

## SIPROTEC 7SA511 distance protection relay (Version V3)



Fig. 1  
SIPROTEC 7SA511 distance protection relay

### Application

The 7SA511 distance protection relay provides fast, reliable and selective clearance of faults on overhead lines and cables, being fed from one or multiple points. The network can be radial, ring or meshed. The system star point may be isolated, resonance earthed (e.g. Peterson coil), solidly earthed or low-resistance earthed.

The relay incorporates all functions normally required for distance protection and can also be applied as a time-graded back-up protection for all types of differential protection schemes.

The 7SA511 can be incorporated in both conventional switchgear systems and modern LSA 678 substation control and protection systems.

### Construction

With its compact construction the 7SA511 contains all the components required for current and voltage measurement for protection scheme logic, fault recording and on-line measurements, operator panel with display field, event/ alarm and command outputs, binary (contact) inputs, serial interfaces and power supply with DC/DC converter.

The relay can be supplied in three case variations. The version for surface mounting is supplied with 100 two-tier terminals accessible from the front. The versions for flush mounting or cubicle mounting have rear connection terminals and are available with or without glass cover.

### Mode of operation

All data processing within the 7SA511 is digital, from the measurement of voltages and currents to the tripping decision logic. The application of digital measurement to a large degree suppresses the influence of switching currents, transient DC current components, high-frequency transients and harmonics.

### Serial interfaces

The relay is fitted with two serial interfaces.

The operator interface on the front panel is suitable for the connection of a PC. The operating and analysis software DIGSI, running under WINDOWS, is available as an option to enable user-friendly parameter setting, analysis of fault data and records, and commissioning.

The system interface (either isolated RS232C/V.24 or fibre-optic) is available for connection to the Siemens SINAUT LSA 678 substation control system, to a central data acquisition system, to the data concentrator DAKON or to a starcoupler.

The communication protocol used is the compatible protocol according IEC 870-5-103. The serial information interface has been certified by the research institute for high-voltage and high-current technology (FGH) and declared to be in conformity with the IEC 870-5-103 standard.

Remote operation of the distance protection relay 7SA511 with the DIGSI software is possible if a modem is connected to the FO-serial interface.

For existing systems, the Siemens-specific protocol to DIN 19 244 is still available.

### Settings

All settings can be input by means of the integrated operator and display field panel, or a PC. All parameters are identified in clear text. The settings are stored in a non-volatile memory, so that they cannot be lost even during interruption of the supply voltage.

All parameters are reliably stored in EEPROMs and are thus independent of the state of charge of the memory battery.

### Self-monitoring

Hardware and software components are monitored continuously and any irregularities are immediately detected and alarmed. As a result, the security, availability and reliability of the relay are significantly improved.

# Overcurrent and Distance Relays

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### Distance protection

Distance protection is the main function of the 7SA511 relay. The distinguishing features of the relay are as follows:

- Availability of multiple starting options:
  - a) Overcurrent fault detection  $I \gg$
  - b) Voltage-dependent overcurrent fault detection  $V < I >$  (option)  
The measured voltages, depending on the selected settings and the earth fault detection, may be  $3 \times$  phase-to-earth  $V_{PH-E}$ , depending on the phase current  $I_{PH}$  (see Fig. 2) or the  $3 \times$  phase-to-phase voltages  $V_{PH-PH}$ .
  - c) Polygonal impedance characteristic fault detection  $Z <$  (option) (see Fig. 3). Either the impedances of the  $3 \times$  phase-to-phase loops or  $3 \times$  phase-to-earth loops are calculated depending on the earth-fault detection. The effect of apparent impedances in unfaulted phases during earth faults is eliminated by a compensation method.
- Earth faults are detected by earth current  $I_E$  detection and/or residual voltage  $V_E$  measurement.
- Polygonal tripping characteristics with separate settings for reactance  $X$  and resistance reach  $R$  (see Fig. 4). Separate settings are provided for the resistance reach  $R$  for phase-to-phase and phase-to-earth faults. Five distance zones are provided and they may be independently set in the forward or reverse direction or non-directional. Two of the zones may also be used for zone extension schemes. In addition, a directional and a non-directional back-up time stage is available.
- Directional measurement using sound phase polarization and voltage memory for unlimited sensitivity.
- Seven independent time delays are provided.
- Phase-selective tripping is available for use with single-pole or single and three-pole rapid auto-reclosing schemes.
- Automatic blocking of the distance protection function is provided following detection of a V.T. failure to prevent incorrect distance measurement.

