7SN71 transient earth–fault relay

Scope of functions

67N

Fig. 1
7SN71 transient earth–fault relay

Application

The highly sensitive transient earth–fault relay 7SN71 determines the direction of and signals transient and continuous earth faults in systems with isolated neutral, in systems with high–impedance resistive earthing and in compensated systems.

The transient earth–fault relay can be used without restriction in any meshed system. The directional signals clearly identify the fault source.

Construction

All protective components, including the converter, are located on a plug–in module of double Eurocard format. This module is located in a housing for surface or flush mounting in a switch panel.

Functions and features

- Bidirectional measurement, indication and signalling
- High pick–up sensitivity due to separate detection and evaluation of total current and displacement voltage
- 1 A and 5 A connection for transformer current matching
- Four sensitivity stages
- Indication of direction and continuous earth fault where displacement voltage V_o > 25 V persists after 3 s
- Signalling and indication of a continuous earth fault possible only in the forward direction
- Command contacts of relay for continuous earth fault
- Blocking and storage of signals via binary input 24 to 250 V DC
- Remote reset (V_{reset}: 24 to 250 V DC)
- Automatic reset facility for indications and signals
- Optional suppression of switching operations
- Connection to 220 V AC (lighting system)
- Connection to 100 to 110 V AC (voltage transformer)
- Connection to 24, 48, 60, 110/125 and 220/250 V DC

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Mode of operation

In the event of an earth fault, the neutral–point voltage to earth can be as high as the full phase voltage. The phase–to–earth capacitances of the non–earth–faulted phases are charged via the transformer inductance. This charging process is bound up with a strong current surge (starting oscillation). The amplitude of this current surge depends on the expands of the system and on contact resistance values at the earth–fault location. This current flows via the phase–to–earth capacitances of the uneffected lines to earth and enters the earth–faulted phase via the earth–fault location. The current flows via this line to the in–feed transformer (see Fig. 2).

At measuring point A, as a result of the transformer summation circuit, the earth current of the faulted line is not included in the measurement, as this current portion flows through the summation transformer or the relevant Holmgreen circuit and back, thereby cancelling itself out. It is the total of the capacitive earth currents from the non–faulted system which has an effect. In the diagram they are summated on the upper line.

With a transient earth–fault relay, the equalizing current forming with a damped oscillation of 100 to more than 4000 Hz decays after only a few periods.

The displacement voltage V_E thereupon also returns to zero. In earthed systems this takes place after a number of periods (decay of the Petersen coil – earth capacitance oscillation circuit); in non–earthed systems this occurs after a very short time.

In the case of a continuous earth fault, the equalizing current in the non–earthed system changes into the mostly capacitive continuous earth current or, in compensated systems, into the relatively low residual active current.

Typical applications

Transient earth–fault relays distributed at suitable points throughout the system allow detection of the earth–fault location from the directional indications (see examples in Fig. 3). If the system is of radial configuration (example a) in Fig. 3), the red lamp immediately indicates the faulted line. If one of the lines consists of several sections (example b) in Fig. 3), the fault is upstream of the last red lamp. In a meshed network, the directional information must be correctly aligned. The faulted line is identifiable by the forward distinction of the two built–in relays (example c) and d) in Fig. 3).

