



(SE970175)

(SE970184)

Features

- Micro-processor based impedance relay with R and X settings for operate values and built in time delay functions
- Characteristic angle settable 0° to 120°
- Three variants with wide setting ranges:
 - RXZK 21H: one zone + time function
 - RXZK 22H: two impedance measuring zones
 - RXZK 23H: one zone + out-of-step function
- Definite time delay settable 0,1-5 s on second measuring stage
- Directional function with settable characteristic angle 0° to +120° and memory
- Assemblies
- Independent measuring elements with indications built in
- Test switch and heavy-duty start and trip output contacts are available as options

Application

The RXZK family of single phase directional and non directional impedance relays are intended for general purpose use in power systems as primary or back-up functions often in combination with other protective relays. The quadrilateral impedance reach characteristic is independently adjustable in the reactive and resistive direction. Forward, reverse and non directional functions are available. Applications of RXZK 21 and 22H include single zone and two zone impedance protection of transformers, generators, lines and cables. Where it is necessary to obtain the same reach for two-phase and three-phase faults the relay assembly should be connected

to measure delta-current i.e. $I_R - I_S$ and phase to phase voltage i.e. $U_R - U_S$ for each measuring elements respectively. The delta current can be derived using a auxiliary CT's or sometimes by connecting the main CT in delta (e.g together with the transformer differential relays. The RXZK 23H is intended for detecting out of step conditions for tie-lines and synchronous generators and motors. The RXZK 23H includes a current reversal logic in order to set up a trip condition. This ensures that the relay will not trip on stable swing conditions, i.e. swings not resulting in a current reversal.

Design

The impedance relay assemblies with RXZK are available in several variants with different output circuitries.

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

The RXZK relay requires a separate dc-dc converter for auxiliary supply (± 24 V). One RXTUG 22H converter can supply up to nine relays.

Note: When the RXZK relay or the dc-dc converter 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 unit in service.

The impedance relay, type RXZK 2H, is a microprocessor based relay. The relay consists mainly of two input transformers, one for current and one for voltage measuring, filter circuits, microprocessor, HMI, LEDs for indications of relay in service, trip of directional function, trip of stage one and trip of stage two, and three output units which provide separate change-over contacts for trip functions equal to the LEDs. The relay is also equipped with two binary inputs, one for blocking all functions and the other for reset and blocking of LEDs.

The impedance operate value of RXZK 22H for stage 1 is set on the scale marked Z1 on the front of the relay.

The impedance setting is $Z1 = R1 + X1$, where the resistive setting follows the formula

$$R1 = X1 \times k \ (\Omega).$$

The reactive setting follows the formula

$$X1 = P1 \times \frac{1}{I_s} \ (\Omega)$$

k is a constant settable with the programming switches, and P1 (and P2 for stage 2) is set by a rotating switch on the front of the relay.

This setting is made in the same way for the second measuring stage.

The characteristic angle α is settable between 0° to 120° and is common for both stages.

The function of Z2 can be blocked within the b angle setting of 0° - 45° .

The directional function, Z_{α} , is settable for a characteristic angle follows α setting with the function range of Z2.

Z1 and D1 outputs operate instantaneously when the measured value decreases the set value, while Z2 can be delayed from 0,1 to 10 s or give a pulsed output of 0,1-10 s.

Technical data

Table 1: Rated values

| RXZK 21H | | |
|---|--|---|
| Rated voltage U_r | 100 V | |
| Rated current I_r | 1 A or 5 A | |
| Scale constant I_s | $(0,1\ 0,2\ 0,4\ \text{and}\ 1,0) \times I_r$ | |
| Setting ranges 1 A Variant 5 A Variant | 0,1-1 A 0,5-5 A | |
| Effective voltage range U | 10-200 V | |
| Effective current range | $(0,5-50) \times I_s$ | |
| Rated frequency f_r | 50-60 Hz | |
| Setting range: | | |
| Under-impedance function (Z <) $I_s = 0,1/0,5$ $I_s = 0,2/1$ $I_s = 0,4/2$ $I_s = 1$ | Rated current 1A 10-200 Ω 5-100 Ω 2, 50 Ω 1-20 Ω | Rated current 5A 2-40 Ω 1 20 Ω 0,5-10 Ω 0,2-4 Ω |
| Operation condition: | | |
| Under-impedance function Z< | $Z = jX + R$ | |
| Reactive reach x | $1-20\ X = x \cdot 1/I_s\ (\Omega)$ | |
| Resistive reach r | $1-20\ R = r \cdot 1/I_s\ (\Omega)$ | |
| Directional function $Z\alpha<$ | Same range as under-impedance function Z<, see Fig. 1. | |
| Auxiliary voltage EL | 24-250 Vdc, $\pm 20\%$ (RXTUG 22H with output voltage $\pm 24\ V$) | |
| Binary input voltage RL | Reconnectable 48-60 V and 110-220 VDC, -20% to +10% | |
| Maximum current 1 A variant continuously 5 A variant continuously 1 A variant during 1 s 5 A variant during 1 s | 4 A 20 A 100 A 350 A | |
| Maximum voltage continuously during 10 s | 250 V 300 V | |
| Power consumption: | | |
| Current circuit $I = I_s = 0,1/0,5\ A$ $I = I_s = 1/5A$ | < 0,002 VA < 0,1 VA | |
| Voltage circuit $U = U_r$ | < 0,2 VA | |
| Auxiliary circuit | Max 3,0 W before and max 4,0 W after operation (without RXTUG 22H) | |
| Binary input 48-60 V 110- 220 V | Max 0,3 W Max 1,5 W | |
| Permissible ambient temperature | -5 to +55 °C | |
| Storage temperature | -20 to +70 °C | |

Technical data (cont'd)

Table 1: Rated values

| Impedance function | Z< | Z _α < |
|------------------------|---------------|------------------|
| Operate time (typical) | 50 ms | 50 ms |
| Reset time (typical) | 50 ms | 50 ms |
| Reset ratio (typical) | 110% | 110% |
| Time function | | |
| Time delay | Definite time | – |
| Setting range | 0-5 s | – |

