



(SE980072)

Features

- Provides local back-up protection when the primary breaker fails to operate
- Initiates tripping of adjacent back-up breakers for disconnection of the fault, thus preventing power system instability
- Start verifier provides retrip or cross-trip of primary circuit-breaker for security and reliability after initiation by trip signal
- Very short operating times due to the fast reset time of the overcurrent detectors
- Evolving faults can be covered
- Insensitive to current transformer saturation and transients
- Accurate, consistent, short operating times and high overload capacity
- In case of multiple busbars tripping is normally achieved through the switching system in the bus protection
- Suitable as a stand-alone protection or can be integrated in a busbar protection. RAICA work together with RADSS bus protection

Application

This relay is required to rapidly initiate fault clearing by power circuit-breakers when, for example, a short-circuit occurs in the power system, consequently isolating the faulty section of the system.

It is then important that the power circuit-breaker operates correctly, so that the fault clearing is done quickly. However, there is always a risk that the breaker will not succeed in interrupting the fault current and that the fault clearing time will be dependent on how fast the back-up protection schemes can initiate clearing.

A simple and secure way to verify correct operation of a power circuit-breaker is to determine that after a certain time, sufficiently long for the circuit-breaker to operate, there is no longer any current through the breaker.

The breaker failure relay has current measuring detectors providing a possibility to measure either phase currents or phase currents and zero sequence current.

The tripping impulse of the protective relay operating the circuit-breaker simultaneously starts the breaker failure relay.

Application (cont'd)

If the current through the power circuit-breaker still is above the set value of the current measuring detectors after the set time, the breaker failure relay provides a tripping impulse to adjacent circuit-breakers in the same station.

In the event of a multibus-configuration, it is normal practice to arrange for the trip signal to pass the appropriate selector switch of the bus protection, in order to trip the particular bus with the faulty breaker.

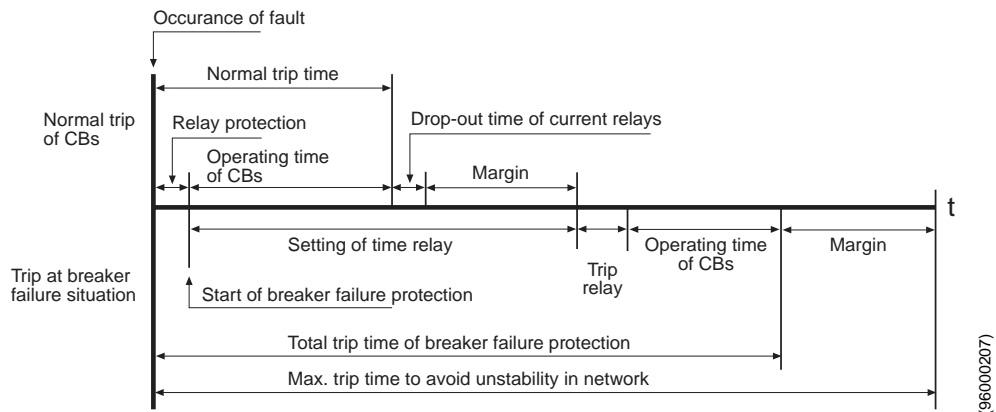


Fig. 1 Operating diagram for trip at a breaker failure situation.

Design

The breaker failure relay RAICA consists of (depending on the variant) a test switch, type RTXP 18, three current relays, RXIB 24, one or two time relays, RXKL 1, an impulse storing device, RXTCB 1, and an output relay type RXMS 1 and auxiliary relay with flag RXME 18 or signal relay RXXSF 1.

RAICA has no power consumption in auxiliary dc circuits during normal service and the current relays can be set below load without operation until after initiation.

The relay includes static current and time measuring units with excellent measuring accuracy.

Two phase and one earth current module are recommended so that the phase modules can be set high for added security and the earth module low for sensitivity.

It is recommended that the phase modules be set below minimum load to enable operation for a trip condition.

Two phase and earth (or three phase) breaker failure relays using three individual current relays are capable of accurate and consistent

timing even during adverse CT saturation conditions, independent of current magnitude and possible dc components.

Retrip feature after start can be included for security and reliability. Seal-in of the start signal can also be included to ensure reliable timing.

