

DIRECTIONAL OVERCURRENT RELAY

RBW


Microelettrica Scientifica

CAT. E1-90

12-01-99

GENERAL CHARACTERISTICS

Two basic versions are available:

- ❑ **RBW/D** functions 32 - 67 - 67N definite time
- ❑ **RBW/I** functions 32 - 67 - 67N inverse time (see time/current curves page 78-79).

The characteristic angle "α" of the measuring direction can be changed over to two different values.

Both versions are fitted, on request, with blocking input and output or with time start output.

SETTINGS

Settings are made on relay's front face by means of 2 DIP-SWITCHES that allow to obtain a wide and accurate range for the trip level as well as for the trip time delay.

SIGNALIZATIONS

- ❑ 1 Green led for signalization of power supply and relay's regular operation.
- ❑ 1 Red led for trip signalization.
- ❑ 1 Yellow led for trip memory.

COMMANDS

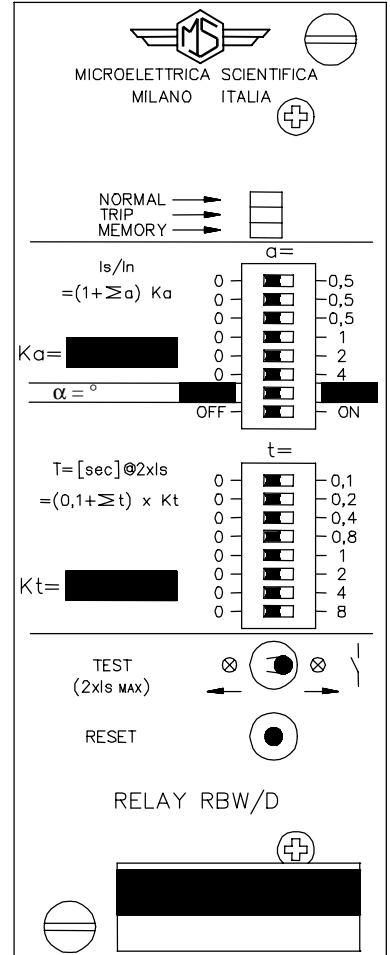
- ❑ Test spring lever switch: when pressed it simulates a current flow of 2 times the rated input current and allows the complete functional check of the relay and of the trip time delay. In one position test function does not operate the output relays; in the other it also operates the output relays.
- ❑ 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 relevant 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 push button.

OUTPUT RELAYS

- ❑ 1 trip relay with 2 Change-over contacts rating 5A
- ❑ 1 blocking output or time start relay with one Change-over contact rating 5A (optional).

The output relays are normally deenergized (energized on trip). On request they can be normally energized (deenergized on trip).



ORDERING DATA

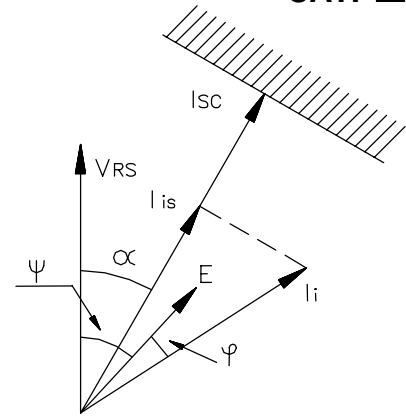
- Relay Type
- Rated Input Current
- Rated Input Voltage
- Auxiliary Power Supply
- Setting Ranges
- Output Relays Configuration
- Execution
- Options on Request

OPERATION

Considering a three phase system, the phase displacement “ ψ ” between the phase-to-neutral voltage “E” of the phase from which the input current “ I_i ” is supplied and the input voltage “ V_i ” to the relay, changes according to the type of connection.

With reference to the figure it is assumed:

- ψ = connection displacement
- α = characteristic angle of the relay
- φ = real phase displacement
- $\varphi_{MS} = \alpha - \psi$ = max sensitivity displacement (max torque angle)
- counter clock wise angles positive



Inside the relay current and voltage are supplied by means of suitable transformers, displacing circuits and amplifiers to a static demodulator the output voltage of which is proportional to the product:

$$I_i \cos(\varphi + \psi - \alpha) = I_{is}$$

The relay operates when $I_{is} > I_{sc}$ i.e. when the input current component in the measuring direction α of the relay exceeds the set level.

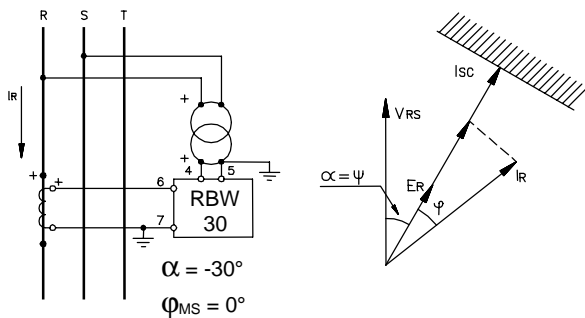
Therefore the relay has its maximum sensitivity when $\cos(\varphi + \psi - \alpha) = 1$, i.e. when $\varphi = \varphi_{MS} = \alpha - \psi$.

