Earth Leakage Protection Relays (ELR series)

Earth Leakage relays (ELR’s) or also known as ground fault relays are residual current monitors (RCM’s) that are used to detect potentially dangerous ground fault currents before they cause any hazard.

**Causes for ground fault currents:**
Inadequate insulation due to mechanical damage of cables and devices.
Low insulation resistance due to humidity and dirt.
Brittle wire insulation of devices and lamps due to continues heating.

**Insulation fault consequences:**
In fault conditions, the live may get connected to the ground inside the faulty equipment, or in some other way which causes some current to flow in the grounding wire. If this fault current goes undetected, it may lead to overheating of cables, and may be fire eventually. If high fault currents are involved, hazardous voltages may also appear on grounded equipment, putting human’s lives and machines at risk. As well factors that are mostly not taken into consideration are unplanned maintenance work and expensive system downtimes.

**ELR/RCM Basics**
ELR employs a Core Balance Current Transformer (CBCT) to sense the leakage current. All load circuit conductors (Line(s) + Neutral) with the exception of the GND conductor is monitored. The wires are passed through the measuring CBCT. Ideally in a leakage free system the incoming and outgoing currents are equal and opposite in direction, which means that the vector sum of three phase currents is zero and can be expressed as:

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IR + IY + IB = 0 \text{ for 3 phase 3 wire system.}
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IR + IY + IB + IN = 0 \text{ for 3 phase, 4 wire system.}
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That means no voltage will be generated by the CBCT and passed to the RCM.
In a fault condition, current will flow via GND or a different path and the sum of the currents in the CBCT is not equal to zero anymore. This leads to voltage induction in the CBCT and indicates a fault condition to the RCM. This method of measurement applies for AC (true RMS) and pulsing DC currents.

**Selec ELR Function**

The 900ELR earth leakage protection relay monitors the fault current (true RMS) continuously and compares it with the user selected leakage level. The relay will trip to indicate a fault condition as soon as the leakage current exceeds the set level. With a very fast response time of less than 40ms, the supply can be disconnected before serious damage can occur. This product becomes extremely important from the safety perspective for any electrical equipment, specifically motors and their control circuits, generator sets and transformers.

**Selec ELR Features**

The 900ELR is a programmable DIN rail mountable device that provides leakage current (true RMS) monitoring in 1 phase and 3 phase systems. It has two relay outputs each SPDT. The relay operation is entirely software selectable; the default operation is to de-energize on trip. The leakage current is selectable from 10mA to 30A. The Trip time delay and recovery time are programmable for both the relays. For additional functionality, the second relay is configurable as a pre alarm at 50 – 100% of the leakage current setting.

The 3-digit LCD display with backlight ensures clear reading and three ergonomically designed keys on the front panel facilitates easy programming of the device. The parameter settings can be locked via programming which prevents tampering of settings by unauthorized personnel.

The elaborate test and reset menu enables proper verification / simulation of the functionality and connections.

CBCTs for use with the device are available in 35mm, 70mm and 120mm versions for separate ordering. The 900ELR has two versions based on the power supply – 230VAC and 110VAC. The product is CE approved.
Application examples for residual current monitoring with CBCT’s:
Safety circuits, motor and control circuits, lighting circuits, variable-speed drives, cooling and air condition equipment, generator sets, transformers, computer systems, fire and property protection in industrial facilities.