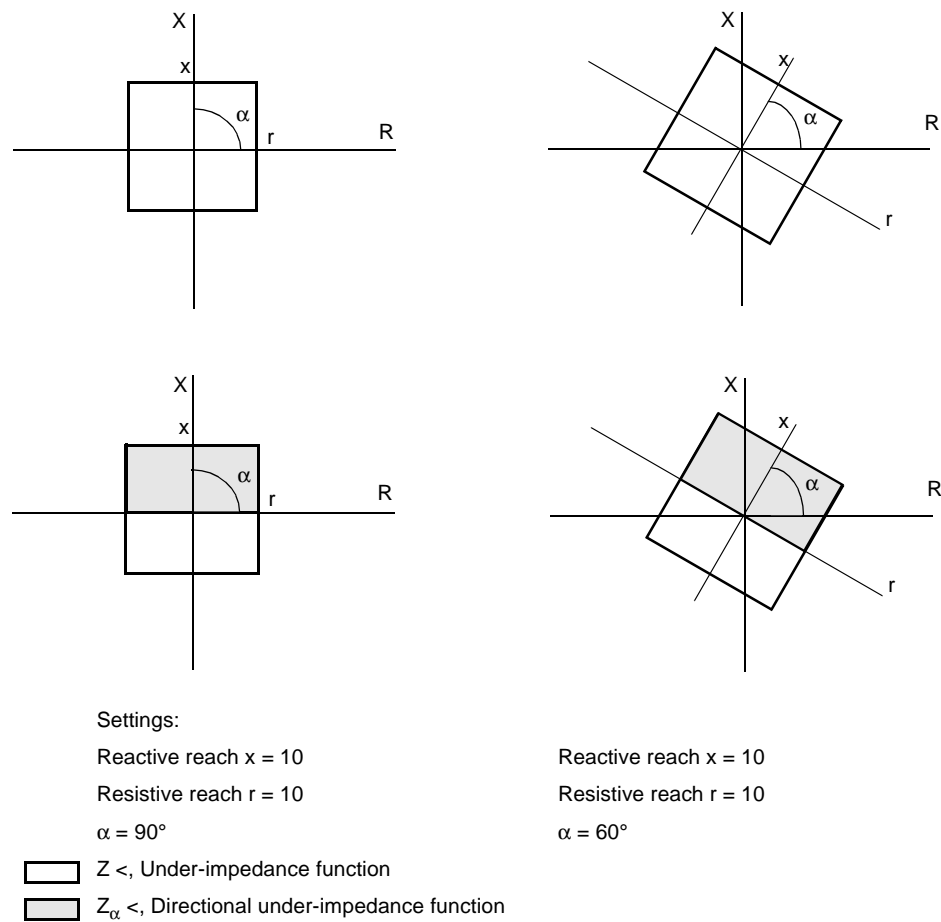


Fig. 1 Characteristic for the under-impedance function

Table 1: Rated values

| RXZK 22H | | | | |
|--|---|-----------------|------------------|-----------------|
| Rated voltage U_r | 100 V | | | |
| Rated current I_r | 1 A or 5 A | | | |
| Scale constant I_s | (0,1 0,2 0,4 and 1,0) x I_r | | | |
| Setting ranges 1 A Variant 5 A Variant | 0,1-1 A 0,5-5 A | | | |
| Effective voltage range U | 10-200 V | | | |
| Effective current range | (0,5-50) x I_s | | | |
| Rated frequency f_r | 50-60 Hz | | | |
| Characteristic angle α | 0-120°, see Fig. 1 | | | |
| Characteristic angle β | 0, 15, 30 and 45°, see Fig. 1 | | | |
| Setting range for Z1< and Z2< | Rated current 1A | | Rated current 5A | |
| Under-impedance function | X-axis | R-axis | X-axis | R-axis |
| $I_s = 0,1 / 0,5$ | 20-100 Ω | 12-200 Ω | 4-20 Ω | 2,4-40 Ω |
| $I_s = 0,2 / 1$ | 10-50 Ω | 6-100 Ω | 2-10 Ω | 1,2-20 Ω |
| $I_s = 0,4 / 2$ | 5-25 Ω | 3-50 Ω | 1-5 Ω | 0,6-10 Ω |
| $I_s = 1 / 5$ | 2-10 Ω | 1,2-20 Ω | 0,4- 2 Ω | 0,24-4 Ω |
| Operation conditions: | | | | |
| Under-impedance zone 1 | $Z1 = jX1 + R1$ | | | |
| Z1< non-directional Setting range P1 Reactive reach x Resistive reach r Constant k | Instantaneous operation 2-10 $X1 = P1 \times 1/I_s$ (Ω) $R1 = X1 \times k$ (Ω) (0,6-2,0) x P1, in steps of 0,2 | | | |
| Under-impedance zone 2 | $Z2 = jX2 + R2$ | | | |
| Z2< non-directional or Z2< α < directional and Z2< non-directional Setting range P2 Reactive reach x Resistive reach r Constant k | Instantaneous operation and time delayed operation Instantaneous operation, independent of β -angle Time delayed operation 2-10 $X2 = P2 \times 1/I_s$ (Ω) $R2 = X2 \times k$ (Ω) (0,6-2,0) x P2, in steps of 0,2 Note The impedance reach for zone 1 should not be set higher than zone 2 | | | |
| Auxiliary voltage EL | 24-250 VDC, $\pm 20\%$ (RXTUG 22H with output voltage ± 24 V) | | | |
| Binary input voltage RL | Reconnectable 48-60 V and 110-220 VDC, -20% to +10% | | | |
| Maximum current 1 A variant continuously 5 A variant continuously 1 A variant during 1 s 5 A variant during 1 s | 4 A 20 A 100 A 350 A | | | |
| Maximum voltage continuously during 10 s | 250 V 300 V | | | |
| Power consumption: | | | | |
| Current circuit $I = I_s = 0,1/0,5$ A $I = I_s = 1/5$ A | < 0,002 VA < 0,1 VA | | | |
| Voltage circuit $U = U_r$ | < 0,2 VA | | | |
| Auxiliary circuit | Max 3,0 W before and max 4,0 W after operation (without RXTUG 22H) | | | |

Technical data (cont'd)

Table 1: Rated values

| | | | | |
|---------------------------------|-----------------------|------------------------|----------------|----------------------------|
| Binary input | 48-60 V 110- 220 V | Max 0,3 W Max 1,5 W | | |
| Permissible ambient temperature | -5 to +55 °C | | | |
| Storage temperature | -20 to +70 °C | | | |
| Impedance function | | Z1 < | Z2 < | Z2_α < |
| Operate time (typical) | | 50 ms | 50 ms | 50 ms |
| Reset time (typical) | | 50 ms | 50 ms | 50 ms |
| Reset ratio (typical) | | 110% | 110% | 110% |
| Time function | | | | |
| Time delay | | – | Definite time | – |
| Setting range | | – | 0 - 5 s | – |

