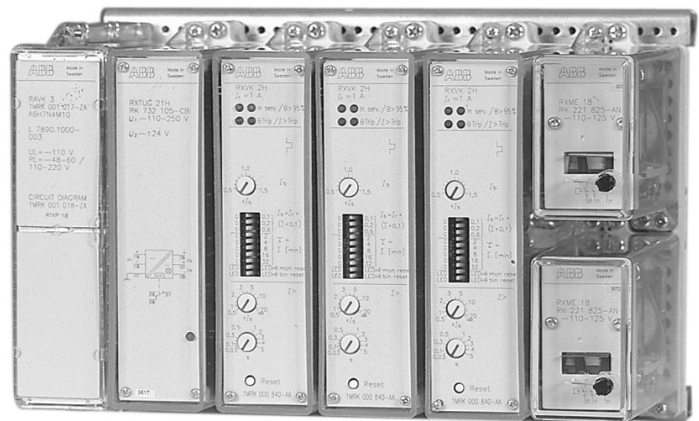


(SE970118)



(SE970139)

## Features

- Thermal overcurrent relay with the same time constants for heating and cooling.
- For protection of motors, generators, transformers, cables and filter reactors.
- Micro-processor based thermal overcurrent relay with continuous settings for time and instantaneous functions.
- Two variants with wide setting ranges:
  - Scale constant  
 $I_s = 0,1, 0,2, 0,4, 1,0 \text{ A}$  or  $0,5, 1,0, 2,0, 5,0 \text{ A}$
  - Thermal basic current  
 $I_b = (0,5-1,5) \times I_s$
  - Overcurrent operate current  
 $I > (0,5-20) \times I_s$
- Thermal time constant programmable 2-62 min in steps of 2 min with the same time constants for heating and cooling.
- Available with optional filter for suppressing frequency dependence 40-2000 Hz
- Relay contacts for  $\Theta > 95\%$  of trip temperature, thermal trip and overcurrent trip.
- Indications for thermal and overcurrent trip,  $\Theta > 95\%$  and in service.
- Overcurrent operation can be delayed up to 5 s for fuse selectivity.
- Binary input; reconnectable for reset LED or reset LED and thermal value.
- Reset ratio typical 95% enables a setting close to maximum service values.
- Recovery time  $< 40 \text{ ms}$  enables small time steps between time selective protection.
- Low transient overreach i.e. the relay is insensitive to dc component in fault current.

## Application

When load currents exceed the permitted continuous current there is an imminent risk that conductors and insulation will be damaged due to overheating. RXVK 2H thermal overcurrent relay effectively prevents such damage and, at the same time, allow full utilization of the protected object.

Time constants from 2 min to 62 min can be selected in steps of 2 min. The thermal time constant,  $\tau$ , is defined as the time required by the protected object to reach 63% of the steady-state temperature,  $\Theta$ , when the object in question is supplied with a constant current, see Fig. 1.

The relay is provided with LEDs for indication in service,  $\Theta > 95\%$  of trip temperature, thermal trip and overcurrent trip.

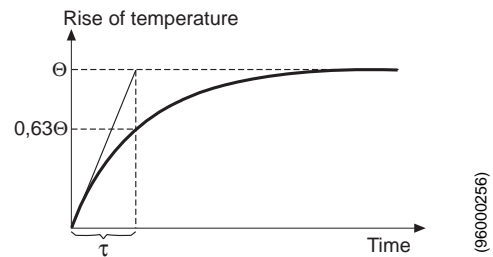


Fig. 1 Definition of thermal time constant.

## Design

The thermal overcurrent relay assemblies with RXVK 2H are available in several variants for single-phase, two-phase and three-phase overcurrent protection with different output circuits. The trip indication is hand reset.

A short-circuiting connector, type RTXK, is delivered with each relay. This connector is mounted on the rear of the terminal base and will automatically short-circuit current input when the relay is removed from the terminal base.

The RXVK 2H relay require a separate dc-dc converter for auxiliary supply ( $\pm 24$  V). One RXTUG converter can supply up to nine relays.