### Fault locator

Fault location is provided through calculation of the fault impedance. The distance-to-fault may be output in ohms, kilometers or percentage of the line length.

As an option, the fault location can be provided by parallel-line mutual compensation, if the zero-current of the parallel-lines can be measured.

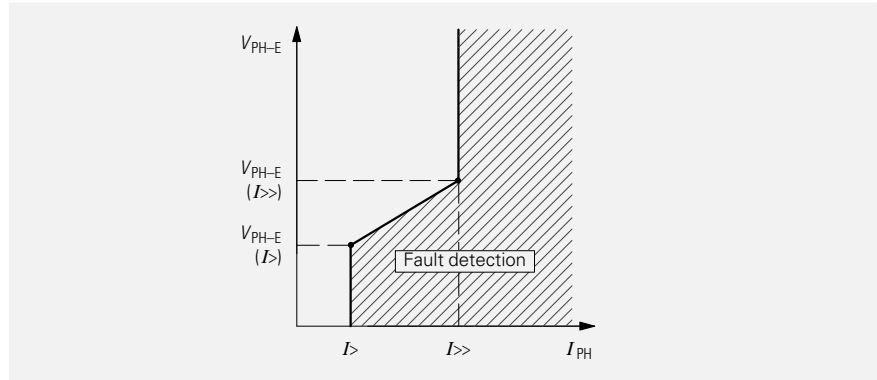


Fig. 2 Characteristic of voltage-dependent overcurrent fault detector  $V_{PH-E} (I_{PH})$

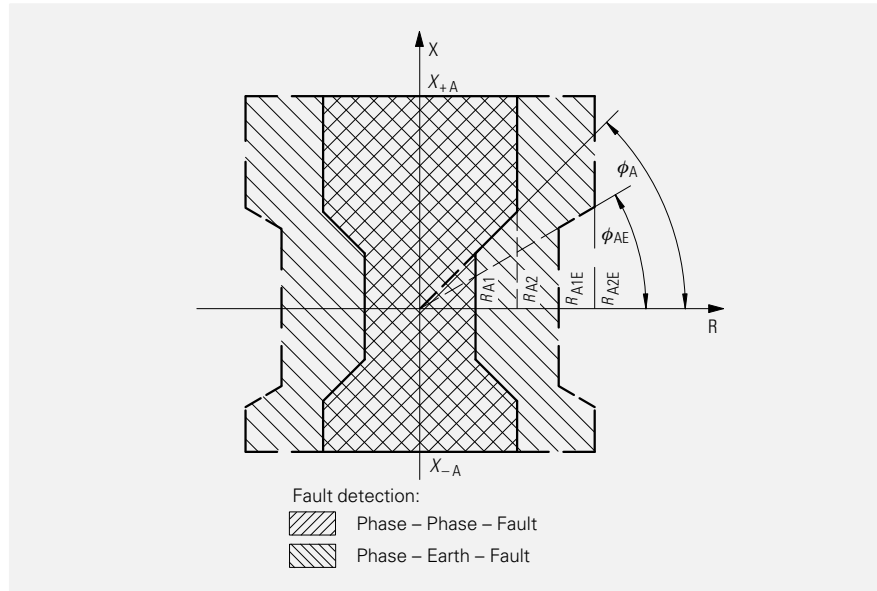


Fig. 3 Characteristic of impedance fault detector ( $Z <$ )