Of course the relay does not trip if the input current has a direction opposite to the measuring one.

Tripping is not affected by input voltage variations within large limits (0.03 ÷ 1.5 V_n).

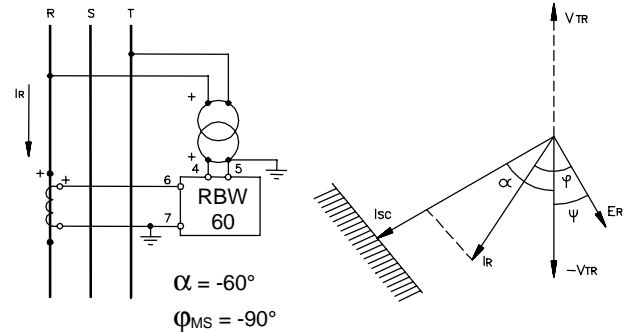
CONNECTION DIAGRAMS

MEASUREMENT OF THE ACTIVE COMPONENT OF CURRENT; REVERSE POWER DETECTION

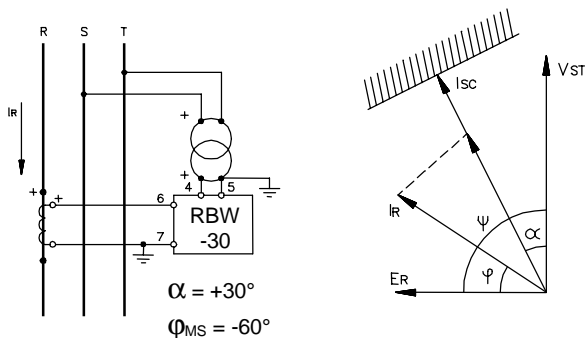


$$V_i = V_{RS} \rightarrow \varphi_{MS} = 180^\circ ; V_i = V_{RS} \rightarrow \varphi_{MS} = 0^\circ$$

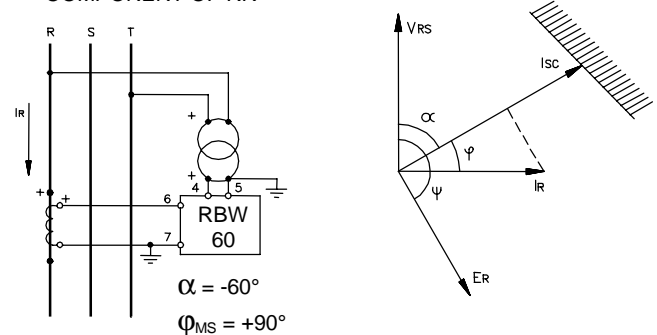
MEASUREMENT OF THE INDUCTIVE COMPONENT OF CURRENT; SYNCHRONOUS MOTOR OUT-OF-STEP



DIRECTIONAL OVERCURRENT DOUBLE PHASE FAULT



MEASUREMENT OF THE CAPACITIVE COMPONENT OF RR



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 power supply	: Type 1 : 24-110 V d.c./a.c. $\pm 20\%$ permanent Type 2 : 90-220 V d.c./a.c. $\pm 20\%$ permanent	Burden on power supply	: 3W(d.c.); 6VA(a.c.)

STANDARD SETTING RANGE (Different on request) – time current curves (page 78-79)

Trip level	: $I_s = [1 + (0 \div 8.5)] \times K_a \times I_n$	
<input type="checkbox"/> $K_a = 0.02$: $I_s = (0.02 \div 0.19) \times I_n$	step $0.01 \times I_n$ (*)
<input type="checkbox"/> $K_a = 0.1$: $I_s = (0.1 \div 0.95) \times I_n$	step $0.05 \times I_n$
<input type="checkbox"/> $K_a = 1$: $I_s = (1 \div 9.5) \times I_n$	step $0.5 \times I_n$
Trip time delay (definite time)	: $T_s = [0.1 + (0 \div 16.5)] K_t \text{ sec}$	
<input type="checkbox"/> $K_t = 0.5$: $T_s = (0.05 \div 8.3) \text{ s}$	step 0.05 s
<input type="checkbox"/> $K_t = 1$: $T_s = (0.1 \div 16.6) \text{ s}$	step 0.1 s (*)
Trip time delay (inverse time)	:	
<input type="checkbox"/> $K_t = 0.5$: $T_s = (0.05 \div 8.3) \text{ s}@2xI_s$	step 0.05 s
<input type="checkbox"/> $K_t = 1$: $T_s = (0.1 \div 16.6) \text{ s}@2xI_s$	step 0.1 s
Characteristic angle	:	
<input type="checkbox"/> $\alpha = (30^\circ), (60^\circ)$ (*)		
<input type="checkbox"/> $\alpha = (-30^\circ), (60^\circ)$		

(*) Standard version

WIRING DIAGRAM