### Note:

When the RXVH 2H relay or the dc-dc converter RXTUG is plugged into or withdrawn from a terminal base, the auxiliary voltage supply must be interrupted. Neither is it allowed to open wiring on plus or minus supply with the unit in service.

### RXVK 2H measuring relay

The thermal overcurrent relay, type RXVK 2H, is a static microprocessor based relay with a thermal stage and a definite time delayed overcurrent stage. The relay consists mainly of an input current transformer (for isolation), filter circuits, microprocessor, HMI, LEDs for start and trip indications and

three output units which provide separate change-over contacts for thermal and overcurrent trips and  $\Theta > 95\%$ . The relay has also one binary input with opto-coupler for external reset of LED or reset of thermal value and LED.

The current for the thermal stage is set on the scale marked  $I_b$ . Operation occurs for a current equal to or larger than the product of set scale value and the selected scale constant ( $I_s$ ) times 1,01 (constant K). The scale constant is selected by dip switches on the front of the relay.

The  $\Theta > 95\%$  output immediately after the measured thermal content exceeds 95% of thermal trip temperature.

The thermal trip will depend of the set time (thermal time constant), and by how much the measured current exceeds set basic the current.

The overcurrent stage  $I >$  operates when the current exceeds the set value. The function can be delayed up to 5 s.

All current and time settings are settable with a programming switch with potentiometers on the front.

The relay is available with optional filter for suppressing frequency dependence 40-2000 Hz.

Technical data

Table 1: Current input

Rated current $I_r$	1 or 5 A
Scale constant $I_s$	(0,1/0,2/0,4 and 1,0) x $I_r$
Scale range 1 A Variant $I_b$ $I >$ 5 A Variant $I_b$ $I >$	0,05-1,5 A 0,05-20 A and $\infty$ 0,25-7,5 A 0,25-100 A and $\infty$
Effective current range	(0,75-65) x $I_s$
Rated frequency $f_r$ Frequency characteristics Frequency range	50-60 Hz Filter options: 50-60 Hz, flat (standard variant), see Fig. 2 40-2000 Hz, flat, see Fig. 3 40-2000 Hz
Power consumption 1 A variant $I = I_s = 0,1$ A $I = I_s = 1$ A 5 A variant $I = I_s = 0,5$ A $I = I_s = 5$ A	0,5 mVA 50 mVA 1 mVA 100 mVA
Over load capacity 1 A variant continuously during 1 s 5 A variant continuously during 1 s	4 A 100 A 20 A 350 A

Technical data (cont'd)

Table 2: Thermal function

Thermal content	Q
Operate current	$k \times I_b$
Constant k	1,01
Basic current $I_b$	Settable (0,5-1,5) $\times I_s$
Alarm level	95% of $\Theta$ for trip operation
Operating range	(0-8) $\times I_b$
Thermal time constant $\tau$	2-62 min, settable in steps of 2 min
Operate time	Equation according to IEC 255-8,1990 $t = \tau \cdot \ln \frac{I^2 - I_p^2}{I^2 - I_b^2 \cdot k^2}$ <p>t = operate time  k = constant = 1,01  <math>I_p</math> = load current before the overload occurs  <math>I_b</math> = set basic current  <math>\tau</math> = set thermal time constant</p>
Accuracy on the operate value	$I = \pm 1\%$ $k = \pm 0,01$ $t = \pm (t_{\text{theoretical}} \times 0,01 + 50 \text{ ms})$
Reset value Alarm Trip Consistency	$\Theta < 95\%$ $\Theta < 80\%$ $< 0,5\%$
Influence of harmonics: 100/120 Hz, 10% 150/180 Hz, 10% 250/300 Hz, 10%	$< 3\%$ $< 3\%$ $< 3\%$

