Operating instructions

Valve regulated stationary lead-acid batteries

Specifications:
- Nominal voltage $U_0$: 2.0 V x number of cells connected in series
- Nominal Capacity $C_N = C_{10}$: 10 hour discharge (see type label)
- Nominal discharge current: $I_N = I_{10}$: $C_{10}$ in 10 h
- Final discharge voltage $U_f$: 1.80 V/Cell
- Nominal temperature $T_N$: 20°C

Valve regulated stationary lead-acid batteries consist of cells which for their entire service life must not be topped up with water. Excess pressure valves are used as vent plugs and will be destroyed if opened.

**Operating instructions**

1. **Commissioning**
   - Before commissioning, all cells/blocks must be inspected for mechanical damage, cells must be connected with the correct polarity and connectors firmly seated.
   - With the charger off and loads isolated, put on.
   - Failure to observe the operating instructions, repair with non-original parts or unauthorised interventions will render the warranty void.

2. **Operation**
   - For the assembly and operation of stationary battery installations, DIN EN 50272 Part 1 and DIN EN 50272 Part 2 resp. IEC 62485-2 apply.
   - The battery must be installed in such a way that an ambient temperature difference of $>3{°}C$ cannot occur between individual cells/blocks.

   **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**
   - The charging procedure with limit values as defined under DIN 41 773 (IU characteristics) may be used.
   - Depending on the system at hand, charging may be carried out under the following operating modes (in accordance with EN 50272-3:2001).
     - Switch mode operation
       - When charging, the battery is separated from the load. The charging voltage of the battery is max. 2.40 V/cell. The charging process must be monitored. When the charging current has decreased to 1.5 A/100 Ah nominal capacity at 240 V/cell, the battery is switched to float charging as under section 2.3 or switching takes place on reaching 2.40 V/cell.

   **2.3 Maintaining the full charge (float charging)**
   - The load is supplied only by the battery. The charging method depends on the application and must be clarified with the battery manufacturer.

   **2.4 Equalising charge**
   - Devices complying with the provisions of DIN 41773 must be used. The charging voltage to be set is specified in the table below.
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 2.40 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 (floating charge) in standby parallel operation or floating operation, the effective value of the alternating current must not exceed 5 A per 100 Ah nominal capacity (recommended: 1 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 range of 20 °C. Lower temperatures reduce the available capacity. The maximum temperature of 55 °C must not be exceeded. Continuous operating temperatures in excess of 45 °C are to be avoided.

2.8 Temperature-related charging voltage
Within the operating temperature range of 15 °C to 25 °C, temperature-related adjustment of the charging voltage is not necessary. Should the operating temperature constantly lie outside this temperature range, the voltage should be adjusted. The temperature correction factor is 0.005 V/°C per K.

- Temperature: -10 0 10 20 30 40 °C
- Charging voltage: 2.40 2.35 2.30 2.25 2.20 2.15 [V/Cell]

2.9 Electrolyte
The electrolyte is dilute sulphuric acid bound in a glass fibre mat or 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/monobloc batteries;
- surface temperature of a few selected cells/monobloc batteries;
- temperature in the battery room.

Should the cell voltage deviate from the average float charge voltage by the values in the table, among other things, and/or should the surface temperature of different cells deviate by more than 5 K, customer services must be called in.

Note: Float charge voltages of lead-acid batteries with electrolyte fixed in gel can vary within approximately the first 2 to 4 years after commissioning. Hence the cell voltage in float charge can differ in the non-critical range from 2.12 V/cell ± 1% to 2.5 V/cell ± 1%. These variations are a normal phenomenon for gel type batteries without negative influence on the capacity resp. efficiency of single battery cells or blocs.

The following must be measured and recorded annually:
- battery voltage
- battery voltage of all cells/monobloc batteries
- surface temperature of all cells/monobloc batteries
- temperature in the battery room

Annual visual checks:
- on all bolted connections
- check all bolted connections are firmly seated
- on battery installation or arrangement
- on ventilation

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:
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 (for PV storage systems, shorter equalizing charge intervals are sometimes necessary. Refer to the corresponding product documentation).

Note: By the end of the max. storage period, battery charge acceptance might be restricted during recharging. We therefore recommend application of an appropriate charging method to ensure gentle and full charge. Refer to the corresponding section in the detailed installation, commissioning and operating instructions.

2. Float charging as under 2.3 above.

The period of use commences with delivery of the filled and charged battery from the HOPPECKE plant. Storage times are to be added to the period of use in full. In addition, batteries require recharging.

Note: Max. two recharges during the storage period. Afterwards, the battery has to be operated under permanent float charge voltage.

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/batteries, the nominal capacity (C10 = Cn) and the battery type can be obtained from the identification plate.

8.1 Example
Identification plate: 4 OPzV 200
4 = number of positive plates
OPzV = battery type
200 = nominal capacity C10
(Capacity for discharge with ten hours’ current (I10) over a discharge time of 10 h (I10))

- Voltage of a few selected cells/monobloc
- Float charge voltage (measured against the battery’s terminals). To determine the value to be set on the charger, multiply the cell voltage with the number of cells.

<table>
<thead>
<tr>
<th>Type</th>
<th>2 V</th>
<th>4 V</th>
<th>6 V</th>
<th>12 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPzV, power.bloc</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>OPzV, net.power</td>
<td></td>
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<tr>
<td>OPzV, 12 V 120 Ah</td>
<td>2.25 V/cell ± 1%</td>
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<tr>
<td>OPzV, power.com</td>
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<tr>
<td>OPzV, solar.power</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>OPzV, 12 V 150 Ah</td>
<td>2.27 V/cell ± 1%</td>
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</tbody>
</table>

Used batteries with this marking are recyclable goods and must be sent for recycling.

Used batteries which are not sent for recycling are to be disposed of as special waste under the relevant regulations.