Table 1: Rated values

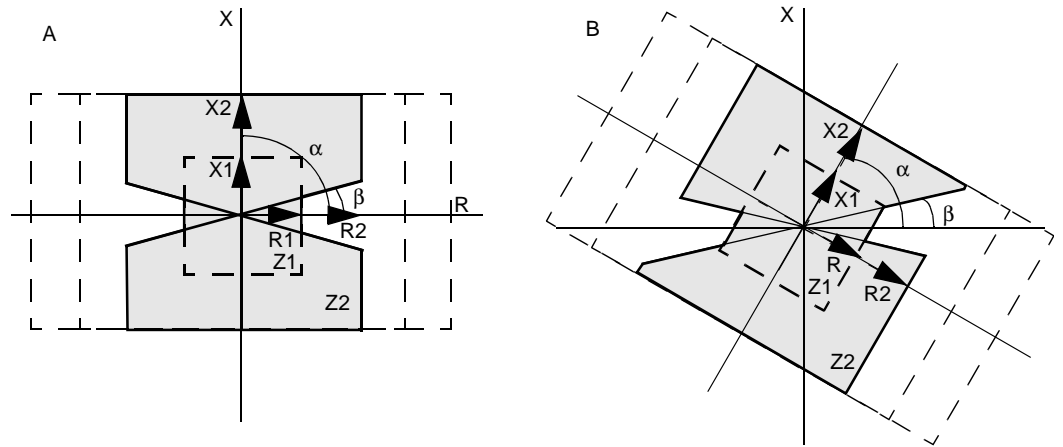


Figure A $\alpha = 90^\circ$ and B $\alpha = 60^\circ$

Settings:

Z1<: X1 and R1

Z2<: X2 and R2, $\beta \approx 15^\circ$



Z1<, Under-impedance function, relay Z1 Trip

Z2<, Under-impedance function, relay Z2 Trip and relay 3

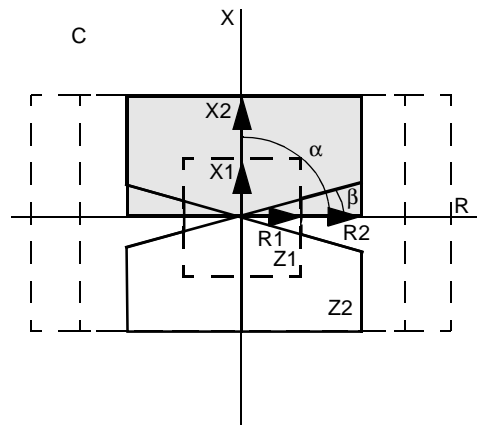


Figure: C $\alpha = 90^\circ$ and D $\alpha = 60^\circ$

Settings:

Z1<: X1 and R1

Z2<: X2 and R2, $\beta \approx 15^\circ$

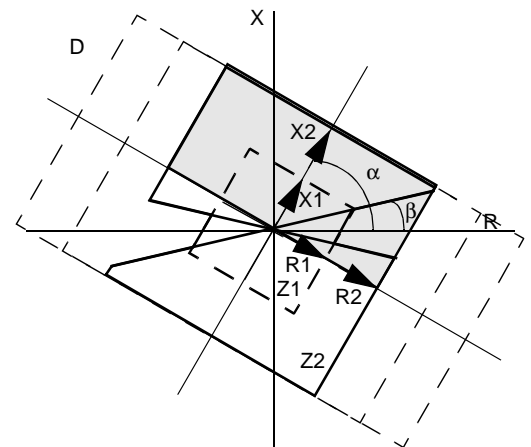
Z2 $_{\alpha}$ <: X2 and R2

Z1<, Under-impedance function, relay Z1 Trip

Z2<, Under-impedance function, relay Z2 Trip



Z2 $_{\alpha}$ <, Directional under-impedance function, relay 3 (Z2< limits operation of Z2 $_{\alpha}$ <)



Shown as example only to illustrate the effect of β angle

Fig. 2 Characteristic for the under-impedance function

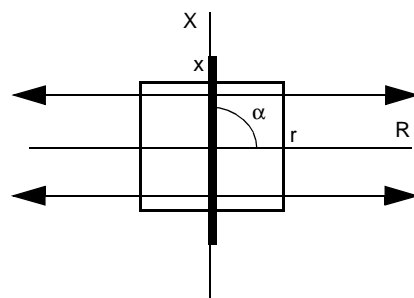
Technical data (cont'd)

Table 1: Rated values

| RXZK 23H | | |
|--|--|------------------------|
| Rated voltage U_r | 100 V | |
| Rated current I_r | 1 A or 5 A | |
| Scale constant I_s | (0,1 0,2 0,4 and 1,0) x I_r | |
| Setting ranges 1 A Variant 5 A Variant | 0,1-1 A 0,5-5 A | |
| Effective voltage range U | 10-200 V | |
| Effective current range | (0,5-50) x I_s | |
| Rated frequency f_r | 50-60 Hz | |
| Characteristic angle α | 0-90°, see Fig. 1. | |
| Setting range: | | |
| Under-impedance function (Z<) | Rated current 1A | Rated current 5A |
| $I_s = 0,1 / 0,5$ | 10-200 Ω | 2-40 Ω |
| $I_s = 0,2 / 1$ | 5-100 Ω | 1-20 Ω |
| $I_s = 0,4 / 2$ | 2,5-50 Ω | 0,5-10 Ω |
| $I_s = 1 / 5$ | 1-20 Ω | 0,2-4 Ω |
| Operation conditions: | | |
| Under-impedance function Z< | $Z = jX + R$ | |
| Reactive reach x | 1-20 $X = x \cdot 1/I_s$ (Ω) | |
| Resistive reach r | 1-20 $R = r \cdot 1/I_s$ (Ω) | |
| Out-of-step function OOS | Same range as under-impedance function Z<, see Fig. 1. | |
| Over-current function | If the input-current is higher than 50 times selected scale constant (I_s), a non-directional over-current function will operate. The relay contacts are the same as for the under-impedance function. | |
| Auxiliary voltage EL | 24 - 250 VDC, $\pm 20\%$ (RXTUG 22H with output voltage $\pm 10\%$) | |
| Binary input voltage RL | Reconnectable 48 - 60 V and 110 - 220 VDC, - 20% to + 10% | |
| Maximum current | | |
| 1 A variant continuously | 4 A | |
| 5 A variant continuously | 20 A | |
| 1 A variant during 1 s | 100 A | |
| 5 A variant during 1 s | 350 A | |
| Maximum voltage | | |
| continuously | 250 V | |
| during 10 s | 300 V | |
| Power consumption: | | |
| Current circuit | $I = I_s = 0,1/0,5$ A $I = I_s = 1/5$ A | < 0,002 VA < 0,1 VA |
| Voltage circuit | $U = U_r$ | < 0,2 VA |
| Auxiliary circuit | Max 3,0 W before and max 4,0 W after operation (without RXTUG 22H) | |
| Binary input | 48-60 V 110-220 V | Max 0,3 W Max 1,5 W |
| Permissible ambient temperature | -5 to + 55 C° | |
| Storage temperature | -20 to + 70 C° | |

