

Operation and maintenance instructions PerfectRail™ DS batteries











ENGLISH

Rail engine starting flooded, flat plate, Pb-1.7%Sb/Pb-1.7%Sb 12V monoblocs

Rating Data

1. Nominal capacity C5	: See type
2. Nominal voltage	: See type
3. Discharge current	: See type
4. Nominal SG. of electrolyte	: 1.29 kg/l
5. Rated temperature	: 25°C

SAFETY PRECAUTIONS

	<ul style="list-style-type: none"> Pay attention to the operating instructions and keep them close to the battery. Works on batteries must only be carried out by skilled personnel! 		<ul style="list-style-type: none"> 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.
	<ul style="list-style-type: none"> 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 DIN EN 50272-3, DIN EN 50110-1. 		<ul style="list-style-type: none"> Electrolyte is highly corrosive.
	<ul style="list-style-type: none"> Keep children away from batteries!! 		<ul style="list-style-type: none"> Do not tip the battery over. Batteries and monoblocs are heavy. Ensure secure installation! Only use suitable handling equipment. Lifting hooks must not damage the blocs, 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.
	<ul style="list-style-type: none"> 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. 		<ul style="list-style-type: none"> Dangerous electrical voltage!
	<ul style="list-style-type: none"> 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. 		<ul style="list-style-type: none"> Pay attention to the hazards that can be caused by batteries

Ignoring the operating instructions, repair with non-original parts will render the warranty void.

All failures, malfunctions or defaults of the battery, the charger or any other accessories, must be notified to our After Sales Service.

1. Commissioning

The battery should be inspected to ensure it is in perfect physical condition.

Check:

- the battery cleanliness. Before installing the battery compartment has to be cleaned.
- the battery end cables have a good contact to terminals and the polarity is correct. Otherwise battery, vehicle or charger could be destroyed.
- the electrolyte level, the electrolyte level must always be above the top of the separators.

Top up with demineralized water to the nominal level. Charge the battery (see 2.2.2) before commissioning. Only blocs with the same state of discharge (the same voltage, tolerance as shown in the following table) should be connected together.

Bloc voltage (V)	Max. tolerance from average value - ΔU_{bloc}
12	± 0.049

After connecting, the terminals must be covered with grease as protection against corrosion.

The specified torque loading for the bolts/screws of the end cables and connectors are:

DIN conic post
$8 \pm 1 \text{ Nm}$

2. Operation

The nominal operating battery temperature is 25°C. Higher temperatures shorten the life of the battery, lower temperatures reduce the available capacity. 55°C is the upper temperature limit and batteries should not be used above this operating temperature. The capacity of the battery changes with temperature and falls considerably under 0 °C. The optimum lifetime of the battery depends on the operating conditions (moderate temperature and discharges equal to or lower than 80% of the nominal capacity C5). The battery obtains its full capacity after about 10 charging and discharging cycles.

2.1. Discharge

Vent plugs on the battery must not be sealed or covered. Electrical connections (e.g. plugs) must only be made or broken in the open circuit condition. To achieve the optimum life for the battery, operating discharges of more than 80%, of the rated capacity should be avoided (deep discharge).

A minimum S.G. of the electrolyte of 1.13 kg/l is to be checked at the end of the discharge. Discharged batteries must be recharged immediately and must not be left in a discharged condition:

Discharge	Recharge
>40%	Every day
<40%	Every second day

This also applies to partially discharged batteries. Discharged batteries can freeze.

2.2. Charge

PerfectRail™ DS batteries can be recharged with 50 Hz or HF charger. If you wish to use an existing charger with Wa, WoWa, IUla, WUla...profile, you should check that the profile is approved by our Technical Department. Only direct current must be used for charging. Only connect the battery to the correctly assigned charger, suitable for the battery size in order to avoid overloading of the electric cables and contacts, electrolyte overflow and unacceptable gassing of the cells. When gassing the current limits must not be exceeded according to DIN EN 50272-3. Before starting the charge, make sure of:

- the presence of the plugs.
- In the case of water refilling system, check the good condition of the filling up circuit and specific plugs, the water tube connection for the filling device (fast connection between the battery and the system with water supply).

When charging, proper provision must be made for venting of the charging gases. Battery container lids and the covers of battery compartments must be opened or removed. Keep vent plugs closed. With the charger switched off, connect the battery ensuring that the polarity is correct (positive to positive, negative to negative). Now switch on the charger. In the case of automatic filling up, with manual command, press the push –button of the electro valve box to release the supply of demineralized water, at the end of charge. When charging the temperature of the battery rises by about 10°C, so charging should only begin if the electrolyte temperature is below 45°C. The electrolyte temperature of the battery should be at least +10 °C before charging, otherwise a full charge will not be achieved without specific settings of the charger. The charge is considered as achieved when the electrolyte S.G. and the battery voltage remain constant for 2 hours. During the recharge, the cells emit hydrogen and oxygen gas. It is necessary to ensure ventilation in the room, especially during the recharge. All installations must comply with the current regulations in force in the country of operation.

