



# Types of Solar Inverters Pros and Cons

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Solar inverters are the operational brain of photovoltaic (PV) systems, making them one of the most important components of a solar system. Since solar panels generate power in DC, which is not useful for most home appliances, you will generally need a solar inverter.

When your solar panels are exposed to sunlight, photons hitting the surface of the modules will release electrons by a phenomenon called the photovoltaic effect. While solar panels generate electricity, this does not mean that you can directly use it on your appliances since solar panels generate DC power and not AC.

Most electronics and appliances (with a few exceptions) operate directly with AC energy. This means that you need to convert the DC power into AC, which is where the solar inverter comes in.

So, what is a solar inverter? Long story short, the solar inverter is the electronic component responsible for converting DC into AC energy, using solar panels or solar batteries as the energy source.

The solar inverter for homes, connects directly to the solar panels on the DC side, while on the AC side is connected to the home and the grid (for grid-connected homes). Homes with a battery backup system, also have the batteries connected to the DC side of the inverter.

The inverter operates by stepping up or down the DC voltage, depending on the operating voltage of the solar array and the input voltage of the inverter. During the stepping process, this device usually takes the voltage to 145V DC considering voltage losses due to the operation of the circuit, but this might vary depending on the solar inverter manufacturers and models.

Once the solar inverter reaches the right voltage, it uses a complex MOSFET circuit to create a sine wave that simulates the 120V AC sine wave coming from the grid (the standard in countries like the United States, Canada, etc.). High-quality Inverters for solar panels, create a Pure Sine Wave (PSW), while older or cheaper models, might create a Modified Sine Wave (MSW).

There are different types of solar power inverter options suiting PV systems. Depending on several factors like the type of solar system, budget, and the performance you want to get from it, you might choose one or another. In this section, we explain the different types of solar inverters, alongside their pros and cons.

Most PV systems use standard string inverters. For this inverter, panels need to be wired into strings, by connecting the positive end of the first panel to the negative of the second one, and so on. PV systems often have several strings in parallel, increasing the power rate of the system.

The solar array is then directly plugged into the inverter for DC-AC conversion. This option is more



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commonly used as a solar grid-tied inverter, for homes with no battery backup systems. Solar inverter pricing for these models is generally the lowest, which is why they are the most used technology PV applications.

Standard string inverters include one or several Maximum Power Point Tracking (MPPT) inputs for the PV system. This technology pinpoints the ideal voltage ( $V_{mpp}$ ) and current ( $I_{mpp}$ ) in the I-V curve of solar panels, to optimize power output from the PV system.

The main disadvantage of standard string inverters is that they are subject to the shading effect. With the shading effect, a solar panel in a string that is partially shaded, will have lower performance and drag down the performance of the whole system. The reason for this is that a string can only perform as best as the lowest-performing solar panel in the string. An example can be seen in the figure below. This is why systems using standard string solar inverters will have lower performance under shading conditions.

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