Table 1: Rated values

| Impedance function | Z < |
|------------------------|---------------|
| Operate time (typical) | 50 ms |
| Reset time (typical) | 50 ms |
| Reset ratio (typical) | 110% |
| Time function | |
| Time delay | Definite time |
| Setting range | 0-5 s |



Settings:

Reactive reach $x = 10$

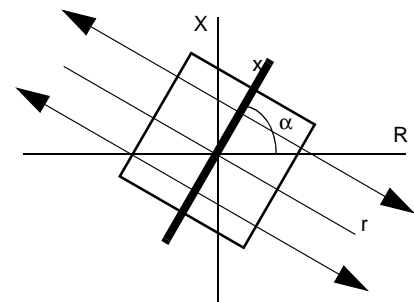
Resistive reach $r = 10$

$\alpha = 90^\circ$

□ Z <, Under-impedance function

↔ OOS, Out-Of-Step function

In order to achieve an out-of-step trip the impedance has to leave the set impedance reach on the opposite side of the characteristic angle (α) from where the impedance entered the set impedance reach.



Reactive reach $x = 10$

Resistive reach $r = 10$

$\alpha = 60^\circ$

Fig. 3 Characteristic for the under-impedance function

Technical data (cont'd)

Table 2: Insulation tests

| RXZK 21H, RXZK 22H, RXZK 23H | Type test values | Ref. Standard |
|--|--|---------------|
| Dielectric test open circuit other circuit overall open circuit | 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 μ s, 0,5 J | IEC 60255-5 |
| Insulation resistance | > 100 M Ω at 500 V DC | IEC 60255-5 |

Table 3: Immunity tests

| RXZK 21H, RXZK 22H, RXZK 23H | Type test values | Ref. Standard |
|---|--|--|
| Surge Immunity test | Differential 2 kV Common 4 kV Differential 1 kV Common 2 kV | IEC 801-5 class 4 IEC 801-5 class 3 |
| AC injection test | 500 V C C = 10 nF differential mode C = 100 nF common mode | SS 436 15 03 PL 4 |
| Power frequency magnetic field Immunity test | Magnetic field 1000 A/m X, Y, Z-axis 3s | EN 61000-4-8 |
| 1MHz burst disturbance test | 2,5 kV | IEC 60255-22-1 class 3 |
| Spark test | 4-8 kV | SS 436 15 03 PL4 |
| Fast transient tests | 4 kV | IEC 60255-22-4 class 4 |
| Electric discharge test with cover on class 4 | 8 kV (contact discharge) 15 kV (air discharge) 8 kV Indirect application | IEC 60255-22-2 IEC 61000-4-2 |
| Radiated electromagnetic field disturbance test | 10 V/m 26-1000 MHz | EN 50082-2 |
| Conducted electromagnetic disturbance test | 0,15-80 MHz | EN 50082-2 |
| Interruption in auxiliary voltage | 2-200 ms No setting for interruptions < 40 ms | IEC 60255-11 |

Table 4: Electromagnetic tests

| RXZK 21H, RXZK 22H, RXZK 23H | Type test values | Ref. Standard |
|-------------------------------------|---------------------|---------------|
| Electromagnetic emission, conducted | 0,15-30 MHz class A | EN 50081-2 |
| Electromagnetic emission, radiated | 30-1000 MHz class A | EN 50081-2 |

Table 5: Mechanical tests

| RXZK 21H, RXZK 22H, RXZK 23H | | Type test values | Ref. Standard |
|------------------------------|----------------|---------------------------|--------------------------|
| Vibration test | Response test | 2,0 g, 10-150 Hz | IEC 60255-21-1, class II |
| | Endurance test | 1 g, 10-150 Hz, 20 sweeps | IEC 60255-21-1, class I |
| Shock tests | Response test | 5 g, 11 ms, 3 pulses | IEC 60255-21-2, class I |
| | Endurance test | 15 g, 11 ms, 3 pulses | IEC 60255-21-2, class I |
| Bump test | | 10 g, 16 ms, 1000 pulses | IEC 60255-21-2, class I |
| Seismic tests | X-axis | 3 g, 1-35 Hz | IEC 60255-21-3, class II |
| | Y-axis | 3 g, 1-35 Hz | IEC 60255-21-3, class II |
| | Z-axis | 2 g, 1-35 Hz | IEC 60255-21-3, class II |

Table 6: Contact data

| RXZK 21H, RXZK 22H, RXZK 23H | | Type test values |
|--------------------------------|----------------------------------|------------------|
| Highest system voltage | | 250 V ac, dc |
| Current carrying capacity | continuous | 5 A |
| | during 1 s | 15 A |
| Making and conducting capacity | during 0,2 s | 30 A |
| | during 1 s | 10 A |
| Breaking capacity | ac, $\cos \varphi > 0,4$, 250 V | 8 A |
| | dc, L/R, < 40 ms | |
| | 48 V | 1,0 A |
| | 110 V | 0,4 A |
| | 220 V | 0,2 A |
| | 250 V | 0,15 A |

Table 7: Additional general data

| RXZK 21H, RXZK 22H, RXZK 23H | Type test values |
|------------------------------|------------------|
| Dimensions | 4U 6C |
| Weight | 0,7 kg |