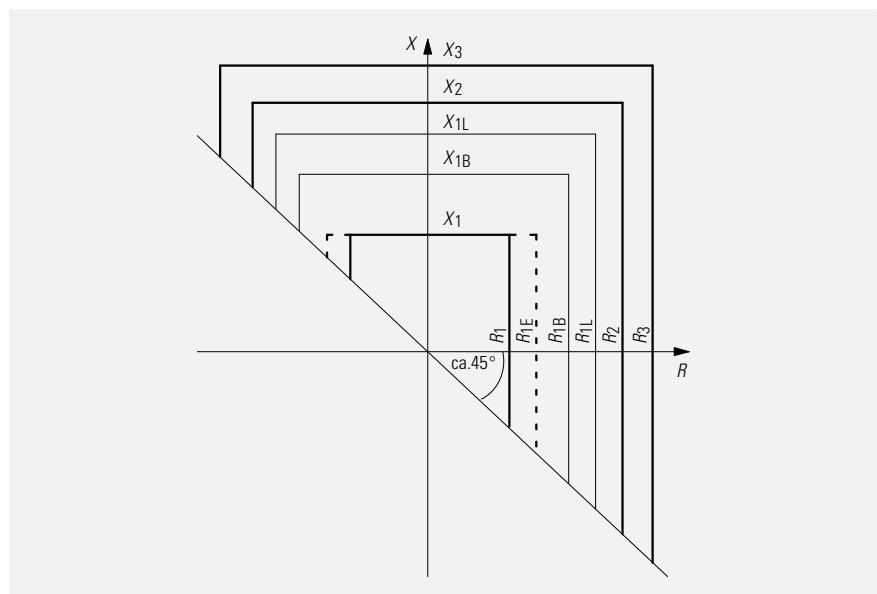


Fig. 4 Distance protection tripping characteristics

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### Overcurrent-time and definite-time overcurrent protection (emergency)

The distance protection 7SA511 can be used as a two-stage definite-time overcurrent protection. This protective function can only be automatically activated if the measuring voltage fails resulting from short-circuit or fault in the V.T. circuit, or if the V.T. c.b. trips.

### Universal teleprotection interface

For fast selective clearance of faults over the complete line a comprehensive teleprotection facility is provided. The following schemes may be selected:

- Intertrip via fault detection
- Intertrip via zone extension Z1B
- Signal comparison with zone extension Z1B
- Unblocking with directional fault detection
- Directional comparison
- Unblocking with zone extension Z1B
- Blocking with zone extension Z1B
- Pilot wire protection
- Reverse interlock function

An echo function for zero or weak infeed, and a current reversal block function for comparison or blocking are integrated.

### Switch-on-to-fault protection

Through the use of a binary input representing manual closing of the line circuit-breaker the 7SA511 can initiate a switch-on-to-fault function. The function may be set to initiate immediate tripping from zone Z1B or from the fault detection elements.

### Earth-fault detection in non-earthed networks (option)

In networks with no star-point earthing, single phase-to-ground earth-fault detection is provided. The following functions are included:

- Detection of an earth fault by monitoring the residual displacement voltage  $V_E$
- Determination of the faulted phase through measurement of the phase-to-earth voltages
- Determination of the direction of the earth fault through precise measurement of the active and reactive components of the residual current ( $I_E$ )
- Annunciation or tripping in the event of an earth fault in forward direction
- Measurement of the respective content of the active and reactive component of the earth current during an earth fault.

### Sensitive earth-fault protection in earthed networks (option)

In earthed networks which are subject to extreme high-resistance earth faults, it is possible for the fault impedance to lie outside of the distance protection impedance characteristic. The 7SA511 may include the following optional functions for high-resistance earth fault protection:

- Directional earth-fault protection with emergency and back-up definite-time overcurrent protection function
- Earth-fault overcurrent protection function with inverse-time characteristic
- The directional earth-fault function may be extended to become a directional comparison scheme with the use of interstation signalling and comparison logic.

### Automatic-reclose function (option)

The 7SA511 can be ordered with an auto-reclose (AR) facility.

