NEUTRAL GROUNDING RESISTOR WITH, N.G.R. MONITORING & PROTECTION RELAY

AUTOMATION CONTROLS
An ISO 9001 : 2015 Company

MODEL: "AC/33/ELR&MR/10k", "AC/66/ELR&MR/20k"

PART NO.: "1503300091", "1506600092"

APPLICATION

There are power distribution networks which feed certain earth-fault prone zone where the earth-fault may cause fire hazards and or damage to the cables and equipment. In those zones as a safety measure, the neutral terminal (star point) of the power transformer secondary is grounded through a suitable neutral grounding resistor (N.G.R.) to restrict the earth-fault current within a certain stipulated limit so that the fire hazards and damage to the equipment may not take place.

The above neutral grounding system alone cannot provide with a long-term safety assurance. In outdoor distribution station there are many possibilities of damage in the neutral grounding connections due to various environmental effects causing open circuit and burning of NGR. This may also result in failure of earth-leakage protection operating through neutral CT or CBCT as the leakage current may not be able to flow through open circuit of neutral grounding connection.

In view of the above, it becomes necessary to incorporate a device that will ensure a fail-safe operation of N.G.R. and the grounding system. The device will continuously monitor the continuity of NGR and neutral grounding connections and will trip the feeder circuit breaker as and when any open circuit occurs in neutral grounding connection or in neutral grounding resistor (NGR). The device will ensure failsafe operation of neutral grounding system.

NGR-MONITORING AND PROTECTION RELAY

A device called as NGR-Monitoring and protection relay, has been developed and made specifically for the above purpose. It has a highly insulated sensor. This sensor is connected to the neutral terminal of the transformer. The sensor has also the capacity to protect the relay from any sudden transient high peak voltage.

This relay ensures the fail-safe function of restricted neutral grounding system. It continuously monitors through its sensor, the continuity of N.G.R. (or variation in resistance value of NGR) as well as the continuity of neutral grounding connections. It trips the circuit breakers as and when any open circuit (or variation in resistance value) occurs in the N.G.R., in the neutral grounding connections or in the relay ground and sensor connections also.

This relay provides earth fault protection also to save the N.G.R. The relay senses earth fault current by its sensor. When the fault current exceeds the limit the relay operates to trips the circuit breaker. The relay by its own earth-fault feature protects the N.G.R. independently.

N G R MONITORING CUM PROTECTION RELAY & EARTHE LEAKAGE RELAY THE TRIPPING CONDITIONS

1. Open Circuit of Grounding Resistor
2. Open Circuit of Neutral Connection
3. Open Circuit of Grounding Connection
4. Open Circuit of Relay Ground Connection
5. Open Circuit of Sensor Connection
6. Phase to Earth Fault.

NOTE: USE CONTACTOR FOR TRIPPING

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NGR-MR SERIES 033

Neutral Grounding Resistor Monitoring Relay (NGR-MR Series 033) & Ground Fault Monitoring Relay

1. GENERAL DESCRIPTION

In neutral resistance grounded power distribution systems, the NGR-MR neutral grounding resistor monitor protects against ground faults and abnormal resistance values of the Neutral **G**rounding **R**esistor (**NGR**). It is designed for use on systems from **480** Volt through 25,000 Volts a.c.

The NGR-MR is a combination NGR monitoring relay and Ground Fault monitoring relay. It measures current through the NGR, transformer neutral-to-ground voltage, and NGR resistance for continuity. The NGR-MR compares the measured values against the field settings of the relay and provides relay outputs and LED indications when an abnormal condition is detected.

Current is measured through an external current transformer (CT). The trip level of the ground fault circuit is Push-button adjustable as an absolute value of the NGR Let-Through Current setting from **5A** to **50A**. Trip time is also Push-button adjustable from **200** milliseconds to 2 seconds (this can be increased if required).

Transformer neutral-to-ground voltage is measured by means of a Sensor unit. Sensor connected across the NGR from the transformer neutral to ground. Also, it is used as sensor of the NGR-MR to monitor the NGR resistance.

A NGR fault will be detected if the measured current, voltage, and resistance increases to more than **150%** or decreases to less than **70%** of the pre-selected values.

There are three output relays:

1) The Trip Relay can be programmed for Non-Failsafe (Shunt Trip) or Failsafe (Under-voltage Trip) operation in a main breaker trip circuit. It can be programmed to re-trip when control voltage is restored after loss of control voltage following a trip, (Memory ON) or, to remain in reset condition when control voltage is restored after loss of control voltage following a trip, (Memory OFF);
2) The NGR Fault Auxiliary Trip Relay can be used to give door mounted or remote indication of a NGR failure.
3) The Ground Fault Auxiliary Trip Relay can be used to give door mounted or remote indication of a ground fault trip.

