

Current Sensing for Photovoltaic Panels

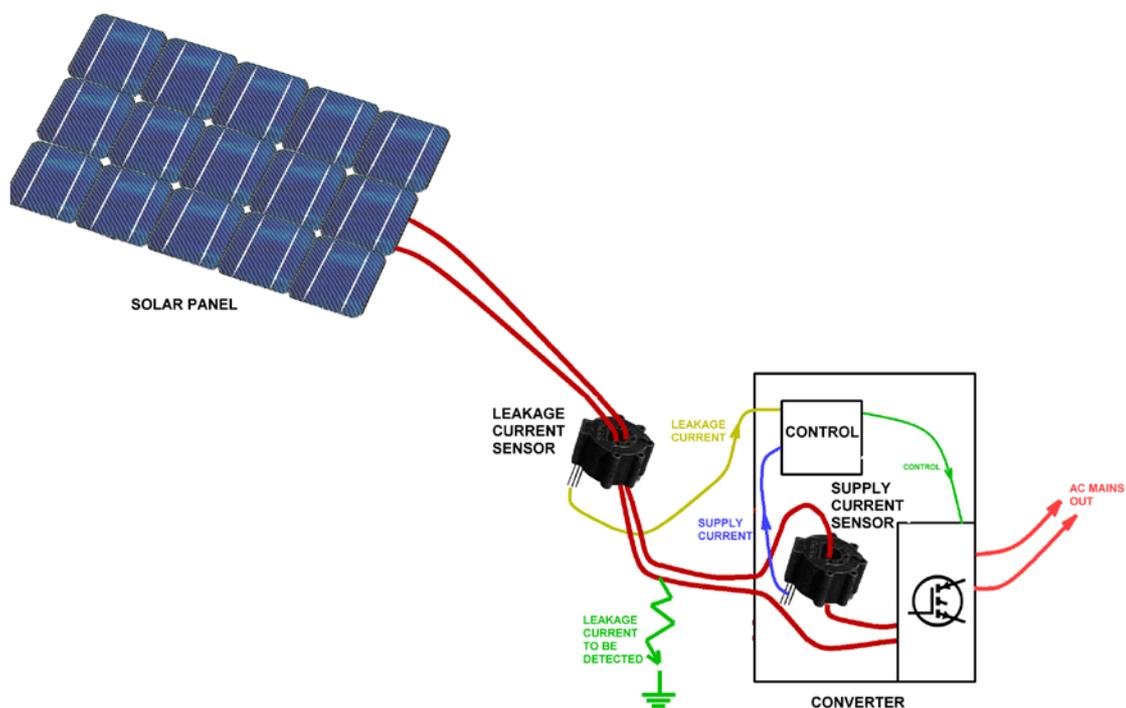
Background:

Photovoltaic panels for solar conversion are rapidly decreasing in price and their application for green energy is continually growing world-wide. In order to optimize efficiency and to produce usable AC power a sophisticated conversion stage is required. This stage involves the monitoring of current and voltage. For safety and reliability reasons it is often best to have galvanic isolation between the controlling circuitry and the panel DC output voltage.

Current transducers perform the role of current sensing.

Raztec offers a wide range of current transducers and is well positioned to manufacture special sensors for particular applications.

This paper describes some of the features needed in current sensors for PV applications.



TYPICAL PHOTOVOLTAIC CONVERSION SETUP

Current sensors are needed to measure both the possible earth leakage current and the DC supply current. Each sensor needs special qualities:

Raztec Offering:

In response to this growing application opportunity, Raztec has developed a family of current sensors providing mains isolation and with the appropriate performance for demanding applications whilst ensuring a modest cost and compact size.

Continuous improvements have been made in essential components which leads directly to current sensor performance improvement.

The result of our research lead to the introduction of our RAZCi family of current sensors. By the selection of component parts, sensors with particular characteristics can easily be put together to cover a very wide range of performance and price targets.

Below is a list of options:



Current rating:

Maximum sensed current spans from +/-4.4 amps to +/-200 amps

Transfer function:

Three ranges are provided: 100mV/A, 33mV/A, 10mV/A

Number of links fitted (primary turns):

If low currents in the order of a few amps are to be sensed, then the full complement of 5 links should be fitted and connected in series. Each link is rated for 30 amps so for currents greater than 30 amps, links should be connected in parallel. Alternatively, a customer may wish to fit just one pass of a heavy primary conductor through the aperture.

Supply voltage:

Many current sensors on the market operate from a 5V supply but there is a trend to operate particularly microcomputer-based systems from 3.3V without the need for a 5V supply. Consequently, current sensors that can operate from a 3.3V supply are desirable and the RAZCi can accommodate this option.

Creepage distance:

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With one link fitted the creepage is 11.7mm making the sensor suitable for measuring 1000V mains voltage in the correct environment. With 4 or 5 links fitted, creepage comes down to 5mm. If an insulated primary conductor is used then creepage becomes irrelevant.

Core Material:

Two different core materials are offered. We now can offer a very special metal core that exhibits negligible remanence. This makes it practical to offer the 100mV/A sensitivity to measure currents down to 10s of milliamps. Traditional core materials make measurements below 250mA unreliable. We also offer our traditional ferrite material where cost is important. Ferrite does have the advantage of negligible high frequency core heating.

Hall sensor selection:

Raztec has available a large number of different hall effect magnetic field sensors to choose from. Different qualities are:

- Thermal stability of offset
- Thermal stability of transfer function
- Frequency response (20kHz to 350kHz)
- Supply voltage (3V to 8V)
- Sensitivity
- Linearity
- Package dimension

Calibration:

Lowest cost sensors are loosely calibrated for customers to perform in-process calibration in the final product. Raztec has two options available for calibrating to +/-2% if so required.

Primary interface:

The may be intrusive through inserted links or non-intrusive with a conductor of up to 6mm diameter passing through the aperture. For high voltage applications, this conductor could carry its normal insulation obviating the need for creepage and clearance distances.

Also, the aperture is large enough to accept a 6.35mm QC tab making for a very compact installation.

Compliance:

The RAZCi family of current sensors is designed to comply with the requirements of EN50178.

Contact Raztec (New Zealand) Limited for a full Product Datasheet: sales@raztec.co.nz

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