



COMPONENTS

Renewable Energy Conversion
Grid Compliance and Reliability for
Renewable Energy Systems

 **SCHAFFNER**

safety for electronic systems



SCHaffner GROUP

Schaffner – quoted on the Swiss stock exchange since 1998 – is the international leader in electromagnetic compatibility (EMC) and power quality (PQ), focusing on high-growth sectors such as the automotive industry, building automation, industrial electronics, consumer goods, aerospace, medical technology, power supply systems, telecommunications, transportation and renewable energy. Schaffner develops, produces, and markets standard and customer-specific components and modules. On the basis of our own worldwide engineering and distribution organization and a broad partner network we are globally present and always close to our customers.

A global one-stop shop

EMC filters

- PCB filters
- IEC inlet filters
- Single-phase filters
- Three-phase filters
- Three-phase + neutral line filters
- Open frame filters

RFI suppression chokes

Feedthrough filters and capacitors

Automotive components

Customized solutions

Power Quality

- Line reactors
- dv/dt reactors and filters
- Sine wave filters
- Harmonic filters
- Regen reactors and filters
- Transformers

Customized solutions



EMC and power quality for renewable energy conversion systems.

Electricity is one of the key resources of the 21st century. Hardly any product can be manufactured and very little of the modern world comforts can be enjoyed without a constant supply of clean electrical power.

In recent years, renewable energy technologies experienced a dramatic technical progress. Higher efficiency levels along with attractive incentive programs founded by governments around the globe, make renewables a real alternative to traditional energy sources like coal or nuclear power.

Getting power in shape. Renewable energy sources deliver environmental friendly, sustainable power. However, the power they initially provide does not immediately meet the requirements of electrical consumers. Photovoltaic panels or fuel cells deliver dc voltages and wind power plants deliver ac with frequencies tied to the momentary wind velocity. Most electrical consumers today are designed to be plugged into a power socket, expecting a clean ac sine wave voltage with 50 or 60 cycles per second.

Making the renewable power available to consumers or to feed it into the power grid requires the “transformation” from dc to ac, or an adjustment to a constant 50Hz or 60Hz mains frequency. This transformation is commonly known as power conversion and takes place by means of power electronic devices like inverters or converters.

Problems associated with converters. Making effective power available is the sole purpose of renewables. In the quest for the highest efficiency levels, converter manufacturers employ high speed semiconductor switch mode techniques that generate fast voltage pulses of the appropriate duration and polarity.

Unfortunately, this creates a broad interference spectrum, ranging from low frequency harmonics all the way up to conducted and radiated electromagnetic interferences (EMI) in the Megahertz range.

This situation is not acceptable for two reasons. First, equipment manufacturers are obliged to meet Power Quality standards in order to feed electrical power back into the grid. Second, it must be assured that other electric and electronic equipment in the vicinity, or connected to the same branch of the power grid, are not affected in their function and reliability.

Short cut or detour. Often, a minimum effort is being made in order to fulfill the essential interference standards and regulations. This procedure can reduce initial cost and time to market. However, once up and running, a system may not be compatible with residential and industrial consumers nearby. Any attempt to upgrade the renewable system at this point relates to downtime, service personnel and cost.

In most cases, this can easily be avoided by looking at the whole spectrum of potential interference problems right from the beginning. Very little additional effort may be needed to cover the entire range of potential problems. Even though some frequency ranges are not subjected to national or international rules and regulations, interference in their bands may still affect surrounding equipment and sensitive electronics.



Solutions for the renewable energy industry. Schaffner has more than 40 years experience of tackling interference problems in power electronic devices such as motor drives or UPS. Our engineers have been working closely with manufacturers and users of renewable energy converters for years, worldwide. And we are proud to support industry leaders like SMA, Conergy or Vestas in creating highly reliable and compliant renewable systems.

Benefit from engineered solutions. Besides providing the broadest selection of off-the-shelf EMC and Power Quality components, Schaffner offers the full complement of testing, engineering and custom design capabilities. Often these services are the key to the most cost-effective solution and to match the system requirements.

With five manufacturing sites in Europe and Asia as well as customer service and application centers in 15 locations around the globe, Schaffner is always in close contact with customer's design and application engineering centers.

