

How do I achieve safe and cost-effective construction and operation of PV power plants?

Requirement

The advantages of solar energy are clear. It is almost limitless and the conversion process using photovoltaic systems generates clean and sustainable electrical energy. For this reason, photovoltaic systems play a key role in the area of renewable energy. In addition to residential (1–10 kW) and commercial systems (10–500 kW), power plant systems (> 500 kW) in particular are expected to experience market growth of 17–20% in 2012.

This stronger market growth is due to the greater yield optimization potential of large plants, meaning significantly greater returns for investors. Power plants systems are a particular challenge in terms of electrical protection equipment, both with DC and AC currents.



Safe

photovoltaic plant

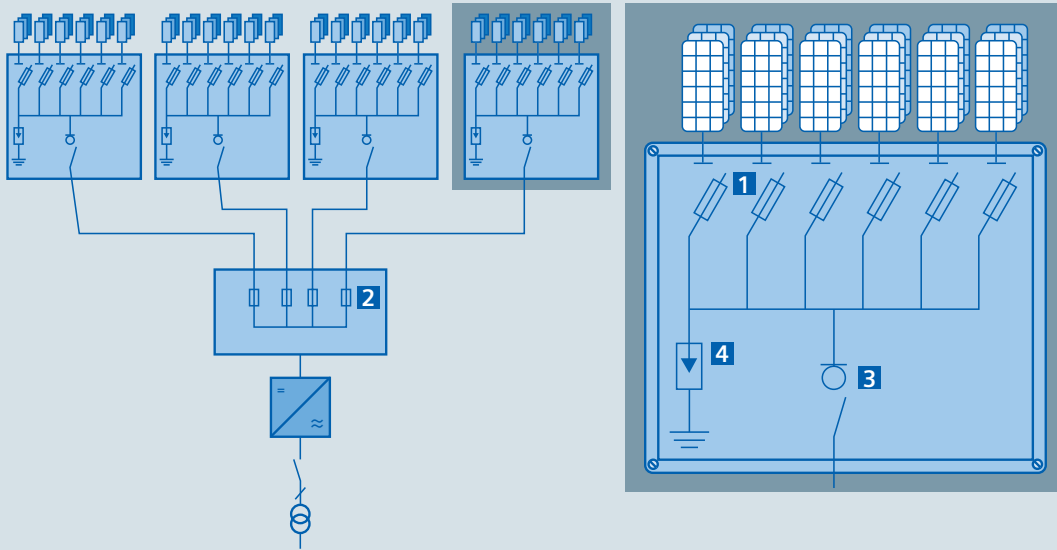
Our answer:

Siemens standard-compliant components for photovoltaic power plants

Typical topologies of PV power plants

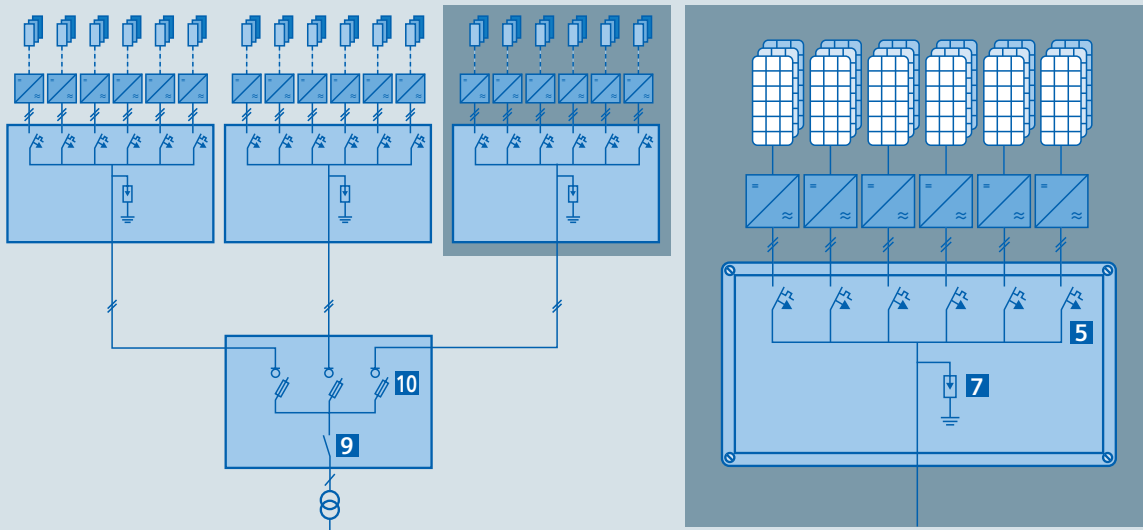
In PV power plants, a large number of PV modules are combined to form strings and their power is fed into the grid via one or more inverters in different topologies.

