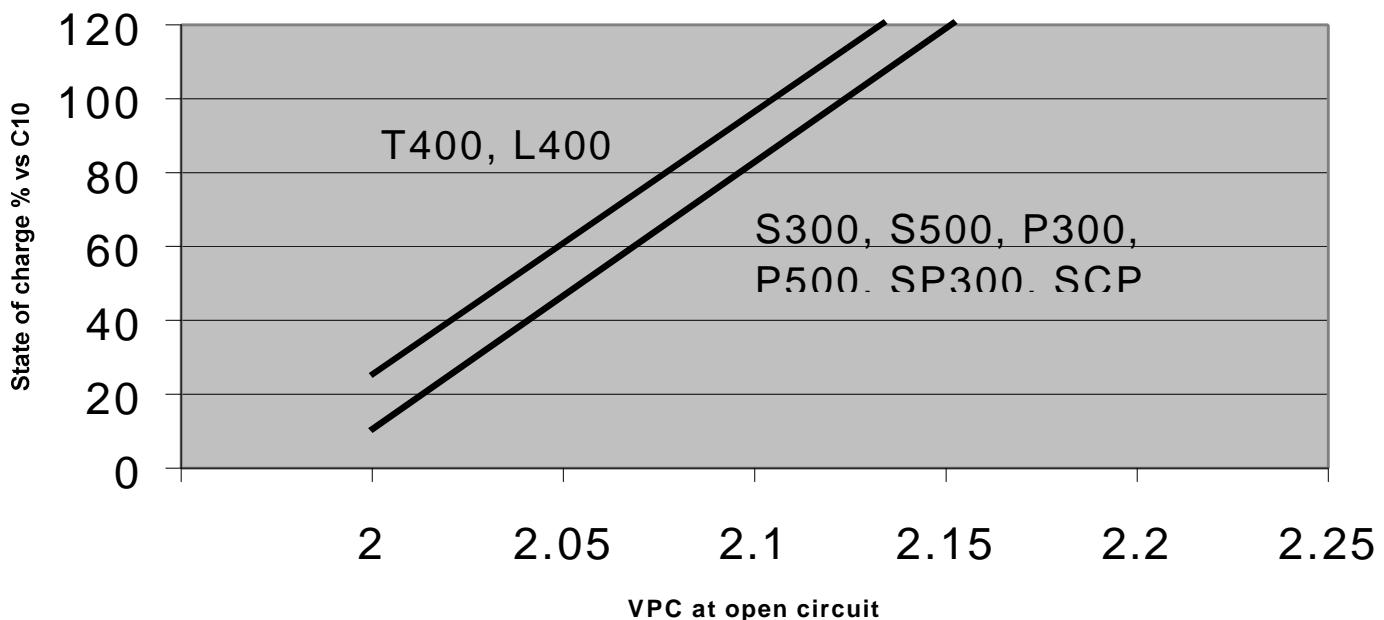
Recharge time using a constant voltage charger with limited current, V=2.27V/cell at 20C



