

Earth Leakage Relay

Introduction

Majority of us have experienced electrical shock while using electrical equipment at some point of our lives. Though momentary, it is quite dangerous.

Earth leakage occurs due to reasons like normal wear and tear of equipment or moisture around terminals which can result in partial breakdown of insulation between supply and earth. Earth leakage currents are dangerous as it can lead to cable heat generation and insulation failure. This can result in a major catastrophe thus leading to significant loss of property and human lives.

Difference between Earth Fault and Earth Leakage

According to IEC 60947-2, Annex B, Earth fault current is the current flowing to earth due to insulation fault and Earth leakage current is the current flowing from the live parts of the installation to earth in the absence of an insulation fault.

Conventional SCPD are not designed to detect earth leakage currents. Earth Leakage Circuit breaker (ELCB or RCCB) has integral current breaking device. It detects as well as protects the system by opening the protected circuit when the residual current exceeds the set value. ELR is a relay that send a signal to the shunt coil of a circuit breaker (MCB/MCCB or ACB) whenever the leakage current exceeds the set level.

Effect of earth leakage on human body

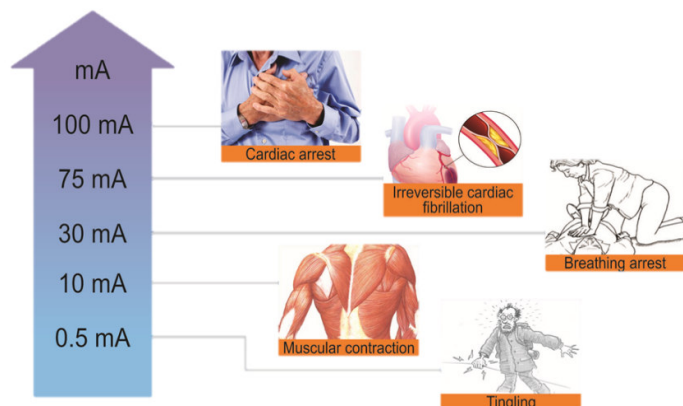
Earth Leakage current beyond 30mA can be lethal leading to death.

30mA sensitivity is required for protection in domestic installations where the person may come in direct contact with electric equipment in locations for eg labs, schools, workshops, etc

100mA and 300mA protection is required where there is indirect contact or due to insulation failure in the cables.

ELR with CBCT:

The Earth Leakage relay with Core Balanced Current Transformer provides protection from earth leakage with advanced intimation of impending occurrence of the event. The user can proactively take action to avoid occurrence of any mishaps.



L&T's ELR with Type class 'A' true RMS measurement (as per IEC 60947-2 Annexure M) provides the user with benefits that go the extra mile.

Earth Leakage relay is a microcontroller based device meant to measure low level of leakage current and isolate the faulty circuit from the system. Leakage current is sensed through core balanced current transformer. Definite Time Trip occurs when Earth Leakage Current exceeds the trip time which is adjustable by means of a front mounted potentiometer.

The user can set the threshold level ranging from 30mA to 30A. In case of earth leakage then the LED indicators will glow depending upon the percentage of set threshold value. For eg: If the set level is 30mA and the leakage current is around 23mA then 75% LED indicator will glow which will provide a visual alert to the user. This empowers the user to take corrective actions before any accident. Output 1C/O can be given to shunt trip of MCB/MCCB or ACB and 1 NO output for alarm indication. The relay has Fail-safe feature inbuilt in it.

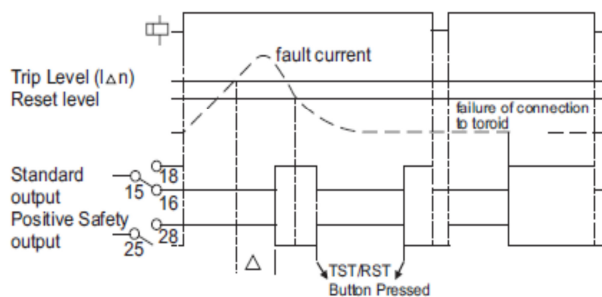
Core Balanced Current Transformer (CBCT) uses the technology of residual magnetic flux. All conductors to be protected shall pass through the core balance current transformer. The vector sum of all the currents should be equal to zero.

$$\bar{I}_r + \bar{I}_y + \bar{I}_b = 0 \quad \text{for 3 phase 3 wire system.}$$

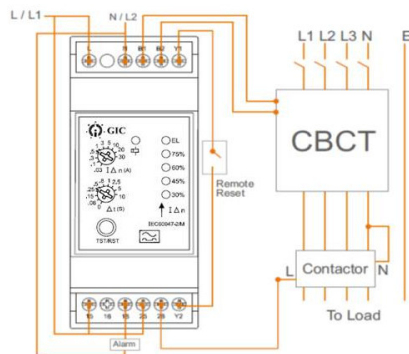
$$\bar{I}_r + \bar{I}_y + \bar{I}_b + \bar{I}_n = 0 \quad \text{for 3 phase 4 wire system}$$

The CT wires should be placed adequately away from high current carrying conductors or source of strong magnetic field to avoid noise pickup.

Output Diagram:



Connection Diagram:



Applications:

1. Motor Control Panels and Switchboards

The relay combined with the CBCT capable of monitoring the supply conductors can be separately mounted within the confines of the switchboard. ELR's features such as test / reset, alarm output and continuous digital indication for the residual current value are more suitable to industrial applications.



ELR is used along with shunt release of MCCB in motor applications. Leakage of current from the motor body to earth causes the CBCT to sense the earth leakage current and hence provides protection to human personnel working in the near vicinity.

2. Earth Mines

In Earth mines any leakage current above the allowed level is lethal. Workers operating in mines with various instruments face a severe danger of fires. The ELR must be used in conjunction with circuit breaker of appropriate rating.



Typical usage areas for ELR:

- Steel Plants
- Generators and Transformers
- Cement plants
- Oil Refineries
- Buildings
- Mobile Operating equipment
- Control Panels
- Switchboards



Features of L&T's ELR and CBCT:

- Monitors, detects and protects power systems from leakage faults
- Wide auxiliary supply range: 110 - 240 V AC, 220 - 415 V AC
- Selectable range 30mA – 30A in a single module.
- Configurable Earth leakage Trip time: 0(instantaneous) to 10s (delayed)
- Manual / Remote reset feature
- Base / DIN Rail mounting
- Used as a component with ACB, VCB or MCCB's with shunt release or Under Voltage release.
- Test feature to check complete product functionality.
- 35mm (2 module) width for usage in Distribution boards
- Indication of 30%, 45%, 60%, 75% of set Earth Leakage level with colour LED indication empowers to user to check the cause of leakage before any mishap occurs.
- Tamper proof cover on the front
- Compact in size



Earth Leakage Relay	110 - 240 VAC, Manual Reset	17G715GF2
	220 - 415 VAC, Manual Reset	17G745GF2
	110 - 240 VAC, Auto Reset	17G715KF2
	220 - 415 VAC, Auto Reset	17G745KF2
CBCT (moulded case)	38 mm	17H7NNHN3
	57 mm	17H7NNIN3
	92 mm	17H7NNJN3