FAQ

HOW MUCH ENERGY DOES A SOLAR PANEL REALLY?

Solar modules are tested in the laboratory under standard test conditions. Here, irradiation (1,000 W/m2) and temperature (25 degrees Celsius) play a role. The angle of incidence is naturally ideal. You get a peak value, which is expressed as Watt Peak (Wp) and can be equated with PS in a car. No practical conditions such as the position of the module, veil clouds, shading or dirt are taken into account. As a rule of thumb, an average value for modules can be taken for Germany, which corresponds to 4 times the nominal power. This means that a 60 Watt module in Germany generates approx. 240 Watt hours per day (Wh/d) when mounted flat, which corresponds to a current of approx. 20 Ampère (240 Wh divided by the present system voltage, in this case 12 VDC). This does not take into account what type of module is involved.

HOW MANY MODULES DO I NEED TO COVER MY NEEDS?

This depends on the sum of your electricity consumption. The number and required power of the modules depends on how long you want to be self-sufficient or whether you only use your system on certain days. You can connect several modules in parallel and thus increase the total output. In case of doubt, you should ask your specialist to answer this question.

DO I NEED AN EXTRA BATTERY FOR THE SOLAR SYSTEM, OR CAN I USE MY EXISTING BATTERY?

You do not need a new battery for the solar system if your vehicle, boat, holiday home, etc. has a battery for the superstructure. However, an extra battery can be used as a buffer for the solar power. The bigger the buffer, the more can be fed in. If you are thinking of installing a second battery in your car, boat, holiday home etc.

Please remember that they should have the same strength and be as similar as possible. You cannot couple a lead/acid battery with a gel battery. These two would discharge each other and break down within a very short time. You should also make sure that the date of manufacture is not too far apart, because a new and an old battery can also discharge each other.

WHAT BATTERY SIZE DO I NEED?

That depends on your consumption. The greater the capacity of the battery (bank), the more and longer you can draw power. Of course, the question of space also plays a role, because you cannot install a second or third battery everywhere. Therefore you should draw a small energy balance of the consumers and take the determined Ah value times 4 to be on the safe side. Then you know how big your battery has to be and can act accordingly. Remember: a small battery is full faster and if the solar system is larger, the additional yield is not used. The solar system is only as good as the storage tank you provide. For the winter, a small solar panel can be used to keep the battery functional. The battery will then continue to be loaded and cannot break down. As a rule, today's solar systems require battery power. Sizes from 100 Ah upwards, because consumption is constantly increasing.

WHAT KIND OF BATTERY SHOULD I USE TAKE?

Each battery has certain advantages and disadvantages. As a rule, gel batteries are already used

as consumer batteries in the factory, so that the motor home driver has no choice but to buy them later. However, it is a fact that according to the manufacturer, a gel battery needs a charge according to the IOU curve every ten to twelve weeks in order to perform its work reliably over a longer period of time. Phaesun has been working successfully with AGM batteries in solar systems for years. Over the years, we have installed more than 10,000 systems with AGM batteries because their low internal resistance makes them ideal for such applications. In addition, they have a very high power density, optimal space utilization and good cycle capability. As a rule, they also cost less than gel batteries, for example.

WHY DO I NEED A SOLAR SYSTEM? MY LAST MOTORHOME HAD ONE, BUT I NEVER USED IT.

This is now a typical example where a system was so well designed that the cycle of charging and discharging was precisely coordinated. The system gave the customer the same yield during the day as he used in the evening and probably even a little more, so that on days with little light there was still enough in the batteries. Here you can see how important the exact design of the system is. With well designed solar systems you do not need to worry about anything.

CAN I USE THE SYSTEM MYSELF INSTALL?

Spontaneously you could say: "But of course you can if you don't have two left hands." But it depends on the area, because a cable always has to be inserted somewhere to get to the battery.

en. In the motorhome sector, if the vehicle is older than six years, then yes, because from then on the guarantee of tightness expires. In the boat and holiday home sector, almost all the work is carried out by the customer, so that the question of tightness is not necessary. Basically, solar technology is not witchcraft, and one usually works there with weak current. However, certain knowledge and experience should not be missing when installing the solar system.

WHICH DIFFERENT MODULE FORMS EXIST?

The standard modules usually have an aluminium frame and a hardened glass surface. These are fastened with a bracket and are also tested for hail impact. Furthermore, there are the so-called marine modules. These are semi-flexible modules that can be walked on and are usually provided with a stainless steel back to be seawater resistant. Mostly they are glued on. In addition, certain marine modules have 39 or 40 cells, respectively, in order to be able to handle temperature differences better. The best results are not always achieved at high temperatures, so one minimizes the loss of yield by a higher output voltage in the module. The third form are flexible, lightweight and rollable modules, manufactured in thin-film PV technology. They can be used flexibly and can be quickly stowed away when not needed. The disadvantage of these modules is their large surface area, which generates little yield compared to crystalline technologies. Advantages, however, are their low weight and flexible use.

