ASEA

Catalogue RK 47-10 E
Edition 1 January 1972 File R, Part 1

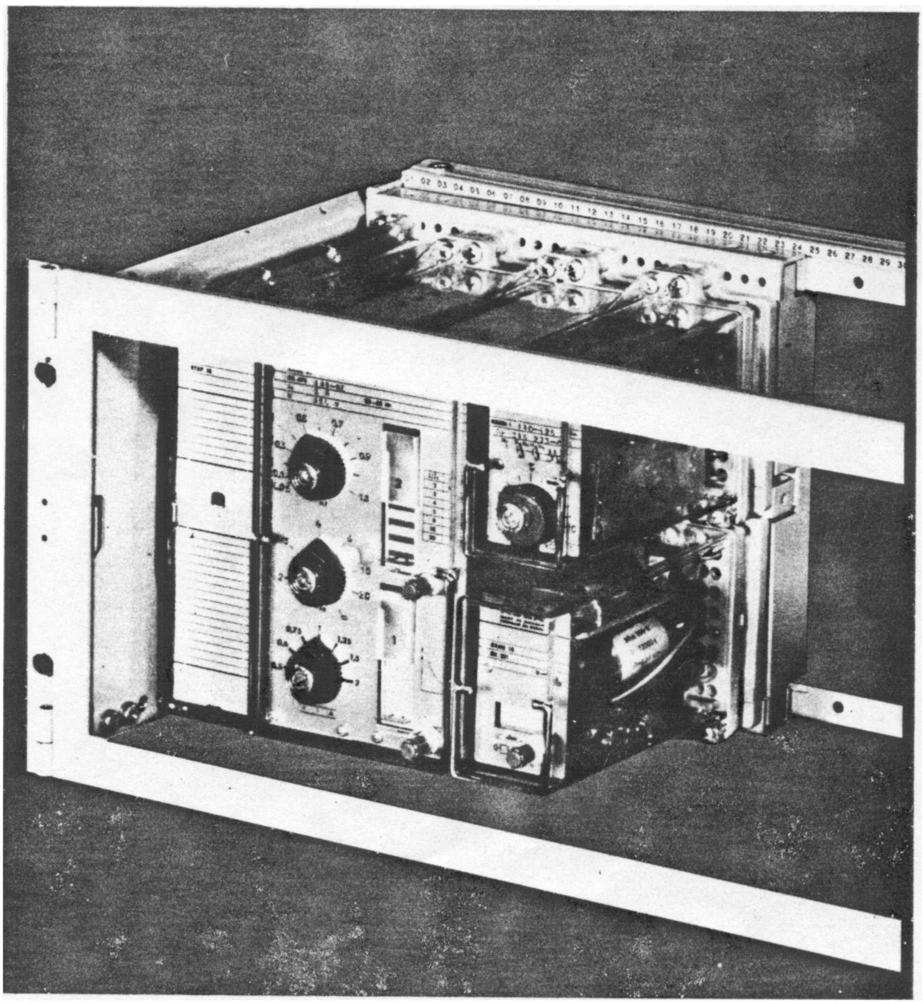
Time-lag over-current relay type RXIDE 4

COMBI FLEX®

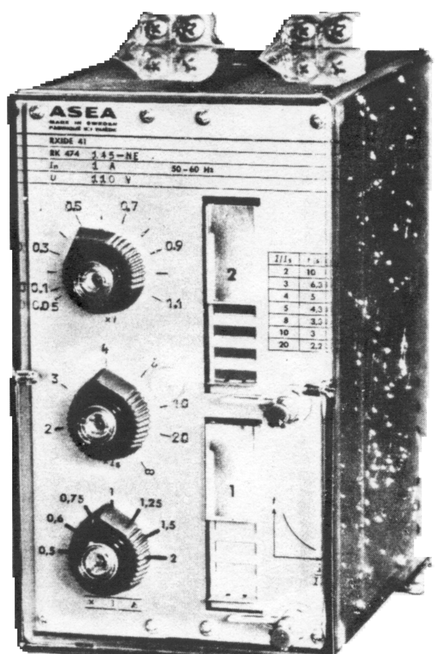
- Single-phase or three-phase design, 50—60 Hz
- Inverse or independent time-lag characteristic
- Adjustable instantaneous operation for high over-currents
- Operation independent of moderate frequency changes
- Low power consumption, approx. 0.1 VA
- Both the delayed and instantaneous operation independent of the d.c. component in the current
- Built-in, sturdy output relays with contacts for starting and tripping
- Indicating flags for both starting and tripping
- The single-phase design occupies 4 seats and the three-phase design 8 seats in the COMBIFLEX® modular system.

