OPERATING INSTRUCTIONS

and maintenance manual for valve regulated stationary lead acid batteries OPzV

Nominal voltage UN:	**2V**
Nominal Capacity: CN = C10:	**10 hour discharge (see type label)**
Nominal discharge current: IN = I10:	**Final discharge voltage Uf= 1.80 V/Cell**
Nominal temperature TN:	**20°C**

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

1. COMMISSIONING

ASSEMBLED BY
Signature and date

COMMISSIONED BY
Signature and date

SAFETY SIGNS
Signature and date

Before commissioning all cells must be inspected for mechanical damage,
Cells must be connected with the correct Polarity and connectors firmly seated. The following torque applies for screw connectors: **20 ± 1 Nm**
If necessary the terminal covers must be put on. With charger off and loads isolated, connect battery to the direct current power supply, maintaining correct polarity (positive terminal to positive post). Switch on the charger and charge as described in section 2.2.

2. OPERATION

For the assembly and operation of stationary battery installations DIN VDE 0510 Part 1 (draft) and DIN VDE 0510 Part 2 apply.
The battery must be installed in such a way that an ambient temperature difference of _ 3 K cannot occur between individual cells.

2.1 Discharging

Never allow the final discharge voltage of the battery to drop below that assigned for the discharge current. Unless the manufacturer has specified otherwise, no more than the nominal capacity is to be consumed. Charge immediately after discharge, including partial discharge.

2.2 Charging

OThe charging procedure with limit values as defined under DIN 41 773 (IU characteristic) may be used Depending on charger type and charging characteristic, alternating currents flow through the battery during charging and are superimposed onto the charging direct current. These superimposed alternating currents and the reaction of the loads lead to additional heating of the battery and strain on the electrodes with possible resulting damage (see section 2.5). Depending on the system at hand, charging may be carried out under the following operating modes (in accordance with DIN VDE 0510 Part 1 Draft).

a) Stand-by parallel operation and floating operation: Here the load, direct current source and battery are continuously connected in parallel. This means that the charging voltage is the operating voltage of the battery and at the same time the battery system voltage. Under stand-by parallel operation, the direct current source is at any time capable of supplying the maximum load current and the battery charging current. The battery only supplies current when the direct current source fails. The charge voltage should be set at 2.25 V ± 1% × number of cells in series, measured at the battery's terminals. To reduce the recharging time a charging stage can be applied in which the charging voltage is max. 2.35 V × number of cells (stand-by parallel operation with recharging stage). Automatic changeover to the charging voltage of 2.25 V ± 1% × number of cells in series follows. With floating 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 current source. During this period the battery supplies power. It is not fully charged at all times. Therefore, depending on the load, the charge voltage must be set at approx. 2.27 to 2.30 V x number of cells following consultation with the battery manufacturer.

b) Switch mode operation: When charging, the battery is separated from the load. The charge voltage of the battery is max. 2.35 V/cell. The charging process must be monitored. When the charge current has decreased to 1.5 A/100 Ah nominal capacity at 2.35 V/cell, the battery is switched to float charging as under section 2.3 or switching takes place on reaching 2.35 V/cell.

c) Battery operation (charge/discharge operation) The load is supplied only by the battery. The charging method depends on the user and must be clarified with the battery manufacturer.

2.3 Maintaining the full charge

(float charging). Devices complying with the provisions of DIN 41773 must be used. They are to be set so that the average cell voltage is 2.25 V ± 1%.

2.4 Equalizing charge

Because it is possible to exceed the permitted load voltages, appropriate measures must be taken, e.g. disconnection of the load. An equalizing charge is necessary after an exhaustive discharge and/or after an inadequate charge; it can be carried out at a constant voltage of max. 2.35 V/cell for up to 48 hours. The charging current should not exceed 10 A per 100 Ah nominal capacity. Should the maximum temperature of 45°C be exceeded, the charging process must be interrupted or temporarily switched to float charge to allow the temperature to drop.

2.5. Superimposed alternating currents

While recharging up to 2.35 V/cell in accordance with the operating modes of section 2.2, the actual value of the alternating current is occasionally permitted to reach a max. 20 A per 100 Ah nominal capacity. After recharging and continuous charging (float charging) in standby parallel operation or floating operation, the effective value of the alternating current must not exceed 5 A per 100 Ah nominal capacity.

2.6. Charging currents

During continuous battery power supply or floating operation without a recharging stage, the charging currents are not limited. The charging current should lie between 10 A and 20 A per 100 Ah nominal capacity (standard value).

2.7. Temperature

The recommended operating temperature range for lead-acid batteries is 10°C to 30°C.
The ideal operating temperature range is 20°C ± 5 K.
Higher temperatures will reduce battery service life. The technical data apply to the nominal temperature of 20°C. Lower Temperatures reduce the available capacity. The maximum temperature of 55°C must nor be exceeded. Continuous operating temperatures in excess of 45°C are to be avoided.