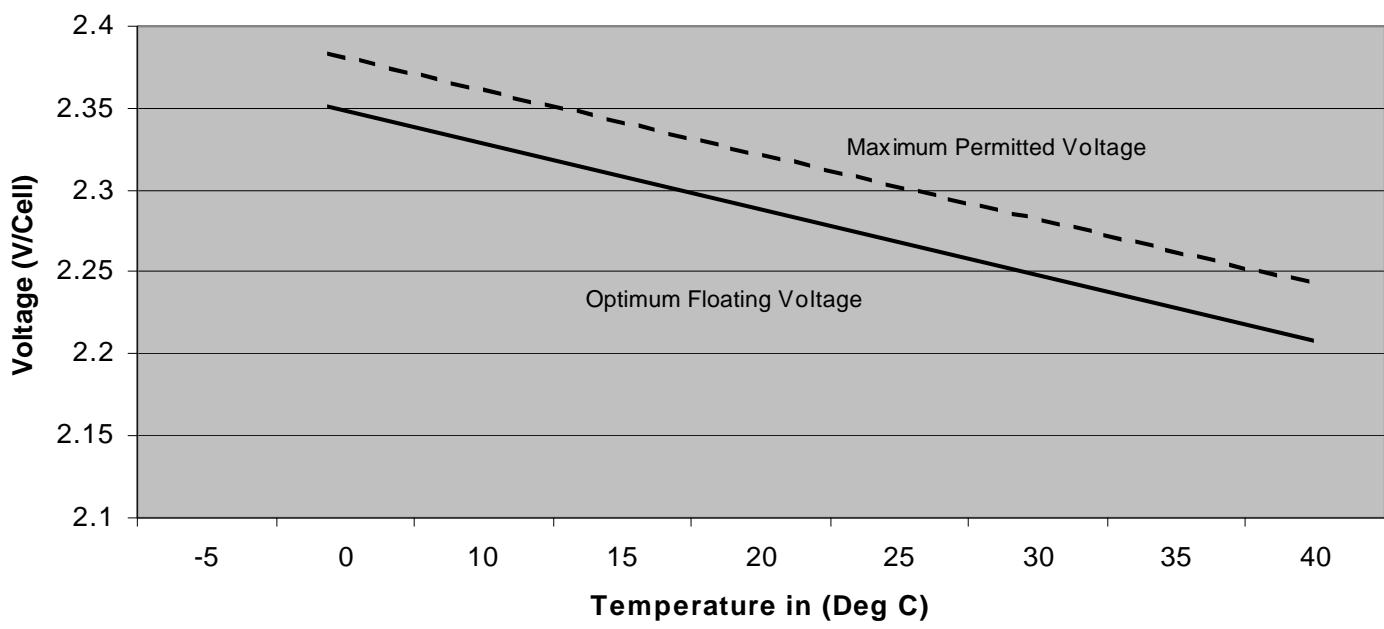
Charge state/Storage



Indicative values of state of charge vs open circuit voltage



Floating Voltage vs Temperature



SEALED LEAD ACID BATTERIES

INSTALLATION GUIDE

Only trained battery engineers should install, test and commission batteries.
No other unauthorised person should be allowed to handle these products

The Sonnenschein range of sealed lead acid batteries are of gas recombination type, which means no topping up is necessary.

When using sealed lead acid batteries certain guidelines must be adhered to at the following stages of usage:

- Acceptance of delivery
- Holding in stock
- Connection and assembly
- Commissioning
- Application

DELIVERY AND STORAGE

When unpacking the batteries care should be taken to avoid damaging the terminals and outer casing of the battery.

Never handle the batteries by the terminals.

Avoid short circuiting the battery terminals.

Avoid placing the battery on sharp objects once unpacked.

Carefully clean off all dust and packing materials from the battery with a damp cloth.

Never use solvents or abrasive cleaners on the batteries as this will cause damage to the battery casing and lid material. A mild detergent diluted in water can be used.

The batteries must be stored in a cool and dry location.

When extended storage is required it is recommended that the batteries are recharged at the following times:

Every 4 months at 20°C

Every 3 months at 30°C.

In every case a recharge is necessary if the voltage per cell is less than 2.06 volts. If this procedure is followed the batteries can be stored for several years.

CONNECTION AND ASSEMBLY

Prior to the connection of the batteries, each monobloc must have its open circuit voltage checked. This should be greater than 2.06 volts per cell.

The battery system should be laid out in accordance with the installation drawing supplied. Strict observation of the batteries' polarity should be observed during the connection procedure, (if a monobloc's polarity is reversed the unit will be destroyed when a charge is applied). All connections must be made with correct washers and a correctly set torque wrench. Do not over tighten, over torquing may cause damage to the terminal assembly of the cell.

The following table details the torque settings for each battery terminal size.

<u>TERMINAL SIZE</u>	<u>TORQUE SETTINGS IN (Nm)</u>
M5	2.5
M6	6
M8	8
M8(SCP4355 Block only)	25
M12	25

M5	2.5
M6	6
M8	8
M8(SCP4355 Block only)	25
M12	25

+/- 20%

Ensure that all covers supplied with the installation kit are fitted to the battery terminals and links. On completion of assembly the battery terminal open circuit voltage should be measured to ensure that this conforms to the number of cells connected within the installation.

ASSEMBLY OF PARALLEL SETS OF BATTERIES

Verify that all connections are correctly made (polarity), only then make connection. First connect the number of batteries required in series to give the desired voltage. Check that all sets of batteries connected in series conform to the desired voltage. Once this is achieved connect the batteries in parallel.