Schaffner customers benefit from:

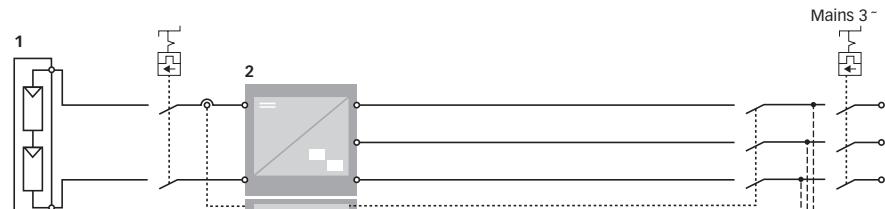
- Local engineering support
- On-site and lab testing capabilities
- Custom product design
- EMC and Power Quality solutions
- Worldwide manufacturing and logistics
- Broad industry experience

If you are a manufacturer or user of renewable energy converters/inverters and face the challenge of getting your system grid compliant or more reliable, consider Schaffner as your partner for EMC and Power Quality.



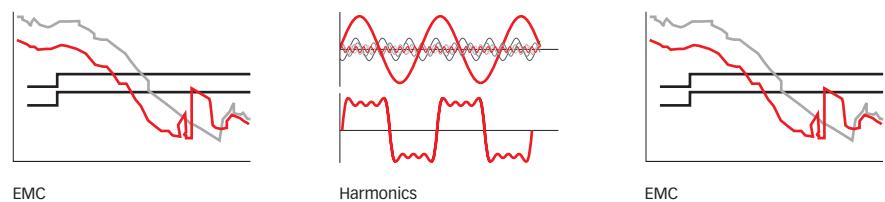
Photovoltaic power – a prime example of renewable energy

Every kind of switch mode power converter produces a broadband interference spectrum and harmonics as a side product of its intended operation. Solar, fuel cell or wind power converters have similar characteristics. Some, or all of the adverse effects below can potentially occur:



1 Solar module
2 Solar converter

3 Regulation/network monitoring



DC side

- EMI radiation off the solar module beyond acceptable limits
- Negative impact to the function and/or efficiency of the solar module
- Cause of malfunctions in nearby electronic equipment or even within its own system

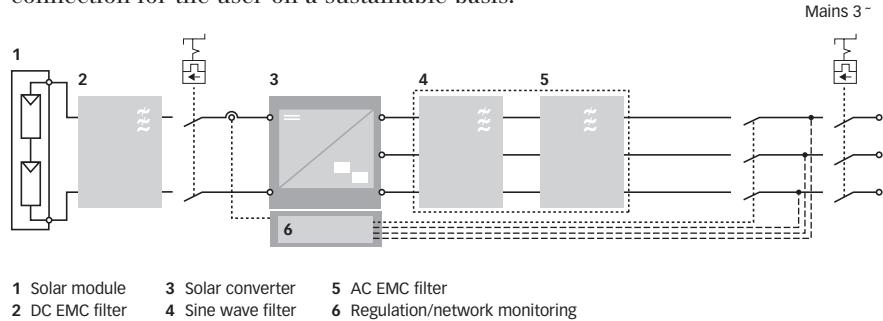
AC side

- Failing compliance with utility requirements
- Failing compliance with international EMC and Power Quality standards
- Causing failures in other grid-tied electric consumers

Note. The example above describes a solar converter system without a built-in transformer. Solar converters are used as a typical example; Schaffner provides solutions for numerous renewable energy and power conversion markets, such as wind, hydro, and fuel cell power systems, variable speed drives, regenerative drives, switch-mode power supplies, UPS systems and the most diverse automation equipment.



Manufacturers and users of renewable energy converters are not alone when it comes to confronting these challenges. Schaffner has already worked out solution concepts for various problems in its totality, which prove successful in daily practice. These represent the answer to the question of clean network connection for the user on a sustainable basis.



DC EMC filter



HF solution for the DC side

- De-coupling the solar module from the converter
- Reduction of conducted EMI towards the solar module
- Avoiding radiation off the module
- Helping ensure system reliability and efficiency

Sine wave filter



LF solution for the AC side

- De-coupling the solar converter from the grid
- Smoothing of pulsed signals towards grid
- Reduction of low frequency interference and harmonics
- Fulfillment of utility requirements

AC EMC filter



HF solution for the AC side

- Reduction of conducted EMI towards the power grid
- Fulfillment of international EMC/RFI regulations
- Improvement of the reliability of surrounding equipment

Investigating potential sources of problems across a broad frequency spectrum at the very beginning allows for the utilization of synergies provided by individual components. As a result, the overall solution can become more compact, less in weight and cost, and use fewer individual components to manage.

For more information please contact your local Schaffner partner.



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