

ROC Earth Continuity Relay

MDA (Ex ia) 17029, AUS 02.2551X

1. Description

The ROC Earth Continuity Relay has been designed to AS2081.2 1988 to monitor the earth continuity of a trailing or reeling cable in an underground mining operation on a fault-limited system. The relay has been approved to be intrinsically safe and is suitable for use in a Zone 0 hazardous area.

The method used is called pilot earth loop or earth continuity monitoring, where an additional core (the pilot core) is included with the power and earth cores in the trailing or reeling cables, which supply power to the machines. The Relay monitors the positive half wave of a low voltage applied between the pilot and earth of the cable and by measuring the height of the positive half wave cycle it determines the resistance of the earth pilot loop. The maximum allowable loop resistance is 45 ohms.

The ROC Earth Continuity Relay performs the following functions:

1. Ensures that there is an earth return path from the machine back to the substation and/or distribution box.
2. Provides an interlock circuit to ensure that if the pilot-earth continuity circuit is broken or short-circuited then the machine is isolated or cannot be energised.
3. It ensures that by the time the pilot pin makes contact, when a plug is inserted into a receptacle, the phase pins are adequately engaged.

The relay is housed in a DIN rail mount enclosure with four LED indicators. The Relay is powered from a 110VAC power supply.

2. Features

- Electronic design
- DIN rail or foot mount
- LED indication to aid fault finding
- Local/Remote Operation
- Mines Department Approved

3. Application

The ROC Relay is normally installed in a substation or a distribution box to provide earth continuity protection. The relay can also be used for remote operation of the main contactor located in the substation or distribution box by selection of the Local/Remote switch located on the front facia of the Relay.

3.1 Earth Continuity Protection

The ROC Earth Continuity Relay continually monitors the earth continuity of a mining trailing cable. To protect against a short circuit of the pilot conductor to earth (at some point before the machine earth is connected), a diode is installed in the machine at the furthestmost point of the pilot earth connection. This ensures detection of a pilot to earth fault. The cathode of the diode must be connected to earth (see typical circuit).



Provided the loop resistance is less than 39 ohms and the resistance between pilot and earth is greater than 600 ohms the relay energises. When this occurs the normally open and changeover contacts change state.

The relay de-energises when the loop resistance of the pilot and earth exceeds 45 ohms or the resistance between the conductors is less than 500 ohms.

A time delay on energisation and de-energisation of the Relay prevents nuisance tripping due to electrical noise or dirty slip rings, on cable reeling applications.

3.2 Remote Operation

When 'Remote' has been selected the Relay is suitable in any installation where there is a requirement for a standard stop/start station to be used.

In this mode of operation the stop/start station is connected in the pilot. A 100 ohm resistor is connected across the start button. The loop resistance of the circuit will be 100 ohms plus the resistance of the cable. When the start button is pressed the contacts short out the 100 ohm resistor and provided the cable resistance is less than 39 ohms the relay will energise. The Relay de-energises when the stop button is operated or the loop resistance of the circuit exceeds 145 ohms or the resistance between the conductors is less than 500 ohms.

3.3 LED Indication

POWER – The LED is illuminated when power is applied to the relay.

RELAY IN - When the loop resistance is less than 39 ohms the LED on the front of the module will be illuminated. This indicates a healthy pilot/earth circuit.

OPEN CCT - The LED is illuminated to indicate a trip condition, due to the pilot/earth loop resistance exceeding 45 ohms.

SHORT CCT - The LED is illuminated to indicate a trip condition, due to leakage of less than 500 ohms between pilot and earth.

A faulty terminating diode could also cause OPEN CCT or SHORT CCT indications.

4. Specifications

Supply Volts:

110VAC 50/60Hz, $\pm 20\%$

Earth Continuity Protection:

Relay energises if the loop resistance is < 39 ohms

Relay de-energises if the loop resistance is > 45 ohms

Shunt Leakage Trip if < 500 ohms – Hysteresis 100 ohms

Time Delay:

On detection of a healthy circuit: 800mS

Drop out due to an open circuit: 400mS

Drop out due to a short circuit: 400mS

Relay Contacts:

1 N/O and 1 C/O contact. Rated at 5A 240VAC, 5A 30VDC

Dimensions:

75 H x 55 W x 110 D mm

5. Equipment List

101577 ROC Earth Continuity Relay 110VAC

115119 PTB Pilot Termination Relay

Typical Circuit

For use on Earth Fault Limited Systems with Symmetrical Cables

