Operating Instructions

HOPPECKE
POWER FROM INNOVATION

Vented stationary lead-acid batteries

Specifications:

Nominal voltage U_N: 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 $I_N = I_{10}$: $\frac{C_N}{10\ h}$

Final discharge voltage U_s: 1.80 V/Cell

Nominal temperature T_N: 20°C

"LA" antimony content < 3% in the grids (material carriers) of the pos. electrodes

Observe operating instructions and display visibly near to the battery.
Work on batteries only after instruction by qualified staff.

No smoking. No open flame, embers or sparks in the vicinity of the battery, to avoid risk of explosion and fire.

Wear eye protection and protective clothing when working with batteries.
Observe accident prevention regulations, also EN 50272-2, VDE 0105 Part 1

Acid splashes in the eyes or on the skin must be washed out or off with plenty of water. Then see a doctor immediately. Acid splashes on clothing should be washed out with water!

Explosion and fire risk, avoid shortcircuits.
Warning! Metal parts of the battery cells are always live. Never place foreign objects or tools on the battery.

Electrolyte is highly corrosive.

Monobloc batteries/cells are very heavy!
Ensure secure installation! Use only suitable conveying equipment!

Dangerous electrical voltage.

Installation by: _____

on: _____

Commissioning by: _____

on: _____

Safety markings affixed by:

_____

on: _____

Non-compliance with operating instructions, repairs made with other than original parts, tampering or use of electrolyte additives (alleged enhancers) render the warranty null and void.

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. The following torque applies for screw connectors:

20 Nm ± 1 Nm.

If necessary the terminal covers must be put on. Check the level of electrolyte in all cells and top up to the maximum level with purified water (acc. to DIN 43530 Part 4) if necessary.

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 operation of stationary battery installations DIN VDE 0510 Part 1 and EN 50272-2 resp. IEC 62485-2 apply.

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

All charging procedures may be used with their limit values as specified in

DIN 41 773 (IU characteristic),

DIN 41 774 (W characteristic),

DIN 41776 (I characteristic).

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

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 2.23 V ± 1% (2,25 V ± 1% for USV-bloc and OSP.XC cells) x 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. 2.33 to 2.4 V x number of cells (stand-by parallel operation with recharging stage). Automatic changeover to the charging voltage of 2.23 V ± 1% (2,25 V ± 1% for USV-bloc and OSP.XC cells) x 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. 2.25 to 2.30 V x the number of cells connected in series.

b) Switch mode operation

When charging, the battery is separated from the load. Towards the end of charging, the charge voltage of the battery is 2.6 - 2.75 V/cell. The charging process must be monitored (see under 2.4, 2.5 and 2.6). On reaching a state of full charge, charging should be terminated or a switch made to float charging as under section 2.3.

c) Battery operation (charge/discharge operation)

The load is supplied only by the battery. In this case, towards the end of charging, the charge voltage of the battery is 2.6 - 2.75 V/cell. The charging process must be monitored (see under 2.4, 2.5 and 2.6). On reaching a state of full charge, charging should be terminated. The battery may be connected to the load if required.

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 2.23 V ± 1% (2.25 ± 1% for USV-bloc and OSP.XC cells), and so that electrolyte density does not fall over longer periods of time.

2.4 Equalising charge

Because it is possible to exceed the permitted load voltages, appropriate measures must

be taken, e.g. disconnection of the load.

Equalising charges are necessary after exhaustive discharge and/or after inadequate charging; they can be carried out as follows:

- at a constant voltage of max. 2.4 V/cell for up to 72 hours,
- with the I or W characteristic in accordance with Table 1.

Should the maximum temperature of 55°C be exceeded, the charging process must be interrupted or continued with reduced current or a temporary switch made to float charging to allow the temperature to drop. The end of equalising charging is reached when the electrolyte densities and the cell voltages no longer rise within a period of 2 hours.