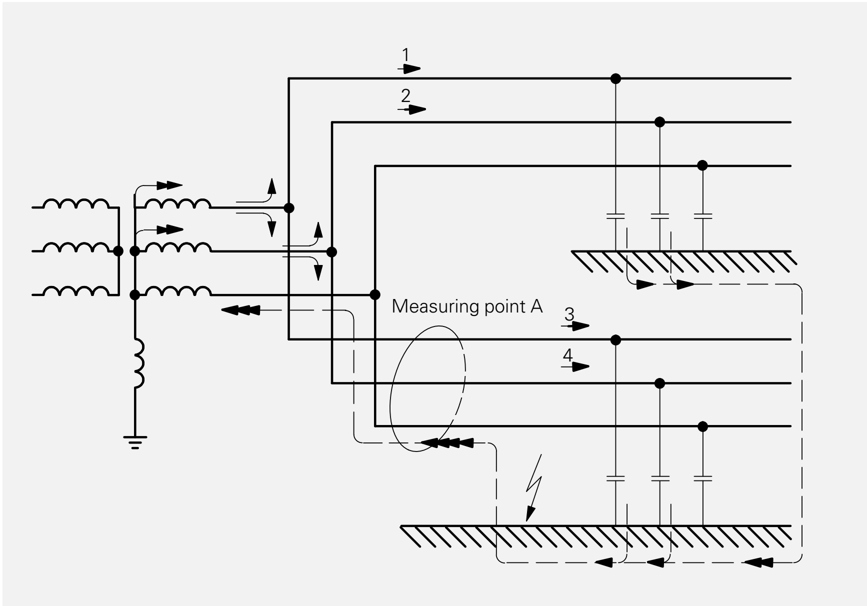

Fig. 2
Charging process in compensated or isolated systems

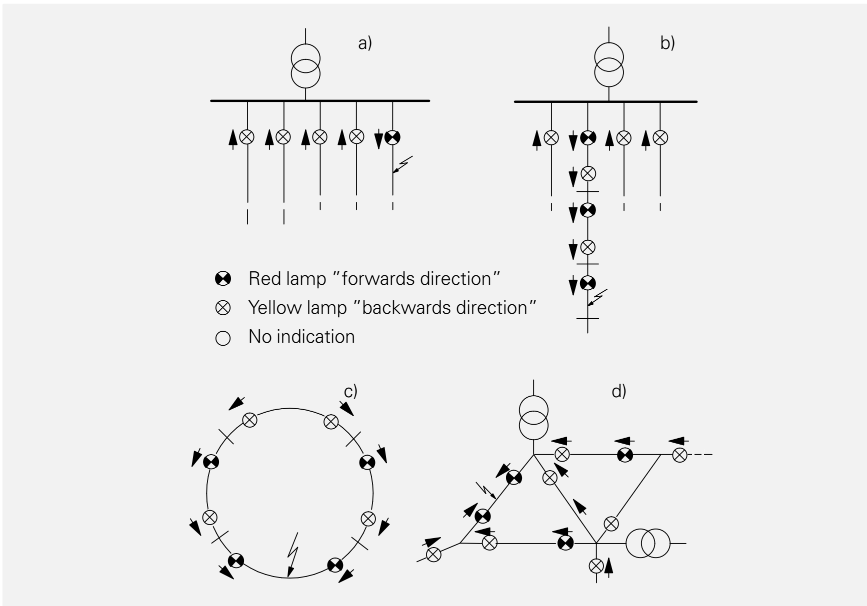

Fig. 3
Detection of fault location

7SN71 transient earth–fault relay

Technical data

Measuring circuit	Rated current I_N Rated voltage V_N Rated frequency f_N Thermal rating, in voltage path, continuous in current path, continuous for 10 s for 1 s (at 1 A) for 1 s (at 5 A)	1 or 5 A 100/110 V AC 50 Hz 120 V AC 4 x I_N 30 x I_N 100 A 300 A	
Auxiliary voltage	Rated auxiliary voltage V_{aux}	24, 48, 60 V DC 110/125 V DC 220/250 V DC 100 to 110/220 V AC, 50 Hz	
	Power consumption	non–energized, approx.	energized, approx.
	at 24, 48, 60 V DC 110 V DC 125 V DC 220 V DC 250 V DC at 100 V AC 110 V AC 220 V AC	2 W 2.5 W 2.8 W 3 W 3.3 W 2.5 W 3.5 W 4 W	4 W 4.5 W 4.7 W 5 W 5.3 W 3.5 W 4.5 W 5 W
Binary input	Input voltage for blocking input and remote reset Operating threshold for blocking input Plug–in jumper X581–2 X582–3	24 to 250 V DC approx. 15 V approx. 50 V	
Current path	Input impedance Z at 50 Hz and 1 x I_N at I_N = 1 A, terminals 2B1/1B1 I_N = 5 A, terminals 1B2/1B1	 < 0.5 Ω < 0.2 Ω	
Earth–fault direction signal	Number of relays, forward or reverse direction Switching capacity make/break Switching voltage Switching current	2 NO contacts each 20 W/VA 250 V AC/DC 1 A	
Continuous earth–fault signal	Number or relays, continuous earth fault Switching capacity make break Switching voltage Permissible switching current continuous 0.5 s	1 NO contact 1000 W/VA 30 W/VA 250 V AC/DC 5 A 30 A	
Version	Housing, dimensions Connections for current for voltage Weight	7XP20, see dimension drawings 2 connection modules 6 connection modules approx. 4 kg	
Standards	DIN VDE 0435, Part 303 and IEC 255–5 or IEC 255–6	–	

Selection and ordering data

7SN71 transient earth–fault relay	Order number **7SN7100 – □ □ A 0 0**
Auxiliary voltage V_{aux}	
100 to 110/220 V AC, 50 Hz	**0**
24 V DC	**1**
48 V DC	**2**
60 V DC	**3**
110/125 V DC	**4**
220/250 V DC	**5**
Housing	
for panel surface mounting	**B**
for panel flush mounting	**C**