Contents Page

Relay protection incorporating time-lag over-current relay type RXIDE 4 mounted on a frame (81687



Time-lag over-current relay type RXIDE 4 (81674)



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General

RXIDE 4 is manufactured in both inverse time-lag and independent time-lag design, for use in single-phase or three-phase systems.
The single-phase version is designed as a four-seat plug-in unit in the COMBIFLEX modular system and is given type designation RXIDE 41. On the front of the relay there are setting knobs for operating current, operating time and operating value for instantaneous operation at high currents.
The three-phase version is composed of two four-seat plug-in units, RXTIE 4 and RXIDE 43.
RXTIE 4 comprises input transformers, rectifiers, etc. On the front of the unit there is a setting knob for operating current.
RXIDE 43 contains the measuring components of the relay as well as the starting and tripping out-put relays. There are setting arrangements for operating time and operating value for instantaneous operation on the front of the relay. Three single-phase RXIDE 41 units can, naturally, be used as a three-phase protection if, for example, indication phases is required.
The relay has built-in instantaneous operation and can be used separately as a non-directional over-current and short-circuit protection for machines, transformers, cables and overhead lines, and in combination with, for example, directional relay RXPE 4 (see Catalogue RK 51-10 E) as directional over-current protection.

Design and mode of operation

The relay's input has a built-in current transformer with several secondary windings with taps, see Fig. 1. Over a switch for setting of the operating current a voltage is taken out across a resistor. This voltage is rectified, smoothed and compared with a reference voltage. When the first mentioned voltage exceeds the reference voltage, the starting relay picks up. At the same time an RC circuit starts charging up. Charging of a relay with an independent time-lag characteristic is done with a stabilised voltage. For a relay with an inverse time-lag characteristic, charging takes place from a voltage which is proportional to the current. For the inverse time-lag relay the required time characteristic is obtained through a combination of zener diodes and resistors used in the RC circuit mentioned. When the capacitor in the RC circuit is charged up to a certain voltage level, the tripping relay also picks up. In the three-phase design, the measuring circuit acquires a voltage which is proportional to the largest of the three currents. Instantaneous operation is obtained through a part of the voltage rectified from the transformer being compared with a reference voltage, and when the latter is exceeded an operation impulse is given to the tripping relay. Indicating flags, which are provided for both starting and tripping, are directly actuated by the armature on each output relay. Flag resetting is done manually. The operation of the relay is illustrated by the block diagram in Fig. 1, in which the various sub-functions of the relay are shown.