Table 3: Over-current function

RXVK 2H	50-60 Hz, standard filter	40-2000 Hz, flat filter
Setting range $I >$	(0,5-20) $\times I_s$ or $\infty$	
Setting range for time delay Accuracy	0,03-5 s 1% and $\pm 10$ ms	
Operate time (typical) $I = 0 \Rightarrow 1,3 \times I >$ $I = 0 \Rightarrow 3 \times I >$ $I = 0 \Rightarrow 10 \times I >$	Time delay = 0,03 s 35 ms 25 ms 20 ms	
Reset time (typical) $I = 3 \Rightarrow 0 \times I >$ $I = 20 \Rightarrow 0 \times I >$	35 ms 60 ms	
Reset ratio (typical) Consistency	95% $< 1,5\%$	
Transient over-reach L/R=10, 50 and 100 ms	$< 5\%$	$< 20\%$
Operate value at 150 Hz	App. 1,5 $\times$ set op. value	–
Operate value within the range 40-2000 Hz	–	$< 1,1 \times$ set op. value
Overshoot time	$< 20$ ms	
Recovery time at $I = 3 \times I >$	$< 40$ ms	
Influence of harmonics: 100/120 Hz, 10% 150/180 Hz, 10% 250/300 Hz, 10%	$< 3\%$ $< 3\%$ $< 3\%$	– – –

Operate current/set operate current

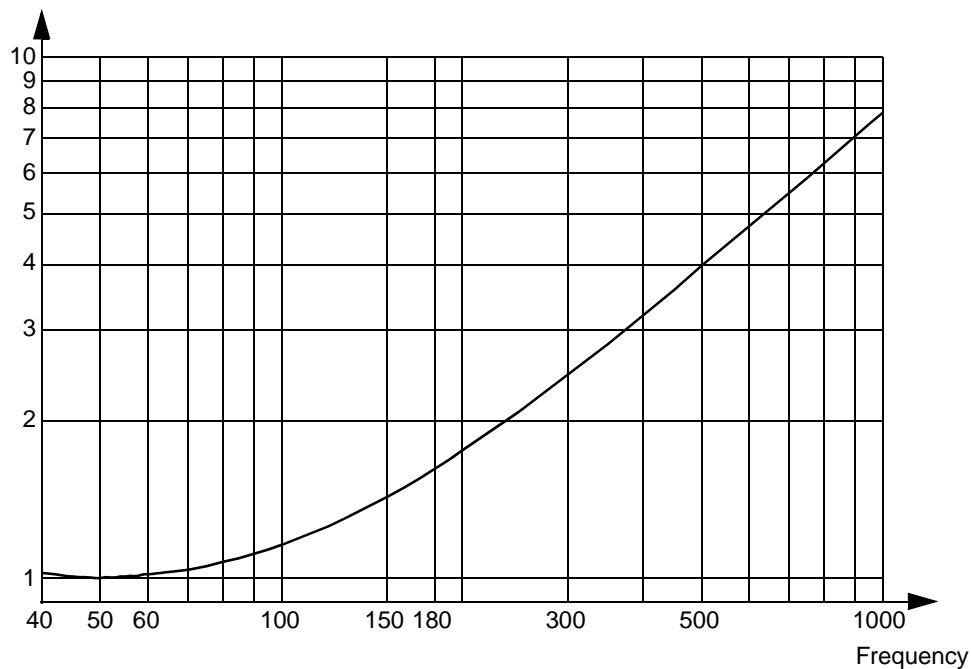


Fig. 2 Typical frequency characteristic for RXVK 50-60 Hz, standard, valid for  $I \leq 65 \times I_s$ .