INSTALLATION IN SITU

When installing batteries into cabinets or enclosed areas, consideration must be made for the amount of energy generated as heat. This is a function of the current of the charging system together with the effect of the RMS ripple current of the system. Particular attention must be paid to the necessary air circulation to ensure correct ambient temperature is maintained to give good battery life. The conditions under which the installation is being used must be considered. Tools must be fully insulated. Insulated gloves should be worn when installing the batteries. Avoid wearing metal objects such as watch straps and jewellery as this can result in short circuits. If possible stand on a rubber mat during the installation process.

COMMISSIONING

Before the system is finally commissioned it is necessary to carry out a pre-commissioning charge routine. This involves a constant voltage of 2.27V/cell with the current limit set at $0.3C_{10}$ for a period of 15 hours. Should part of the commissioning of the equipment require an Autonomy test it is advisable to extend the pre-commissioning period of charging to six days.

For temperature up to 25°C see note in the next paragraph.

APPLICATION

The floating voltage per cell must be regulated at:

2.27 volts for temperature range $15^{\circ}\text{C} - 25^{\circ}\text{C}$

2.25 volts for temperature range $20^{\circ}\text{C} - 30^{\circ}\text{C}$

2.23 volts for temperature range $25^{\circ}\text{C} - 35^{\circ}\text{C}$.

Temperature compensation of charging voltage for variations in ambient temperature should be made at -3mV per cell, per degree Celsius increase in temperature. This is necessary when the temperature variations exceed 10°C .

CHARGING

Constant voltage with the limitation of current ($I_{\text{max.}} = 0.3C_{10}$). In order to avoid excessive overcharging which affects the lifetime of the battery a constant voltage procedure is recommended ($U = 2.27\text{V/cell} @ 20^{\circ}\text{C}$).

It is possible to determine the state of charge of a stored battery and the required period for recharge by the following method:

1. Measure the open circuit voltage of the battery. Note: The battery should be disconnected from the charging circuit for at least 12 hours prior to this test.
2. Consult the state of charge (SOC) table.
3. From the table the depth of discharge can be determined. With reference to the charging time V's depth of discharge graph the recharging time for the battery can be seen. The amount of time to recharge a battery can be reduced by increasing the voltage per cell (see product data brochure).

EFFECT OF RIPPLE CHARGE CURRENT

The RMS value of the alternating floating current component must be less than $0.1C_{10}$. Above this limit the effect is a rise in temperature of the battery which leads to a reduction in the battery life.

AC RIPPLE VOLTAGE

1% of floating voltage.

DISCHARGE

The lifetime of the battery is dependent on the depth of discharge which the battery experiences. In order to avoid extreme discharge problems the end cell voltage in relationship to the time of discharge must be considered as shown in the table below.

Time of Discharge	End Cell Voltage
5 to 60 minutes	1.60V
1 to 3 hours	1.65V
3 to 5 hours	1.70V
5 to 10 hours	1.75V
Over 10 hours	Refer to Exide Technologies

ACCIDENTAL EXTREME DISCHARGE

In case of extreme discharge the battery must be immediately recharged for a minimum of 48 hours at 2.27V/cell with the current limited to 0.1C₁₀ of the battery. Following this procedure we recommend that an autonomy test is conducted.

EFFECT OF TEMPERATURE

In case of rise in temperature the effective capacity is increased (see product data brochure) but the lifetime of the battery is reduced. Above 20°C the life expectancy is halved per 10°C rise in temperature. The floating voltage must be adjusted according to the ambient temperature (see technical information sheet) to reduce this effect.

USE OF PARALLEL BATTERIES

The use of batteries in parallel does not affect the performance of the batteries and can offer the advantage that should one battery fail the remaining batteries will give a reduced autonomy to the system. Usually the maximum number of parallel sets is four, above this consult Sonnenschein supplier. During the lifetime of a sealed battery, equalisation charges should not be required. However, periodic discharges should be used to evaluate the condition of the battery. The results from these tests can be used to predict the required replacement date.

INSPECTIONS

The purpose of periodic inspections is to verify the integrity of the battery system, assess the battery conditions and determine the capacity and future life expectancy. Discharge tests are a method of verifying the actual capacity available. Regular inspection will detect ageing systems and allow for a planned replacement.

RECYCLING

An unused battery left abandoned is considered as being a potentially hazardous product. Exide Technologies Network Power will provide details of licensed waste disposal companies. Alternatively Exide will accept unused batteries if delivered to our Logistics centre in Stevenage.

