

How to connect batteries in series

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If you've ever been looking to buy a battery for your caravan, motorhome, boat or needed replacements for your emergency light or UPS unit people have probably recommended a 'deep cycle' battery.

In some cases you may have been struck by how similar they look to standard lead acid batteries not marked 'deep cycle'; except for the price tag. So what makes a deep cycle battery different?

Well first, what do we mean by 'deep cycle'? This is the industry term for batteries which are good at discharging slowly to low states of charge and then recharging again.

Each discharge and recharge is known as 'a cycle' or a 'charge cycle'. Even if you only half discharge a battery before recharging this is still a cycle. But the more you discharge before recharging the deeper the cycle.

Standard Lead Acid batteries are designed to provide high amounts of energy for a short period, say several seconds to start an engine. Deep cycle batteries are designed to provide lower levels of energy over a longer period, usually several hours.

The key to understanding this lies inside the battery. In our video 'How a Flooded Lead Acid Battery is Made' we covered the basics of lead acid battery construction. If you missed it here's a quick recap.

Lead based Anode and Cathode plates are manufactured as grids to maximise their surface area. They are coated in an active paste and arranged in pairs but kept physically apart by a separator. The pairs are bundled and placed in compartments to form cells. In this example we've got a battery with 6 cells. The cells are connected together and then an electrolyte is added to allow chemical processes to take place between the plates and this will create electricity.

Small buckling causes the active paste to fall off reducing how effective the plates can be at giving and taking a charge, reducing the battery's performance and overall lifespan.

The most basic is just to make the plates thicker so they are less likely to buckle but thicker plates means more lead and as lead is one of the most expensive parts in the manufacturing process it also pushes up the price of the final product.

There are other options. In the 1970s a company called Enersys came up with the idea of rolling the plates into spirals which makes it harder for the lead to buckle. In fact it is so effective that plates can be made from near

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pure lead. These batteries are often obvious because the casing looks like cylinders. They come in all shapes and sizes and are sometimes labelled 'Cyclon'; or 'Pure Lead';

Another alternative is to make the plates differently. Some designs for plates are made up of tiny tubes with the active paste placed inside. This way the paste can't flake off and the circular design of the tubes helps the plates resist buckling.

When an AGM battery is subject to constant jarring and jolting the Glass Mat can grind against the plates and actually rub the active paste away reducing its performance and reducing its lifespan.

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