

Tips and Technology

For Bosch partners

Current information for the successful workshop No. 01/2016

Electrics / Electronics



BOSCH

Invented for life

Basics Lead-Acid Battery



Functions of batteries

12 V batteries consist of six identical battery cells, each with ~ 2 V, which are connected in a series ($6 \times 2 \text{ V} = 12 \text{ V}$). Each battery cell contains a block of plates consisting of negative and positive plates.



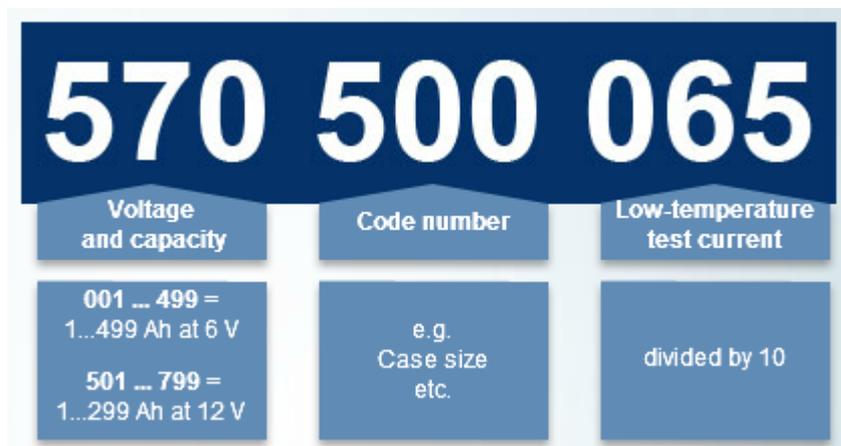
The quality of a battery is determined by

- its current capacity
- its service life
- its water consumption due to gassing and evaporation
- its protection against acid leaks and explosion

You will find the battery characteristics on its label. These are defined according to European standard EN 50342.



The European Type Number (ETN) indicates the size and the layout of the battery.



The low-temperature test current is the current intensity, which the battery can provide at -18°C for 10 seconds, without its terminal voltage dropping below 7.5 V. The low-temperature test current depends on the total surface area of all plates. The value provides information about the high-current capacity of the battery when it is cold. The startability of the engine in winter depends on this.

The nominal capacity is the amount of charge, which a battery can supply at 25°C within a discharging time of 20 hours at a constant discharge current of 1/20 of its normal capacity, until its terminal voltage drops to 10.5 V (K20). In case of traction and lighting batteries, the indication at only 5 hours of discharging (K5) is common as well. The nominal capacity depends on the active mass of lead on all plates. In addition, it is affected by the discharging time: The faster the discharge (due to a higher discharge current), the lower the amount of charge supplied by the battery.

Usage of batteries

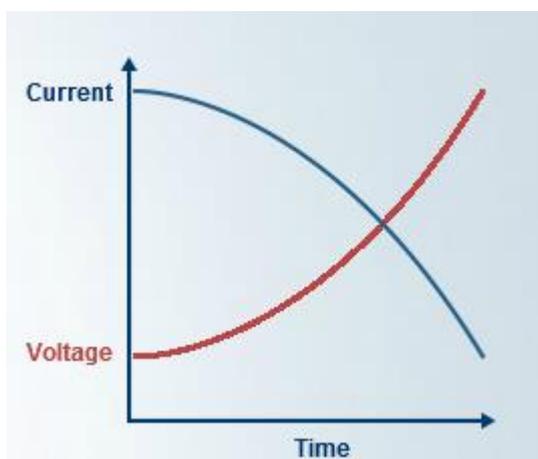
In principle, one must distinguish between starting batteries and traction and lighting batteries. The main requirement of a starting battery is its high current capacity. By contrast, a traction and lighting battery must be designed, above all, for deep-cycle resistance (very often rechargeable). Both battery types are therefore optimized differently and are not interchangeable, even with the same nominal capacity.

The performance of a battery depends on the temperature, as this influences the electrochemical reactions. With falling temperatures, the chemical reactions become slower and the battery performance decreases. At falling temperatures, however, the starter needs even more battery power in order to be able to start the engine.

The state of charge of a battery can be determined by its terminal voltage. With new batteries, it can be read out at any time. Used batteries, however, should be given a rest of some days before reading it out.



If a battery is not charged by the vehicle, chargers are used: Older chargers – or those from the low-price segment – often show an unregulated charging curve. These chargers may damage the battery with their high charge current at the beginning and, most of all, the rising voltage at the end.



Unregulated charging curve

Voltage U x current intensity I = constant (“W characteristic curve”)

Special technologies

AGM-Batteries



AGM batteries are regarded as the best lead-acid technology in the market: They have a particularly high current capacity and at the same time a high deep-cycle resistance. (Standard lead batteries are optimized for only one of these factors!) Typical use: Passenger cars with start/stop system and regenerative braking.

EFB-Batteries



In terms of their deep-cycle resistance and their insensitivity to electrolyte stratification, EFB batteries are located somewhere between standard batteries and AGM batteries. They are, however, not equipped with fiberglass mats and VRLA (valve-regulated lead-acid) safety valves. Typical use: Passenger cars with start/stop function and regenerative braking.

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