The range of functions include:

- 3-pole RAR/DAR for all fault types (DAR: delayed AR-cycle)
- 1-pole RAR for single-phase faults, no reclose for multiple-phase faults
- 1-pole RAR for single-phase faults, 3-pole RAR/DAR for multiple-phase faults
- 1-pole RAR for single-phase and for 2-phase faults without involvement of earth, and 3-pole RAR/DAR for other faults
- Multi-shot DAR
- Integration with external AR equipment with communication via binary (contact) inputs and outputs
- Control of the 7SA511 AR function by an external protection scheme
- AR blocking for faults in the cable section of mixed routes (cable and overhead line).

### Power swing (option)

Power swings can give rise to high equalization currents and small voltages. Small voltages, with simultaneous high currents, mean small impedances, which can lead to tripping of the distance protection. In order to avoid uncontrolled tripping by the distance protection and specific tripping in the event of synchronism loss, the 7SA511 distance protection relay features an additional power swing function option.

The following reaction to power swings can be set:

- Blocking  
The distance protection tripping function may be blocked for the duration of the power swing
- Tripping  
Tripping may be initiated following the detection of a power swing outside the defined stability limits.

### Synchronism check (option)

Where two network sections are switched in by control command or following a 3-pole RAR, it must be ensured that both network sections are mutually synchronous. For this purpose, the distance protection relay 7SA511 features a synchronism check function. After verification of network synchronism, the function enables the CLOSE command. Alternatively, reclosing can also be verified after a check for dead state of the busbar or cable.

### Thermal overload protection

For thermal protection of cables an overload protection with an early-warning stage is provided. The thermal replica can be formed with the maximum or mean value of the respective excess temperatures in the three phases, or with the temperature rise from the respective maximum phase current.

The tripping time characteristics are exponential functions to IEC 255-8 and they take account of heat loss due to the load current and the accompanying drop in temperature of the cooling medium. The previous load is therefore taken into account in the tripping time on overload. A settable alarm stage can output a current or temperature-dependent indication before the tripping point is reached.

### Selectable parameter changeover setting groups (option)

Through binary (contact) inputs or via the relay setting facilities (front panel or serial interface) it is possible to change between four sets of previously stored parameter settings. This allows the rapid modification of relay settings to match configuration changes in the protected network.

Parameter set changeover is also possible via the compatible IEC 870-5-103 interface.

# Overcurrent and Distance Relays

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### Fault recording

The digitized measured values of phase currents, earth current, phase voltages and residual earth voltage, together with several binary channels, are stored with parameterizable pre-trigger and post-fault time. Storage of recorded fault data is battery-buffered and therefore remains available even after an interruption of the auxiliary power supply. Fault recording can be transmitted to a PC and to the SINAUT LSA substation control system for evaluation. Parallel operation of PC and substation control system is possible. If the IEC870-5-103 protocol is used, up to 8 fault records can be stored. The data memory is organized as a ring buffer store with a maximum length of 5 s (at  $f_N = 50$  Hz). The oldest fault records are overwritten with the newest data. A fault record can also be started via a binary input or – especially as an aid in commissioning – via an integrated control panel or PC. The respective record duration can then be parameterized.

### Function allocation for command and alarm relays, LEDs and binary inputs

The 7SA511 is equipped with 5 heavy-duty output relays. They can be linked with the commands for the above-mentioned protective functions and with all other signal outputs or binary signals.

For user-specific output and display of signals, alarm relays and LEDs may be allocated as desired. Individual signals can be grouped. The stored LED indications are protected from supply voltage failure.

All binary inputs can likewise be allocated as desired.

### Measurement and test functions

The 7SA511 provides a large number of test and measurement functions, including the following:

- Measurement of the (in-service) impedance of six impedance loops and indication of direction, reactance and resistance
- Monitoring of the phase sequence
- In-service measurement  $I_{L1}$ ,  $I_{L2}$ ,  $I_{L3}$
- In-service measurement  $V_{L1-L2}$ ,  $V_{L2-L3}$ ,  $V_{L3-L1}$ ,  $V_{L1}$ ,  $V_{L2}$ ,  $V_{L3}$
- Active and reactive power measurement
- Frequency measurement
- Trip circuit test facility, single and three-pole operation
- Auto-reclose test facility, single and three-pole operation
- Measurement of the respective content of the active and reactive component of the earth current during an earth fault.