The start signal to the RAICA supplies dc auxiliary voltage to the current modules. Only if current is present above the set levels will the start verifier pick-up, seal-in, provide a trip signal to the primary breaker and start the timer.

If the primary breaker fails to trip, the timer operates to trip the back-up circuit-breakers. The filter has an RC network to absorb transient energy and prevent false starting of the start verifier (caused, for example, by accidental earth on the initiate output).

The BFR type RAICA is suitable either as a stand-alone protection or can be integrated in the busbar protection RADSS

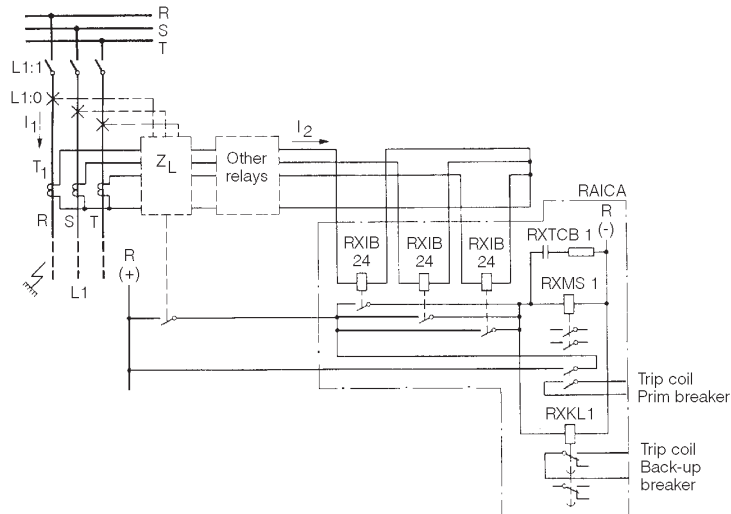


Fig. 2 Basic RAICA relay for one line.

Retrip own CB

Several of the available versions give a retrip command to their circuit-breaker.

Two time steps

When very short times on three-phase or multiphase faults are necessary because of system stability the two timer scheme is recommended so that more frequent, less critical earth faults can be cleared with greater margin.

Signal flags

Signal relay of type RXSF may optionally be included in the breaker failure relay. Indication may be obtained for instantaneous tripping or for tripping on the individual time steps.

Single-pole trip

RAICA can be used for single-pole tripping if the current measuring units are set above the largest load current. At single-pole tripping, the RAICA must be supplemented with relay logic that selects the proper phase of the circuit-breaker to be tripped on the first time step. This optional version may be quoted upon request.

Evolving faults

Evolving faults can be dealt with by including one optional time-lag relay per phase.

Technical data

Scale range (RXIB 24)	10-150 mA, 0,1-1,5 A, 0,2-3 A or 1-15 A										
Operating value	Settable (1-3) x rated scale contact I_S										
Operating time (RXIB 24, typical)	4-6 ms (2,5 x rated value)										
Resetting time (RXIB 24, typical) Resetting ratio	5-11 ms > 70%										