The NGR-MR has an isolated CT input so that one side of the external CT secondary may be grounded.

There is built-in digital display for voltage and current indication through 2-digit display each of KV and Amps respectively.

Technical Specifications

Neutral Grounding Resistor Monitoring Relay (NGR-MR Series 033) & Ground Fault Monitoring Relay

Specifications:

A) Fault-Tripping Conditions:

- **a.** NGR open circuit
- **b.** Neutral open circuit
- **c.** Ground open circuit
- **d.** Sensor open circuit
- **e.** Phase to Earth Fault
- f. NGR continuous Monitoring

B) Sensor: Suitable Sensor to suit the NGR-MR series 033, which gives the sensing, signals to the monitoring relay. It is connected across the NGR from the transformer neutral to ground.

C) Spike Protection Unit:

1. Spike Protection Unit to protect from spikes due to lightening, sudden change in heavy loads.
2. Protect from Voltage Fluctuation
3. Epoxy Molded 15 KV Isolated Transformer to protection circuit of Fail Safe Relay.

D) Sense Voltage Range : 2 KV to 6.6 KV system.

E) Trip-set Adjust for let-through current Range : 0.1Amp – 9.9Amp
Trip Current Setting : Through Set, Increment, Decrement push-button Keys in steps of 1 Amps.
(Min from 0.1 Amp to Max 9.9 Amp.)

F) Trip Delay-Time Range (Adjustable) : 150 mSec. - 2 Sec. in steps of 50 m Sec.
Trip Delay Time Setting : Through Set, Increment, Decrement push-button Keys in steps of 150 m Sec.
(min from 2000 mili-second to max 2 second.)

G) Audio –Buzzer : Latching-type Fault Trip operation Audio buzzer.

H) Indication : Actual fault current in seven segment LED display in 2 Digit in Amp.
Actual fault Voltage in seven segment LED display in 2 Digit in Kilo-Volts.

I) LED indications for :
1) NGR Fault (Red LED indication)
2) Sensor Fault. (Yellow LED indication)
3) Phase Fault. (Red LED indication)
4) Set Adjustment mode, Push Button (Green Flashing LED)

J) Fail safe relay :

1. Current Sensing Range:- 0.1 mA. 9.9 Amp. With adjustable setting in steps of 150 mA.
2. Test & Reset Push Button for Ground Fault Test
3. Inject virtual 50 Amp. Current to test the CT.

I. **Continuously Monitoring Parameters for Fault Tripping**
a. Neutral/Ground Open Circuit
b. Sensor Failure
c. Phase to Earth Fault
d. Continuous Monitoring of NGR's Circuit due to Locking Arrangements & Trip NGR if any wire or NGR open

II. **Trip Time Delay:- 150 mili-Sec. to 2 Sec. with Adjustable Push Button Key**

III. **Real Time Display:- Real Time Display in seven segment**
a. Neutral to Ground Current in Amp.
b. Neutral to Ground Voltage in KV

IV. **Fault Indication LED**
a. NGR Fault Trip
b. Ground Fault Trip
c. Sensor Fault Trip

V. **Sensor Unit:** Sensor for Sensing of Fault Voltage. Monitor NGR Continuously & Warn through Alarm & Trip Signal in Case of NGR Failure. Ensure Healthy Condition of NGR

VI. **Current Transformer:** CT is Epoxy Casted with 15 KV of Isolation to protect form Spark and better safety. Special provision for Virtual input of 50 Amp from Fail Safe relay for testing for the working condition without any external circuit. CT Ratio 50:0.5 Amp

K) Actuator – Relay (3-Nos.)

1. The Trip Relay can be programmed for Non-Failsafe (Shunt Trip) or Failsafe (Under-voltage trip) operation in a main breaker trip circuit. It can be programmed to re-trip when control voltage is restored after loss of control voltage following a trip, (Memory ON) or, to remain in reset condition when control voltage is restored after loss of control voltage following a trip, (Memory OFF);
2. The NGR Fault Auxiliary Trip Relay can be used to give door mounted or remote indication of a NGR failure.
3. The Ground Fault Auxiliary Trip Relay can be used to give door mounted or remote indication of a ground fault trip.