Operate current/set operate current

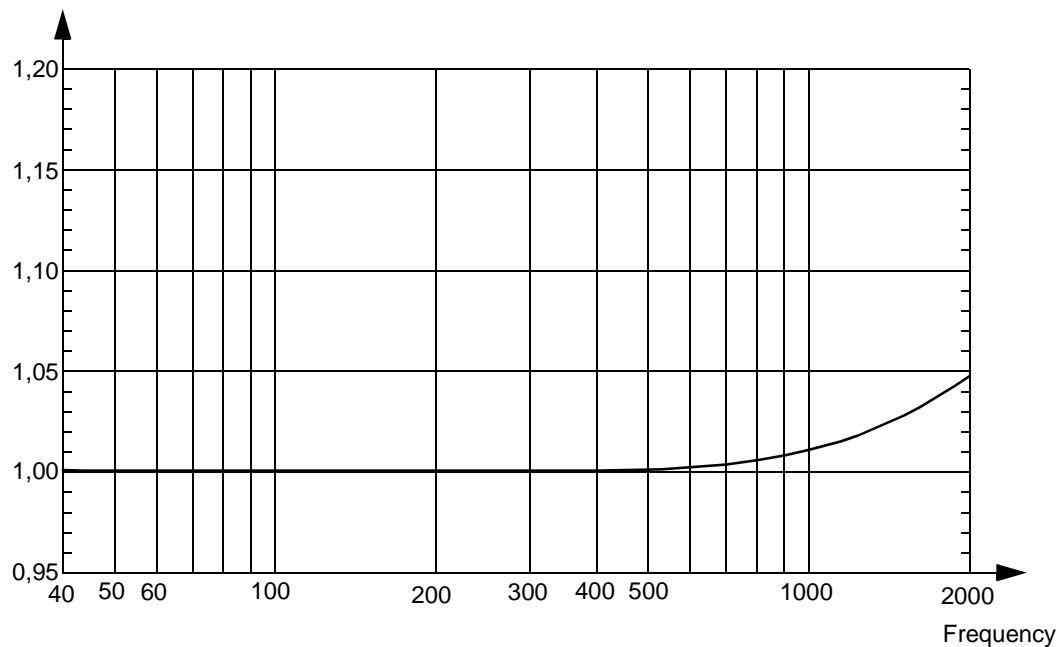


Fig. 3 Typical frequency characteristic for RXVK 40-2000 Hz, flat, valid for  $I \leq 65 \times I_s$ .

Technical data (cont'd)

**Table 4: Auxiliary DC voltage supply**

Auxiliary voltage EL for RXTUG 22H Auxiliary voltage to the relay	24-250 V DC, $\pm 20\%$ $\pm 24$ V (from RXTUG 22H)	
Power consumption at RXTUG 22H input 24-250 V before operation after operation without RXTUG 22H $\pm 24$ V before operation after operation	Standard Max. 4,5 W Max. 6,0 W	other filter Max. 5,5 W Max. 6,5 W Max. 1,3 W Max. 2,0 W Max. 3,0 W

**Table 5: Binary input**

Binary input voltage RL	48-60 V and 110-220 V DC, -20% to +10%
Power consumption 48-60 V 110-220 V	Max. 0,3 W Max. 1,5 W

**Table 6: Output relays**

Contacts	3 change-over
Maximum system voltage	250 V AC / DC.
Current carrying capacity continuous during 1 s	5 A 15 A
Making capacity at inductive load with L/R >10 ms during 200 ms during 1 s	30 A 10 A
Breaking capacity AC, max. 250 V, $\cos \varphi > 0,4$ DC, with L/R < 40 ms 48 V 110 V 220 V 250 V	8 A 1 A 0,4 A 0,2 A 0,15 A

**Table 7: Electromagnetic disturbance tests**

All tests are done together with the DC/DC-converter, RXTUG 22H

Test	Severity	Standard
Surge immunity test	1 and 2 kV, normal service 2 and 4 kV, destructive test	IEC 61000-4-5, class 3 IEC 61000-4-5, class 4
AC injection test	500 V, AC	SS 436 15 03, PL 4
Power frequency field immunity test	1000 A/m	IEC 61000-4-8
1 MHz burst test	2,5 kV	IEC 60255-22-1, class 3
Spark test	4-8 kV	SS 436 15 03, PL 4
Fast transient test	4 kV	IEC 60255-22-4, class 4
Electrostatic discharge test In normal service with cover on	8 kV (contact) 15 kV (air) 8 kV, indirect application	IEC 60255-22-2, class 4 IEC 60255-22-2, class 4 IEC 61000-4-2, class 4
Radiated electromagnetic field test	10 V/m, 26-1000 MHz	IEC 61000-4-3, level 3
Conducted electromagnetic test	10 V, 0,15-80 MHz	IEC 61000-4-6, level 3
Interruptions in auxiliary voltage 110 VDC, no resetting for interruptions	2-200 ms < 40 ms	IEC 60255-11