Diagrams

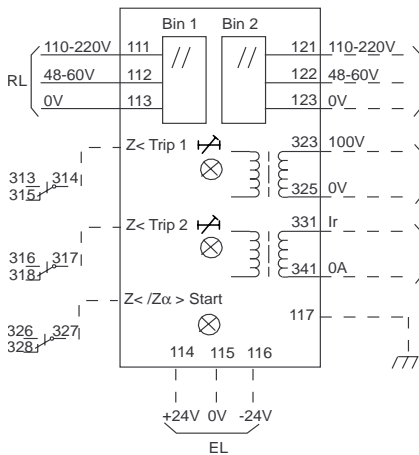


Fig. 4 Terminal diagram for RXZK 21H

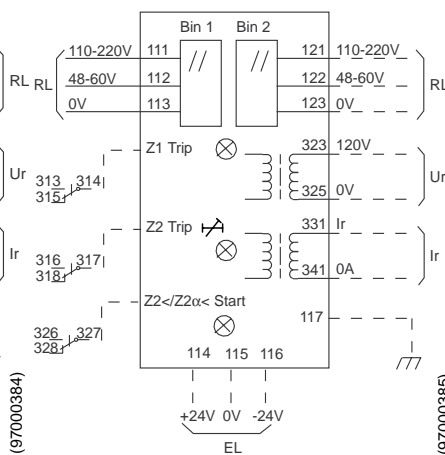


Fig. 5 Terminal diagram for RXZK 22H

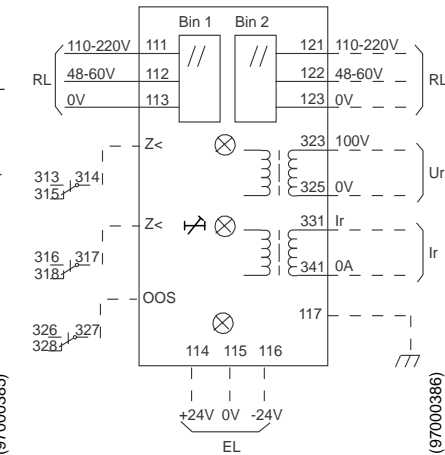


Fig. 6 Terminal diagram for RXZK 23H

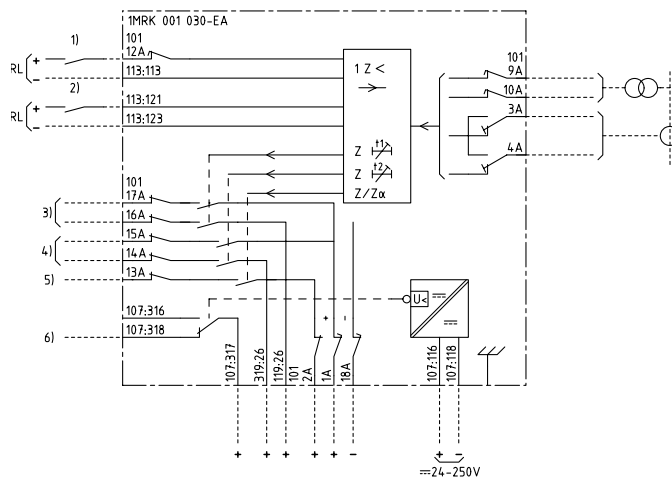
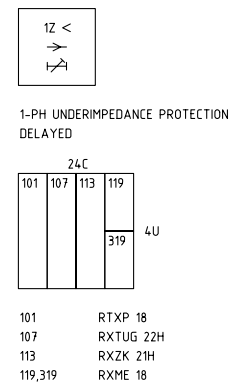


Fig. 7 Terminal diagram 1MRK 001 030-EAA



- 1) BLOCKING OF ALL FUNCTIONS EXCEPT $Z_{\alpha <}$ OR BLOCKING OF TRIP $Z_{\alpha <}$ OR ENABLE OF $Z/Z_{\alpha <}$ OR ACCELERATION OF $Z_{\alpha <}$
- 2) RESETTING OF INDICATION
- 3) UNDERIMPEDANCE, TRIPPING STAGE 1
- 4) UNDERIMPEDANCE, TRIPPING STAGE 2
- 5) DIRECTIONAL UNDERIMPEDANCE, START
- 6) LOSS OF AUXILIARY VOLTAGE

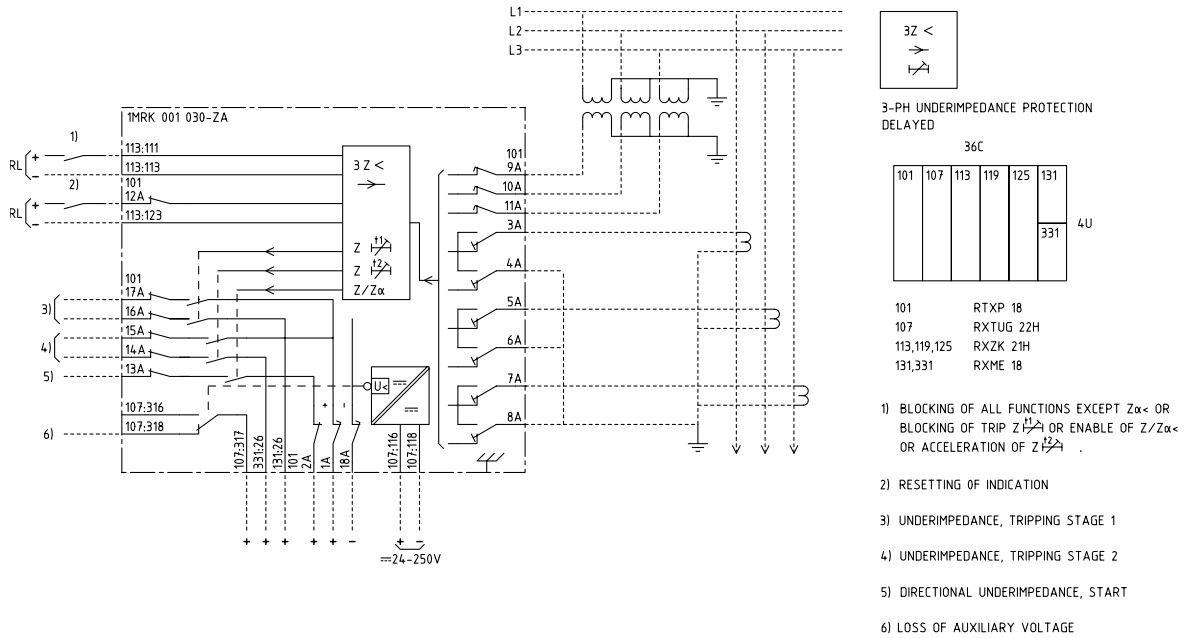


Fig. 8 Terminal diagram 1MRK 001 030-ZAA

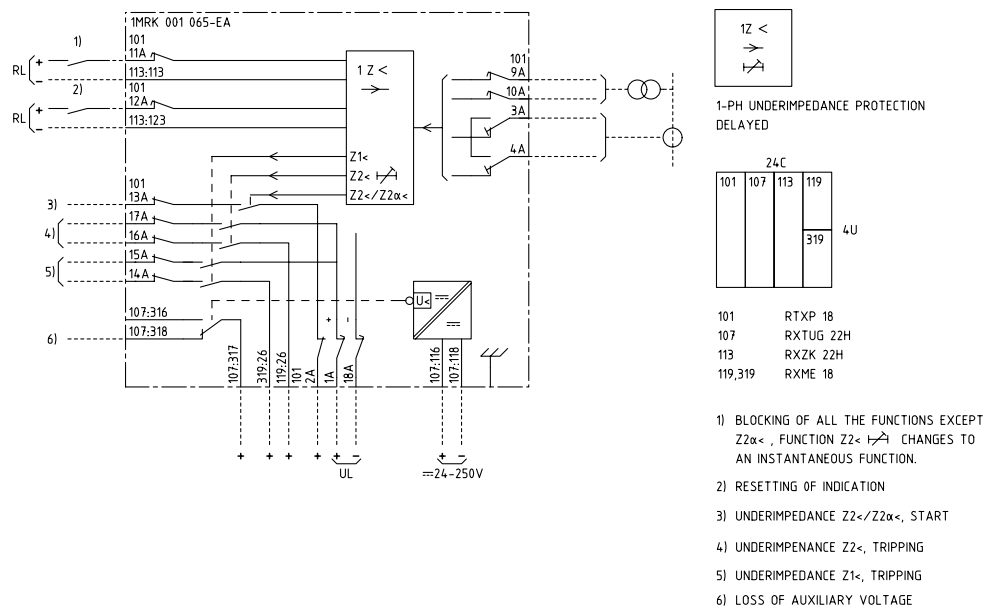


Fig. 9 Terminal diagram 1MRK 001 065-EAA

Diagrams (cont'd)