2.8. Temperature-related charge voltage

Within the operating temperature range of 15°C to 25°C, temperature-related adjustment of the charge voltage is not necessary. Should the operating temperature constantly lie outside this temperature range, the voltage should be adjusted. The temperature correction factor is -0.004 V/Cell per K.

2.9 Electrolyte

The electrolyte is sulphuric acid mixed in gel.

3. Battery maintenance and Inspection

To avoid leakage currents keep the battery clean and dry. Cleaning the battery should be carried out as specified in the ZVEI pamphlet on battery cleaning. Plastic battery components, in particular the cell containers, must only be cleaned with pure water. At least every 6 months the following must be measured and recorded:

+ battery voltage
+ voltage of a few selected cells batteries
+ surface temperature of a few selected cells batteries
+ temperature in the battery room

Should the cell voltage deviate from the average float charge voltage by + 0.2 V/cell or - 0.1 V/cell and/or should the surface temperature of different cells deviate more than 5K, customer services must be called in.
The following must be measured and recorded annually:

+ voltage of all cells batteries
+ surface temperature of all cells batteries
+ temperature in the battery room.

Annual visual checks:

+ on bolted connectors (check that unsecured bolt connectors are firmly seated)
+ on battery installation or arrangement
+ on ventilation.

ENERGY IN MOTION

OPERATING INSTRUCTIONS

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4. TESTS
Tests must be conducted in accordance with EN 60896-2. In addition, special test instructions, e.g. as set out in DIN VDE 0107 and DIN VDE 0108 should be observed.

5. FAULTS
Should faults be detected in the battery or the charging device, customer services should be called in immediately. Measured data as under section 3 simplify fault detection and elimination. A service contract with us facilitates the timely detection of faults.

6. STORAGE AND TAKING OUT OF OPERATION
Should cells/batteries be stored or be taken out of operation for extended periods, they must be stored fully charged in a dry, frost-free room. Direct sunlight must be avoided.
To prevent damage, the following charging conditions should be chosen:

6.1. Equalizing charges as defined under 2.4 above, to be given twice a year. At average ambient temperatures in excess of 20°C, shorter intervals may be necessary.

6.2. Float charging as under 2.3 above. The period of use commences with delivery of the filled and charged battery from the TAB plant. Storage times are to be added to the period of use in full. In addition, batteries require recharging.

7. TRANSPORT
Filled lead-acid batteries which are undamaged, show no leaks and are firmly secured on pallets with protection against sliding, overturning and short-circuits are not treated as dangerous goods for conveyance by road so long as there are no dangerous traces (acid, lye) visible on the outside of the package.
ATTENTION: It is essential that loads on road vehicles are properly secured!

8. TECHNICAL DATA
The nominal voltage, the number of cells, the nominal capacity (C10 = CN) and the battery type can be obtained from the identification plate.

8.1 Example
Identification plate: 5 OPzV 250
5 = number of positive plates
250 = nominal capacity C10

SAFETY REQUIREMENTS ACCORDING TO EN 50272-3.


Pay attention to the operating instructions and keep them close to the battery. Work on batteries should be carried out by skilled personnel only!


No smoking! Do not expose batteries to naked flames, glowing embers or sparks, as it may cause the battery to explode.


Use protective glasses and clothes when working on batteries. Pay attention to the accident prevention rules as well as EN 50272-3 and EN 50110-1.


Risk of explosion and fire, avoid short circuits! Caution: metal parts of the battery are always live. Do not place tools or other metal objects on the battery! Do not remove the plugs.


Electrolyte is highly corrosive. In the normal operation of this battery contact with acid isn't possible. If the cell containers are damaged, the immobilised electrolyte (gelled sulphuric acid) is corrosive like liquid electrolyte.

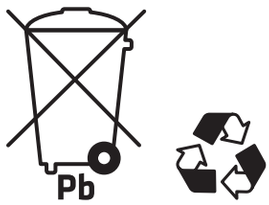

Batteries and cells are heavy. Ensure secure installation! Use only suitable handling equipment. Lifting hooks must not damage the cells, connectors or cables.


Dangerous voltage!
Caution: Metal parts of the battery are always live - avoid contact and sgort circuits. Do not place tools or other matal object on the battery!


Acid splashes into the eyes or on the skin must be washed with plenty of water. In case of accident after abundant flushing consult a doctor immediately! Clothing contaminated by acid should be washed in water.

IGNORING THE OPERATING INSTRUCTIONS, REPAIR WITH NON-ORIGINAL PARTS WILL RENDER WITH WARRANTY VOID.

Spent batteries must be COLLECTED SEPARATELY and recycled.



TAB Tovarna akumulatorskih baterij, d. d., Polena 6, SI-2392 Mežica, Slovenia | T: +386 (0)2 8702 300 | F: +386 (0)2 8702 305 | info@tab.si | www.tab.si