Battery

The accumulators or batteries of electric cars and hybrid vehicles supply electric energy to the electric motor(s). This energy is then converted into the mechanical kinetic energy required for propulsion.

Function

Like internal combustion engines, electric drives also need energy. In electric cars, the required energy is saved in accumulators, i.e. batteries. The electric motor converts this electric energy into kinetic energy. The main types of batteries almost always used in modern vehicles are lithium-ion batteries (Li-ions), although some hybrid models still run on nickel-metal-hydride batteries. The lead or nickel-cadmium batteries widely distributed in the past are rarely used these days.

Accumulators in electric vehicles are now often referred to as batteries. Strictly speaking, this is not correct, because unlike accumulators, batteries become unusable once their energy has been spent. But internationally and in English-speaking countries, people don’t differentiate between accumulators and batteries. Therefore, the international term for the electric car is BEV – Battery Electric Vehicle.

Design and operating principle

Batteries in electric cars consist of several individual cells which are interconnected to become modules and which store and release power. These cells have a positive electrode (cathode) made from a lithium metal oxide, and a negative electrode (anode), which is usually made from graphite. The

cathode contains lithium ions that move about and which move over to the anode during charging. Ions are electrically charged particles. When a car is being driven, i.e. during discharge, the ions move from the anode back to the metal oxide of the cathode via the electrolyte (a substance that is electrically conductive and ensures the ions can move about).

Capacity

Capacity is one of the factors that has a significant influence on the efficiency of a battery in an application context. Some of the batteries now made for electric cars can reach a capacity of around 100 kWh (kilowatt hours). For example, if consumption is 20 kWh per 100 km, in theory, this level of capacity means a vehicle should be able to achieve a range of 500 kilometres. However, a range of this scale can only be achieved using very large, heavy batteries, which can weigh up to around 700 kilograms. Even small electric vehicles with a limited range currently have batteries that weigh at least 200 kilograms.

Charging process

You can charge the batteries of an electric car via a plug at home or at purpose-built charging stations. Charging an electric car battery works in much the same way as refuelling: open the cap, insert the plug, and start charging. In Europe, the “Type 2 plug” has become established as the standard plug model. And in Germany, the “Ladesäulenverordnung” (a regulation governing charging stations), which specifies the “Type 2 plug” as the mandatory plug, has been in place since 2016. Other types of plugs may only be offered as an addition to this.

Electric cars are operated solely with direct current. That is why the alternating current that comes out of the plug or the charging station has to be converted. This conversion process is performed by rectifiers which are integrated into the power electronics of the car. Many charging stations also have these types of converters to be able to supply batteries directly with direct current.

Car drivers can use the following formula to work out for how long an electric car has to charge:

Charging time = battery capacity / charging capacity

Use the following to calculate the charging capacity:

Charging capacity = number of phases x voltage in volt x electric current strength in amperes

Protection of the environment

Given that electric motors don’t emit any emissions, at least at a local level, they are considered more environmentally friendly than internal combustion engines. However, the production of the electrical power itself may produce harmful substances. The most environmentally friendly solution is when 100% renewable energy sources are used to generate power.

The disposal of old batteries is a problem, but battery manufacturers are already working on ways of recycling old batteries.

Value retention

Batteries are sensitive to temperature and should not be operated when it is too cold or too hot: cold and heat are detrimental to battery capacity and reduce battery service life. The ideal operating temperature for a lithium-ion battery is around 20 °C. So having an efficient thermal management system is key. Furthermore, avoiding extreme charging states helps to delay the inevitable loss of charging capacity in batteries. The battery level should not drop below 20 percent.

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Quelle:
http://www.my-cardictionary.comhttps://www.my-cardictionary.com/cardictionary/hybrid/products/battery-392.html