2.2.1 Normal charge:

It is applied further to a «normal» discharge of the battery (up to 80% of C5). It is not interrupted until the end of charge indication by the charger display. It is not necessary to recharge the battery immediately if after a use cycle, the residual capacity is still more or equal to 60% of its capacity. In that case it is necessary to recharge the day after at the latest.

2.2.2. Equalizing charge:

Equalizing charges are used for insuring the service life and to maintain the capacity. They are necessary after deep discharges and after repeated uncompleted charges. They allow homogenization of the specific gravity of the electrolyte:

- to compensate the self-discharge due to the storage period
- to compensate the eventual lack of charge with normal charges.
- to quickly homogenize the electrolyte, following the addition of distilled or demineralized water.
- to compensate stratification, following partial charges without mixing of the electrolyte (not recommended).

To be carried out after a normal charge when a variation (differences more than 10 grams per litre) of specific gravity is recorded. It is carried out using a constant current with a low value near C5 /30 (C5 /20 max) and after a normal charge of the battery (end of charge, see 2.2). The recommended duration is 8 hours. The equalizing charge may be interrupted if the specific gravities are homogenized. When the nominal electrolyte specific gravity is not obtained after an equalizing charge, and when this low specific gravity is not the consequence of electrolyte overflowing, a recharge in completion with the equalizing charge can be carried out. It must be done with constant current, near C5 /60 A, and after a complete charge for 72 hours. Watch the temperature and a sufficient ventilation!

2.2.3. Desulphation charge:

Should be carried out after a very deep discharge of the battery (> 80% C5) when the charger does not start the recharge due to an over discharge of the battery. It must be carried out with constant current, near C5 /60, for 2 hours minimum. It is followed by a normal charge and equalizing charge (desulphation if necessary). The best result is obtained with the lowest value of current. In any case, stop the charge if the electrolyte temperature reaches 45°C

2.3. Electrolyte

The electrolyte nominal S.G. is 1.29 kg/l at 25°C when in fully charged condition. According to temperature, S.G. correction, in respect to 25°C, will be applied:

T °C	Correction per °C
If T °C > 25°C	- 0,0007
If T °C < 25°C	+ 0,0007

Example: SG reading 1.282 at 36°C:
 $1.282 + (0,0007 \times 11) = 1.289$ at 25°C

The purity of the electrolyte must correspond to DIN 43530-2.

2.4. Battery Check

After a normal charge, measure:

- the total voltage
- the voltage per cell
- the electrolyte specific gravity on several cells or on the whole battery.

NB: measure at the constant intensity of I=0.033 C5 or if the charger can do it, at “equalizing charge”. The voltages for a new battery will be greater than or equal to 2.65 Volts per cell under I=0,033 C5.

3. Maintenance

3.1. Daily maintenance:

- keep the battery, clean and dry in order to avoid self-discharging and current leakage.
- check: the condition of the plugs, cables and that all insulation covers are in place and in good condition.

3.2. Weekly maintenance:

If necessary, adjust the electrolyte level of each cell, only use demineralized or distilled water. The level must never be lower than the minimum level, in other words, always above the plates. It is carried out:

- at the end of charge and without over exceeding the maximum level if the battery has standard filling plugs.

VERY IMPORTANT

In difficult conditions, high room temperature for example, the electrolyte level must be checked as often as necessary.

If there are traces of electrolyte-overflowing, in general, lead sulphate trails, wash the battery with clean water at low pressure, with the cells vent plugs in place and closed.

3.3. Monthly or quarterly maintenance:

Carry out an end-of-charge control: measure and record the voltages of all blocs with the charger switched on. Measure and record the electrolyte S.G. of all blocs. If significant variations to the earlier measurements or big variations between the blocs or cells are noticed, please contact our Service. If the battery autonomy is not sufficient, check that the work required is compatible with the battery capacity, the battery condition (end of charge SG), and the settings of the charger.

3.4. Annual maintenance:

Battery: for bolt on connectors, check the torque settings of the terminal bolts/screws, the terminals must be covered with grease as protection against external corrosion. Charger: internal dust removal, check all connections (plugs, cables and contacts) and charging parameters.

At least once a year, the insulation resistance of the locos and of the battery must be checked by an electrical specialist.

The test on the insulation resistance of the battery must be conducted in accordance with DIN EN 1987-1. The average insulation resistance of the battery must not be lower than 50 Ω per Volt nominal voltage (DIN EN 50272-3) For batteries up to 20 V nominal voltage the minimum value is 1000 Ω.

4. Storage and Transportation

Batteries must always be stored and transported securely in the vertical position in order to avoid any electrolyte leakage. Store the battery in a fully charged condition in a dry, clean and frost free area. Always disconnect the battery from the electric vehicle before storage. For easy recharge of the batteries, it is advised not to store without recharge for more than 3 months at 20°C and 2 months at 30°C.

The storage time is to be considered within the battery life expectancy.

To ensure the battery is always ready for use a choice of charging methods can be made:

- monthly equalizing charge according to 2.2.2
- float charge with 2.27 V x number of cells.

Back to the manufacturer!
Batteries with this sign must be recycled.
Batteries which are not returned for the recycling process must be disposed of as hazardous waste!