Table 8: Electromagnetic emission tests

Test	Severity	Standard
Conducted	0,15-30 MHz, class A	EN 50081- 2
Radiated emission	30-1000 MHz, class A	EN 50081- 2

Table 9: Insulation tests

Test	Severity	Standard
Dielectric test current circuit other circuits over open contact	2,5 kV AC, 1 min 2,0 kV AC, 1 min 1,0 kV AC, 1 min	IEC 60255-5
Impulse voltage test	5 kV, 1,2/50 $\mu$ s, 0,5 J	IEC 60255-5
Insulation resistance	> 100 M $\Omega$ at 500 V DC	IEC 60255-5

Table 10: Mechanical tests

Test	Severity	Standard
Vibration	Response: 2,0 g, 10-150-10 Hz Endurance: 1,0 g, 10-150-10 Hz, 20 sweeps	IEC 60255-21-1, class 2 IEC 60255-21-1, class 1
Shock	Response: 5 g, 11 ms, 3 pulses Withstand: 15 g, 11 ms, 3 pulses	IEC 60255-21-2, class 1
Bump	Withstand: 10 g, 16 ms, 1000 pulses	IEC 60255-21-2, class 1
Seismic	X axis: 3,0 g, 1-35-1 Hz Y axis: 3,0 g, 1-35-1 Hz Z axis: 2,0 g, 1-35-1 Hz	IEC 60255-21-3, class 2, extended (Method A)

Table 11: Temperature range

Storage	-20 °C to +70 °C
Permitted ambient temperature	-5 °C to +55 °C

Table 12: Weight and dimensions

Equipment	Weight	Height	Width
RXVK 2H without RXTUG 22H	0,7 kg	4U	6C

## Diagrams

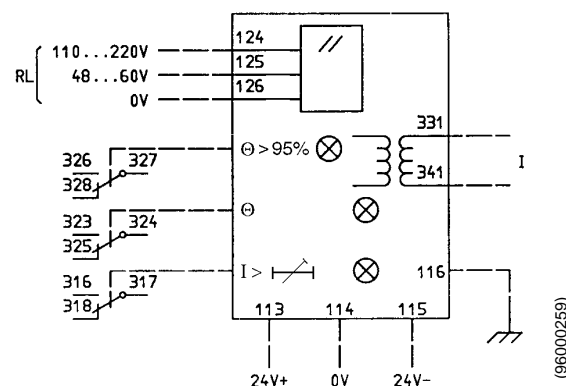


Fig. 4 Terminal diagram RXVK 2H.