Central inverter with 2-stage concept (DC side)




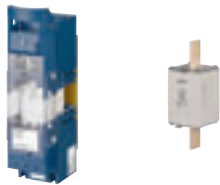


In this concept, the strings are first pooled into string boxes (1st stage) and then routed to the inverter via the generator junction box (2nd stage). Voltages up to 1,000 V and high currents on the DC side place special demands on the protection components.

Multi-inverter with 2-stage concept (AC side)





With this concept, several strings are routed direct to an inverter. The AC side of several inverters is grouped into AC collection boxes (1st stage). These are pooled into another AC collection box (2nd stage) and fed into the grid. High currents on the AC side place special demands on the protection components.





Products for the DC side

		Product	Description of functions
1		<p>PV fuse Size 10 mm x 38 mm</p> <p>Cylindrical fuse case Order no. 3NW7 0..- 4</p> <p>Cylindrical fuse links Order no. 3NW6 0..- 4</p>	<p>The PV fuse is used to protect individual strings against overloading and residual currents, particularly reverse currents.</p> <p>Safe disconnection in case of fault currents reduces the risk of fire due to DC electric arcs.</p> <p>In accordance with the new E DIN IEC 60269-6 standard.</p>
2		<p>LV HRC PV fuse system</p> <p>Fuse bases Order no. 3NH7 ...-4</p> <p>Fuse links Order no. 3NE1 ...-4 / -4D / -4E</p>	<p>The LV HRC PV fuses are used in large plants for safeguarding groups or as summary fuse of the inverter.</p> <p>High rated voltage.</p> <p>Operating class gPV in accordance with the new E DIN IEC 60269-6/VDE 0636-6 standard.</p>
3		<p>DC safety disconnect</p> <p>Order no. 5TE2 515-1</p>	<p>For disconnecting PV strings under load, e.g. for maintenance work. Used in string boxes.</p> <p>All accessories for the miniature circuit breakers (e.g. undervoltage releases, auxiliary switches, remote actuator) can be attached.</p>
4		<p>DC overvoltage protection</p> <p>Order no. 5SD7 483-.</p>	<p>Type 2 surge arresters protect the photovoltaic generator and the input side of the inverter against overvoltages.</p> <p>A device failure can be signaled remotely. Version available for plants requiring increased freedom from leakage current.</p>



Products for the AC side

		Product	Description of functions
5		<p>Miniature circuit breakers</p> <p>Order no. 5SL Order no. 5SY</p>	<p>For protection against short circuit and overload in the inverter:</p> <ul style="list-style-type: none"> - for control circuits (e.g. auxiliary voltage of contactors, measuring circuits) - for protecting fan motors, or for cabinet or container lighting <p>Maximum plant safety and availability due to extensive line and plant protection.</p>
6		<p>Measuring device 7KM PAC3100, PAC3200 and PAC4200</p> <p>Order no. 7KM...</p>	<p>Used in the inverter for measuring current, voltage, output, power quality, etc. Communication capability via PROFIBUS, PROFINET, Modbus RTU through to Ethernet with Modbus TCP.</p>