HOW'S THAT FOR BIG CONSUMERS SUCH AS THE REFRIGERATOR?

Nowadays, people want the comfort of home also in their motorhome, boat or holiday home. This clearly includes a cooling option. The normal refrigerators in the 12/24 VDC range use absorber technology, i.e. they can be operated with gas, 230 VAC or even with battery power. Here the consumption for solar is usually too high to operate it sensibly. However, there are so-called compressor refrigerators - boxes or chests that are characterized by a low mileage and lower power consumption. These devices are definitely suitable for working with solar power supply.

NOWADAYS THERE ARE SO MANY MODULES ON THE INTERNET, HOW DO I FIND THE RIGHT?

The price of solar modules has been falling steadily for years. The price reduction is due to falling raw material costs, new production technologies, mass production and the much greater competition worldwide. Of

course, it is always difficult to decide what is right for you with such a large offer, because the price is usually tempting. But be careful: You never know what is behind it! As in other areas, the price does not come out of the blue. There is a large number of suppliers who sell modules from overproduction or from dubious manufacturers worldwide. So here is our tip once again: Have your system calculated by a professional and buy it from the dealer you trust to avoid unpleasant surprises.

WHAT OUTPUT IS OBTAINED WITH INTERCONNECTED SOLAR CELLS?

No matter whether series connection or parallel connection, both switching options result in the same electrical output for solar cells of the same type. When manufacturing solar modules, it is common practice to connect between 36 and 144 solar cells in series to increase the total voltage of the solar module. Such a solar module generates a total voltage of 20 to 80 V. The output of such a solar module is between 100 W and 300 W.

WHAT HAPPENS WHEN SOLAR MODULES ARE CONNECTED IN SERIES AND PARALLEL?

A solar module consists of many solar cells, mostly connected in series (this way a higher total voltage of the solar module is achieved). The solar modules are also interconnected with other solar modules. Connecting the individual solar modules in series results in an even higher total voltage. However, if one of the solar modules is shaded, for example, the "chain" is interrupted and no more electric current can flow. The entire photovoltaic system produces less power.

A parallel connection of the individual solar modules leads to a higher total current. If individual solar modules fail when connected in parallel, e.g. because they are shaded, electrical current can still flow through the other solar modules. Only the total current intensity is reduced.

HOW DO THE PWM AND MPPT CONTROLLERS WORK ?

PWM SOLAR CONTROLLER:

A PWM controller connects a solar module to a battery, the current then flows through the controller to the battery. The module voltage almost breaks down to the battery voltage. Basically nothing else happens than in the example above when we connect a solar module directly to a 12 V battery. But when the battery becomes full (the absorption voltage is reached), the solar regulator starts working. It separates the module and battery from each other and when the battery voltage has dropped a few millivolts, the solar module is switched on again. This process takes place several times per second. This control mode is called pulse width modulation (PWM). Solar modules deliver a certain current depending on the sunlight. This current is independent of the module voltage. Consequently, the same current flows at 18 V or 13 V. However, the module delivers a power (measured in watts). The power is the product of voltage and current. Anyone who paid attention in physics at that time knows that it is possible to calculate electrical power simply by multiplying voltage and current. As a result, the power at 18 V is higher than at 13 V if the same current is used as a basis.

MPPT SOLAR CONTROLLER

MPPT = Multi Power Point Tracking - in English about as much multi point tracking.

An MPPT controller scans the power curve of the solar module and finds the highest power point. Usually a module delivers the maximum power at a voltage of 16-18V. The power of the module is then converted to the battery voltage, like a voltage converter that converts 12V into 230V or 24V into 12V. This method is so effective that despite the losses in the regulator, much more power is transferred to the battery through the voltage conversion than with a PWM regulator.

Here is a short example:

100 Wp bring (exemplary!) in the sun 18 V and 5 A (corresponds to 90 W). With a PWM regulator you could charge a 13.5 V battery with 5 A charge current.

Which corresponds to a power of 67.5 W (at exactly 13.5 V). With a MPPT regulator the 5 A and 18 V are converted to battery voltage and at 13.5 V 6.66 A (90 W) flows

Phaesun GmbH
Brühlweg 9
87700 Memmingen Germany
Phone +49 (8331) 990 42 0
Fax +49 (8331) 990 42 12
info@phaesun.com

www.phaesun.com