## Diagrams (cont'd)

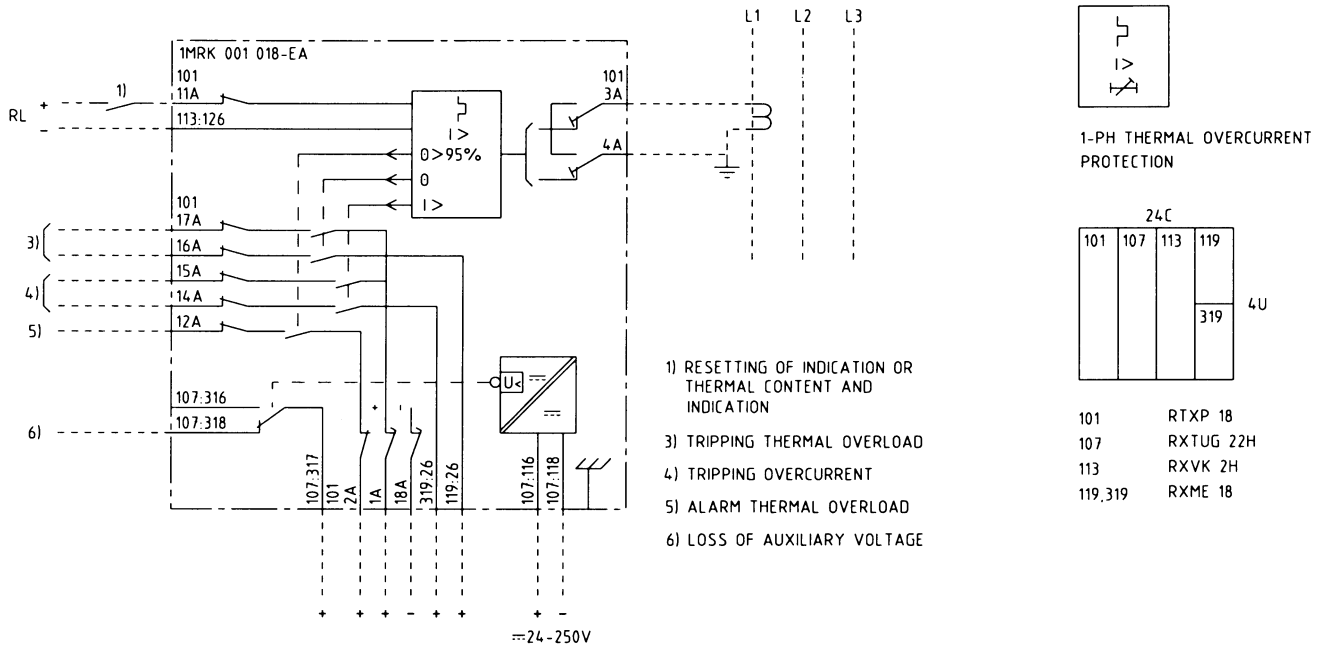


Fig. 5 Terminal diagram 1MRK 001 018-EAA

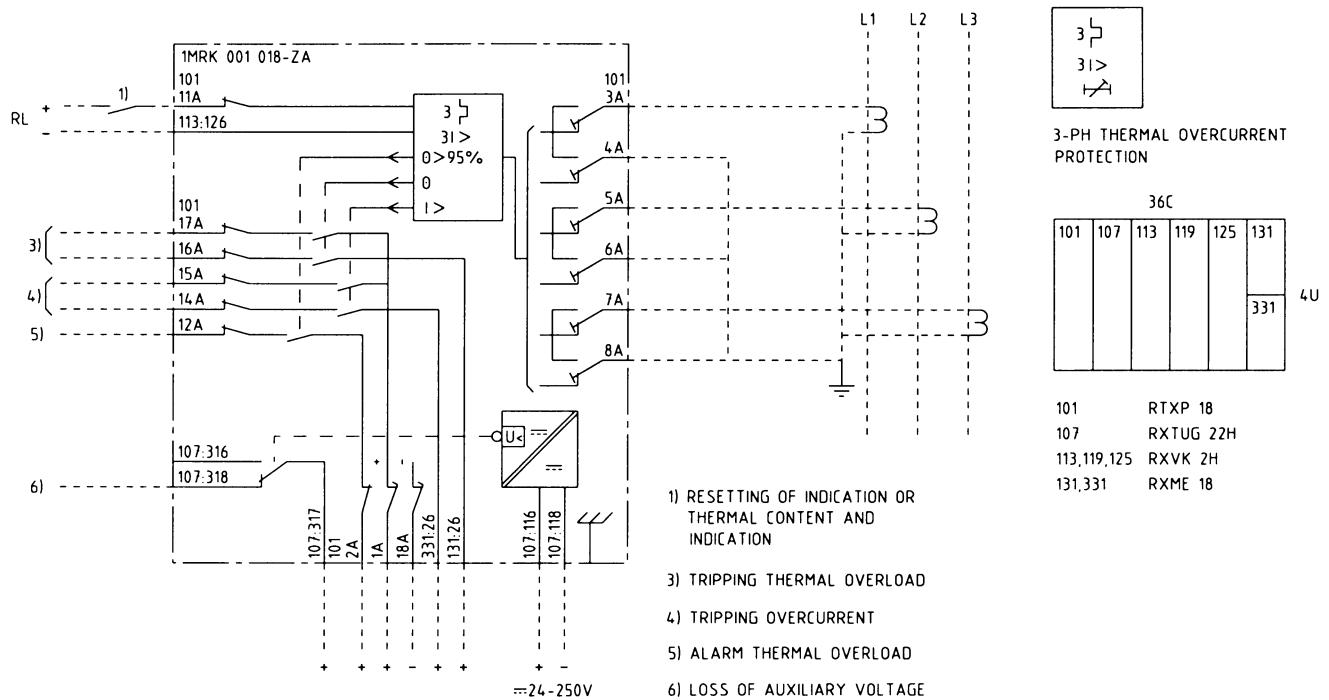


Fig. 6 Terminal diagram 1MRK 001 018-ZAA

**Protection assemblies**

**RAVK**

Protection assemblies are built up based upon time thermal overcurrent relay RXVK 2H. Test device RXTTP 18 and dc/dc-converter RXTUG 22H can also be included for specific application requirements. Test device RTXP 18 is a tool for relay testing.

DC/DC-converter RXTUG 22H can be used either separately for a single protection or to feed also other protections with up to 9 units of the same relay family. With RXTUG 22H all requirements concerning disturbance emission and immunity with this protection assembly will be met.

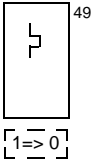

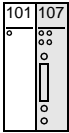
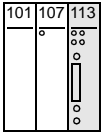
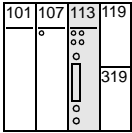
The assemblies have output contacts as specified for the relay RXVK 2H, which in most cases are fully sufficient.

Protections are normally available with output logic with heavy duty relay RXME 18 (RK 221 825-XX) with indicating flag and can upon request be completed with an output logic of free choice. Output relays are connected to separate auxiliary voltage.

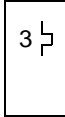

