OPERATING INSTRUCTIONS

for traction batteries with positive tubular plates type PzS and PzB

Nominal capacity C5:	see plate type
Nominal voltage:	2.0 V × No. of cells
Discharge current:	C5 / 5h
Nominal S.G. of electrolyte*:	1,29 kg/L
Rated temperature:	30 °C

BATTERIES ARE PRODUCED IN ACCORDANCE WITH EN 60254-1.

* Nominal capacity and electrolyte S.G. will be reached within the first 10 cycles.

1. COMMISSIONING

1.1 Filled and charged batteries
The battery should be inspected to ensure it is in perfect physical condition. The charger cables must be connected to ensure a good contact, taking care that the polarity is correct, otherwise battery, vehicle or charger could be damaged. The specified torque loading for the polscrews of the charger cables and connectors is: **20–25 Nm.**
The level of the electrolyte must be checked. If it is below the pole bridge, it must first be topped up to this height with purified water (DIN 43530 part 4). The battery is then charged as in item 2.2. After charging, the electrolyte should be topped up to the specified level with purified water.

1.2 Dry charged (DC) batteries
See separate instructions!

2. OPERATION
EN IEC 62485-3 is the standard which applies to the operation of traction batteries in industrial trucks.

2.1 Discharging
Be sure that all breather holes are not sealed or covered. Electrical connections must only be made or broken in the open circuit condition to avoid sparks and explosion risks. To achieve the optimum life for the battery, operating discharges of more than 80 % of the rated capacity should be avoided (deep discharge). Discharged batteries must be recharged immediately and must not be left discharged. This also applies to partially discharged batteries.

2.2 Charging
For charging only direct current must be used. All charging procedures in accordance with DIN 41773 and DIN 41774 are permitted. Connect the battery assigned to a charger suitable for the size of battery in order to avoid overloading of the electric cables and contacts, unacceptable gassing and the escape of electrolyte from the cells. In the gassing stage the current limits given in EN IEC 62485-3 must not be exceeded. If the charger was not purchased together with the battery, it is best to have its suitability checked by the charger manufacturers service department. When charging, proper provision for venting of the charging gases, accordingly to EN IEC 62485-3 must be made. Battery container lids and the covers of battery compartments must be opened or removed. The vent plugs should stay on the cells and remain closed. With the charger switched off connect up the battery, ensuring that the polarity is correct (positive to positive, negative to negative). Now switch on the charger. When charging, the temperature of the electrolyte rises by about 10 °C, so charging should only begin if the electrolyte temperature is below 45 °C. The electrolyte temperature of batteries should be at least + 10 °C before charging otherwise a full charge will not be achieved. A charge is finished when the specific gravity of the electrolyte and the battery voltage have remained constant for two hours.

2.3 Equalising charge
Equalising charges are used to safeguard the life of the battery and to maintain its capacity. They are necessary after deep discharges, repeated incomplete recharges and once a week in case of charges to an IU characteristic curve. Equalising charges are carried out following normal charging. The charging current must not exceed 5 A/100 Ah of rated capacity (end of charge - see point 2.2). The temperature may not exceed 55 °C!

2.4 Temperature
An electrolyte temperature of 30 °C is specified as the rated temperature. Higher temperatures shorten the life of the battery, lower temperatures reduce the capacity available. 55 °C is the upper temperature limit and is not acceptable as an operating temperature.

2.5 Electrolyte
The rated specific gravity (S. G.) of the electrolyte is related to a temperature of 30 °C and the nominal electrolyte level in the cell in fully charged condition. Higher temperatures reduce the specified gravity of the electrolyte, lower temperatures increase it. The temperature correction factor is - 0.0007 kg/L per °C, e.g. an electrolyte specific gravity of 1.28 kg/L at 45 °C corresponds to an S.G. of 1.29 kg/L at 30 °C. The electrolyte must conform to the purity regulations in DIN 43530 part 2.

3. MAINTENANCE
By each charging the following data should be recorded: time of connecting battery to the charger, time of disconnection, time of start using battery, electrolyte temperature at the end of charging and whether the battery has been topped up with water. Service, maintenance and other special cases should also be recorded.

3.1 Daily
After every discharge, charge the battery. After the comletion of charging the electrolyte level should be checked and if necessary topped up to the specified level with purified water. The electrolyte level must not fall below pole bridge.