### Non-volatile storage of operational records

The 7SA511 provides all the data necessary to analyze the operational performance of the relay following a network fault. The following recording functions are all secure from interruption of the auxiliary power supply.

- Real-time clock  
A standardized, battery-backed, real-time clock is available which may be synchronized via a binary input or via the system serial interface. The clock time can be set via PC and IEC 870-5-103 interface. All events are recorded with a date and time tag.
- Fault indications  
The operational records (e.g. fault type, distance-to-fault etc.) for the last three fault operations are available via the integrated control panel. The last four operational records are available at the PC interface via DIGSI.
- Operational indications  
All signals not associated directly with the fault are stored in the operational indication buffer.
- Earth-fault protocol (isolated networks)  
Relays with the optional isolated/compensated network earth-fault detection function store, record and fault details in a separate memory block.
- Tripping statistics  
For each pole of a circuit-breaker it is possible to record the progressive total of tripping and opening operations as well as the summation of the breaking current.
- Automatic data display  
An operation mode may be selected in which two (normal service) measured values are continuously updated on the integrated LCD display. Following a fault operation two (previously selected) stored fault information values are displayed.

### User-definable binary inputs and time stages, external tripping

There are four binary inputs available for recording of binary signals, e.g. signals from other protective devices. These inputs are stored in the operational indications buffer and can be passed to alarm relays, LEDs and the SINAUT LSA substation control and protection.

The relay is also equipped with two parameterizable time stages. The start and reset signals can be marshalled to binary inputs; the timing period can be marshalled to alarm relays and LEDs. Pickup and reset delay can be set across a broad range. External use of additional time relays for special switching requirements will in future be dispensed with.

By coupling in from outside via binary inputs, phase-selective remote tripping can take place with and without automatic reclosing.

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### Technical data

<b>Input circuits</b>	<p>Rated current <math>I_N</math>            Rated voltage <math>V_N</math>            Rated frequency <math>f_N</math>            Thermal overload capability in v.t. circuits, continuous            in c.t. circuits, continuous for 10 s            for 1 s            Dynamic overload            Burden v.t. circuits            c.t. circuits at <math>I_N = 1</math> A            at <math>I_N = 5</math> A            Residual current input 1 A            (isolated network option)</p>	<p>1 or 5 A            80 to 125 V AC            50 or 60 Hz            140 V AC  <math>4 \times I_N</math>  <math>30 \times I_N</math>  <math>100 \times I_N</math>  <math>250 \times I_N</math>            Approx. 0.1 VA            Approx. 0.05 VA            Approx. 0.2 VA            Approx. 0.05 VA</p>
<b>Voltage supply</b> via integrated DC/DC converter	<p>Rated auxiliary voltage <math>V_{aux}</math>            Permissible tolerance            Permissible max. ripple (pk-pk)            Power consumption quiescent            energized            Max. operating time after auxiliary voltage drop</p>	<p>24, 48 V DC            60, 110, 125 V DC            220, 250 V DC            -20 to +15 %  <math>\leq 12</math> %            Approx. 16 W            Approx. 26 W  <math>\geq 50</math> ms at <math>V_{aux} \geq 110</math> V</p>
<b>Binary inputs</b>	<p>Number of inputs            Voltage range            Current input</p>	<p>10 (marshallable)            24 to 250 V DC, adjustable in 4 ranges            Approx. 1.7 mA</p>
<b>Indication contacts</b>	<p>Number of relays with 1CO contact each            with 1NO contact each            Switching capacity make/break            Switching voltage            Permissible current continuous</p>	<p>11 (marshallable)            6            5            20 W/VA            Max. 250 V AC/DC            1 A</p>
<b>Heavy duty contacts</b>	<p>Number of relays, with 2 NO contacts each            Switching capacity make            break            Switching voltage            Permissible current continuous            0.5 s</p>	<p>5 (marshallable)            1 000 W/VA            30 W/VA            Max. 250 V AC/DC            5 A            30 A</p>
<b>LED displays</b>	<p>Ready for operation green            Fault indication red            Marshallable LEDs red</p>	<p>1            1            14</p>
<b>Serial interfaces</b>	<p>Operator interface            Baud rate            System interface            Baud rate            Electrical connection            Insulation transmission distance            fibre-optic connection            optical wavelength            permissible line attenuation            transmission distance</p>	<p>On the front panel, not isolated, suitable for connection of a PC            1 200 to 19 200 Bd            Control system interface, isolated, suitable for coupling to a central unit            1 200 to 19 200 Bd            Similar to V.24/V.28 to CCITT or RS232C to EIA, 2kV isolated, cable with 2 core pairs, with individual and common screening e.g. LIYCY-CY/2 x 2 x 0.25 mm<sup>2</sup>            Max. 1 km            Integrated FSMA connector for fibre-optic connection            820 nm            Max. 8 dB (for 62.5/125 <math>\mu</math>m fibre)            Max. 1.5 km</p>
<b>Construction</b>	<p>Housing, dimensions            Weight panel flush mounting/cubicle mounting            panel surface mounting            Degree of protection according to EN 60 529 housing            terminals</p>	<p>7XP20, see dimension drawings            Approx. 9.5 kg            Approx. 11 kg            IP 51            IP 21</p>



