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# Sonnenschein A 500C

## Operating Instruction 32550

### Valve regulated lead acid batteries

#### Nominal data

- Nominal voltage  $U_N$  : 2.0 V x number of cells
- Nominal capacity  $C_N = C_{20}$  : 20h discharge (see type plate and technical data in these instructions)
- Nominal discharge current  $I_N = I_{20}$  :  $C_N / 20h$
- Final discharge voltage  $U_f$  : see technical data in these instructions
- Nominal temperature  $T_N$  : 20°C

Assembly by: \_\_\_\_\_ EXIDE Technologies order no.: \_\_\_\_\_ date: \_\_\_\_\_

Commissioned by: \_\_\_\_\_ date: \_\_\_\_\_

Safety signs attached by: \_\_\_\_\_ date: \_\_\_\_\_



- Observe these Instructions and keep them located near the battery for future reference!
- Work on the battery should only be carried out by qualified personnel!



- Do not smoke.
- Do not use any naked flame or other sources of ignition. Explosion and fire hazards are present!



- While working on batteries wear protective eye-glasses and clothing!
- Observe the accident prevention rules as well as DIN VDE 0510, VDE 0105 Part 1.



- Any acid splashes on the skin or in the eyes must be flushed with plenty of clean water immediately. Then seek for medical assistance. Spillages on clothing should be rinsed out with water!



- Explosion and fire hazard, avoid short-circuits!



- Electrolyte is strongly corrosive! In normal working conditions the contact with electrolyte is impossible. If the housing is damaged the exposed fixed electrolyte is as corrosive as liquid electrolyte.



- Bloc batteries are heavy! Ensure adequate mounting security and always use suitable handling equipment for transportation!



- Caution! Metal parts of the battery are always alive, therefore do not place items or tools on the battery.



- Keep children away from batteries.

**Non-compliance with operating instructions, repairs made with other than original parts, or repairs made without authorization (e. g. opening of valves) render the warranty void.**



#### Disposal of Batteries

Batteries marked with the recycling symbol should be processed via a recognised recycling agency. By agreement, they may be returned to the manufacturer. Batteries must not be mixed with domestic or industrial waste.



Valve regulated lead acid batteries consist of 12V blocs. No topping up with water is allowed during the whole lifetime. Pressure valves are used for sealing, these cannot be opened without destruction.

#### 1. Start up

Prior to installation the batteries are to be checked for mechanical damages, exact polarity and firmly seated connectors. The following torques apply for screw connectors:

G 5	G 6	A
5 Nm ± 1	6 Nm ± 1	8 Nm ± 1

If needed rubber covers should be attached. Connect the battery with the correct polarity to the charger. The charger should not be switched on during this process, the load should not be connected (pos. pole to pos. terminal), Switch on charger and start charging following the instruction no. 2.2 with higher voltage.

#### 2. Operation

For the operation of this battery DIN VDE 0510 (as well as EN 50 272-2) are mandatory. In addition according to the usage table 1 is to be applied.

Usage	DIN VDE
Stationary batteries	EN 50 272-2
Traction batteries in electric vehicles	0510 part 3
Starter batteries in automobiles	0510 part 4
Onboard batteries in boats, trains and ground vehicles	0510 part 5
Airplanebatteries	0510 part 6
Equipment-batteries	0510 part 7

Table 1

#### 2.1 Discharge

The final discharge voltage in relation to the discharge current must not be beyond the level specified. If not further specified by the manufacturer the permissible discharge capacity is according to table 3. Recharge immediately following complete or partly discharge. With battery operation in electric vehicle applications (charge-/discharge operation) it is recommended to avoid a discharge beyond 60% of the nominal capacity for the benefit of an optimum of lifetime. Discharge beyond 60% of the nominal capacity for this application are **deep discharges** and shorten the lifetime of the battery. Therefore only by the battery manufacturer recommended charge-condition meters must be used.

#### 2.2 Charging

Applicable is the charging procedure with its limit values according to DIN 41773 (IU-characteristic) or WU-characteristic with a limit value only for the constant voltage-characteristic. According to the charging equipment specification and characteristics alternating currents flow through the battery superimposing onto the direct current during charging operation. These alternating current and the reaction from the loads lead to an additional temperature increase of the battery, and strain the electrodes with possible damages (see 2.5). Depending on the installation charging may be carried out in following operation.

#### Buffer Operation

With buffer operation the direct current source is not able to supply the maximum load-current at all times. The load-current intermittently exceeds the nominal current of the direct source. During this period the battery supplies power. The battery is not fully charged at all times. Therefore, depending on the load the charge voltage must be set to 2.35 V/cell ± 1% x number of cells. This has to be carried out in accordance

with the recommendations of the battery manufacturer.

