Operating instructions

HOPPECKE
POWER FROM INNOVATION

Valve regulated 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

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.

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 DIN EN 50272 T2, DIN EN 50110 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 short-circuits.
Warning! Metal parts of the battery cells are always live. Never place foreign objects or tools on the battery.

Electrolyte is highly corrosive. In normal operation there is no possibility of contact with the electrolyte. Should the casing be destroyed, the combined electrolyte released is as corrosive as liquid electrolyte.

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: _____

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:

M8 with 20 Nm ± 1 Nm

M5/M6 with 8 Nm ± 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 EN 50272 Part 1 (draft) and DIN EN 50272 Part 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 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 EN 50272 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% 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. 2.35 V x number of cells (stand-by parallel operation with recharging stage). Automatic changeover to the charging voltage of 2.25 V ± 1% (2,27 V ± 1% for power.com H.C, power.com XC, dry.power and net.power 12 V 92 as well as 12 V 170) 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. 2.27 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% (2,27 V ± 1% for power.com H.C, power.com XC, dry.power and net.power 12 V 92 as well as 12 V 170).

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.

An equalising 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 end of equalising charge is reached when the electrolyte densities and cell voltages no longer rise within a period of 2 hours. The charging current should not exceed 20 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°C.

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 55ºC must nor be exceeded. Continuous operating temperatures in excess of 45ºC 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 -0.005 V/Cell per °C.

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

2.9 Electrolyte

The electrolyte is dilute sulphuric acid.

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 +0.2 V/cell or -0.1 V/cell and/or should the surface temperature of different cells deviate more than 5°C, customer services must be called in.

The following must be measured and recorded annually:

- voltage of all cells/monobloc batteries
- surface temperature of all cells/monobloc 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.

4. Tests

Tests must be conducted in accordance with DIN 60896 Part 21 / Part 22. In addition, special test in-structions, e.g. as set out in DIN VDE 0100-710 and DIN 0100-718 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.

HOPPECKE service number: + 49 (0) 800 246 77 32

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.
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.

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/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 OPzV 200

4 = number of positive plates

OPzV = 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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