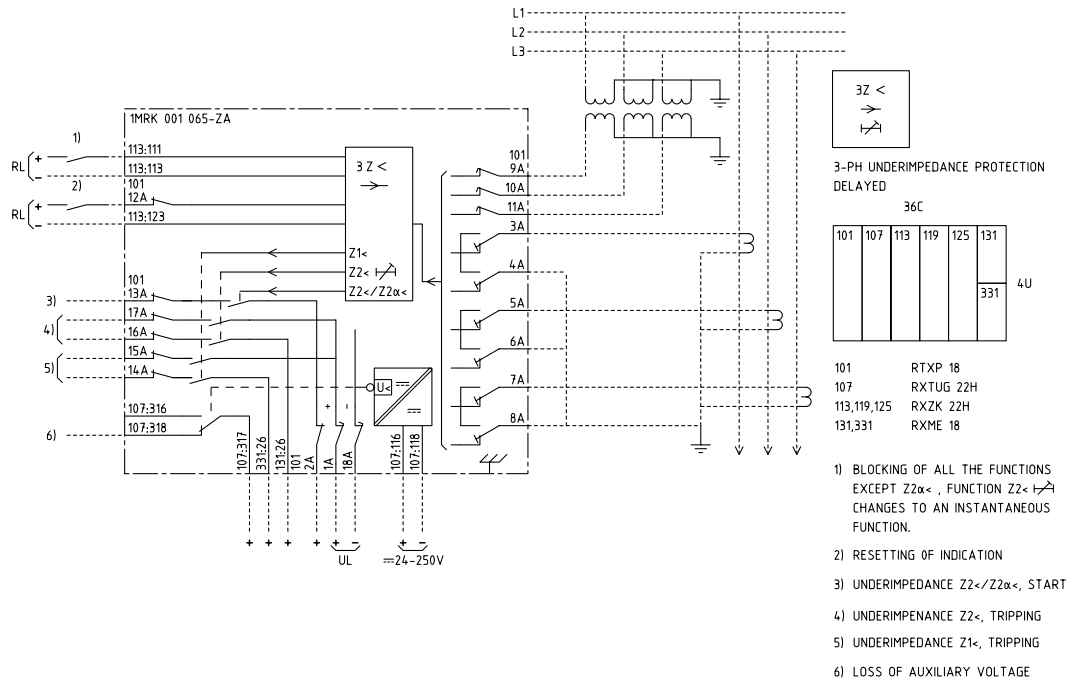


Fig. 10 Terminal diagram 1MRK 001 065-ZAA

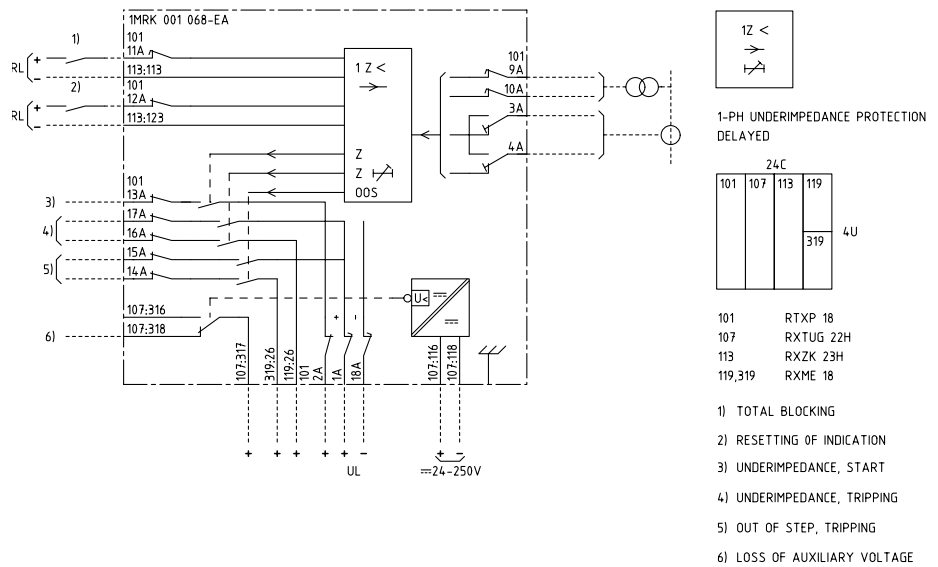
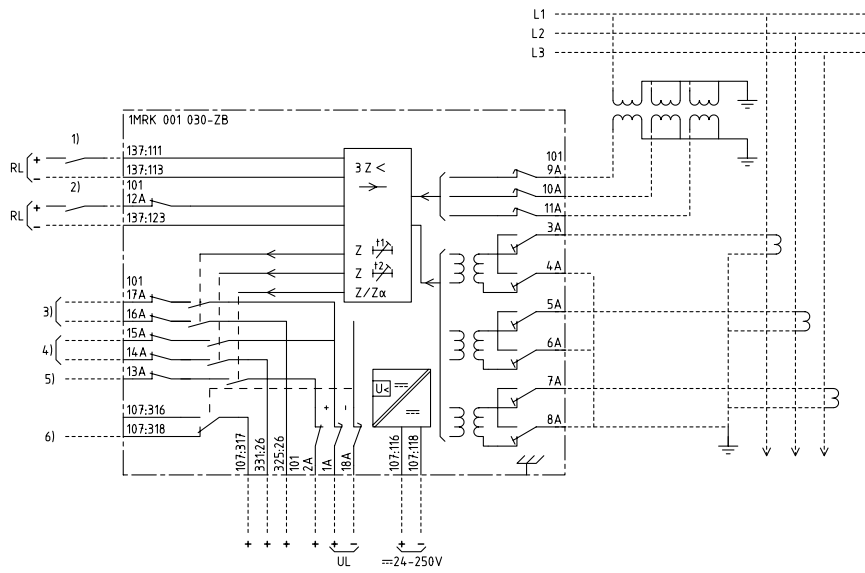
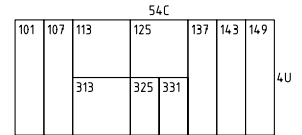


