

Application Note No. 010

RCD Solution For Renac Inverter

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What is the RCD?

Residual Current Protection Devices (RCD), also known as earth leakage protectors are used in photovoltaic systems to provide additional protection in case of a fault. They are necessary because the fault current may be too small to activate the overcurrent protection device. Installing a residual current action protector (RCD) is an effective safety measure to prevent personal electric shock, electrical fires, and damage to electrical equipment in low-voltage grids.

What is the function of the RCD?

A Residual Current Device (RCD) works by detecting any leakage of electric current in the power circuit. It then compares this current with a standard reference value and disconnects the circuit if the current exceeds the reference value.

Residual Current factor in PV system

1. The Capacitive discharge current of a module in a PV system can be affected by various factors such as the type of module, the environment it is exposed to (rain, humidity), and the distance between the module and the roof. Additionally, there are other factors that may contribute to the parasitic capacitance, such as the inverter's internal capacitance to PE and external protection elements like lightning protection.
2. The DC bus is connected to the alternating current grid through the inverter during operation. Then a part of the alternating voltage amplitude is transmitted to the DC bus. The fluctuating voltage constantly modifies the charge state of the parasitic PV capacitor, which refers to the capacitance of PE. This process generates a displacement current that is proportional to both the capacitance and the applied voltage amplitude. If there is a fault, such as defective insulation, and an energized cable comes into contact with a grounded person, a residual current flows.

Renac solution for RCD

All Renac inverters come equipped with a certified internal RCD (Residual Current Device) to protect against potential electrocution in case of any malfunction in the PV array, cables, or inverter (DC). This safety measure is in accordance with the standard EN 62109-1, section 7.3.8. The RCD in the

Renac inverter can detect leakage on the DC side and has two trip thresholds as required by the DIN VDE 0126-1-1 standard. The low threshold is used to protect against rapid changes in leakage, which are typical of direct contact by people, while the higher threshold is used for slowly rising leakage currents to limit the current in grounding conductors for fire safety. The default value for higher speed personnel protection is set at 30mA, and 300mA per unit for lower speed fire safety.

Installation and selection of an external RCD device

It is mandatory to install an external RCD in some countries. The type of RCD required should be checked by the installer as per the local electric codes. The installation process of an RCD should always comply with the local codes and standards. Renac recommends using a type-A RCD and suggests using an RCD value between 100mA and 300mA unless a lower value is required by the specific local electric codes. For the three-phase inverters mentioned in the table below, please use the following RCD values:

Renac Three-Phase Inverter	Minimum RCD value
N3-HV Series(5~10K)	100mA
R3-Note Series(4~12 kW)	100mA
R3-LV Series(10~15 kW)	300mA
R3-Pre Series(15~25kW)	300mA
R3-Note Series(30~50 kW)	300mA