Sonnenschein

GNB INDUSTRIAL POWER
A Division of Exide Technologies

81700454

Sonnenschein A 500
Operating Instruction
Stationary valve regulated lead acid batteries

Nominal data

- Nominal voltage U_N : 2.0 V x number of cells
- Nominal capacity $C_N = C_{20}$: 20 h discharge (see type plate on cells/blocs and technical data in these instructions)
- Nominal discharge current $I_N = I_{20}$: C_N / 20 h
- Final discharge voltage U_f : see technical data in these instructions
- Nominal temperature T_N : 20° C; 25° C

Battery type: _____ Number of cells/blocks: _____

Assembly and CE marking by: _____ EXIDE Technologies order no.: _____ date: _____

Commissioned by: _____ date: _____

Security 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. Risk of explosion and fire!

- While working on batteries wear protective eye-glasses and clothing.
- Observe the accident prevention rules as well as EN 50272-2 and EN 50110-1.

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

- Explosion and fire hazard, avoid short circuits.
- Avoid electrostatic charges and discharges/sparks!

- Electrolyte is very corrosive. In normal working conditions contact with electrolyte is impossible. If the cell or monobloc container is damaged do not touch the exposed electrolyte because it is corrosive.

- Cells and monoblocs are heavy. Make sure they are installed securely! Always use suitable handling equipment for transportation.
- Handle with care because cells/monoblocs are sensitive to mechanical shock.
- Do not lift or pull up blocks/cells on the poles.

- 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, installations or repairs made with other than original accessories and spare parts or with accessories and spare parts not recommended by the battery manufacturer or repairs made without authorization (e. g. opening of valves) render the warranty void.

Spent batteries have to be collected and recycled separately from normal household wastes (EWC 160601). The handling of spent batteries is described in the EU Battery Directive (2006/66/EC) and their national transitions (UK: HS Regulation 1994 No. 232, Ireland: Statory Instrument No. 73/2000). Contact your supplier to agree upon the recollection and recycling of your spent batteries or contact a local and authorized Waste Management Company.

Stationary valve regulated lead acid batteries do not require topping-up water. Pressure valves are used for sealing and cannot be opened without destruction.

1. Start Up

Check all cells/blocs for mechanical damage, correct polarity and firmly seated connectors. Torques as shown in **table 1** apply for screw connectors.

G-M5	G-M6	A
5 Nm ± 1	6 Nm ± 1	8 Nm ± 1

Table 1: Torque

Before installation the supplied rubber covers should be fitted to both ends of the connector cables (pole covers).

Control of insulation resistance:
New batteries: > 1M
Used batteries: > 100 /Volt

Connect the battery with the correct polarity to the charger (pos. pole to pos. terminal). The charger must not be switched on during this process, and the load must not be connected. Switch on charger and start charging following instruction no. 2.2.

2. Operation

For the installation and operation of stationary batteries DIN VDE 0510 part1 (draft) and EN 50 272-2 is mandatory.

Battery installation should be made such that temperature differences between individual units do not exceed 3 degrees Celsius/Kelvin.

2.1 Discharge

Discharge must not be continued below the voltage recommended for the discharge time. Deeper discharges must not be carried out unless specifically agreed with the manufacturer. Recharge immediately following complete or partial discharge.

2.2 Charging

All charging must be carried out according to DIN 41773 (IU-characteristic with limit values: I-constant: ± 2%; U-constant: ± 1%).

