

UNDERSTANDING EARTH LEAKAGE RELAYS ACCORDING TO IEC 947 (Annex M)

Protection of human life, Equipment against earth leakage is an important aspect which needs to be taken into consideration. There are different international standards which are clearly defining guidelines for selection of earth leakage protection devices. Depending on application areas, products complying with these standards are to be considered. These standards are

- IEC 61008 – Residual current operated circuit breakers without integral overcurrent protection for Household and similar applications
- IEC 61009 – Residual current operated circuit breakers with integral overcurrent protection for Household and similar applications
- IEC 947
 - Annexure B – Circuit breakers incorporating residual current protection
 - Annexure M – Modular residual current devices (MRCD) without integral current breaking devices.

We can see clearly there are different standards which are in place depending applications. The selection of these devices becomes very critical as user. We had discussed in our previous journal about IEC 61008.

In this article we will understand criteria requirement to be fulfilled by Earth leakage relays complying with Annexure M of IEC 947. In annexure the devices are called “MODULAR RESIDUAL CURRENT DEVICES”. Additionally the standards also incorporate Type B devices which are applicable for DC applications. However we will discuss in this article about Type A devices.

According IEC 947 standards the operating time is very critical. The guidelines are clearly specified in the standards. The definitions are as below.

- Operating time – Time which elapses between the occurrence of the fault and status change in the relay contacts of MRCD
- Cumulative operational time – Time which elapses between the occurrence of fault and opening of associated circuit breaker.
- Non-operation time – This is adjustable time delay on MRCD which defines hold-on time from the occurrence of fault for relay contacts to change over.

Standards clearly indicate time delay allowed. The same is to be complied with by all manufacturers of earth leakage relays. One of the difficult tasks is to achieve the tripping time defined in standards from the time occurrence of fault.

UNDERSTANDING EARTH LEAKAGE RELAYS ACCORDING TO IEC 947 (Annex M)

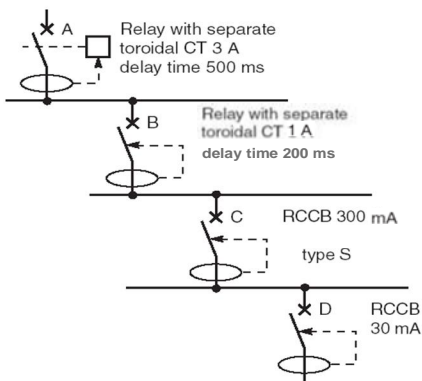
Please find below the time delay allowed for tripping of circuit breaker from occurrence of fault (For both non-time delayed and time delayed MRCD's) according to IEC 947 standards

Non Time delayed

Residual current		$I_{\Delta n}$	$2I_{\Delta n}$	$5I_{\Delta n}$	$10I_{\Delta n}$
Maximum break time	s	0,3	0,15	0,04	0,04

Time delayed

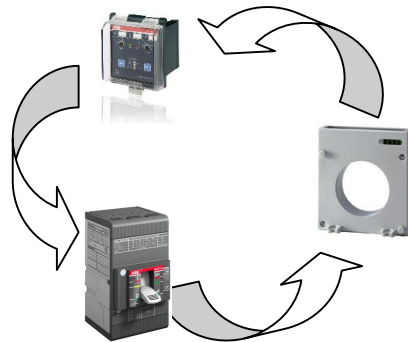
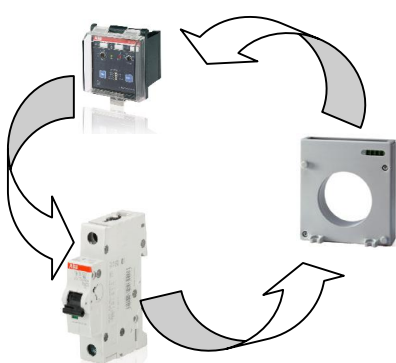
Residual current		$I_{\Delta n}$	$2I_{\Delta n}$	$5I_{\Delta n}$	$10I_{\Delta n}$
Maximum break time	s	0,5	0,2	0,15	0,15



The time delay option is allowed to establish selectivity between upstream and downstream devices as shown below. In the SLD shown, All 4 circuit breakers are coordinated to ensure proper selectivity. Circuit breakers A&B are with MRCD's (Earth leakage relays). Circuit breaker C is selective type and circuit breaker D is with no time delay.

As a user one needs to be careful in selecting earth leakage relays. The important aspect which needs to be checked prior to selecting ELR is whether the relay has been tested with corresponding circuit breaker and shunt trip coil to ensure tripping is within the stipulated value according to standards.

It is mandatory that following combinations are to be tested to ensure compliance to Annex M of IEC 947 as shown below. As user it is recommended to obtain confirmation from the manufacturer that these combinations are tested.



UNDERSTANDING EARTH LEAKAGE RELAYS ACCORDING TO IEC 947 (Annex M)

As a user one more very important aspect which is to be taken into consideration is whether the relay has fail safe option. When fail safe option is enabled, ELR activates the shunt trip even when auxiliary power supply is not available to the relay and line is protected.

ABB has tested the ELR with complete range of S200 Miniature circuit breakers and Tmax MCCB's in compliance with IEC 947. This ensures complete reliability of protection system in the V network. ABB offers Earth leakage relays even for applications where harmonic disturbances are present.

ABB offers versatile range of Din rail and panel mounting type Earth leakage relays for various applications complying with IEC 947.



Contact us for further information on

ABB Limited
Design Institute
88/3, 88/6, Basavanahalli Village
562123, Bangalore North, Karnataka, INDIA
email: Ramprasad.satyam@in.abb.com

[Technical Journal 8/12](#)