3.1.1. Aquamatic water refilling system
Optional water refilling system built on batteries is used to automatically maintain the nominal electrolyte levels. The battery should be topped up after completion of a full charge with water of the conductance below 30 µS/cm.
The battery should be connected to the filling system at least once a week. In multiple shift and warm ambient temperature operations it may be necessary to have shorter-daily topping up intervals. In winter, batteries fitted with Aquamatic system, should only be charged or refilled in a room temperature above 0 °C. For proper water pressure and optimal system operation, the water tank must be located from 2 to 6 m above the upper edge of the battery (0,2 to 0,6 bar). The top up process takes a few minutes and can vary according to the battery range. The valve in each cell allows the flow of water into cell and the float closes the valve when the correct water level has been reached. A flow indicator which is built into the water supply pipe to the battery, monitors the filling process. During filling the water flow causes the flow indicator to turn. When all the plugs are closed the indicator shows that the filling process is complete, the water supply to the battery should be turned off. Regularly clean integrated water filter! The system installed by the producer should not be modified in any way.

3.2 Weekly
Visual inspection after recharging for signs of dirt and mechanical damage (point 4). If the battery is charged regularly with a IU characteristic curve, an equalising charge must be carried out (see point 2.3).

3.3 Monthly
At the end of the charge the voltages of all cells or bloc batteries should be measured with the charger switched on and recorded. After the charging the specific gravity and the temperature of the electrolyte in all cells should be measured and recorded. If significant changes from earlier measurements or differences between the cells or bloc batteries are found, further testing and maintenance should be requested by the service department.

3.4 Annually
Inter cell connectors torque load must be checked at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist. The insulation resistance of the battery thus determined must not be below a value of 50 Ω per Volt of nominal voltage in compliance with EN IEC 62485-3. For batteries up to 20 V nominal voltage, the minimum value is 1000 Ω.

4. CARE OF THE BATTERY
The battery should always be kept clean and dry to prevent tracking currents and to avoid self discharging and explosion risks. Cleaning must be done in accordance with the ZVEI code of practice "The Cleaning of Vehicle Traction batteries". Any liquid in the battery tray must be extracted and disposed of in the prescribed manner. Damage to the insulation of the tray should be repaired after cleaning to prevent tray corrosion and to ensure that the insulation value complies EN IEC 62485-3.

5. STORAGE
If batteries are taken out of service for a longer period, they should be stored in the fully charged condition in a dry, frost-free room. To ensure the battery is always ready for use, a choice of charging methods can be made:

5.1 A monthly equalising charge as in point 2.3.

5.2 Float charging at a charging voltage of 2.27 V × the number of cells. The storage time should be taken into account when considering the life of the battery.

6. ELECTROLYTE CIRCULATION SYSTEM
This optional system is recommended for heavy duty use, short charge times, boost or opportunity charging and in high ambient temperatures. The system reduces water consumption, working temperatures and a charge factor, prevents the stratification of the electrolyte and reduces charging time. The principle of the electrolyte circulation system is based on pumping of air into each battery cell which creates a circulating air stream inside the cell box. The charge plug with integrated air supply automatically supplies air to the battery pipe system after connecting to the charger designed for electrolyte circulation. For optimized operation the pump should supply pressure around 0,2 bar and air flow 60 litters/cell, hour. Before initial operation of battery with electrolyte circulation system make a visual examination of the electrolyte surfaces of all cells for movement and rising air bubbles during running the air pump. At least once a year the pump air filter must be changed. In working areas with high level of air pollution, the filter should be checked and replaced more frequently in order to assure proper air circulation.

7. MALFUNCTIONS
If malfunctions are found on the battery or the charger, suppliers service department should be called in without delay. The measurements taken in point 3.3 will facilitate fault finding and their elimination.

8. TRANSPORT
Batteries, wet, filed with acid, require transport under demands of European Agreement concerning the international carriage of dangerous goods (ADR and RID).
ADR special provision № 598:
New batteries are not subject to the requirements of ADR when:
+ they are secured in such a way that they can not slip, fall or be damaged;
+ they are provided with carrying devices, unless they are suitably stacked, e.g. on pallets;
+ there are no dangerous traces of alkalis or acids on the outside;
+ they are protected against short circuits.

SAFETY REQUIREMENTS
ACCORDING TO EN IEC 62485-3.


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 IEC 62485-3 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 short circuits. Do not place tools or other metal 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.

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