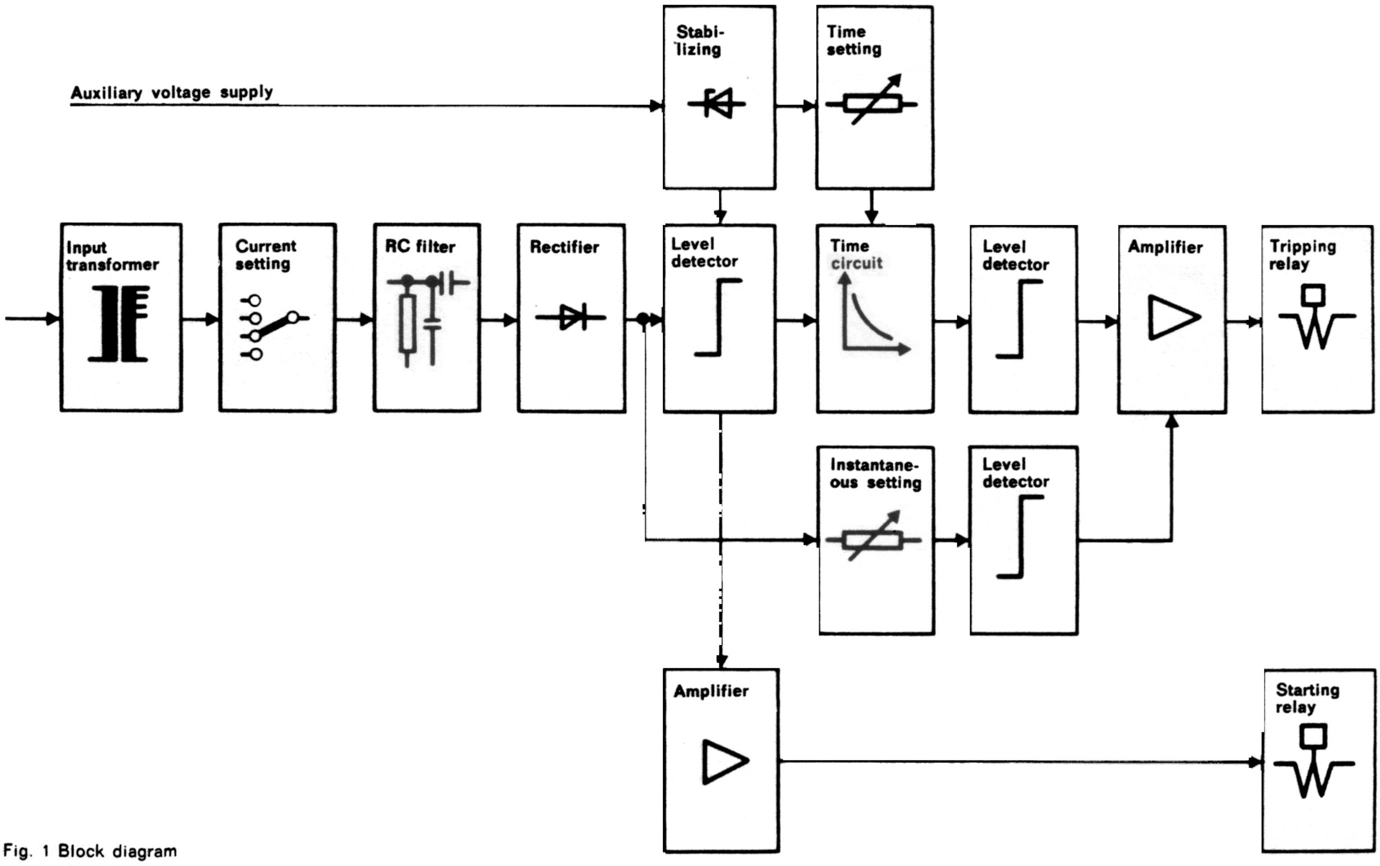


Fig. 1 Block diagram

Current setting

Various operating values can be set using a switch operated by a knob on the front of the relay. Using this switch, various numbers of turns on the secondary side of the input transformer can be connected in. Reconnection takes place with make-before-break operation and can thus be carried out during service as well without risking damage to the transformer.

The scale for the current setting is graduated 0.5, 0.6, 0.75, 1, 1.25, 1.5 and 2, which, multiplied by a scale constant 1, 2, 4 or 8 A gives four versions with the current ranges 0.5—2, 1—4, 2—8 and 4—16 A.