Fig. 11 Terminal diagram 1MRK 001 068-EAA



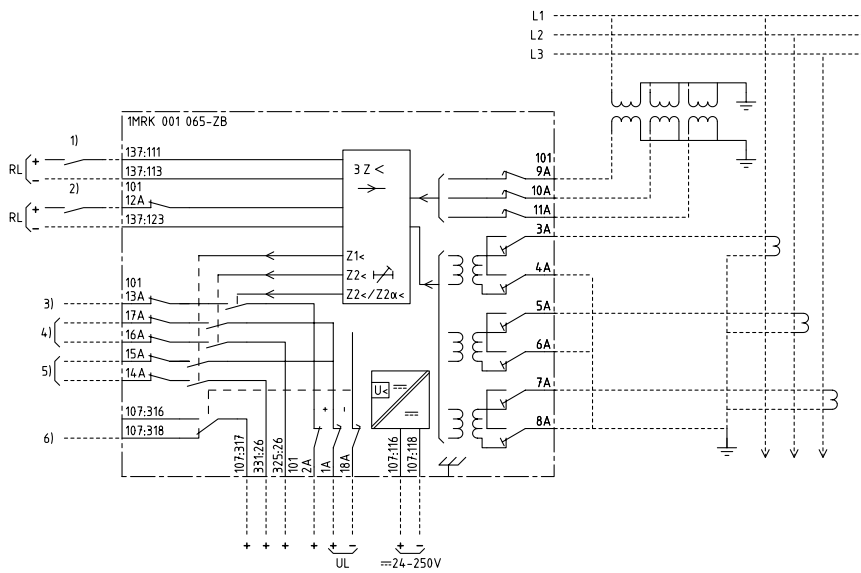
3-PH UNDERIMPEDANCE PROTECTION DELAYED



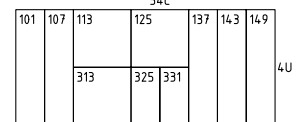
101 RTXP 18
 107 RXTUG 22H
 113,125,313 TRANSFORMER UNIT
 137,143,149 RXZK 21H
 325,331 RXME 18

- 1) BLOCKING OF ALL FUNCTIONS EXCEPT $Z\alpha <$ OR BLOCKING OF TRIP $Z\alpha <$ OR ENABLE OF $Z/Z\alpha <$ OR ACCELERATION OF $Z\alpha <$
- 2) RESETTING OF INDICATION
- 3) UNDERIMPEDANCE, TRIPPING STAGE 1
- 4) UNDERIMPEDANCE, TRIPPING STAGE 2
- 5) UNDERIMPEDANCE/DIR. UNDERIMPEDANCE, START
- 6) LOSS OF AUXILIARY VOLTAGE

Fig. 12 Terminal diagram 1MRK 001 030-ZBA



3-PH UNDERIMPEDANCE PROTECTION DELAYED



101 RTXP 18
 107 RXTUG 22H
 113,125,313 TRANSFORMER UNIT
 137,143,149 RXZK 22H
 325,331 RXME 18

- 1) BLOCKING OF ALL FUNCTIONS EXCEPT $Z2\alpha <$, FUNCTION $Z2 <$ CHANGES TO AN INSTANTANEOUS FUNCTION.
- 2) RESETTING OF INDICATION
- 3) UNDERIMPEDANCE $Z2 </Z2\alpha <$, START
- 4) UNDERIMPEDANCE $Z2 <$, TRIPPING
- 5) UNDERIMPEDANCE $Z1 <$, TRIPPING
- 6) LOSS OF AUXILIARY VOLTAGE

Fig. 13 Terminal diagram 1MRK 001 065-ZBA

Protection assemblies

RAZK

Protection assemblies are built up based upon impedance relay RXZK 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.

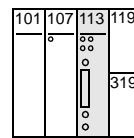
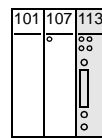
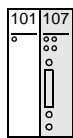
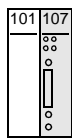
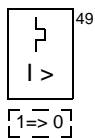
The assemblies have output contacts as specified for the relay RXZK 2H, which in most cases are fully sufficient.

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.

RAZK 1 Single-element impedance protection



101 RTXP 18
107 RXZK

101 RXTUG 22H
107 RXZK

101 RTXP 18
107 RXTUG 22H
113 RXZK

101 RTXP 18
107 RXTUG 22H
113 RXZK
119 RXME 18
319 RXME 18

Order No. Circuit diagram

Order No. Circuit diagram

Order No. Circuit diagram

Order No. Circuit diagram

RAZK 211 (1 RXZK 21H)

1MRK 1MRK
001 029-BA 001 030-BA

1MRK 1MRK
001 029-CA 001 030-CA

1MRK 1MRK
001 029-DA 001 030-DA

1MRK 1MRK
001 029-EA 001 030-EA

RAZK 221 (1 RXZK 22H)

1MRK 1MRK
001 064-BA 001 065-BA

1MRK 1MRK
001 064-CA 001 065-CA

1MRK 1MRK
001 064-DA 001 065-DA

1MRK 1MRK
001 064-EA 001 065-EA

RAZK 231 (1 RXZK 23H)

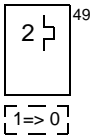
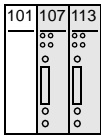
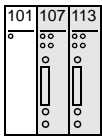
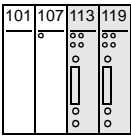
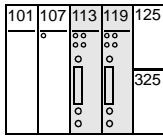
1MRK 1MRK
001 067-BA 001 068-BA

1MRK 1MRK
001 067-CA 001 068-CA

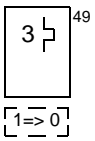
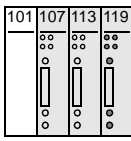
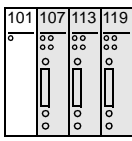
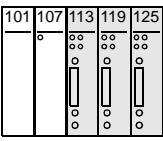
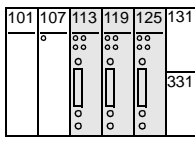
1MRK 1MRK
001 067-DA 001 068-DA