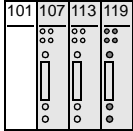
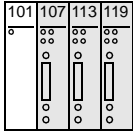
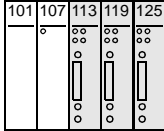
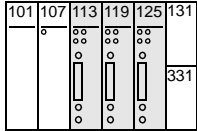
The extremely flexible mounting system COMBIFLEX together with a modern CAD-system enables us to present a unique flexibility for designing assemblies upon the customers requests.

The interface voltage for enable or block impulses can be connected to either 48-60 V dc or 110-220 V dc by connecting the voltage circuit to separate terminals. At delivery all relays are connected for 110-220 V dc.

**RAVK 1 Single-phase thermal overcurrent protection**

				
	<p>101RTP 18 107RXVK 2H</p>	<p>101RXTUG 22H 107RXVK 2H</p>	<p>101RTP 18 107RXTUG 22H 113RXVK 2H</p>	<p>101RTP 18 107RXTUG 22H 113RXVK 2H 119RXME 18 319RXME 18</p>
	<p>Order No.    Circuit diagram</p>	<p>Order No.    Circuit diagram</p>	<p>Order No.    Circuit diagram</p>	<p>Order No.    Circuit diagram</p>
<b>Standard</b>	<p>1MRK    1MRK 001 017-BS    001 018-BA</p>	<p>1MRK    1MRK 001 017-CS    001 018-CA</p>	<p>1MRK    1MRK 001 017-DS    001 018-DA</p>	<p>1MRK    1MRK 001 017-ES    001 018-EA</p>
<b>Filter</b>	<p>1MRK    1MRK 001 017-BA    001 018-BA</p>	<p>1MRK    1MRK 001 017-CA    001 018-CA</p>	<p>1MRK    1MRK 001 017-DA    001 018-DA</p>	<p>1MRK    1MRK 001 017-EA    001 018-EA</p>