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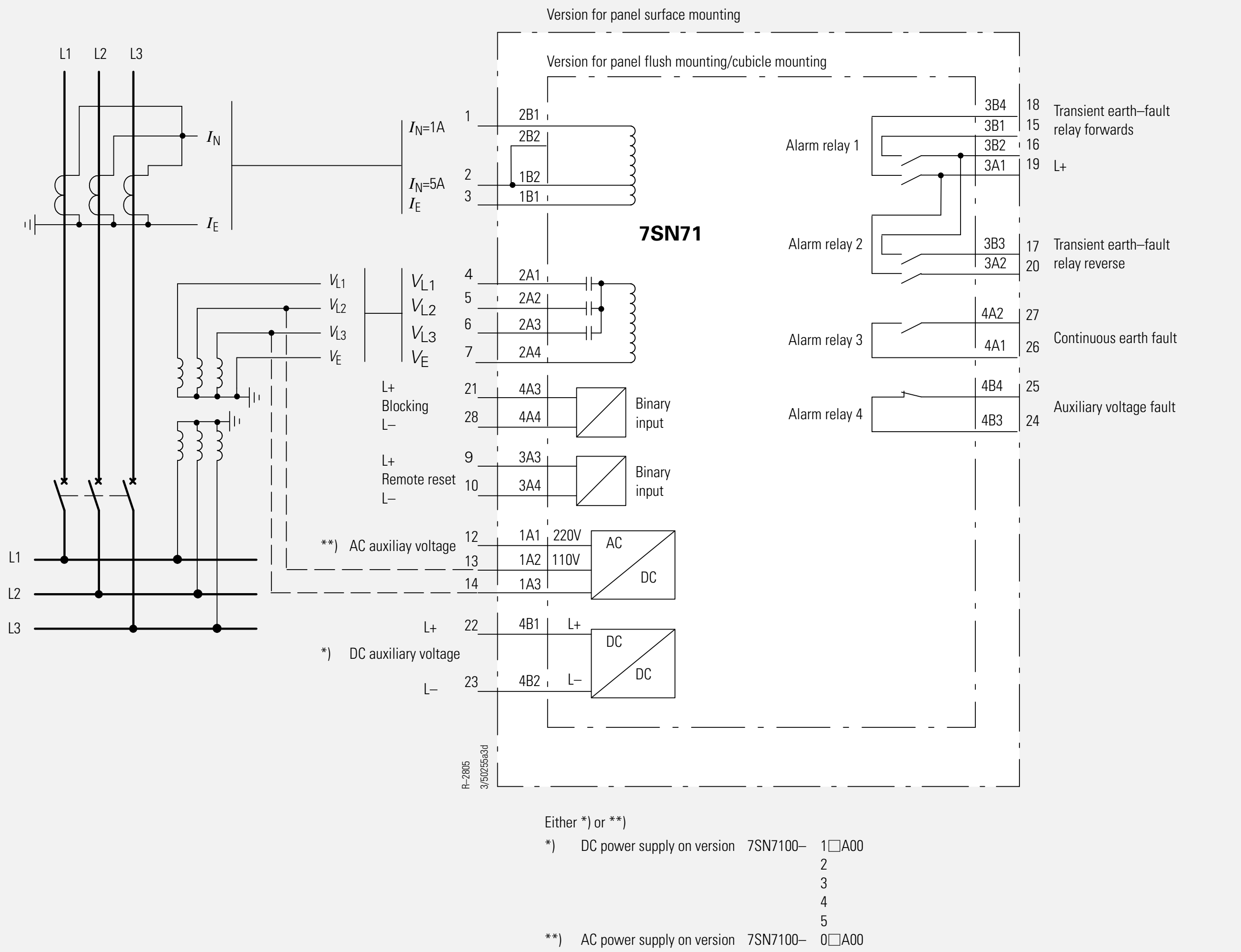