Rated frequency	50 or 60 Hz										
Time range (RXKL 1)	20 ms-99 h										
Load carrying capacity $I_S = 10/25/50$ mA $I_S = 0,1/0,25/0,5$ A $I_S = 0,2/0,5/1$ mA $I_S = 1/2/5$ A	<table border="0"> <tr> <td>Continuous</td> <td>During 1s</td> </tr> <tr> <td>0,3/0,7/1,2 A</td> <td>4,4/12/15 A</td> </tr> <tr> <td>2,7/6,5/10 A</td> <td>33/100/180 A</td> </tr> <tr> <td>6,8/11/15 A</td> <td>180/230/230 A</td> </tr> <tr> <td>15/20/20 A</td> <td>230/350/350 A</td> </tr> </table>	Continuous	During 1s	0,3/0,7/1,2 A	4,4/12/15 A	2,7/6,5/10 A	33/100/180 A	6,8/11/15 A	180/230/230 A	15/20/20 A	230/350/350 A
Continuous	During 1s										
0,3/0,7/1,2 A	4,4/12/15 A										
2,7/6,5/10 A	33/100/180 A										
6,8/11/15 A	180/230/230 A										
15/20/20 A	230/350/350 A										
Burden per phase	5-150 mVA										
Auxiliary voltage UL	48, 55, 110, 125, 220, 250 V dc -20%, +10%										
Permitted ambient temperature	-25 °C, +55 °C										
Dimensions Weight	See Ordering table										
Insulation test: Dielectric test Current circuit Voltage circuit Impulse voltage test	<table border="0"> <tr> <td>50 Hz, 2500 V, 1 min</td> </tr> <tr> <td>50 Hz, 2000 V, 1 min</td> </tr> <tr> <td>5 kV, 1,2/50 μs, 0,5 J</td> </tr> </table>	50 Hz, 2500 V, 1 min	50 Hz, 2000 V, 1 min	5 kV, 1,2/50 μ s, 0,5 J							
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5 kV, 1,2/50 μ s, 0,5 J											
Disturbance test: Normal frequency test 1 MHz-test Fast transient test	<table border="0"> <tr> <td>50 Hz, 500 V, 2 min</td> </tr> <tr> <td>2,5 kV, 2 s</td> </tr> <tr> <td>4-8 kV, 2 min</td> </tr> </table>	50 Hz, 500 V, 2 min	2,5 kV, 2 s	4-8 kV, 2 min							
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2,5 kV, 2 s											
4-8 kV, 2 min											
Contact data: RXME/RXSF/RXMS RXKL	<table border="0"> <tr> <td>see 1MRK 508 015-BEN</td> </tr> <tr> <td>see 1MRK 508 002-BEN</td> </tr> </table>	see 1MRK 508 015-BEN	see 1MRK 508 002-BEN								
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Diagrams