RAVK 3 Three-phase thermal overcurrent protection

 49 				
	101RTPX 18 107RXVK 2H 113RXVK 2H 119RXVK 2H	101RXTUG 22H 107RXVK 2H 113RXVK 2H 119RXVK 2H	101RTPX 18 107RXTUG 22H 113RXVK 2H 119RXVK 2H 125RXVK 2H	101RTPX 18 107RXTUG 22H 113RXVK 2H 119RXVK 2H 125RXVK 2H 131RXME 18 331RXME 18
	Order No.    Circuit diagram <b>Standard</b> 1MRK            1MRK 001 017-NS    001 018-NA	Order No.    Circuit diagram <b>Standard</b> 1MRK            1MRK 001 017-YS    001 018-YA	Order No.    Circuit diagram <b>Standard</b> 1MRK            1MRK 001 017-PS    001 018-PA	Order No.    Circuit diagram <b>Standard</b> 1MRK            1MRK 001 017-ZU    001 018-ZA
	Order No.    Circuit diagram <b>Filter</b> 1MRK            1MRK 001 017-NA    001 018-NA	Order No.    Circuit diagram <b>Filter</b> 1MRK            1MRK 001 017-YA    001 018-YA	Order No.    Circuit diagram <b>Filter</b> 1MRK            1MRK 001 017-PA    001 018-PA	Order No.    Circuit diagram <b>Filter</b> 1MRK            1MRK 001 017-ZA    001 018-ZA

Mounting alternatives

All assemblies can be delivered in the following mounting alternatives:

- on apparatus bars (standard)
- in equipment frame 60C
- in RHGS
- in RHGX

Ordering

Specify RAVK (Protection):

- Quantity
- Ordering number
- Code A, H, M
- Desired wording on the lower half of the test switch face plate max. 13 lines with 14 characters per line.

Specify RXVK (Loose relay):

- Quantity
- Ordering number

Thermal overcurrent relay, standard 50-60 Hz (flat)

Type	Rated current	Filter	Article No.	Code
RXVK 2H	1 A	50-60 Hz (flat)	1MRK 000 840-AA	<input type="checkbox"/> A1
RXVK 2H	5 A	50-60 Hz (flat)	1MRK 000 840-HA	<input type="checkbox"/> A6

Thermal overcurrent relay, filter 40-2000 Hz (flat)

Type	Rated current	Filter	Article No.	Code
RXVK 2H	1 A	40-2000 Hz (flat)	1MRK 000 840-DA	<input type="checkbox"/> A4
RXVK 2H	5 A	40-2000 Hz (flat)	1MRK 000 840-MA	<input type="checkbox"/> A9

**Auxiliary voltage**

For included auxiliary relays

	<b>Code</b>
24 V dc	<input type="checkbox"/> H5
48-55 V dc	<input type="checkbox"/> H6
110-125 V dc	<input type="checkbox"/> H7
220-250 V dc	<input type="checkbox"/> H8

**Mounting**

<b>Mounting alternatives</b>	<b>Size</b>	<b>Article No.</b>	<b>Code</b>
Apparatus bars			<input type="checkbox"/> M10
Equipment frame without door	4U 19"	1MRK 000 137-GA	<input type="checkbox"/> M11
Equipment frame with door	4U 19"	1MRK 000 137-KA	<input type="checkbox"/> M12
RHGX 4	4U 12C	RK 927 001-AB	<input type="checkbox"/> M71
RHGX 8	4U 24C	RK 927 002-AB	<input type="checkbox"/> M72
RHGX 12	4U 36C	RK 927 003-AB	<input type="checkbox"/> M73
RHGX 20	4U 60C	RK 927 004-AB	<input type="checkbox"/> M74
RHGS 30	6U x 1/1 19" rack	1MRK 000 315-A	<input type="checkbox"/> M81
RHGS 12	6U x 1/2 19" rack	1MRK 000 315-B	<input type="checkbox"/> M82
RHGS 6	6U x 1/4 19" rack	1MRK 000 315-C	<input type="checkbox"/> M83

**References**

Connection and installation components in COMBIFLEX	1MRK 513 003-BEN
Relay accessories COMBIFLEX	1MRK 513 004-BEN
Test system COMBITEST	1MRK 512 001-BEN
User's Guide RXVK	1MDU09026-EN

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