User manual for STB, SCB, and HPB maintenance-free batteries.

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EN

- **General information:**

The: STB, SCB, and HPB batteries are maintenance-free Valve Regulated Lead Acid Batteries with self-regulating one-sided safety valves and internal gas recombination. The batteries are made in AGM (Absorbent Glass Mat) technology; the electrolyte is held in the glass mat. The technology used allows installing batteries in places with natural (gravity) ventilation and minimizes maintenance. To ensure long and safe use of the battery, follow the instructions in the manual.

- **Health and safety recommendations:**

  - All work on the battery should only be carried out by a qualified person with appropriate qualifications.
  - Before starting work, remove rings, necklaces, watches and other metal objects.
  - Use appropriate protective measures such as glasses, gloves, protective clothing, and extinguishing agents.
  - Do not touch the metal parts of the batteries directly; all work on the battery should only be carried out using insulated tools.
  - The battery should not be placed in sealed enclosures that do not provide adequate ventilation, because in the case of improper operating parameters or unfavorable conditions, flammable gases may be released from the battery, which may lead to explosion.
  - The possibility of shorting the positive (+) and negative (-) terminals of an individual battery or a battery pack, even if discharged, must be strictly prevented.
  - Extreme caution should be taken when connecting batteries in series, because the total voltage can be dangerously high.
  - Do not disassemble the enclosure and safety valves.
  - If the battery housing is damaged (cracks or damaged cover safety valves), the battery needs to be replaced; prevent electrolyte leakage and dispose the battery.

- **Storage:**

The batteries should be stored in a dry and cool place with an efficient ventilation system, away from heat, fire, sunlight, and metal elements. The recommended storage position is to set the battery terminals facing up. The storage temperature should be between -10°C ÷ 40°C. Due to the self-discharge phenomenon, check the battery charge level once every three months and recharge when needed. If the battery is stored at a temperature above 25°C, the charge level should be checked more often. This is due to the fact that the self-discharge increases with increase in temperature. The battery must be recharged if the voltage at the terminals is lower than 12.54V (2.09V for a single cell), which is equivalent to about 80% of the nominal capacity.

- **Installing the batteries:**

Before installing the battery, it must be inspected for mechanical damage; check the polarity, condition of connections, and terminals. Do not mix batteries of different types or which have different usage history, as this may damage the batteries or shorter their life. The batteries cannot operate with terminals facing down, because the adverse conditions can activate the safety valves and the electrolyte may leak out of the housing. The recommended position is to set the battery terminals facing up. In order to ensure good ventilation, a distance of approx. 10mm ÷ 20mm is to be kept.

- **Operation:**

The batteries operate at a temperature of 0°C ÷ 40°C; maintain the recommended temperature range of 20-25°C to ensure the longest lifespan. Every 8°C increase in operating temperature will cause the battery life reduce by 50% Sealed VRLA batteries must not be too deeply discharged (the minimum discharging voltage can be determined on the basis of discharge characteristics in the data sheet) and cannot be discharged because each time a lead acid battery is discharged, it sulfates, which results in an irreversible capacity loss and reduced service life. The battery should be

charged immediately after each discharge. The battery should be charged using the constant voltage method (ripple voltage should not exceed 1% of the nominal voltage) with the limitation of the charging current, using devices (power supplies, chargers etc.) which can be used with this type of batteries. The recommended charging current should be in the range of 0.1*C ÷ 0.2*C (C-nominal capacity of the battery), the maximum charging current is 0.3 *C. To ensure the longest lifespan, it is recommended to use power supplies with temperature compensation of the charging voltage.

- **Buffer operation:**

The charging voltage for a single battery during buffer operation should be in the range 13.60V ÷ 13.80V at 25 °C. The voltage temperature compensation for buffer operation should be -18mV /°C.

- **Cyclic operation:**

The charging voltage for a single battery during cyclic operation should be in the range 14.40V ÷ 14.90V at 25 °C. The voltage temperature compensation for cyclic operation should be -30mV/°C.

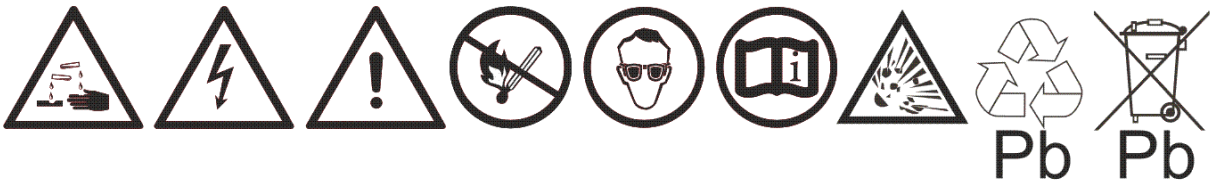
- **Maintenance:**

Batteries made in VRLA technology are maintenance-free batteries, it means that they do not require monitoring the electrolyte and the periodic addition of distilled water. Maintenance is limited to ensuring the battery operation in optimum conditions depending on the operating mode and adequate cleanliness of the battery housing, which, if necessary, should be cleaned with a cotton cloth humidified with water without detergents. Coat battery terminals with e.g. Vaseline to prevent corrosion if needed. The battery capacity should be checked at least once per year; to do that, leave a fully charged battery for 24 hours and then discharge with I_{20} = the nominal capacity/20 up to the discharge voltage of 10.5V. If the measured capacity is less than 80% of the nominal capacity, the battery should be replaced.

- **Environmental protection and recycling:**

- Due to the content of harmful substances, used batteries are hazardous waste (EWC 160601). According to the Directive 2006/66/EU and Polish regulations, waste electrical and electronic equipment should be disposed of separately from normal household waste (return old batteries to the manufacturer or recycling facility).

- **Cautions:**



(a) (b) (c) (d) (e) (f) (g) (h) (i)

(a) Contains sulfuric acid, (b) Danger! High voltage, (c) Be careful, (d) No smoking, sparks, (e) Wear your safety glasses, (f) Follow instructions, (g) explosion risk, (h) recyclable, (i) separate collection.

Pulsar
Siedlec 150, 32-744 Łapczyca, Poland
Phone (+48) 14-610-19-40, Fax. (+48) 14-610-19-50
Email: biuro@pulsar.pl, sales@pulsar.pl
http:// www.pulsar.pl, www.zasilacze.pl