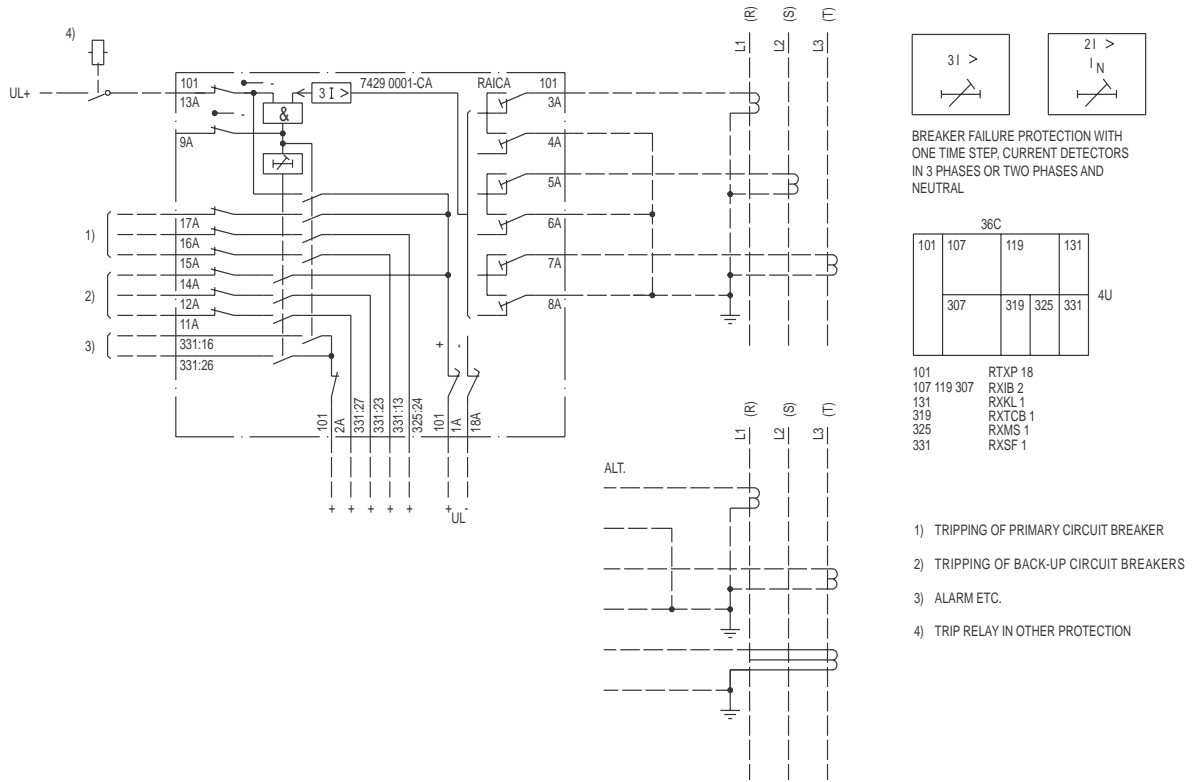


Fig. 3 Terminal diagram 7429 0001-CAA for RAICA, RK 651 211-CA

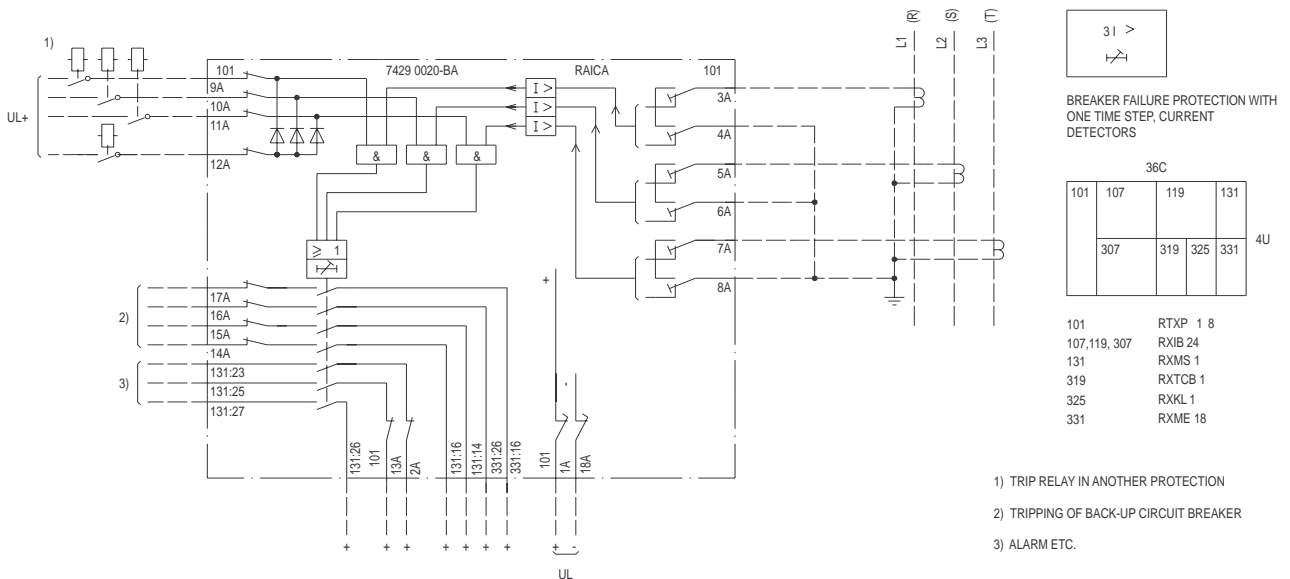


Fig. 4 Terminal diagram 7429 0020-BAA for RAICA, RK 651 034-BA

Diagrams (cont'd)