Time setting

On relays with an inverse time-lag characteristic the time is set in multiples of the operating time for various over-currents stated in the table on the front of the relay. For example, a relay with the characteristic "normal inverse" according to BS 142:1966 has in the table a time of 4.3 seconds at a current which is 5 times the set operating value. Thus if the knob is set at 0.8, an operating time of approx. 3.44 seconds (0.8×4.3 seconds) is obtained. The scale is graduated from 0.05 to 1.1. The various operating curves for inverse time-lag versions are shown in Figs. 3, 4 and 5. For relays with an independent time-lag characteristic, where the scale is graduated directly in seconds, the ratio between highest and lowest setting is 10:1.

Instantaneous operation

Instantaneous operation can be set continuously within the range 2—20 times the value I_S. By setting the knob at ∞, instantaneous operation can be totally blocked. Instantaneous operation is independent of any d.c. component in the short-circuit current. When setting, therefore, only the a.c. value of the current need be taken into account.

Starting operation

The time-lag over-current relay is provided with a separate output relay (starting relay) which operates when the current has reached the set operating value I_S.

The starting relay picks up for a current which is 100—107% of the set value.

The starting relay resets, if the tripping relay has not had time to operate for a value >95% of the set operating value. If the tripping relay has dropped out, the reset value is >85%.

The contacts of the starting relay can be utilised for:

- Instantaneous tripping followed by high-speed autoreclosing and delayed definite tripping.
- Blocking of other protective relays in the event of over-currents.
- So-called blocking protection for radial-fed busbars, transformers and cables.
- Operating of a counter for recording the number of faults which have not led to tripping.
- Actuating a separate indicating device.

Indication

The relay is fitted with two indicating flags for both starting and tripping. Start indication is obtained when a yellow flag becomes visible in the lower window, whereas tripping indication is given when a red flag becomes visible in the upper window of the relay. Resetting takes place manually by pushing up the flags in front of the relay. Upon delivery the indicating flags are blocked with a flag locking strip, which can be removed when flag indication is required. See Fig. 2.

Mounting

The static time-lag over-current relays RXIDE 41 and RXIDE 43 as well as RXTIE 4 are four-seat modularised plug-in units in the COMBIFLEX® modular system for relays. They occupy four and eight relay seats for single-phase and three-phase designs, respectively (83×162 mm and 2×(83×162 mm). The relays should be so installed that they are protected from dust, moisture and corrosive atmospheres. A short-circuit device of type RTXK is supplied with each relay for mounting in the terminal bases which the relays are mounted on. RTXK automatically short-circuits the secondary circuit of the current transformer when the relay is removed from the terminal base. The COMBIFLEX system is described in Catalogue RK 92-10 E.

Maintenance

In normal conditions the relays need no special maintenance. Burnt contacts on the output relays should be carefully dressed with a diamond file or extremely fine file. This can be done after the relay cover has been removed and the printed circuit card detached. Abrasives such as emery cloth are unsuitable for dressing the relay contacts, as grit may become detached and remain on the contact surfaces and cause failures through its insulating effect.

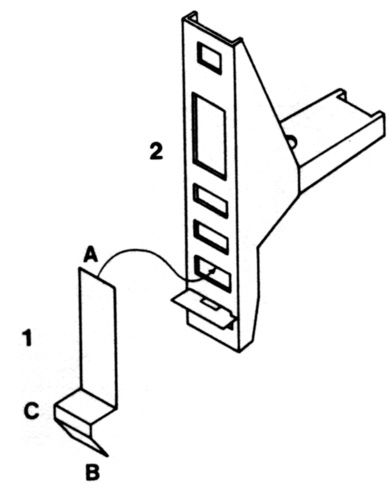


Fig. 2. Removal and insertion of flag locking strip. Normally the flag locking strip (1) is inserted in flag unit (2). To remove, push the angular projection (C) outwards and then pull the strip downwards. When replacing, position the end (A) in the second window from the bottom and then push upwards inside until the end (B) snaps into place in the lowest indicating window.

Technical data

General

Rated frequency 50—60 Hz

Rated current I_n 1.2 and 5 A

Current scales 0.5—2, 1—4, 2—8 and 4—16 A

Auxiliary voltage 24 to 250 V d.c.

