3RV16 Voltage Transformer Circuit-Breaker

Fig. 14/12
3RV16 voltage transformer circuit-breaker

Function overview

Application

- Protection of voltage-transformer secondary circuits for the connection of protection relays with voltage-dependent starting element

Functions

- Auxiliary contact of 3RV16 prevents the distance protection tripping via the underimpedance starting in case of a fault in the voltage transformer circuits
- Tripping time of instantaneous element in few milliseconds

Construction

- Snap-on mounting on 35-mm mounting rail, or screw mounting

Description

The voltage transformer circuit-breaker protects the secondary side of voltage transformers used to connect protection relays with voltage-dependent starting. The switch is used for distance protection with low-impedance starting. Special auxiliary contacts reliably prevent low-impedance starting from triggering distance protection if only one error has occurred in the converter line.

The voltage transformer circuit-breaker can also be used to safely disconnect the distance protection relay from the voltage transformer. In this case the special auxiliary contacts also prevent erratic triggering of the distance protection.

Additional fuses are not required. A “Fuse Failure Monitor” (FFM) is also not required.

The circuit-breakers are snap-mounted on a 35-mm mounting rail to EN 50022. Push-in lugs are available for screw-type connection of the circuit-breakers.

The circuit-breaker for voltage transformers also incorporates 2 auxiliary contacts (normally 1 NO + 1 NC). During the closing operation, contact making via the NO contact of the control switch takes place later than via the main contacts, whereas during the opening operation the auxiliary circuits are interrupted at the same time as the main circuits, if not before. This adjustment has the effect of preventing the opening of the circuit-breaker from producing a tripping command via the underimpedance starting of the distance protection relay.

The auxiliary voltage for blocking voltage-dependent starting (underimpedance) must always be routed via the NO contact 11-14.

Functions

The voltage transformer circuit-breaker largely corresponds with the circuit-breaker 3RV1, SIRIUS, size S00. Two special characteristics are taken into account for safe prevention of faulty triggering of the distance protection relay.

Auxiliary switch for blocking the distance protection

The main contacts of the circuit-breaker open if the voltage transformer circuit-breaker is tripped or switched off. The distance protection would falsely interpret low impedance as a fault, which results in immediate power cut-out within only a few milliseconds.

To prevent this fault response, special auxiliary contacts with a time-dependent assignment to the circuit-breaker's main contacts (see Technical data) must be provided. The distance protection is blocked with the help of these auxiliary contacts, and thus prevents faulty triggering.

An auxiliary switch for blocking the distance protection relay is available, equipped with 1 changeover contact fitted permanently in the voltage transformer circuit-breaker. This changeover contact can be used as 1 NO (11-14) or 1 NC (11-12) contact. Due to the high contact stability of these auxiliary contacts at the lowest possible rated operational currents I_e/AC-15 ≥ 0.5 mA at 230 V, it is also suitable for modern solid-state distance protection relays.

The laterally mountable auxiliary switches of the SIRIUS range can be used for signaling functions. They cannot be used for blocking the distance protection relay.

Impedance across the main contacts

There is only minor current flow across the main contacts of the voltage transformer circuit-breaker. To ensure reliable functioning of the distance protection, main contact resistance must be minimal and nearly constant throughout the service life of the circuit-breaker.

This is realized with suitable contacts and contact materials for the 3RV16 voltage transformer circuit-breaker.

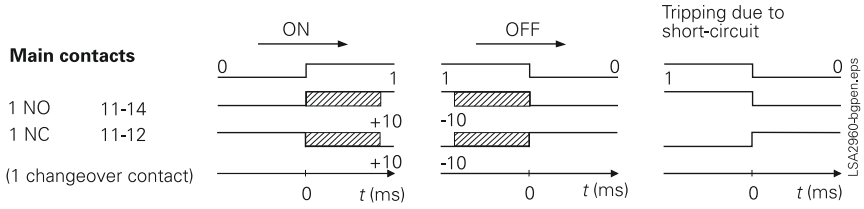
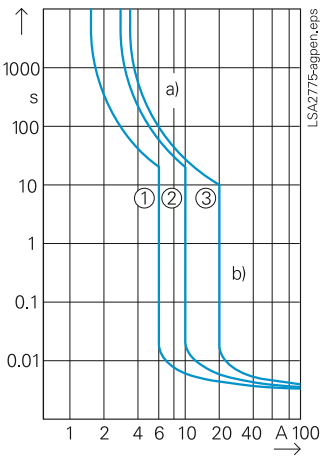


Fig. 14/13 Timing diagram of auxiliary switches for blocking distance protection

Characteristics

The specified tripping characteristics of the thermal overload pickup (a) correspond to the mean value of the leakage bandwidth in cold state; at operating temperature these times are reduced to approx. 25 % of the specified values. The characteristics below are schematic representations. Precise characteristics are available from "Technical Assistance" (E-mail: nst.technical-assistance@siemens.com).



