

Operation and maintenance instructions for 12V ZeMaRail™ DS batteries

ENGLISH

Hawker® Rail Diesel Starter batteries, VRLA / AGM / TPPL valve regulated lead acid battery with absorbent glass mat and Thin Plate Pure Lead technology
ZeMaRailDS battery types: DS12ZeMa70, DS12ZeMa95, DS12ZeMa126, DS12ZeMa214.

Rating Data

- | | |
|------------------------|------|
| 1. Nominal capacity : | C20 |
| 2. Nominal voltage : | 12V |
| 3. Rated temperature : | 30°C |

Hawker ZeMaRailDS batteries series are valve-regulated lead-acid batteries. Unlike conventional batteries with liquid electrolyte these batteries have immobilised electrolyte. Instead of a vent plug, a valve is used to regulate the internal gas pressure, preventing the ingress of oxygen from the air and allowing the escape of excess charging gasses should an overcharged condition occur. When operating valve regulated lead-acid batteries the same safety requirements as for vented batteries apply, to protect against hazards from electric current, from explosion of electrolytic gas and - with some limitations - from the corrosive electrolyte.

Battery valves should never be removed. These batteries do not require topping up with distilled or demineralised water.

Flexible connectors must be used for all Monobloc connections.

EnerSys® approved fastener must be used.

SAFETY PRECAUTIONS



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



- Use protective glasses and wear safety clothing when working on batteries.
- Adhere to the current accident prevention rules in the country where the battery is used or EN 50272-3, EN 50110-1.



- No smoking!
- Do not expose batteries to naked flames, glowing embers or sparks, as it may cause the battery to explode
- Avoid sparks from cables or electrical apparatus as well as electrostatic discharges.



- Acid splashes into the eyes or on the skin must be washed immediately with an abundance of clean water. After abundant flushing consult a doctor immediately!
- Clothing contaminated by acid should be washed in water.



- Risk of explosion and fire
- Avoid short circuits: do not use non-insulated tools, do not place or drop metal objects on top of the battery. Remove rings, wristwatches and articles of clothing with metal parts that might come into contact with the battery terminals.



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



- Batteries are heavy. Ensure secure installation! Use only suitable handling equipment.
- Lifting hooks must not damage the cells connectors or cables.
- Do not place batteries in direct sunlight without protection. Discharged batteries can freeze. For that reason, always store in a frost-free zone.



- Dangerous electrical voltage!
- Avoid short circuits: Hawker ZeMa batteries are capable of high short circuit currents.
- Caution - metal parts of the battery are always live: do not place tools or other objects on the battery!



- Pay attention to the hazards that can be caused by batteries

Ignoring the operating instructions, and repair with non-original parts will render the warranty void. All failures, malfunctions and default codes of the battery, the charger or any other accessories, must be notified to Hawker Service immediately.

1. Commissioning

Hawker ZeMaRailDS batteries are supplied in a charged condition. The battery should be inspected to ensure it is in perfect physical condition.

Check:

1. The battery cleanliness. Before installing, the battery compartment has to be cleaned.
2. The battery end cables have a good contact to terminals and the polarity is correct. Otherwise the battery, vehicle or charger could be damaged.

Use special coding systems for maintenance free batteries for the charging plug- and- socket devices to prevent accidental connection to the wrong type of charger. Never directly connect an electrical appliance (for example: warning beacon) to a part of the battery. This could lead to an imbalance of the cells during the recharge, i.e. a loss of capacity, the risk of

insufficient discharge time, damage to the cells and voids the battery warranty.

Charge the battery (see 2.2) before commissioning.

2. Operation

EN 50272-3 "Traction batteries for industrial trucks" is the standard which applies. The nominal operating temperature is 30°C. The optimum lifetime of the battery depends on the operating conditions (temperature and depth of discharge). The optimal temperature range of use for the battery is between +10°C and +35°C. Higher temperatures shorten the life of the battery (according to IEC1431 technical report), lower temperatures reduce the available capacity. The upper temperature limit is 50°C and batteries should not be operated above this temperature. The capacity of the battery changes with temperature and falls considerably below 0°C.

The optimum lifetime of the battery depends on the operating conditions and lifetime will be optimised with 60% DOD or lower.

The maximum permissible discharge is 80% of C_s nominal capacity. The battery obtains its full capacity after about 3 charging and discharging cycles.

2.1 Discharging

The valves on the top of the battery must not be sealed or covered. Electrical connections (e.g. plugs) must only be made or broken in the open circuit condition. Discharges over 80% of the rated capacity are categorized as deep discharges and are not acceptable as they reduce considerably the life expectancy of the battery. Discharged batteries MUST be recharged immediately and MUST not be left in a discharged condition.

Note: The following statement only applies to partially discharged batteries.