Permissible variation +10% and −20 %. For auxiliary voltages higher than 125 V d.c., see table on p 7.

Time scales

Independent time-lag 0.2—2 and 0.6—6 s

Inverse time acc. to BS 142:1966 (See diagrams on page 5)

Instantaneous operation

Setting range Continuous 2—20 times set current I_s

Operating time in the event of an over-current

I=	1.1	1.5	3.0	5.0 × I_s
Make contact	70			
Break contact	60			

Starting operation

Operating value 100—107% of the set current I_s

Operating time in the event of an over-current

I=	1.1	1.5	3.0	5.0 × I_s
Make contact	40			
Break contact	35			

Resetting value

Before tripping operation ⩾95%

After tripping operation ⩾85%

Overshoot time

Independent time-lag

After supply with 10 times I_s ⩽60 ms

Inverse time

After supply with 10 times I_s ⩽70 ms

Resetting time

Independent time-lag

After supply with 2 times I_s ⩽100 ms

After supply with 10 times I_s ⩽150 ms

Inverse time

After supply with 2 times I_s ⩽120 ms

After supply with 10 times I_s ⩽180 ms

Over-load capacity

Continuously,

5 times rated current max. 20 A

For 1 second,

100 times rated current max. 350 A

Power consumption

A. Measuring circuit

The relay's power consumption S_n for the measuring circuit is given at the rated current I_n and for various current settings. For other currents I not mentioned in the table the power consumption is obtained by multiplying S_n by the square of the ratio between the actual current I and the rated current I_n. Example: A relay with the rated current I_n = 5 A, the scale constant = 4 A and the set current I_s = 3 A has the power consumption S_n = 0.09 VA. At an actual current I = 10 A the power consumption is $S = 0.09 \left(\frac{10}{5}\right)^2 = 0.36$ VA.

The power factor of the relay is practically equal to one. For the three-phase version the power consumption refers to each phase.

Rated current I_n A	Scale constant A	Current setting I_s A	Power consumption S_n at rated current VA
			0.07
			0.05
			0.04
			0.03
		1.25	0.03
		1.5	0.02
		2	0.02
			0.08
			0.06
			0.05
2	2		0.04
			0.03
			0.03
			0.03
			0.13
			0.10
			0.09
5	4		0.07
			0.06
			0.05
			0.05
		4	0.06
		4.4	0.05
		6	0.04
5	8	8	0.04
		10	0.03
		12	0.03
		16	0.03

B. Auxiliary voltage circuit

At 24 V	2 W
36 V	3.1 W
48—55 V	3.7—4.2 W
110 V	6 W
125 V	6.6 W
220 V	12.3 W
250 V	14.0 W

Dispersion

Operating value max. ±1 %

Operating time

independent time-lag max. ±2 %

inverse time-lag acc. to BS 142:1966

Dependence on frequency

If the rated frequency is changed ±20%, then the following are changed:

Operating value max. ±2%

Operating time

independent time-lag ±0%

inverse time-lag at time setting 1.0 and current 2—20 times the set value I_s max. ±3%

Dependence on temperature

In the event of changes in temperature in the range −5°C to +40°C the following are altered:

Operating value max. ±2%

Operating time

independent time-lag at the highest scale setting max. ±3%

inverse time-lag at time setting of 1.0 and current 2—20 times the set value I_s max. ±3%

Dependence on auxiliary voltage

In the event of changes in the auxiliary voltage in the range 80—110% of the rated voltage the following are altered:

Operating value max. ±2%

Operating time

independent time-lag at the highest scale setting max. ±1%

inverse time-lag at time setting of 1.0 and current 2—20 times the set value I_s max. ±3%

Test voltage

Current circuit 2500 V, 50 Hz, 1 min.

Other circuits 2000 V, 50 Hz, 1 min.