2.5 Superimposed alternating currents

While recharging up to 2.4 V/cell in accordance with operating modes a) to c), the actual value of the alternating current is occasionally permitted to reach a max. 20 A per 100 Ah nominal capacity (for shortest time).

Up to 2.4 V/cell, 10 A per 100 Ah nominal capacity may not be exceeded. In fully charged state with a charge voltage of 2.23 to 2.30 V/cell, the effective value of the alternating current must not exceed 5 A per 100 Ah nominal capacity.

2.6 Charging currents

Charging currents are not limited up to 2.4 V/cell. If charge voltages of 2.4 V/cell are exceeded, greater water decomposition will occur. The charging currents per 100 Ah nominal capacity shown in Table 1 should not be exceeded.

Charging procedure	Types OPzS, OPzS bloc, max.power, solar.power, OGi bloc HC, OGi bloc, OSP.HC, OSP.XC, USV bloc	GroE	Cell voltage
I-charact.	5.0 A	6.5 A	2.6-2.75 V
W-charact.	7.0 A 3.5 A	9.0 A 4.5 A	bei 2.4 V bei 2.65 V

Table 1

2.7 Temperature

The recommended operating temperature range for lead-acid batteries is 10°C to 30°C. The technical data apply to the nominal temperature of 20°C. The ideal operating temperature range is 20°C ± 5K.

Higher temperatures will reduce battery service life. Lower temperatures reduce the available capacity. The maximum temperature of 55°C must nor be exceeded.

2.8 Temperature-related charge voltage

Within the operating temperature range of 10°C to 30°C, temperature-related adjustment of the charge voltage is not necessary.

If the temperature range is below 10°C and/or above 30°C, the charge voltage should be adjusted. The temperature correction factor is -0.004 V/Cell per K.

If the temperature is constantly above 40°C, the factor is -0.003 V/Cell per K.

2.9 Electrolyte

The electrolyte is dilute sulphuric acid. The nominal density of the electrolyte is based on a temperature of 20°C and nominal electrolyte level in fully charged condition, maximum deviation ± 0.01 kg/l. Higher temperatures will reduce electrolyte density, while lower temperatures increase electrolyte density.
The associated correction factor is 0.0007 kg/l per K.

Example: Electrolyte density 1.23 kg/l at 35°C corresponds to a density of 1.24 kg/l at 20°C. An electrolyte density of 1.25 kg/l at 5°C corresponds to a density of 1.24 kg/l at 20°C.

3. Battery maintenance and inspection

Check the electrolyte level regularly. If it has fallen below the lower electrolyte level mark it should be topped up with purified water to DIN 43530 Part 4, max. conductivity 30 µS/cm.

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;
- electrolyte density of a few selected cells/ monobloc batteries;
- electrolyte temperature of a few selected cells/ monobloc batteries.

The following must be measured and recorded annually:

- voltage of all cells/monobloc batteries;
- electrolyte density of all cells/monobloc batteries;
- electrolyte temperature of a few selected cells/monobloc batteries.

Should the float charge voltage of any cell vary by more than + 0.1 V or -0.05 V from the average value, customer services must be called in.

Annual visual checks:

- on bolted connectors (check that unsecured bolt connectors are firmly seated),
- on battery installation or arrangement,
- on ventilation of the battery room.

4. Tests

Tests must be conducted in accordance with EN 60896-11. 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, frostfree 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 four times a year. At average ambient temperatures in excess of 20°C, monthly equalizing charges may be necessary.

Note: Battery charge acceptance might be restricted by the end of max. storage period. We recommend application of a different charging method to ensure gentle and full recharge. Refer to 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 storage period. Battery has to be operated under permanent float charge thereafter.

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 as 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 blocks, the nominal capacity ($C_{10} = C_N$) and the battery type can be obtained from the identification plate.

8.1 Example

Identification plate: 4 OPzS 200
4 = number of positive plates
OPzS = battery type
200 = nominal capacity C_{10}
(capacity for discharge with ten hours' current (I_{10}) over a discharge time of 10 h (t_{10})

Old 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.

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