Discharged batteries can freeze. Limit the discharge to a maximum of 80% DOD. The cycle life of the battery will depend on the DOD, the higher the DOD, the shorter the cycle life. The presence of a discharge limiter on the vehicle is imperative.

The following energy cut-off settings must be used:

- 60% DOD 1.96 V
- 80% DOD 1.92 V

when discharged with currents in the range of I1 to I5.

The battery is fitted with a Low Voltage Alarm (LVA) and the customer must observe the visual and audible warning signals that the battery has reached its maximum discharge level and must be charged immediately.

At lower currents please seek advice from Hawker[®] Service.

2.2 Charging

For Hawker ZeMaRail™DS batteries recommended chargers are EnerSys[®] Life IQ™ or LifeSpeed IQ™ chargers. The specific charging profile developed for recharging Hawker ZeMaRailDS batteries allows a rapid recharge of less than 4 hours from 60% DOD and opportunity charging as often as needed without damaging the batteries.

Hawker ZeMaRailDS batteries have an extremely low gas emission under normal circumstances. For safety purposes when calculating gas emission levels, use 1A/ 100Ah C_s. Nevertheless, provision must be made for venting of the charging gases. Doors, battery container lids and the covers of battery compartments must be opened or removed. With the charger switched off, connect the battery to the charger, ensuring that the polarity is correct (positive to positive, negative to negative). Now switch the charger on. Hawker ZeMaRailDS batteries must receive their full charge at least once a week.

2.3 Equalising Charge

Life IQ and Lifespeed IQ chargers will automatically provide an equalising charge, following normal full charge.

3. Maintenance

The electrolyte is immobilised. The density of the electrolyte can not be measured. Never remove the safety valves from the cell. In case of accidental damage to the valve, contact Hawker Service for replacement.

3.1 Daily

- Recharge the battery after every discharge.
- Check the condition of the plugs, cables and that all insulation covers are in place and in good condition.

3.2 Weekly

- Visual inspection for signs of dirt and mechanical damage to all component parts of the battery, pay particular attention to the battery charging plugs and cables.

3.3 Quarterly

At the end of the charge, carry out end of charge voltage readings, measure and record:

- The voltage of the complete battery
- The voltages of each cell

If significant changes from earlier measurements or differences between the cells are found, please contact our Hawker Service.

If the discharge time of the battery is not sufficient, check:

- That the required work is compatible with the battery capacity
- The settings of the charger
- The settings of the discharge limiter on the vehicle.

3.4 Annually

Remove internal dust from the battery. Electrical connections: test all connections (sockets, cables, and contacts). In accordance with EN 1175-1 at least once per year, the insulation resistance of the truck and the battery must be checked by an electrical specialist. The tests on the insulation resistance of the battery must be conducted in accordance with EN 1987 part1. 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 50272-3. 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. 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 ensure that the insulation value complies with EN 50272-3 and to prevent tray corrosion. Call Hawker Service if it is necessary to remove cells.

5. Storage

Batteries are despatched from the manufacturer in a fully charged condition. The state of charge will decrease with storage. All batteries lose their stored energy when allowed to stand open-circuit, due to parasitic chemical reactions. The rate of self-discharge is non-linear and decreases with decreasing state of charge. It is also strongly influenced by temperature. High temperatures greatly reduce storage life. It is recommended that the fully charged battery should be stored in a cool dry place, ideally below 20°C. The battery has a maximum inspection-free storage life of 2 years, if stored at or below 20°C, after which a refresh charge should be administered. However, it is advisable to conduct an inspection and open circuit voltage check after 12 months and recharge if the OCV is less than 2.10 Volts per cell. The battery may be stored for up to 5 years without degradation of performance provided that an open circuit voltage (OCV) check is conducted every 12 months and refreshed charged if OCV is less than 2.10Vpc. When stored at temperatures in excess of 30°C (86°F), the battery should be OCV checked every 6 months.

If the truck/vehicle is going to be unused for periods in excess of 48 hours, the ignition key must be removed and any auxiliary equipment (such as lights, beacons, on-board computer etc) must be switched off.

If the truck or battery is going to be decommissioned for a period of 1 month or longer, all electronic devices (such as Wi-IQ[®], LVA) must be professionally disconnected by Hawker Service - please contact us for assistance.

6. Malfunctions

If malfunctions are found on the battery or the charger, Hawker Service should be called in without delay. The measurements taken in point 3.3 will facilitate fault finding and their elimination. A service contract with us will make it easier to detect and correct faults in good time.

7. Disposal

Hawker ZeMaRailDS batteries are recyclable. Scrap batteries must be packaged and transported in accordance with prevailing transportation rules and regulations. Scrap batteries must be disposed of in compliance with local and national laws by a licensed or certified lead acid battery recycler.