Contact data

Max. voltage between lines d.c. 300 V, a.c. 250 V

Continuous current carrying capacity 5 A

Making capacity 10 A

Making capacity (200 ms) 30 A

Breaking capacity:

a.c., P.F. ⩾0.1, max. 220 V	10 A
d.c., L/R ⩽40 ms, 48 V	1 A
55 V	1 A
110 V	0.3 A
125 V	0.25 A
220 V	0.15 A
250 V	0.1 A

Weight

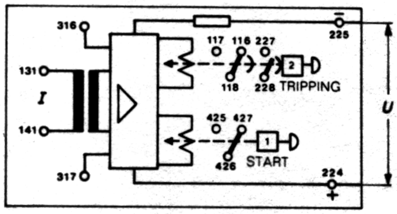
Single-phase design RXIDE 41 2 kg

Three-phase design RXIDE 43 + RXTIE 4 2.0 kg

Ordering data

Single-phase design RXIDE 41

RXIDE 41



Inverse time-lag characteristic

Rated current A	Current scale A	Auxiliary voltage V d.c.	Frequency Hz	Inverse time-lag characteristic according to BS 142:1966 "Extremely inverse" Cat. No.	"Very inverse" Cat. No.	"Normal inverse" Cat. No.
1	0.5—2			RK 474 125-DE	RK 474 135-DE	RK 474 145-DE
2	1—4			-DF	-DF	-DF
5	2—8	24	50—60	-DG	-DG	-DG
5	4—16			-DH	-DH	-DH
To order	To order			-DX	-DX	-DX
1	0.5—2			RK 474 125-FE	RK 474 135-FE	RK 474 145-FE
2	1—4			-FF	-FF	-FF
5	2—8	36	50—60	-FG	-FG	-FG
5	4—16			-FH	-FH	-FH
To order	To order			-FX	-FX	-FX
	0.5—2			RK 474 125-HE	RK 474 135-HE	RK 474 145-HE
	1—4			-HF	-HF	-HF
	2—8	48—55	50—60	-HG	-HG	-HG
	4—16			-HH	-HH	-HH
'o order	To order			-HX	-HX	-HX
1	0.5—2			RK 474 125-NE	RK 474 135-NE	RK 474 145-NE
2	1—4			-NF	-NF	-NF
5	2—8	110	50—60	-NG	-NG	-NG
5	4—16			-NH	-NH	-NH
To order	To order			-NX	-NX	-NX
1	0.5—2			RK 474 125-PE	RK 474 135-PE	RK 474 145-PE
2	1—4			-PF	-PF	-PF
5	2—8	125	50—60	-PG	-PG	-PG
5	4—16			-PH	-PH	-PH
To order	To order			-PX	-PX	-PX
1	0.5—2			RK 474 125-SE	RK 474 135-SE	RK 474 145-SE
2	1—4			-SF	-SF	-SF
5	2—8	220[1])	50—60	-SG	-SG	-SG
5	4—16			-SH	-SH	-SH
To order	To order			-SX	-SX	-SX
	0.5—2			RK 474 125-TE	RK 474 135-TE	RK 474 145-TE
	1—4			-TF	-TF	-TF
	2—8	250[1])	50—60	-TG	-TG	-TG
5	4—16			-TH	-TH	-TH
To order	To order			-TX	-TX	-TX

[1]) See "External series resistors" p 7.

