PV Inverters

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The inverter is the heart of every PV plant; it converts direct current of the PV modules into grid-compliant alternating current and feeds this into the public grid. At the same time, it controls and monitors the entire plant. This way, it ensures on the one hand that the PV modules always operate at their radiation- and temperature-dependent maximum power. On the other, it continually monitors the power grid and is responsible for the adherence to various safety criteria.

A large number of PV inverters is available on the market - but the devices are classified on the basis of three important characteristics: power, DC-related design, and circuit topology.

1. Power The available power output starts at two kilowatts and extends into the megawatt range. Typical outputs are 5 kW for private home rooftop plants, 10 - 20 kW for commercial plants (e.g., factory or barn roofs) and 500 - 800 kW for use in PV power stations.

1. Low-loss conversion One of the most important characteristics of an inverter is its conversion efficiency. This value indicates what proportion of the energy "inserted" as direct current comes back out in the form of alternating current. Modern devices can operated with an efficiency of around 98 percent.

3. Monitoring and securing On the one hand, the inverter monitors the energy yield of the PV plant and signals any problems. On the other, it also monitors the power grid that it is connected to. Thus, in the event of a problem in the power grid, it must immediately disconnect the plant from the grid for reasons of safety or to help support the grid - depending on the requirements of the local grid operator.

In addition, in most cases the inverter has a device that can safely interrupt the current from the PV modules. Because PV modules are always live when light is shining on them, they cannot be switched off. If the inverter cable is disconnected during operation, this can lead to dangerous light arcs forming, which do not go out on account of the direct current. If the cutout device is integrated directly in the inverter, installation and wiring efforts are reduced considerably.

4. Communication Communication interfaces on the inverter allow control and monitoring of all parameters, operational data, and yields. Data can be retrieved and parameters can be set for the inverter via a network connection, industrial fieldbus such as RS485, or wireless via SMA Bluetooth(R). In most cases, data is retrieved through a data logger, which collects and prepares the data from several inverters and, if desired, transmits them to a free online data portal (e.g. Sunny Portal from SMA).

5. Temperature management The temperature in the inverter housing also influences conversion efficiency. If it rises too much, the inverter has to reduce its power. Under some circumstances the available module power cannot be fully used.

6. Protection A weather-proof enclosure, ideally built in line with protective rating IP65, allows the inverter to be installed in any desired place outdoors. The advantage: the nearer to the modules the inverter can be installed, the lower the expenditure for the comparatively expensive DC wiring.