Depending on the charging equipment, specification and characteristics alternating currents flow through the battery. Alternating currents and the reaction from the loads may lead to an additional temperature increase of the battery, and strain the electrodes with possible damages (see 2.5) which can shorten the battery life. Depending on the installation charging (acc. to EN 50272-2) may be carried out in following operations.

a.) Standby Parallel Operation

Here, the load, battery and battery charger are continuously in parallel. Thereby, the charging voltage is the operation voltage and at the same time the battery installation voltage. With the standby parallel operation, the battery charger is capable, at any time, of supplying the maximum load current and the battery charging current. The battery only supplies current when the battery charger fails. The charging voltage should be 2.30 Vpc at 20° C measured at the end terminals of the battery.
To reduce the charging time a boost charging stage can be applied in which the charging voltage 2.40-2.45 Vpc at 20° C can be adjusted (standby-parallel operation with boost recharging stage).
Automatic change over to charging voltage 2.30 Vpc at 20° C should be applied.

b.) Buffer operation

With buffer operation the battery charger is not able to supply the maximum load current at all times. The load current intermittently exceeds the nominal current of the battery charger. During this period the battery supplies power. This results in the battery not fully charged at all times. Therefore, depending on the load the charge voltage must be 2.30-2.35 Vpc at 20° C. This has to be carried out in accordance with the manufacturers instructions.

c.) Switch-mode operation

When charging, the battery is separated from the load. The charge voltage of the battery must be 2.45 Vpc at 20° C (max. values). The charging process must be monitored. If the charge current reduces to less than 1.5 A/100 Ah C_{10} with 2.45 Vpc at 20° C the mode switches to float charge acc. to item 2.3.

d.) Battery operation (charge-/discharge operation)
The load is only supplied by the battery. The charging process depends on the application and must be carried out in accordance with the recommendations of the battery-manufacturer.

2.3 Maintaining the full charge (float charge)
Devices complying with the stipulations under DIN 41773 must be used. They are to be set so that the average cell voltage is 2.30 Vpc at 20° C.

2.4 Equalizing charge
Because it is possible to exceed the permitted load voltages, appropriate measures must be taken, e.g. switch off the load. Equalizing charges are required after deep discharges and/or inadequate charges. They can be carried out with 2.45 Vpc at 35 A per 100 Ah C_{10} up to 48 hours.
The cells / bloc temperature must never exceed 45° C. If it does, stop charging or revert to float charge to allow the temperature to drop.

2.5 Alternating currents
When recharging up to 2.40 Vpc under operation modes 2.2 the actual value of the alternating current is occasionally permitted to reach 10A (RMS)/100Ah C_{10}. In a fully charged state during float charge or standby parallel operation the actual value of the alternating current must not exceed 5 A (RMS)/100 Ah C_{10}.

2.6 Charging currents
The charging currents are not limited during standby parallel operation or buffer operation without recharging stage. The charging current should range between 10 to 35 A per 100 Ah C_{10} (guide value).

2.7 Temperature
The recommended operation temperature range for lead acid batteries is 10° C to 30° C (best: nominal temperature ± 5K). Higher temperatures will seriously reduce service life. Lower temperatures reduce the available capacity.
The absolute maximum temperature is 55° C and should not exceed 45° C in service.
All technical data refer to a nominal temperature of 20° C and 25° C respectively.

2.8 Temperature related charge voltage
The temperature related adjustment has to be carried out **acc. to the following figure**.
An adjustment of the charge voltage must not be applied within a specified temperature range of 15° C to 35° C.

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

3. Battery maintenance and control
Keep the battery clean and dry to avoid creeping 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 cells/blocs
– Surface temperature of several cells/blocs
– Battery-room temperature

If the cell or bloc voltage differs from the average float charge voltage by more than the values in given in **table 2**, or if the surface temperature difference between cells / monoblocs exceeds 5K, the service agent should be contacted.

2V	4V	6V	8V	12V
+0.2/ -0.1	+0.28/ -0.14	+0.35/ -0.17	+0.40/ -0.20	+0.49/ -0.24

Table 2: Criteria for voltage measurements

Annual measurement and recording:
– Voltage of all cells / blocs
– Surface temperature of all cells/blocs
– Battery-room temperature
– Insulation-resistance acc. to DIN 43539 part1

Annual visual check:
– Screw-connections
– Screw-connections without locking devices have to be checked for tightness
– Battery installation and arrangement
– Ventilation

4. Tests
Tests have to be carried out according to IEC 60896-21, DIN 43539 part 1.
Special instructions like DIN VDE 0107 and EN 50172 have to be observed.