Time

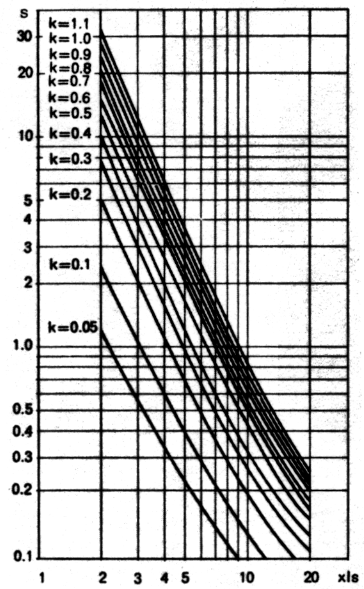


Fig. 3. "Extremely inverse" time according to BS 142:1966, k=time constant

Time

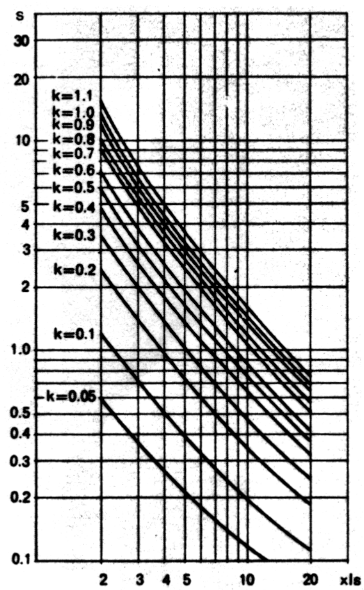


Fig. 4 "Very inverse" time according to BS 142:1966, k=time constant

Time

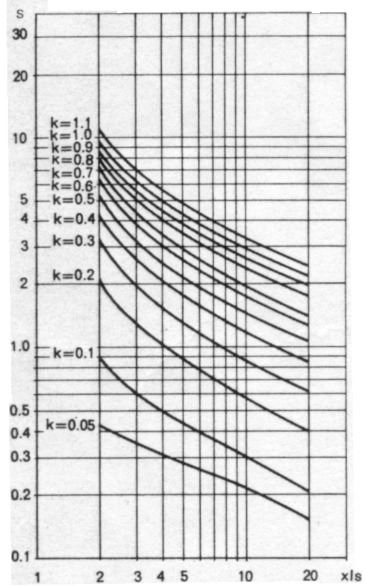


Fig. 5. "Normal inverse" time according to BS 142:1966, k=time constant

Application

Complete protective schemes incorporating RXIDE 4 can be obtained in a number of versions. They include test device type RXTP (see Catalogue RK 92-11 E) and often consist of combinations with other relays. These relay protections are supplied mounted on apparatus bars (see Catalogue RK 92-10 E) for mounting in rack units with supporting frames or in cases type RHGX.

As a directional over-current protection, RXIDE 41 combined with directional relay RXPE 4 can be used (see Catalogue RK 51-10 E). The single-phase relay RXIDE 41 is prepared for this combination. The internal connection between terminals 316 and 317 on RXIDE 41 should first be broken and a make contact on RXPE 4 connected in between these terminals for this purpose. To obtain operation, the contact on the power directional relay must first make. When ordering state whether RXIDE 41 is to be used together with directional relay RXPE 4, as the relay can then be supplied with the connection mentioned already broken (see "Information required when ordering" on p. 4).

In the three-phase design the contacts of the power directional relays are connected in parallel between terminals 222—223 in the circuit between RXIDE 43 and RXTIE 4.

See the symbol for three-phase design at the top of page 7.

