

ELM Earth Leakage Relay

Designed for the Metalliferous Market

1. Description

The Ampcontrol ELM Earth Leakage Relay is electronic in design and is based on microprocessor technology. The 'Healthy' LED flashes to indicate correct operation of the microprocessor. The Relay uses a toroid to measure earth fault current. A definite time operating characteristic is provided with adjustable trip sensitivity and time delay. When a fault occurs and the trip level and time delay is exceeded the relay's trip function is activated, operating the trip contacts connected in the system control circuit. The 'Trip' LED is 'On' when a trip occurs. The trip condition is latched in non-volatile memory and requires operation of the reset input to clear the trip condition. An internal reset is also provided on the facia of the relay. The 'Relay' LED is 'On' to indicate the relay is energised.

A ten-segment LED bar graph indicates the % of leakage level being detected. This reading can be remotely monitored/displayed using the 4-20mA Output of the Relay. When the relay measures currents with frequencies much greater than 50Hz the bar graph LED fast flashes (5Hz) instead of being steady. Should the high frequency current persist until the time delay is exceeded the relay will trip. The 'Har.Trip' LED (Harmonic Trip) is 'On' when a trip occurs.

The ELM Earth Leakage Relay is housed in a stainless steel case and can be either 'DIN Rail' mounted or 'Panel Mounted' through a 68 x 38mm cut out. When panel mounted the front of the ELM Relay is designed to provide IP-56 ingress protection. There is provision to prevent unauthorised adjustment of the trip settings by sealing the post (in front of the knurled nut) with a lead seal, thus preventing the removal of the front facia cover.

An internal switch mode power supply allows the ELM to operate from 24VAC to 132VAC or 20VDC to 185VDC.

2. Features

- Microprocessor based for high stability and accuracy.
- Adjustable trip level and time delay settings.
- Fail safe or non-fail safe on loss of supply.
- Bar graph to monitor leakage level. 4-20mA Output for remote indication.
- Maximum leakage since last power up/reset stored in memory.
- Continual monitoring of the toroid.
- AC or DC Supply operation.
- Functions normally for a period of two (2) seconds during extreme power dip or power loss.

3. Application

The ELM Relay has been designed and approved for use on earth fault-limited systems. To ensure maximum protection the earth leakage system should be used in conjunction with the other protection systems. The collective systems are designed to limit touch and step potentials.



The relay is also suitable for industry where equipment or system earth leakage protection is required.

The relay is not suitable for personal protection, i.e. users of portable drills, grinders etc, which require trip levels of 20-30mA, with instantaneous operation. (Refer AS3190).

The Relay continually monitors the toroid and if the connection is lost the relay will trip and flash the 'CT Fault' LED.

3.1 Methods of Earth Leakage Protection

There are two methods of protection used. They are the Core Balance and Series Neutral earth leakage protection systems. (See ELM user Manual E09802 for full details).

Core Balance:

With this method the three phases are passed symmetrically through the toroid. If there is no earth fault, the vector sum of the currents in a three-phase supply is zero. If current from any phase flows to earth the system becomes unbalanced. The toroid produces an output, which trips the relay.

Series Neutral:

With this method the neutral connection of the supply transformer is passed through the toroid. An earth fault on any of the phase conductors causes an earth current which returns, through the toroid, to the star point of the transformer and trips the relay.

A test current is injected through the window of the toroid to test the operation of the relay (See typical connection diagram, page 2). To reset the relay press the button located on the facia of the relay or provide an external normally open contact (it is recommended that a twisted pair be used between the N/O contact and the reset input). The reset button is also used to access the memory of the processor to view the maximum level of leakage since the previous trip. A section of the bar graph will slow flash (2Hz) indicating the peak level while, the reset button is held closed and will continue to flash for 1 second after the reset button is released.

3.2 Toroids

The ELM Relay is designed for use with Ampcontrol EL500 series Toroids. They are available with window sizes 20, 60, 85mm. These allow trip settings from 100mA to 2.5A.

3.3 Mode of Operation

The relay can be operated in fail-safe or non-fail safe modes of operation.

Fail Safe Mode:

This mode is the default and preferred method, where the relay drops out on fault or loss of power. Power to the relay is from the line side of the isolating device or from an independent supply.

Non Fail Safe Mode:

In this mode of operation the relay picks up on fault. This method should only be used when the supply to the relay is only available from the load side of the isolating device. To select this mode link the 'NFS' input terminals ('NFS' LED is 'On' when this mode is selected).

Note1: To restore power following a trip condition the reset needs to be held while re-closing the circuit breaker.

Relay Contacts:

1 N/O, 1 C/O. Rated at 5A 250V, 100VA maximum.

Trip and Time Delay Settings:

Two separate rotary, 16 position switches, set the trip and time delay parameters of the relay.

Switch Position	Trip Level mA	Time Delay ms
0	100	50
1	150	100
2	200	150
3	250	200
4	300	250
5	350	300
6	400	350
7	450	400
8	500	450
9	750	500
A	1000	750
B	1250	1000
C	1500	1500
D	1750	2000
E	2000	2500
F	2500	3000

4. Specifications

Relay Supply Volts: 24 –132VAC, 20-185VDC

Dimensions: 47 H x 77 W x 116 D mm

4-20mA Output:

The 'Loop Powered' current output represents the leakage current as a percentage of the trip level.

4mA => 0% leakage, 20mA =>120% leakage

(100% = 17.33mA)

Maximum Loop Resistance = $[V_s - 10] \times 50$, where V_s must be greater than 10VDC and less than 30VDC.

5. Equipment List

- E09792 ELM Earth Leakage Relay
- E08406 ELD DIN Rail Mounting Kit
- E08554 ELD-ELC Adapter Kit
- E08554 ELD-ELC/F Adapter Kit
- C18058 Toroid - 60mm ID
- C18059 Toroid - 85mm ID
- C18057 Toroid - 112mm ID

Typical Connection Diagram