① 1.4 A/6 A
② 2.5 A/10.5 A
③ 3 A/20 A
a) Thermal overload pickup
b) Instantaneous electromagnetic surge trip

Fig. 14/14 Characteristics

Connection diagrams

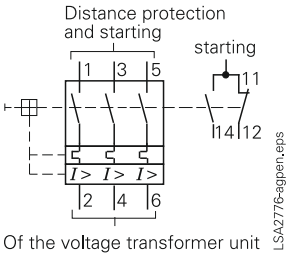
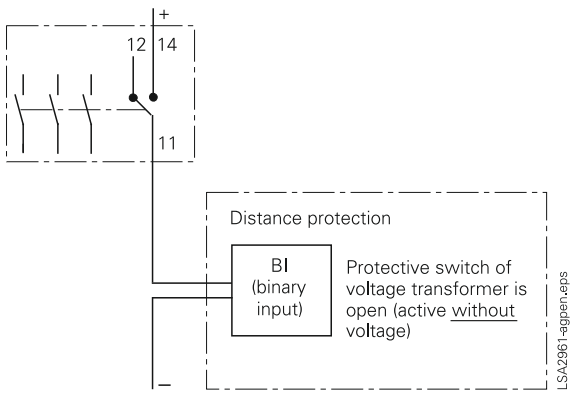


Fig. 14/15 Internal connections



Note:
When using the NC contact to connect the voltage transformer circuit-breaker, the binary input of the distance protection device (Siemens 7SA xxx) should be set to "active without voltage". This type of connection is used for additional monitoring of correct wiring.

Fig. 14/16 Typical connections

Technical data

Conductor cross-sections, main circuit, 1 or 2 conductors			
Type	3RV1611-1AG14	1CG14	1DG14
Terminal type	Screw connection		
Terminal screw	Prozidriv size 2		
Solid	2 x (0.5 to 1.5 mm^2); 2 x (0.75 to 2.5 mm^2); (max. 4 mm^2);		
Finely stranded with end sleeve	2 x (0.5 to 1.5 mm^2); 2 x (0.75 to 2.5 mm^2)		
Stranded	2 x (0.5 to 1.5 mm^2); 2 x (0.75 to 2.5 mm^2); (max. 4 mm^2)		
Auxiliary switch for blocking the distance protection			
With defined time-dependent assignment for blocking distance protection	1 changeover contact, solid-state compatible (usable as 1 NO or 1 NC)		
Rated operational current I_E/ rated operational voltage V_E	AC-14 0.5 A/V_E 250 V AC-14 1 A/V_E 125 V DC-13 0.27 A/V_E 250 V DC-13 0.44 A/V_E 125 V		
Short-circuit protection for auxiliary circuit			
Fusible link, gL/gG	max. 10 A		
Miniature circuit-breaker, C characteristic	max. 6 A		

General technical data			
Type	3RV1611-1AG14	1CG14	1DG14
Rated current	1.4	2.5	3
Permissible ambient temperature			
During storage/transport	-50 to +80 °C		
During operation	-20 to +60 °C (up to 70 °C possible with current reduction)		
Rated operational voltage V_E	400 V		
Rated frequency	16.7 to 60 Hz		
Rated insulation voltage V_I	690 V		
Short-circuit breaking capacity at 400 V AC, short-circuit proof up to	50 kA		
Current setting of the thermal overload release	1.4 A	2.5 A	3 A
Operating value of the instantaneous electromagnetic overcurrent release	6 ± 20 %	10.5 ± 20 %	20 ± 20 %
Tripping time of the instantaneous electromagnetic overcurrent release	Approx. 6 ms at 12 A	6 ms at 20 A	6 ms at 40 A
Disconnection life:			
short-circuit current I_p	Max. short-circuit disconnections		
≤ 0.1 kA	≤ 10		
0.1 to 2 kA	≤ 3		
2 kA to 50 kA	1		
Internal resistance			
in cold state	> 0.25 Ω ± 6.5 %		
in heated state	> 0.30 Ω ± 6.5 %		
Shock resistance acc. to IEC 60068, Part 2-27	15 *g*		
Degree of protection acc. to IEC 60529	IP 20		
Touch protection acc.to DIN VDE 0106 Part 100	Safe against finger touch		
Service life	Operating cycles		
mechanical	10000		
electrical	10000		
Permissible mounting position	any		

Selection and ordering data

Description	Order No.
3RV16 voltage transformer circuit-breaker	
with 1 auxiliary contact, 1 changeover	
1.4/ 6 A	*3RV1611-1AG14*
2.5/10.5 A	*3RV1611-1CG14*
3/20 A	*3RV1611-1DG14*
Laterally mountable auxiliary switches 1 NO/NC	*3RV1901-1A*