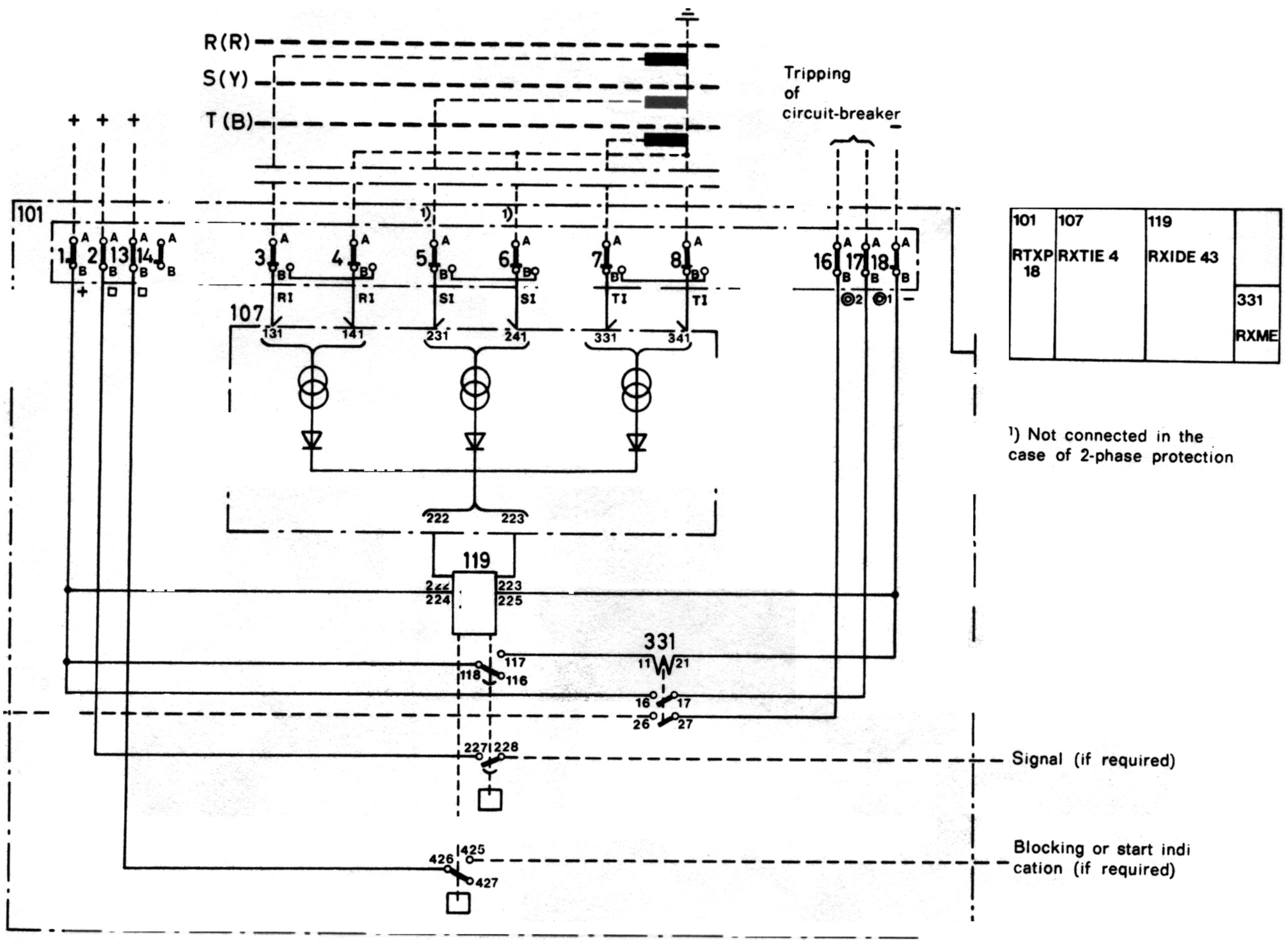


Fig. 5. 2- or 3-phase time-lag over-current protection with RXTIE 4, RXIDE 43 and tripping relay RXME 1

ASEA

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Tidöverströmsreläer typ RXIDE

I beställningstabellen för RXIDE 43 s. 7 har två beställningsnummer blivit omkastade.
RK 474 345 skall vara RK 474 325
RK 474 325 skall vara RK 474 345
Tabellen skall således ha följande utseende:

To avoid mistakes we draw your attention to the incorrect placing of two Cat.Nos. on p.7,which must be reversed. They are RK 474 325 whic should read RK 474 345 and vice versa.

RXIDE 43

Karakteristik	Hjälpspänning V ls	Frekvens Hz	Beställningsnummer
Extremely inverse enl. BS 142 1966	24 36 48—55 110 125 220 250	50—60	
Very inverse enl. BS 142:1966	24 36 48—55 110 125 220 250	50—60	
Normal inverse enl. BS 142:1966	24 36 48—55 110 125 220 250	50—60	
Konstanttid 0,2—2 s	24 36 48—55 110 125 220 250	50—60	
Konstanttid 0,6—6 s	24 36 48—55 110 125 220 250	50—60	

(int.)