

UNDERIMPEDANCE RELAY

RBZ


Microelettrica Scientifica

CAT. E3-93

12-01-99

GENERAL CHARACTERISTICS

Single-phase static underimpedance relay (F21) with independent time delay, generally used as generator phase-fault backup protection.

The relay RBZ measures the magnitude of the impedance and trips when its value is below the set level Z_s .

Therefore the relay's operation zone in the R-X diagram is that inside a circle with its centre on the origin of the axes and radius $Z_s = |V| : |I|$.

SETTINGS

Settings are made on front face by means of two DIP-SWITCHES that allow to obtain a wide and accurate setting range of the trip current level as well as of the trip time delay.

SIGNALIZATIONS

- ☐ 1 Green led for signalization of auxiliary supply presence and relay regular operation.
- ☐ 1 Red led for trip signalization.
- ☐ 1 Yellow led for trip memory.

COMMANDS

- ☐ Test spring lever switch: when pressed it simulates an impedance below the set value allowing the complete functional check of the relay as well as of the trip time delay. In one position test function does not operate the output relays; in the other it also operates the output relays.
- ☐ 2-position switch for selection of the rated input current (1 or 5A).
- ☐ ON-OFF switch for blocking of the timed output contacts.
- ☐ Output relays reset after trip can be:
 - manual by reset push button on front face
 - manual by remote push button connected to the terminals provided on the relay
 - automatic by connecting a bridge on remote reset terminals.

The trip memory led can be reset only by the front face reset push button.

OUTPUT RELAYS

Two output relays are provided:

- ☐ R1 with 2 Change-over contacts rating 5A
- ☐ R2, on request, with 1 Change-over contact rating 5A

The output relay R1 is normally deenergized and is energized on trip. On request it can be normally energized (deenergized on trip).

The output relay R2 is normally deenergized and it is energized on trip

APPLICATION: Generator Transformer Block

Protection against faults in the zone including Generator-connection-Transformer's Primary.

The relay should not trip for fault on the secondary side of the Transformer.

The trip level is set to a value lower (0.7-0.8) than 1/2 of Transformer's short circuit impedance:

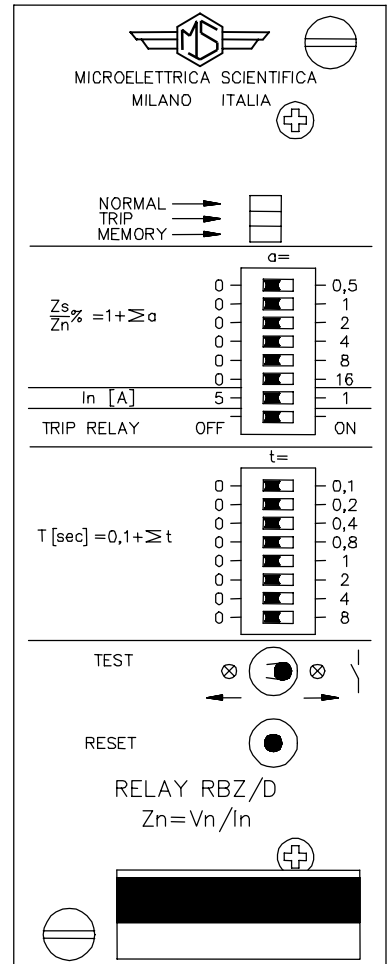
$$[Z_s] = 0.8 \left(\frac{1}{2} Z_T \right) \Rightarrow \text{Relay setting: } \left[\frac{Z_s}{Z_N} \% \right] = [Z_s] \times 100 \times \frac{I_n}{V_n} \times \sqrt{3}$$

Example:

- Transformer: $A_T=10\text{MVA}$; $V_{T1}=5.5\text{kV}$ (generator side); $V_{cc}\%=5\%$ (short circuit voltage)
- CTs Ratio: $K_C=1200/5=240$; PTs Ratio: $K_V=6000/100=60$
- Relay: $V_n=100\text{V}$; $I_n=5\text{A}$

$$Z_T = \frac{V_{T1}^2}{A_T} \times \frac{V_{cc}\%}{100} \times \frac{K_C}{K_V} = \frac{5500^2}{10 \times 10^6} \times \frac{5}{100} \times \frac{240}{60} = 0.6 \Omega$$

$$\left(\frac{Z_s}{Z_N} \right) \% = 0.8 \times \frac{1}{2} Z_T \times 100 \times \frac{5}{100} \times \sqrt{3} \approx 2$$



ORDERING DATA

- Relay Type
- Rated Input Voltage
- Rated Input Current
- Auxiliary Power Supply
- Setting Ranges
- Output Relays Configuration
- Execution
- Options on Request

OPTIONS

On request are provided:

- ☐ Blocking input (BI).
- ☐ Blocking output (BO) relay R2.
- ☐ Start time output (TO) relay R2.

OVERALL DIMENSIONS

See Overall Dimensions - 1 Module Relay.

ELECTRICAL CHARACTERISTICS

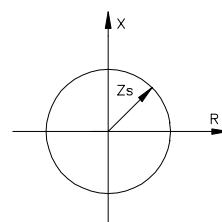
Rated input current	: 1A or 5A	Burden on input current	: 0.05VA @ 1A ; 0.25VA @ 5A
Rated input voltage	: $V_n = 100 \div 380V, 50/60Hz$	Burden on input voltage	: 2 VA @ V_n
Auxiliary supply	:	Burden on power supply	: 3W(d.c.); 6VA(a.c.)
	Type 1	: 24-110 V d.c./a.c. $\pm 20\%$ permanent	
	Type 2	: 90-220 V d.c./a.c. $\pm 20\%$ permanent	

STANDARD SETTING RANGES (Different on request)

Trip level:

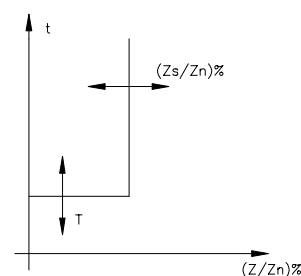
- $Z_s = [1 + (0 \div 31.5)]\%Z_n$ step 0.5% Z_n

$$Z_n = \frac{V_n}{I_n} = \frac{\text{Rated input voltage}}{\text{Rated input current}}$$



Trip time delay:

- $T = [0.1 + (0 \div 16.5)] s$ step 0.1 sec



Operation lock-out:

- $V < 0.1V_n$

WIRING DIAGRAM

