Overview

The resistance of a human body to current depends on the current path. Measurements have shown that, a current path of hand/hand or hand/foot has a resistance of approx. 1000Ω, taking into account a fault voltage of 230V AC, this produces a current of 230mA for the current path hand/hand.

Three function groups largely determine the setup of residual current protective devices:

a. Summation current transformers for fault current detection

b. Releases to convert the electrical measured quantities into a mechanical tripping operation

c. Breaker mechanism with contacts

The summation current transformer covers all conductors required to conduct the current, i.e. also the neutral conductor where applicable.

In a fault free system, the magnetizing effects of the conductors through which current is flowing cancel each other out for the summation current transformer, as the sum of all currents is zero. There is no residual magnetic field left that could induce a voltage in the secondary winding. However, by contrast, if a residual current is flowing due to an isolation fault, this destroys the equilibrium and a residual magnetic field is left in the core of the converter. This generates a voltage in the secondary winding, which then uses the release and the breaker mechanism to switch off the electrical circuit afflicted with the isolation fault. This tripping principle operates independently of the system voltage or an auxiliary power supply. This way it can be ensured that the full protective action of the residual current protective device is maintained even in the event of a system fault.

Due to the use of electronic components in household appliances and industrial plants, insulation faults can also cause residual currents that are not AC residual currents to flow through residual current protective devices, even in the case of devices with ground terminals.

The basic prerequisite for use of a residual current protective device is the running of a grounded PE conductor to the components and equipment to be protected. A current flow can then pass through a human body only when two faults occur (1) Interruption of the PE conductor in addition to the insulation fault or (2) When there is unintentional contact with live parts.

Residual current protective devices offer protection against

1. Direct contact – Direct contact is considered as direct contact of a human body with a live part.
2. Indirect contact (fault protection) – Indirect contact is considered as the contact of a human body with a de-energized, electrically conductive part. In these cases, the demand is for automatic interruption of the power supply when a fault can pose a risk due to the intensity and duration of the touch voltage.
3. Fire protection – For locations exposed to fire hazards, residual current protective devices should offer earth leakage protection for the prevention of fires, which may originate from insulation faults.

Types of residual current protective devices

1. Type AC – Residual current protective devices of type AC are suitable only for detecting sinusoidal AC residual currents.
2. Type A – In addition to AC sinusoidal currents, residual current protective devices of type A also measure pulsating DC residual currents. e.g. applications like ECGs, washing machines, fax machines etc. having electronic components.

Betagard RCBOs have the unique distinction of combining the earth leakage protection function of an RCCB with the overload and short circuit function of MCB.

Betagard RCBO (2P, 2M) is available from 6 to 40A in 1Pole+Neutral version. The device has a breaking capacity of 10kA as per IEC60898 and is available in 2 Module width size.

This RCBO can be used for personnel as well as fire protection:

– $I\Delta n \leq 30mA$: Additional protection in the case of direct contact

– $I\Delta n \leq 300mA$: Preventive fire protection in the case of ground fault currents

Betagard RCBOs are also offered combination devices, which offer overcurrent protection for overload and short circuit protection in addition to protection against residual currents. A version in this device group is a residual current block (RC unit) combined to a miniature circuit breaker (selected on the basis of characteristic & rated current) to form a RCBO. These devices are factory assembled and offer the same functions as RCBO. The RC unit has no contacts of its own; in the event of a fault, it trips the circuit breaker, which opens the contacts and interrupts the circuit.

Betagard RCBOs are available in 4 standard versions from 32A to 63A. They offer 10kA-breaking capacity as per IS8828 in 2P and 4P versions.

1. MCB C characteristics with RC unit Type AC
2. MCB C characteristics with RC unit Type A
3. MCB D characteristics with RC unit Type AC
4. MCB D characteristics with RC unit Type A

Betagard 5SU RCBOs

Technical specifications

Technical specifications (5SU1 RCBOs)

Standards	IS 12640-2 (2008), IEC 61009, VDE 0664 Part 20/Part 30, IEC 61543
No. of Poles	1Pole + N, 2P, 4P
Rated voltages, Un (V)	125...240V AC, 50...60Hz; 240V / 415 V AC 50...60Hz
Rated currents, In (A)	6, 10, 16, 20, 25, 32, 40, 63
Rated residual currents (mA)	30, 100, 300
Rated short circuit capacity (kA)	10
Tripping characteristics	C, D
Energy limiting class	3
Enclosure	Gray molded plastic (RAL 7035)
Mounting depth (mm)	70
Terminals **1. Conductor cross section (sqmm)** **2. Terminal tightening torque (Nm)**	 1... 25 2.5.... 3
Supply connection	Either top or bottom
Mounting position	Any
Mounting technique	Can be snapped on to a 35mm DIN rail
Degree of protection	IP20 acc to EN60529 (VDE 0470 Part 1) IP40/IP42 for installation in distribution boards
Minimum operating voltage for test function operation (V)	195V AC
Device service life	> 10,000 operations (electrical and mechanical)
Storage temperature (°C)	-40.... +75
Ambient temperature (°C)	-25.... +45
CFC and silicon free	Yes