# Overcurrent and Distance Relays

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### Technical data (continued)

Distance protection	Setting ranges		
	Earth-fault detection		
	Earth current $I_E/I_N$	Step	0.01
	Displacement voltage		
	$V_E > (= \sqrt{3} V_0, \text{ earthed network})$		1 V
	$V_E > (= \sqrt{3} V_0, \text{ isolated network})$		1 V
	Overcurrent fault detection ( $I \gg$ )		
	Overcurrent $I_{PH}/I_N$		0.01
	Impedance fault detection ( $Z <$ )		
	Characteristic		Polygonal
	Forward reach $X+$		0.01 $\Omega$
	Reverse reach $X-$		0.01 $\Omega$
	Resistance tolerance		0.01 $\Omega$
	Threshold angle between load and short-circuit range		0.1°
	Minimum current $I_{PH}/I_N$		0.01
	Voltage dependent overcurrent fault detection ( $V < I >$ )		
	Phase-to-earth voltage $V_{PH-E} (I >)$		1 V
	Phase-to-earth voltage $V_{PH-E} (I \gg)$		1 V
	Phase-to-phase voltage $V_{PH-PH} (I >)$		1 V
	Phase-to-phase voltage $V_{PH-PH} (I \gg)$		1 V
	Distance measurement		
	Characteristic		Polygonal
	Distance zones		5, 2 as zone extensions and all zones may be set in the forward, reverse or in both directions (non-directional)
	Reactance reach $X$		0.01 $\Omega$
	Resistance tolerance $R$		
	for phase-to-phase faults		0.01 $\Omega$
	for phase-to-earth faults		0.01 $\Omega$
	Time stages		
	Timer range		0.01 s
	Residual compensation		
	$\frac{X_E}{X_L}, \frac{R_E}{R_L}$		0.01
	Parallel line mutual compensation		
	$\frac{X_M}{X_L}, \frac{R_M}{R_L}$		0.01
	Directional determination for all failure types		
	Directional sensitivity		
	Operating times		
	Minimum trip contact		23 ms
	Reset time		Approx. 30 ms
	Tolerances		
	for impedance fault detection		Measurement tolerances according to VDE 0435, Part 303 for sinusoidal quantities
			$\frac{\Delta X}{X} \leq 5\%$ for $30^\circ \leq \varphi \leq 90^\circ$
			$\frac{\Delta R}{R} \leq 10\%$ for $0^\circ \leq \varphi \leq 60^\circ$
	for distance measurement		$\frac{\Delta X}{X} \leq 5\%$ for $30^\circ \leq \varphi \leq 90^\circ$
			$\frac{\Delta R}{R} \leq 5\%$ for $0^\circ \leq \varphi \leq 60^\circ$
	for amplitude measurement		$\pm 5\%$
	Timer accuracy		$\pm 1\%$ of set value or 10 ms

1) Impedance settings referred to  $I_N = 1$  A; at  $I_N = 5$  A these values are 5 times the secondary values.