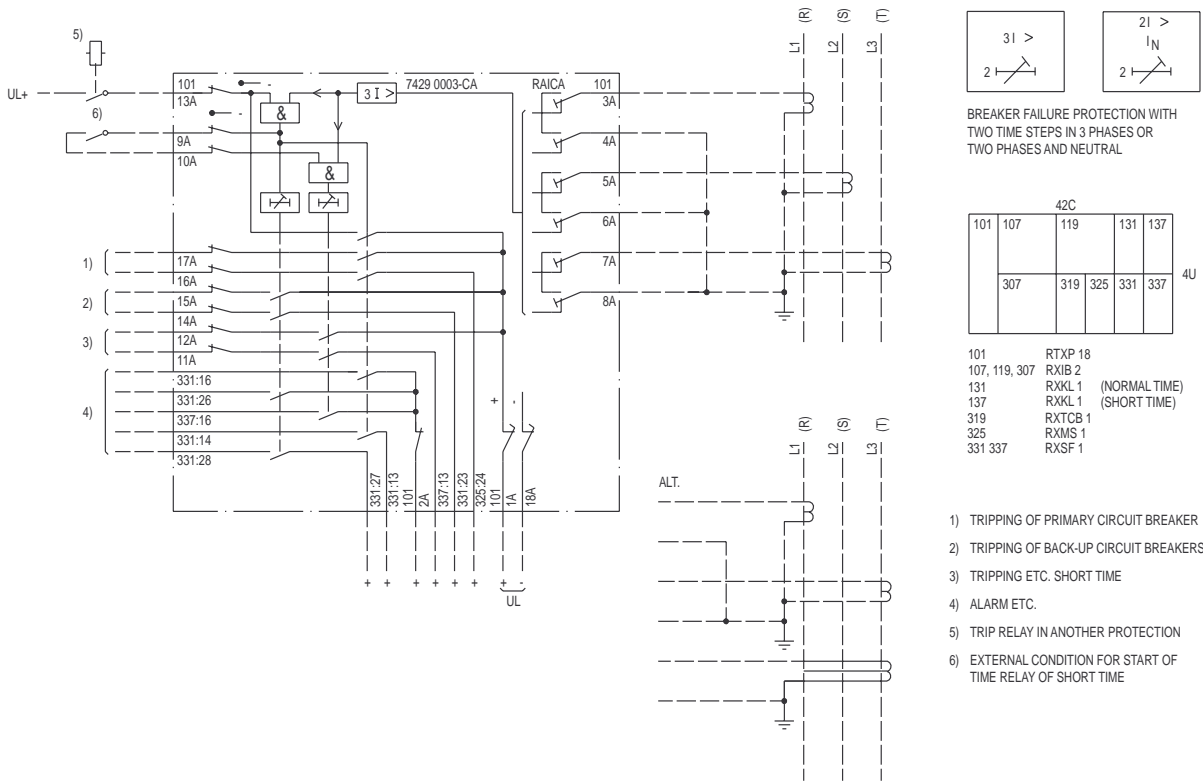


Fig. 5 Terminal diagram 7429 0003-CAA for RAICA, RK 651 213-CA

Ordering

Specify:

- Quantity
- Ordering No.
- Rated frequency
- Auxiliary voltage UL
- Scale range, for each RXIB 24
- Desired wording on the lower half of the test switch face plate max. 13 lines with 14 characters per line.
- RAICA is provided on apparatus bars. When additional mounting is required specify a 4U equipment frame for 19" rack mounting or a type RHGX 12 or 20 case for panel mounting.

Current detection	Description	Dimensions	Weight	Ordering No.	Circuit diagram/ Terminal diagram
3l> single-phase start	One time step, one flag	4U 36C	5 kg	RK 651 034-BA	7429 0020-BA 7429 0020-BAA
3l> or 2l> + I _N >	Single-phase tripping of primary circuit breaker, one time step, one flag	4U 48C	7 kg	RK 651 222-AA	7429 0006-AA 7429 0006-AAA
3l> or 2l> + I _N >	Tripping of primary circuit breaker, one time step, one flag	4U 42C	6 kg	RK 651 036-BA	7429 0022-BA 7429 0022-BAA
3l> or 2l> + I _N >	Tripping of primary circuit breaker, one time step, two flags	4U 36C	5 kg	RK 651 211-CA	7429 0001-CA 7429 0001-CAA
3l> or 2l> + I _N >	Tripping of primary circuit breaker, two time steps, external start	4U 36C	5 kg	RK 651 213-AA	7429 0003-AA 7429 0003-CAA
3l> or 2l> + I _N >	Tripping of primary circuit breaker, two time steps, external start, three flags	4U 42C	6 kg	RK 651 213-CA	7429 0003-CA 7429 0003-CAA
3l> + I _N >	Four current relays, two time steps, one flag	4U 60C	8 kg	RK 651 081-DC	7431 0122-DC 7431 0122-DCA
3l> + I _N >	Four current relays, tripping of primary circuit breaker, two time steps, two flags	4U 60C	9 kg	RK 651 081-DB	7431 0122-DB 7431 0122-DBA
3l> or 2l> + I _N >	One time step, tripping via bus protection RADSS	4U 30C	4,5 kg	RK 651 025-AA	7431 0019-BA 7431 0019-BAA

References

RXIB 24 current relay 1MRK 508 018-BEN

RADSS busbar protection 1MRK 505 003-BEN

Auxiliary relays 1MRK 508 015-BEN

Time relays 1MRK 508 002-BEN

Further information:

Description RK 651-302E

Information RF 637 375E

Manufacturer

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