1MRK 1MRK
001 067-EA 001 068-EA

RAZK 2 Two-element impedance protection without auxiliary CTs

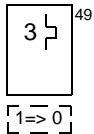
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| |  |  |  |  |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXZK</td></tr> <tr><td>113</td><td>RXZK</td></tr> </table> | 101 | RTXP 18 | 107 | RXZK | 113 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RXTUG 22H</td></tr> <tr><td>107</td><td>RXZK</td></tr> <tr><td>113</td><td>RXZK</td></tr> </table> | 101 | RXTUG 22H | 107 | RXZK | 113 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXTUG 22H</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> </table> | 101 | RTXP 18 | 107 | RXTUG 22H | 113 | RXZK | 119 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXTUG 22H</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> <tr><td>125</td><td>XME 18</td></tr> <tr><td>325</td><td>RXME 18</td></tr> </table> | 101 | RTXP 18 | 107 | RXTUG 22H | 113 | RXZK | 119 | RXZK | 125 | XME 18 | 325 | RXME 18 |
| 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | XME 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 325 | RXME 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-GA</td><td>001 030-GA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-GA | 001 030-GA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-HA</td><td>001 030-HA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-HA | 001 030-HA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-KA</td><td>001 030-KA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-KA | 001 030-KA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-LA</td><td>001 030-LA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-LA | 001 030-LA | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-GA | 001 030-GA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-HA | 001 030-HA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-KA | 001 030-KA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-LA | 001 030-LA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 212 (2 RXZK 21H) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 222 (2 RXZK 22H) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

RAZK 3 Three-element impedance protection without auxiliary CTs

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|--|---|------------|------------|--|-----------|---|------|-----------|------------|------------|--|-----------|-----------------|------|---|------------|------------|--|-----------|-----------------|------|------|------------|------------|------|---|-----|---------|-----|-----------|-----|------|-----|------|-----|------|-----|---------|-----|---------|
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| | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXZK</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> </table> | 101 | RTXP 18 | 107 | RXZK | 113 | RXZK | 119 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RXTUG 22H</td></tr> <tr><td>107</td><td>RXZK</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> </table> | 101 | RXTUG 22H | 107 | RXZK | 113 | RXZK | 119 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXTUG 22H</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> <tr><td>125</td><td>RXZK</td></tr> </table> | 101 | RTXP 18 | 107 | RXTUG 22H | 113 | RXZK | 119 | RXZK | 125 | RXZK | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">101</td><td>RTXP 18</td></tr> <tr><td>107</td><td>RXTUG 22H</td></tr> <tr><td>113</td><td>RXZK</td></tr> <tr><td>119</td><td>RXZK</td></tr> <tr><td>125</td><td>RXZK</td></tr> <tr><td>131</td><td>RXME 18</td></tr> <tr><td>331</td><td>RXME 18</td></tr> </table> | 101 | RTXP 18 | 107 | RXTUG 22H | 113 | RXZK | 119 | RXZK | 125 | RXZK | 131 | RXME 18 | 331 | RXME 18 |
| 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 107 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 107 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 113 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 119 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | RXZK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 131 | RXME 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 331 | RXME 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-NA</td><td>001 030-NA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-NA | 001 030-NA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-YA</td><td>001 030-YA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-YA | 001 030-YA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-PA</td><td>001 030-PA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-PA | 001 030-PA | <table border="0" style="width: 100%;"> <tr><td style="width: 50%;">Order No.</td><td>Circuit diagram</td></tr> <tr><td>1MRK</td><td>1MRK</td></tr> <tr><td>001 029-ZA</td><td>001 030-ZA</td></tr> </table> | Order No. | Circuit diagram | 1MRK | 1MRK | 001 029-ZA | 001 030-ZA | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-NA | 001 030-NA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-YA | 001 030-YA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-PA | 001 030-PA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1MRK | 1MRK | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 001 029-ZA | 001 030-ZA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 211 (3 RXZK 21H) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 221 (3 RXZK 22H) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Protection assemblies (cont'd)

RAZK 3 Three-element impedance protection with auxiliary CTs to achieve delta current

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|--|--------------------|-----|-----|-----|-----|--------------------|--------------------|-----|-----|-----|-----|-----|--|--|-----|--|--|--|--|---|--|--|--|--|--|-----|-----|-----|-----|-----|-----|-----|--|--|-----|-----|-----|--|--|
|  | <table border="1"> <tr> <td>101</td><td>107</td><td>113</td><td>125</td><td>137</td><td>143</td><td>149</td> </tr> <tr> <td></td><td></td><td colspan="2">137</td><td></td><td></td><td></td> </tr> </table> | | | | | | 101 | 107 | 113 | 125 | 137 | 143 | 149 | | | 137 | | | | | <table border="1"> <tr> <td>101</td><td>107</td><td>113</td><td>125</td><td>137</td><td>143</td><td>149</td> </tr> <tr> <td></td><td></td><td>313</td><td>325</td><td>331</td><td></td><td></td> </tr> </table> | | | | | | 101 | 107 | 113 | 125 | 137 | 143 | 149 | | | 313 | 325 | 331 | | |
| | 101 | 107 | 113 | 125 | 137 | 143 | 149 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 137 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | 107 | 113 | 125 | 137 | 143 | 149 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 313 | 325 | 331 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 101 | RTXP 18 | | | | | 101 | RTXP 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 107 | RXTUG 22H | | | | | 107 | RXTUG 22H | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 113, 125, 313 | CT | | | | | 113, 125, 313 | CT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 137, 143, 149 | RXZK | | | | | 137, 143, 149 | RXZK 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | 325, 331 | RXME 18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Order No. | Circuit diagram | | | | | Order No. | Circuit diagram | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 213 (3 RXZK 21H) | 1MRK 001 029-PB | 1MRK 001 030-PB | | | | | 1MRK 001 029-ZB | 1MRK 001 030-ZB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAZK 223 (3 RXZK 22H) | 1MRK 001 064-PB | 1MRK 001 065-PB | | | | | 1MRK 001 064-ZB | 1MRK 001 065-ZB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Mounting alternatives

All assemblies can be delivered in the following mounting alternatives:

- on apparatus bars
- in equipment frame
- in RHGS
- in RHGX

Ordering

Specify:

- 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 RXZK 21H, RXZK 22H and RXZK 23H (Loose Relay)
 - Quantity
 - Ordering number

Impedance relay

| Type | Rated current | Article No. | Code |
|----------|---------------|-----------------|-----------------------------|
| RXZK 21H | 1 A | 1MRK 000 845-AA | <input type="checkbox"/> A1 |
| RXZK 21H | 5 A | 1MRK 000 845-BA | <input type="checkbox"/> A2 |
| RXZK 22H | 1 A | 1MRK 000 845-CA | <input type="checkbox"/> A3 |
| RXZK 22H | 5 A | 1MRK 000 845-DA | <input type="checkbox"/> A4 |
| RXZK 23H | 1 A | 1MRK 000 845-EA | <input type="checkbox"/> A5 |
| RXZK 23H | 5 A | 1MRK 000 845-FA | <input type="checkbox"/> A6 |

Auxiliary voltage

Mainly for included (auxiliary relays)

| | Code |
|--------------|-----------------------------|
| 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

| Mounting alternatives | Size | Article No. | Code |
|------------------------------|-------------------|-----------------|------------------------------|
| 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 |

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