# Overcurrent and Distance Relays

## SIPROTEC 7SA511 distance protection relay (Version V3)

### Technical data (continued)

<b>Fault locator</b>	Distance to fault Start signal Reactance per unit length Step 0.001 Ω/km Parallel line compensation Measurement tolerance (according to VDE 0435, Part 303 for sinusoidal quantities)	Secondary Ω, primary Ω, km or % of line length Trip output, fault detector reset or binary input 0.01 to 5 Ω/km Selectable; option $\leq 2.5\%$ line length for $30^\circ \leq \varphi_k \leq 90^\circ$ and $V_k/V_N \geq 0.1$ without intermediate infeed
<b>Power swing</b> (devices with impedance starting Z<)	Power swing detection principle Modes Differences between power swing polygon and fault detector Step 0.01 Ω Rate of change (impedance) 1 Ω/s Operating time 0.01 s	Measurement of the rate of change of impedance Power swing blocking Power swing tripping 0.1 to 50 Ω 0 to 200 Ω/s 0.01 to 32 s or until end of power swing
<b>Definite-time o/c emergency mode</b>	Automatic initiation on recognition of measuring voltage failure or v.t. m.c.b. trip Setting ranges Overcurrent $I_{PH} > I_N$ Step 0.01 Earth current $I_E > I_N$ 0.01 High set o/c $I_{PH} \gg I_N$ 0.01 Timers $t_1 >$ , $t_{E1} >$ , $t_1 \gg$ 0.01 s Measurement tolerance (according to VDE 0435, Part 303 for sinusoidal quantities)	0.1 to 4 0.1 to 4 0.5 to 9.99 0 to 32 s or infinite $\pm 5\%$
<b>Universal teleprotection interface</b>	Modes Tripping Comparison Pilot wire protection Reverse interlock	Tripping via fault detection Tripping via zone extension (POTT/PUTT) Signal comparison Directional comparison Unblocking with zone extension Unblocking with tripping Blocking – –
<b>Earth-fault detection</b> (isolated networks)	Earth-fault detection using residual displacement voltage $V_E > (= \sqrt{3} V_0)$ Step 1 V Faulted phase detection $V_{PH-E} <$ (faulted phase) 1 V $V_{PH-E} >$ (unfaulted phase) 1 V Measurement tolerance (according to VDE 0435, Part 303 for sinusoidal quantities) Directional determination Measuring principle Earth-fault current $I_E >$ (active/reactive I), cable-type c.t. angle error correction 1 mA 0.1° Measurement tolerance (according to VDE 0435, Part 303 for sinusoidal quantities)	10 to 100 V 10 to 100 V 10 to 100 V $\leq 5\%$ of set value Active/reactive power measurement 3 to 1 000 mA 0 to 5° in 2 operating points $\leq 10\%$ of set value
<b>Sensitive earth-fault protection</b> (high-resistance faults in earthed networks)	Directional earth-fault protection with back-up definite-time non-directional overcurrent function Earth-current fault detection $I_E > I_N$ Step 0.01 Residual displacement voltage $V_E > (= \sqrt{3} V_0)$ 0.1 V Directional determination Carrier signalling Operating times Shortest tripping time Current reversal guard time Tripping time delay 0.01 s Timer tolerance Undirectional-earth-fault protection with inverse-time characteristic Characteristics according to IEC 255-3, or BS142 Pick-up value $I_E > I_N$ 0.01 Time multiplier $t_{IE}$ 0.01 s Tolerances Current pick-up Operating time	0.1 to 4 1 to 10 V with $I_E$ and $V_E$ Directional comparison Approx. 30 ms Approx. 30 ms 0 to 32 s or ineffective $\leq 1\%$ of set value or 10 ms Normal inverse Very inverse, Extremely inverse 0.1 to 4 0 to 32 s 5 to 15 % of set value $\leq 5\% \pm 15\text{ ms}$ for $2 \leq (I/I_E) \leq 20$ and $1\text{ s} \leq t_{IE} \leq 30\text{ s}$