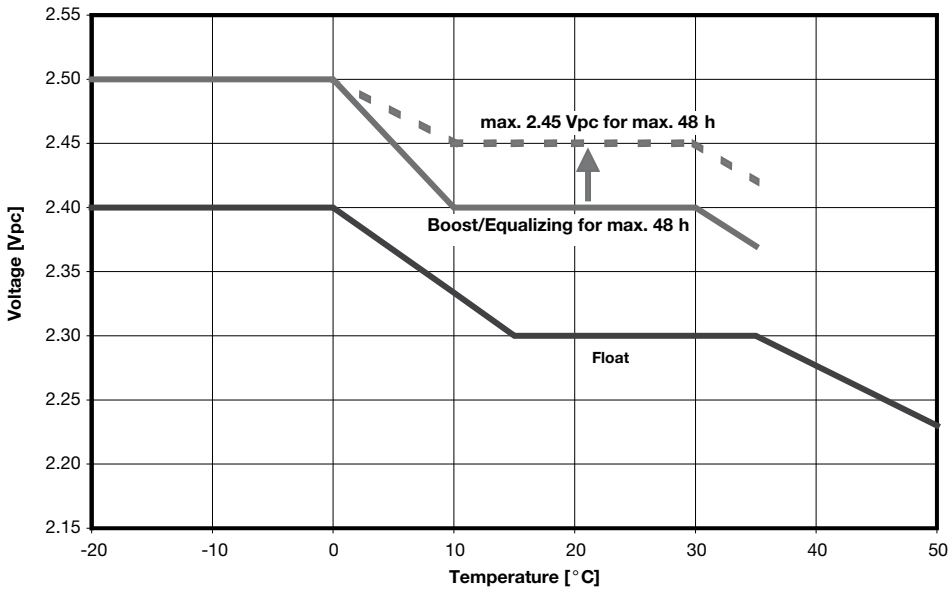

Figure: A 500 Charging voltage vs. temperature

Capacity test
In order to make sure the battery is fully charged IU-charge methods as shown in **table 3** can be applied depending on the different battery types.

The current available to the battery must be between 10 A / 100 Ah and 35 A / 100 Ah C_{10}.

Option 1	Option 2
2.30 Vpc ≥ 72 hours	2.45 Vpc ≥ 16 h (max. 48h) followed by 2.30 Vpc ≥ 8h

Table 3: Preparation for capacity test

5. Faults
Call the service agents immediately if faults in the battery or the charging unit are found. Recorded data as described in item 3. must be made available to the service agent. It is recommended that a service contract is taken out with our agent.

6. Storage and taking out of operation
To store or decommission cells/blocs 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 refreshing charge acc. to item 2.4.
   Gel batteries A 500 can be stored without refreshing charge for maximum 24 months at ≤ 20° C.
   At average ambient temperatures of more than the nominal temperature shorter intervals can be necessary.

2. Float charging as detailed in 2.3.

7. Transport
Cells and blocs must be transported in an upright position. Batteries without any visible damage are not defined as dangerous goods under the regulations for transport of dangerous goods by road (ADR) or by railway (RID). They must be protected against short circuits, slipping, upsetting or damaging. Cells/blocs may be suitable stacked and secured on pallets (ADR and RID, special provision 598). It is prohibited to staple pallets.
No dangerous traces of acid shall be found on the exteriors of the packing unit.
Cells/blocs whose containers leak or are damaged must be packed and transported as class 8 dangerous goods under UN no. 2794.
In case of air transport, batteries which are part of any equipment must be disconnected at their terminals, and the terminals must be protected against short-circuits. This is in order to avoid the risk of any incidents like fire etc.

8. General items
The ventilation of battery rooms and cabinets, respectively, must be carried out acc. to EN 50272-2 always. Battery rooms are to be considered as safe from explosions, when by natural or technical ventilation the concentration of hydrogen is kept below 4% in air.
This standard contains also notes and calculations regarding safety distance of battery openings (valves) to potential sources of sparks.