### 2.3 Equalizing charge

Equalizing charges are required after exhaustive discharges and/or inadequate charges. They have to be carried out as follows: Up to 48 hours of max. 2.45 V/cell. The charge current must not exceed 10A/ 100 Ah nominal capacity. On exceeding the max. temperature of 45 °C charging must be either stopped or switched to float charge to allow the temperature to drop.

### 2.4 Alternating currents

On recharging up to 2.40 V/cell under operation modes 2.2 the actual value of the alternating current is occasionally permitted to reach 20A/ 100Ah nominal capacity. In a fully charged state during float charge or standby parallel operation the actual value of the alternating current must not exceed 5A/ 100Ah nominal capacity.

### 2.5 Charging currents

During float charge or standby parallel operation without rechargingstate the charging currents are not limited. The charging current should range between 10A to 20A/ 100 Ah nominal capacity. (approx. value)

### 2.6 Temperature

The nominal operation temperature range for sealed lead acid batteries is 10 °C to 30 °C. All technical data are produced for a nominal temperature of 20 °C. The ideal temperature range is 20 °C +/- 5 K. Higher temperatures will seriously reduce the service life. Lower temperatures reduce the available capacity. The absolute maximum temperature is 55 °C and should not exceed 45 °C in service.

### 2.7 Temperature-related charge voltage

A temperature related adjustment of the charge voltage within the operating temperature of 15 °C to 25 °C is not necessary. Is the operating temperature constantly outside this range the charge voltage has to be adjusted as follows:

Battery temperature [°C]	Charge voltage [Vpc]
-10	2.50
0	2.50
10	2.40
20	2.40
30	2.40
40	2.33

Table 2

### 2.8 Electrolyte

The electrolyte is diluted sulphuric acid and fixed in a gel.

### 2.9. Battery maintenance and control

Keep the battery clean and dry to avoid leakage currents. Plastic parts of the battery especially containers, must be cleaned with pure water without additives.

#### At least every 6 month measure and record:

- battery voltage
- voltage of several blocs
- surface temperature of several blocs
- battery-room temperature

If the difference of the average float-charge voltage is exceeding

higher	lower
0.49 V	-0.24 V

for 12V Blocs, or is the surface temperature-difference between blocs exceeding 5K, the service agent should be contacted.

#### Annual measurement and recording:

- voltage of all blocs
- electrolyte temperature of all blocs
- battery-room temperature
- insulation-resistance according to DIN 43539 part 1

#### Annual visual check:

- screw-connections
- screw-connection without locking devices have to be checked for tightness
- battery installation and arrangement
- ventilation

### 6. Technical data (Table 3)

Capacities at different discharge times until the final discharge voltage with the battery temperature at 20° C

Discharge time	10 min	30 min	1 h	3 h	5 h	10 h
Capacity	C <sub>1/6</sub> /Ah	C <sub>1/2</sub> /Ah	C <sub>1</sub> /Ah	C <sub>3</sub> /Ah	C <sub>5</sub> /Ah	C <sub>10</sub> /Ah
A512C/15.0	5.8	8.1	9.5	11.7	12.5	14.0
A512C/24.0	7.7	12.3	15.3	20.1	22.0	22.0
A512C/28.0	10.1	14.5	17.1	22.2	24.0	26.0
A512C/38.0	12.0	17.5	20.9	27.3	30.5	33.0
A512C/52.0	16.6	24.6	29.5	37.5	41.5	45.0
A512C/56.0	17.7	26.9	33.7	43.8	47.5	51.0
A512C/80.0	30.7	42.9	51.5	66.6	72.0	77.0
A512C/110.0	42.2	57.5	68.3	87.0	93.5	100.0
U <sub>i</sub> in V/cell	1.6 V/cell	1.6 V/cell	1.65 V/cell	1.70 V/cell	1.70 V/cell	1.80 V/cell

Table 3

### 3. Tests

Tests must be carried out according to IEC 896-1 + 2. Special test requirements according to DIN VDE 0107 and DIN VDE 0108 have to be acknowledged. To assure the reliability of the current source the complete battery should be replaced after the end of the expected design life. This should be done under consideration of the application and the temperatures.

### 4. Storage and taking out of operation

To store or decommission bloc batteries for a longer period of time they should be fully charged and stored in a dry frost-free room. To avoid damage the following charging-methods can be chosen:

1. Annual equalizing-charge acc. to 2.3. In average ambient temperatures of more than 20 °C shorter intervals may be necessary.

### 5. Transport

Bloc batteries must be transported in an upright position. To avoid short circuits the terminals have to be fully insulated.

Bloc batteries without any visible damages are not defined as dangerous goods providing they are protected against short circuit, slipping, upsetting, or damage and are packed in an upright properly secured position onto pallets. It is prohibited to staple pallets. If the bloc batteries containers are damaged, refer to national regulations (dangerous goods).

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