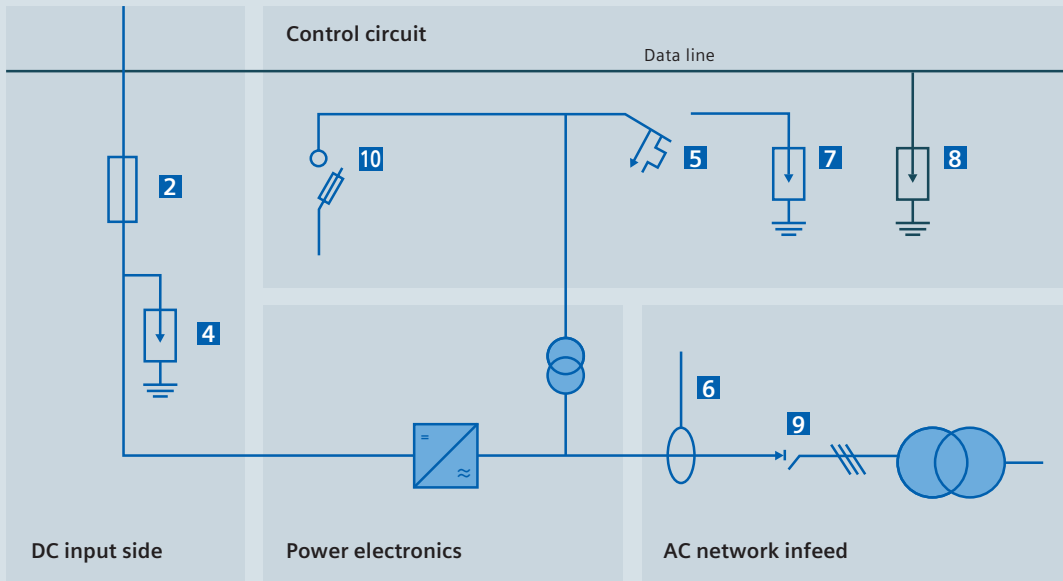
Products for the AC side

		Product	Description of functions
7		AC overvoltage protection Order no. 5SD7 4..	Type 1 lightning arresters and Type 2 surge arresters protect the inverter's control circuits against overvoltages and high surge currents.
8		Surge arresters for measuring and control technology Order no. 5SD7 5..	This device protects signal lines such as PROFIBUS, Telecom, sensor lines in the inverter or the PV field.
9		Molded-case circuit breaker up to 1,600 A Order no. 3VL...	For protecting the AC output of the inverter against short circuit and overload. Complete range with rated current up to 1,600 A. Communication capability via PROFIBUS DP.
10		Fuse switch disconnectors Order no. 3NP1 ... LV HRC fuse links Order no. 3NA...	Used in the inverter, e.g. as backup fuse for the overvoltage protection device, for protecting the compensation system, or in AC collection boxes in multi-inverter systems. Extensive range of different sizes and performance classes.

Other products for photovoltaic plants

		Product	Description of functions
		Casing Insulated distribution system Order no. 8HP SIMBOX WP Order no. 8GB1 37..	Can be used as a string box or generator junction box for interconnecting and accommodating the DC protection components. Can also be used as a collection box on the AC side (see multi-inverter concept). Extremely rugged thanks to glass-fiber-reinforced polyester. High weather resistance.
		SIVACON cubicle system Order no. 8MC... Order no. 8MF...	Enclosure for central inverter or electrical LV equipment in PV containers. Customized design possible.


Design of a central inverter



Highlights

- Comprehensive, coordinated portfolio of protection components for power plants
- Compliance with the requirements of the standards DIN VDE 0100-712, E DIN IEC 60269-6 and VDE 0636-6
- Safety at high voltages and currents on the DC side as well as on the AC side
- Comprehensive support – from planning to plant operation
- Suitable for global use in accordance with the IEC/EN and UL standards

Products for the DC side

		Product	Description of functions
		<p>ALPHA FIX terminal blocks</p> <p>ALPHA FIX iPo spring-loaded terminals Order no. 8WH2 ...</p> <p>ALPHA FIX insulation displacement terminals Order no. 8WH3...</p> <p>ALPHA FIX combination plug-in terminals Order no. 8WH5...</p> <p>ALPHA FIX iPo plug-in terminals Order no. 8WH6 ...</p> <p>ALPHA FIX screw-type terminals Order no. 8WH1000-0...</p>	<p>For wiring the system components in string boxes, generator junction boxes and inverters.</p> <p>Complete series covering all connection methods.</p> <p>Type with proof voltage 1,000 V DC available.</p>

Further information

For details on individual products:

www.siemens.com/lowvoltage/photovoltaic

Technical Support:

www.siemens.com/lowvoltage/technical-support

For technical assistance regarding the use of products:

www.siemens.com/automation/support-request

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