

# APPLICATION NOTES

## Leakage Current Protection using Rish ELR

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### Introduction:

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When a conductor is raised to a potential above that of earth, some current is bound to flow from that conductor to earth. This is true even if the conductors are well insulated from earth. The amount of current that flows depends on the voltage on the conductor, capacitive reactance from between conductor & earth (virtual capacitance - air as a dielectric) and the resistance between the conductor and earth. The currents that flow from or between conductors that are insulated from earth and from each other are called leakage currents, and are normally small. However, since the amount of current required to produce adverse effects on the human body is also small. Therefore proper protection is required.

## The Problem:

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Earth leakage current gives rise to heat generation and progressive failure of insulation of conductors, this further leads to major earth faults and flashovers. It also deteriorates the earthing arrangement and leads to fires that can damage costly equipment and precious lives. It is therefore essential to detect the earth leakage current well before they cross thresholds such that the circuits can be isolated in the event of faults. Protection systems like overcurrent and short circuit protection are not designed to detect leakage currents.

## Our Solution:

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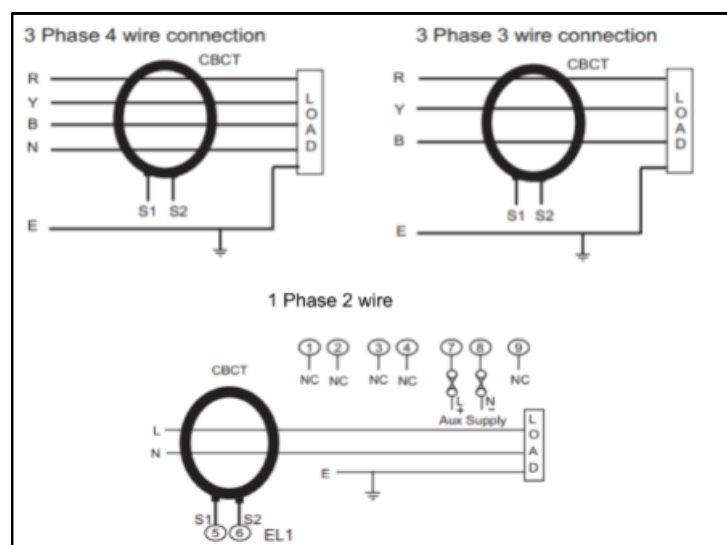
Earth leakage relays with Core Balance Current transformers are used to detect leakage currents in any electrical system. ELR gives signals to connected circuits like Contactors, ACB, MCB, etc to trip the circuitry or provide alarm signals.

### Operating principle:

The Core Balance Current Transformer (CBCT) is connected to the ELR to sense the leakage current in an electrical system. The mounting of a CBCT is such that the three phase conductors (if it is a 3 phase system) along with neutral pass through a CBCT core. In a healthy system or in ideal conditions the incoming & outgoing currents are equal and opposite in direction and the vector sum of currents is zero:

1.  $I_R + I_Y + I_B = 0$ ..... for 3 phase 3 wire system
2.  $I_R + I_Y + I_B + I_N = 0$ ..... for 3 phase 4 wire system

In the above situation CBCT should produce zero resultant magnetic flux indicating the system is healthy.



When leakage occurs due to increase in ground voltage or insulation failure, the CBCT produces residual magnetic flux, as the vector sum of currents does not remain zero. If the generated flux goes beyond threshold limits and output signal from the ELR will actuate an auxiliary contact of circuit breaker or contactors and/or generate alarming signals.

## The Benefits:

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- Protects equipment and life of operating personnel from hazards due to leakage current
- Increases system stability
- Provision of fault recording helps analyse the frequency of increased earth fault and understand root cause of failures

## Contact:

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