Fig. 4
Connection diagram for the 7SN71 transient earth–fault relay

Dimension drawings in mm

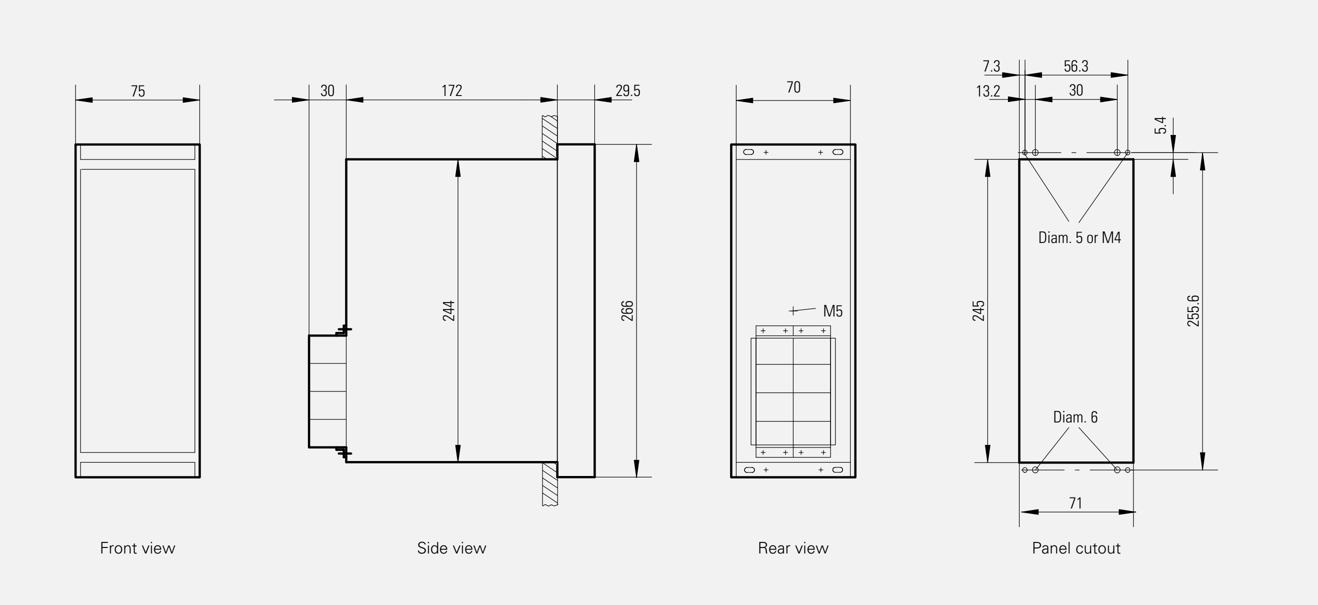

Fig. 5
7SN71 with housing 7XP2020–2 (for panel flush mounting or cubicle mounting)

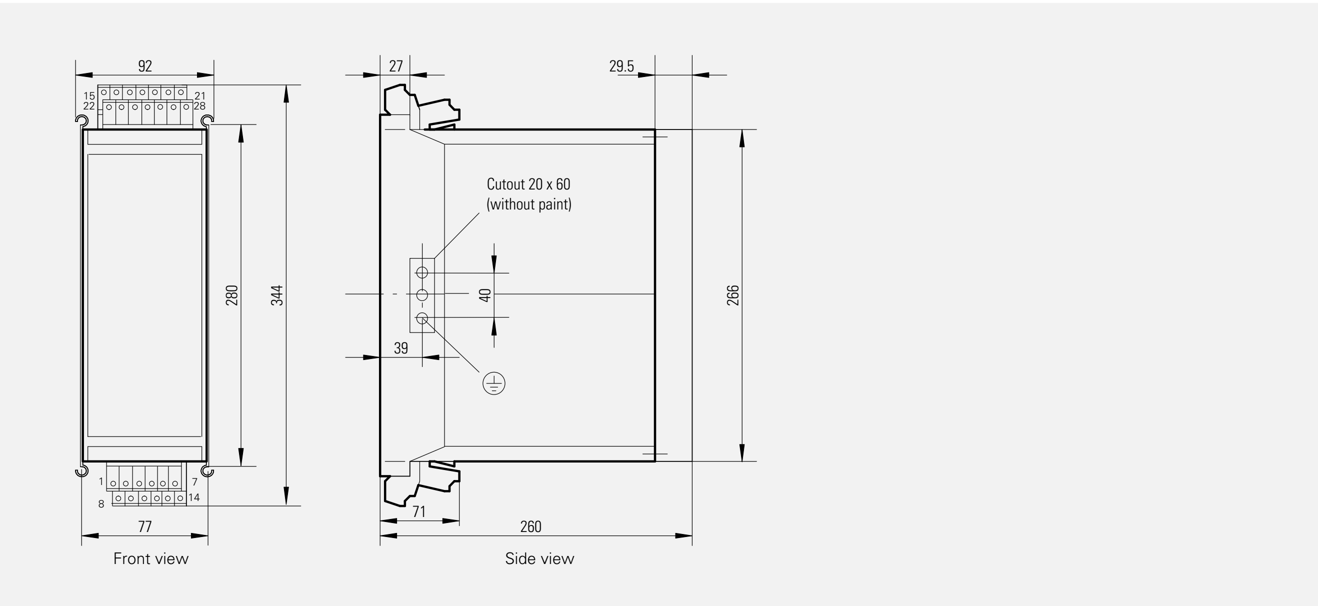

Fig. 6
7SN71 with housing 7XP2020–1 (for panel surface mounting)

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