Neutral Grounding Resistor (NGR)

1) For 6.6 KV System: **Resistor: 76 Ohms, 200 K Watts, 20KW Continuous rating.**

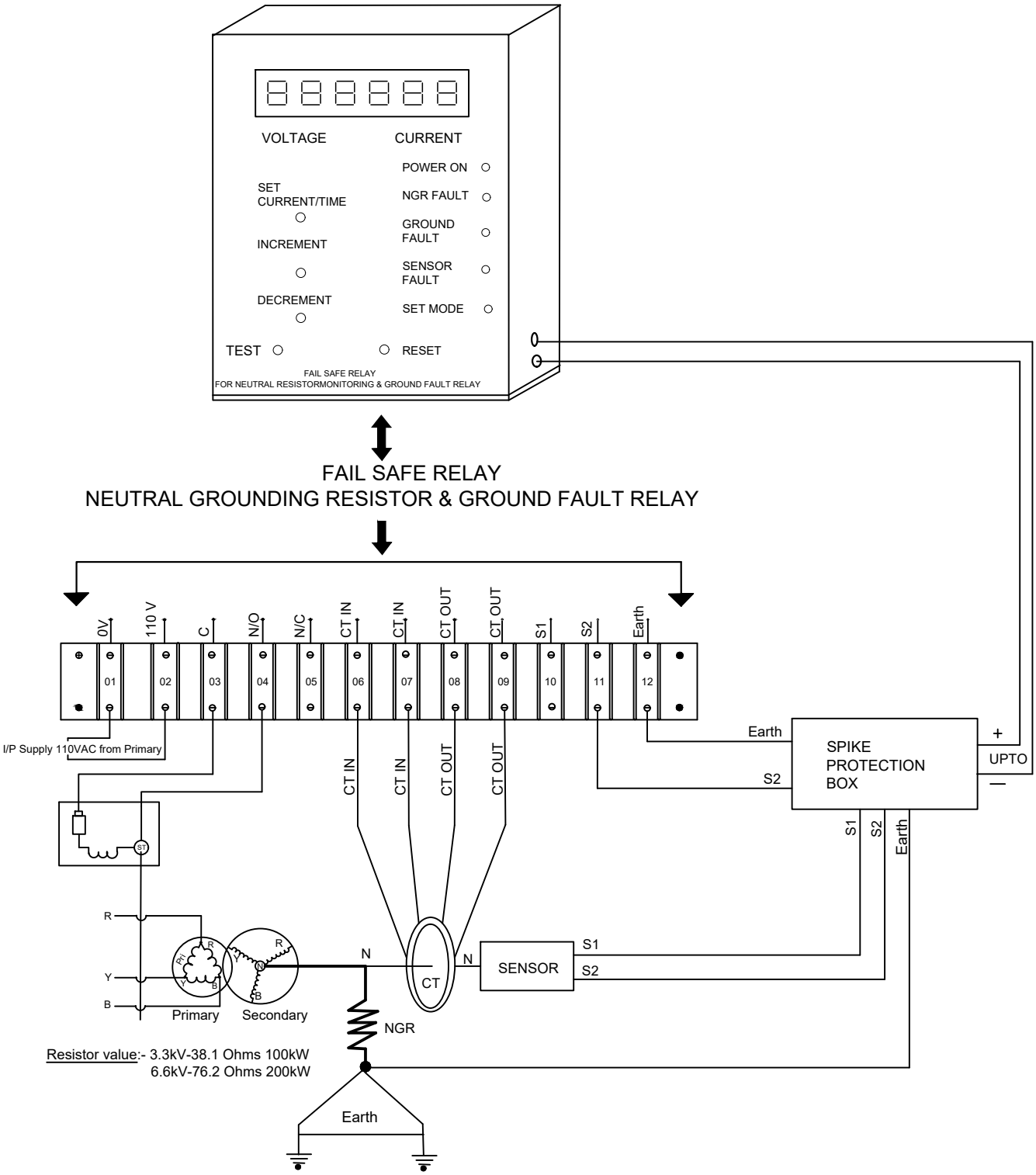
2) For 3.3 KV System: **Resistor: 38 Ohms, 100 K Watts, 10KW Continuous rating.**

3) Operating Temperature: **- 55°C to 375°C.**

4) Dielectric Strength: **2500 VAC for 1 Minute.**

5) Temperature Coefficient: **1000 ppm / °C.**

6) Punch Grid Type: **SS304.**



Wiring diagram of Neutral Grounding resistor & Ground Fault relay

Drw No.	Title : **Wiring diagram of Neutral Grounding resistor & Ground Fault relay**
Sheet No. Date	
Scale	Product :
All Dimension in mm	

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