

Varta Standard Lead-Acid Batteries

Installation, Charging, and Maintenance Guide

Battery Storage

Storage Precautions

1.1 Keep away from heat sources, store in a ventilated, dry, and clean warehouse.

1.2 To minimize battery self-discharge, the storage environment temperature should not exceed 40°C, with the optimal range being 5 to 25°C.

1.3 The number of stacked layers should not exceed 5, and pallets should not be stacked.

1.4 The warehouse should be equipped with at least 1-2 bottles of dry powder (ABC) fire extinguishers for emergency use.

1.5 The batteries should be stored in a fully charged state. To compensate for self-discharge during storage, the batteries should be regularly recharged.

1.6 The batteries should only be placed flat to ensure that the positive and negative terminals do not short circuit.

1.7 The storage area should avoid metal surfaces or other potential metal contact surfaces to prevent short circuits if the batteries accidentally tip over.

Storage Period

1.1 The storage period of new batteries primarily depends on the storage temperature. The higher the temperature of the battery storage environment, the faster the self-discharge rate. Ideally, at room temperature of 5-25°C, fully charged batteries can be stored for up to 3 months. For every 10°C increase in temperature, the storage period is halved. Therefore, if stored at 35°C, batteries should be recharged approximately every 1.5 months.

1.2 After being stored, proper labeling should be done, following the first-in-first-out principle to avoid disorganized shipments and prolonged storage of batteries.

Battery Installation

2.1 Before installation, please wear safety goggles

2.2 The battery should not be tilted more than 45 degrees, and it is prohibited to invert or place the battery sideways.

2.3 Before installation, check the open-circuit voltage of the battery, which should not be lower than 12.60V. If the battery is discharged, it should be recharged immediately.

2.4 The sequence for connecting the battery cables is as follows: First, connect the positive terminal cable of the battery, then connect the negative terminal cable of the battery.

2.5 The sequence for disconnecting the battery cables is as follows: First, disconnect the negative terminal cable of the battery, then disconnect the positive terminal cable of the battery.

2.6 The method of securing the battery during installation is often overlooked, and excessive force applied to the top can lead to deformation of the battery. The recommended torque range for installing the battery at the top is 2.3-4.5N.m. The recommended method for securing the battery is as follows:

- 1) Diagonal bracing fixation: Using angle iron bars for diagonal bracing fixation can prevent excessive pressure on the top of the battery.



- 2) Strap fixation method: The strap fixation method is more flexible and convenient, suitable for all battery models.



3) Base fixation method: Refer to the base fixation method used in automobiles



2.7 Non-recommended fixation methods

The battery installation method shown in the figure below places the top of the battery under vertical downward force. If this force exceeds the battery's tolerance, deformation may occur. Additionally, if the fixing bracket becomes loose, it may lead to a short circuit between the positive and negative terminals of the battery.



Battery Recharging

3.1 Battery Charger Selection

- a) It should have constant voltage charging and current limiting functions.
- b) It should have reverse polarity charging protection to prevent damage to the battery from incorrect connections.

3.2 How to Recharge the Battery Correctly

Using constant voltage and current limiting charging method:

- a) Charging Single or Multiple Batteries in Parallel: Set the voltage to 15.0V, and the current setting should be $(1/10 \text{ of the capacity value})$ multiplied by the number of batteries.
- b) Charging Multiple Batteries in Series: Set the total voltage to 15V multiplied by the number of batteries, and the current setting should be $1/10$ of the capacity value.

Criterion for Full Charge: When the current drops below 1-2A and remains unchanged for 2 hours consecutively.

3.3 Recharging Deeply Discharged Batteries

- a) Using constant voltage and low current limiting charging: Set the voltage to 14.5V, and the current setting should be $0.1 * (1/20 \text{ of the capacity value})$.
- b) Precautions:
 - Deeply discharged batteries should be charged individually.
 - For batteries with voltage below 11.0 volts, there may be difficulty in

initially recharging the battery. This is because severely discharged batteries have sulfuric acid density close to pure water, resulting in high internal resistance. Using the aforementioned charging current or switching to parallel charging with another battery, as the charging progresses, the sulfuric acid density inside the battery increases, and the charging current of the battery can gradually return to normal.

- Using a high current to recharge deeply discharged batteries can lead to the detachment of active materials from the battery.

3.4 Considerations for Recharging:

- Wear gloves and safety goggles when charging
- Batteries from different manufacturers, different models, and different batches should not be mixed together for charging.
- The charging environment should be dry, cool, and well-ventilated, with temperatures not exceeding 25°C.
- The terminal posts should be clean, polarity connections should be correct, and the contacts should be reliable.
- After charging is complete, the charging switch should be turned off first before disconnecting the charging connection from the battery.
- If charging is unattended at night, the charging machine must be turned off and the connection cable disconnected. Charging can resume during the day.

- Test the battery voltage 24 hours after charging is complete to avoid false voltage readings

Battery Maintenance and Care

4.1 Maintenance of Stored Batteries

- Check the open-circuit voltage and eye status of stored batteries every 3 months.
 - a) For batteries with voltage $\geq 12.45V$ and green eye status, or if the eye is green, it can be preliminarily judged that the capacity is sufficient.
 - b) Batteries with voltage $< 12.45V$, or if the eye is black, are discharged batteries and must be recharged.
- Fully recharge the batteries every 6 months to avoid long-term discharge of the batteries.

4.2 Maintenance of Installed Batteries

- Equipped with a float charger, keep charging the battery continuously when the machine is stopped
- For units without a float charger, it is necessary to disconnect the battery switch to avoid long-term discharge of the battery.
- Check the battery voltage at least once a month, and recharge the battery if the voltage is low.
- It is recommended to replace the battery every 2 years.