

## Solar Power Installations – Do you know what type of RCCB to use and why?

### Do I need an “A” or “B” Type RCCB for my PV System?

Assuming an RCCB is required for automatic disconnection - no other design option is available, the PV Installer has to have at the very least the following knowledge and information to make a safe and informed decision.

#### 1. Basic understanding of the difference between A and B type RCCBs and RCMs

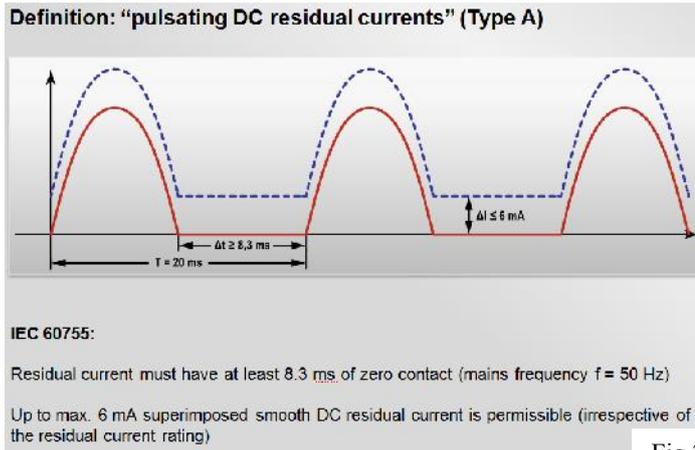


Fig 2

**Type A RCCB / EN61008-1** Suitable for use with AC and pulsating DC with a maximum DC content of <6mA (Fig 1). If more than 6 mA DC flows through the RCCB, the tripping characteristic will be altered due to the saturation effect of the DC current on the A Type sensing coil. As the level of DC current increases the tripping time will increase to a point where the coil is completely saturated and the RCCB will not operate – see clause 133.1.3 IEE Wiring Regulations.

**Type B RCCB / IEC60755 / IEC62423** Designed for use in installations subject to AC and DC residual currents, outside of the range of an A type RCCB.

Refer to individual manufactures data to check that the B Type RCCB can detect the full range of residual currents present in the installation. - See IEC60479 current /frequency effect on the human body and fire protection limit of 300mA if applicable - example Reg 331. , 422.3.and 705.411

**RCM / EN62020** Residual current monitors are used to monitor a supply and give a warning signal of possible problem. RCMs used in PV inverters, because of their design cannot replace the RCCB installed on the AC side of the inverter see Reg 411.1.

**2. The effects of the PV Installation** as a whole (not just the PV Inverter) have to be taken into account, on the ability of the RCCB to perform its safety function when called upon to do so - Reg 331.1 and 411. RCCBs are classed as an additional protection measure, so it is imperative that they are used within their design limits Reg 133.2

In a PV installation which does not contain simple separation between the PV inverter and the RCCB , a restricted earth fault (fig 2) will result in a DC residual current flowing back through the RCCB. The form of the residual current will vary along with the DC content, which means it would not be safe to use a Type A RCCB,- see Reg 712.411.3.2.1.2

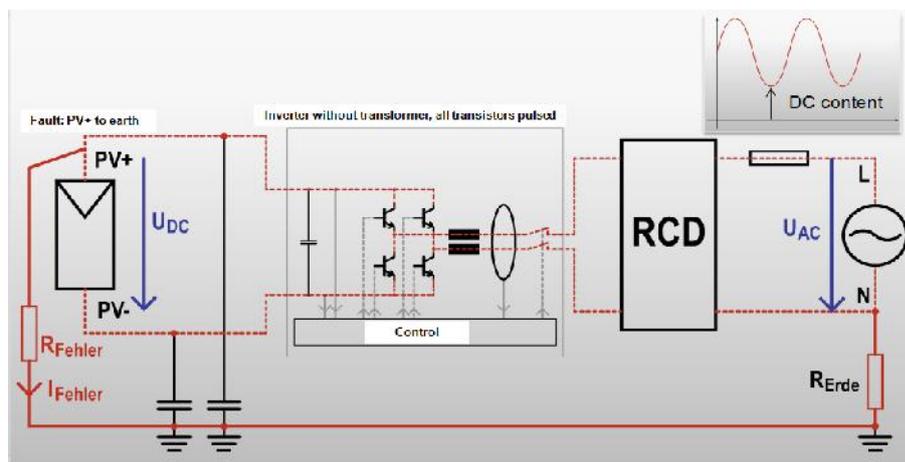


Fig 2

The statement in the above regulation *where the PV converter is by construction not able to feed DC fault currents back into the installation....* With existing technology that is readily available, the only way of guaranteeing that any DC fault currents will not flow through the RCCB, is to use an Inverter with an isolating transformer. If you use an inverter without a transformer and an A type RCCB, you have no way of confirming, that the device will not be subject to residual currents with a smooth DC content >6mA , you would be outside of the scope of the standard for the RCCB (see Reg 133.1.3). If you are relying on a statement from your Inverter supplier to cover you for using a Type A RCCB with a transformerless Inverter, read the declaration carefully. They

also warn quite clearly that in the case where a Type A RCCB is used, the smooth DC content of the residual current can affect the tripping characteristic by as much as 30% based on their tests. Using a Type A RCCB on the basis of the above would be in direct contravention of IEE Wiring Regulation 133.1.3

The Electrical Safety Council's best practice guide relating to the *Connection of microgeneration systems to domestic or similar electrical installations*. Page 12 gives "essential criteria which must be met" Clause IV makes it quite clear that you need to look at the microgenerator (SSEG) as whole when selecting the RCCB and not just the PV inverter. The "supplier (normally the Installer) of the SSEG would have to guarantee that the smooth DC content would not exceed 6mA, before using A type RCCBs. MCS installers working to the requirements of MIS3002 / DTI "Guide to the installation of PV systems" are required to fit Type B RCCB for transformerless inverters. Clause 2.3.1 is a mandatory requirement.

**3. The level and frequency of leakage currents** present in normal operation. See - *Reg 331.1 and 133.2.3 and 422.3.9*

At the design stage check that the characteristics of the inverter are compatible with the leakage current limits and RCCB protection level required for the intended installation. It will reduce the risk of costly re-work on site at the commissioning stage (Completing SSEG installation commissioning confirmation sheet - Appendix 3 of G83/1-1, the Installer signs to confirm that the installation complies with BS7671).

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For more detailed information Doepke UK have a free 60 page Technical Application Guide - log on to [WWW.doepke.co.uk](http://WWW.doepke.co.uk) to download the pdf or obtain further information on RCCBs. For technical support please e mail [chazandrews@doepke.co.uk](mailto:chazandrews@doepke.co.uk)