9. Technical Data

Discharge time t_n	10 min	30 min	1 h	3 h	5 h	10 h	20 h	Length	Width	Height	Weight
Capacity C_n [Ah]	$C^1/_6$	$C^1/_2$	C_1	C_3	C_5	C_{10}	C_{20}	[mm]	[mm]	[mm]	[kg]
A502/10	4.8	6.4	7.1	9.0	9.5	10.0	10.0	52.9	50.5	98.4	0.70
A504/3.5	1.4	1.95	2.3	3.0	3.15	3.3	3.5	90.5	34.5	64.4	0.50
A506/1.2	0.5	0.66	0.8	1.05	1.1	1.0	1.2	97.3	25.5	55.6	0.33
A506/3.5	1.4	1.95	2.3	3.0	3.15	3.3	3.5	135	34.8	64.4	0.70
A506/4.2	1.1	1.75	2.5	3.78	3.95	4.0	4.2	52.0	62.3	102	0.90
A506/6.5	2.6	3.5	4.0	4.8	5.5	6.3	6.5	152	34.5	98.4	1.30
A506/10	4.8	6.4	7.1	9.0	9.5	10.0	10.0	152	50.5	98.4	2.1
A508/3.5	1.4	1.95	2.3	3.0	3.15	3.3	3.5	179	34.1	64.4	1.00
A512/1.2	0.5	0.66	0.8	1.05	1.1	1.0	1.2	97.5	49.5	54.9	0.65
A512/2	0.8	1.1	1.5	1.8	1.85	1.9	2.0	179	34.1	64.4	1.00
A512/3.5	1.4	1.95	2.3	3.0	3.15	3.3	3.5	135	66.8	64.4	1.50
A512/6.5	2.6	3.5	4.0	4.8	5.5	6.3	6.5	152	65.5	98.4	2.60
A512/10	4.8	6.4	7.1	9.0	9.5	10.0	10.0	152	98.0	98.4	4.00
A512/16	7.0	9.0	10.6	13.8	14.5	15.0	16.0	181	76.0	167.0	6.00
A512/25	7.8	11.45	14.4	18.6	20.5	22.0	25.0	167	176.0	126.0	9.60
A512/30	11.4	16.3	20.1	24.6	26.5	27.0	30.0	197	132.0	180	11.10
A512/40	14.1	19.5	24.0	28.5	34.0	36.0	40.0	210	175.0	175.0	14.60
A512/55	19.3	27.6	35.7	42.9	46.5	50.0	55.0	261	135.0	230	18.80
A512/60	22.1	30.9	37.1	48.6	52.0	56.0	60.0	278	175.0	190.0	20.8
A512/65	22.5	33.8	40.9	53.7	58.5	62.0	65.0	353	175.0	190.0	24.0
A512/85	33.1	47.5	59.0	69.0	75.5	80.0	85.0	330	171.0	236	30.0
A512/115	37.8	58.5	67.0	84.0	95.0	104	115	286	269.0	230	39.5
A512/120	44.5	62.0	74.0	89.7	96.0	102	120	513	189.0	223	40.0
A512/140	50.5	71.5	85.4	105.3	113	119	140	513	223.0	223	47.0
A512/200	68.5	101	120	151.8	164	173	200	518	274.0	238	67.0
U_f [V] (2 V cell)	1.6	1.6	1.65	1.70	1.70	1.80	1.75				
U_f [V] (4 V bloc)	3.2	3.2	3.3	3.4	3.4	3.6	3.5				
U_f [V] (6 V bloc)	4.8	4.8	4.95	5.1	5.1	5.4	5.25				
U_f [V] (8 V bloc)	6.4	6.4	6.6	6.8	6.8	7.2	7.0				
U_f [V] (12 V bloc)	9.6	9.6	9.9	10.2	10.2	10.8	10.5				

All technical data refer to 20° C.

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