# Overcurrent and Distance Relays

## SIPROTEC 7SA511 distance protection relay (Version V3)

### Selection and ordering data

Distance protection relay	Order No.
Rated current at 50/60 Hz 1 A 5 A	7SA511 □ - □ □ A □ - □ □ □ □ ↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑ 1 5
Rated auxiliary voltage 24, 48 V DC 60, 110, 125 V DC 220, 250 V DC	2 4 5
Construction For panel surface mounting For panel flush mounting/cubicle mounting For panel flush mounting/cubicle mounting without glass cover	B C E
Functions/language V3 with IEC 870-5-103 protocol, overload protection and with synchrocheck (option) Operator language German Operator language English	6 7
Fault detection With overcurrent ( $I \gg$ ) With impedance ( $Z <$ )/Overcurrent ( $I \gg$ )/Voltage-dependent overcurrent ( $V <$ , $I >$ ), settable option With voltage-dependent overcurrent ( $V <$ , $I >$ )/Overcurrent ( $I \gg$ ), settable option	1 2 3
Options A Without wattmetric earth-fault detection without FLPC With wattmetric earth-fault detection without FLPC Without wattmetric earth-fault detection with FLPC	0 1 2
Serial system interface Without Isolated, V.24/RS232C Integrated fibre-optic interface	A B C
Options B Without AR without parameter changeover facility, without synchronism check With AR, 3-pole without parameter changeover facility, with synchronism check With AR, 1 and 3-pole without parameter changeover facility, with synchronism check Without AR with parameter changeover facility, with synchronism check With AR, 3-pole with parameter changeover facility, with synchronism check With AR, 1 and 3-pole with parameter changeover facility, with synchronism check	A B C E F G
Options C Without power swing without earth-fault protection for earthed networks With power swing <sup>1)</sup> without earth-fault protection for earthed networks Without power swing with earth-fault protection for earthed networks With power swing <sup>1)</sup> with earth-fault protection for earthed networks	0 1 2 3

FLPC – Fault location with parallel line mutual compensation  
AR – Auto-reclose

### Operation software (German and English are standard, other languages on request)

DIGSI program (suitable for all protection relays 7UM..., 7UT..., 7SJ..., 7SA..., ...)	German English	7XS5020-0AA00 7XS5020-1AA00
Test version:	German English	7XS5021-0AA00 7XS5021-1AA00
Connecting cables for protection relays (25-pin) – PC (9-pin); (other variations supplied on request)		7XV5100-2

### Documentation

<b>German:</b> Katalogblatt LSA 2.2.11: Abzweigschutz SIPROTEC 7SA511 (Version V3) Handbuch: Abzweigschutz SIPROTEC 7SA511 (Version V3)		E50001-K5712-A211-A2 C53000-G1100-C98-3
<b>English:</b> Catalog LSA 2.2.11: SIPROTEC 7SA511 distance protection relay (Version V3) Manual: SIPROTEC 7SA511 distance protection relay (Version V3)		E50001-K5712-A211-A2-7600 C53000-G1176-C98-3

1) Only available with impedance starting ( $Z <$ ). Mark "2" in the 12<sup>th</sup> digit of the Order No.

# Overcurrent and Distance Relays

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### Function scope of special device versions

Special device versions can be supplied for specific applications. The following functions are available in all versions:

Fault location, thermal overload protection, load values, overcurrent–time and definite time overcurrent protection,

current, voltage, active power, reactive power, frequency measurement, switching statistics with summation of interrupted currents per pole, integrated clock, battery–buffered signal memory and fault recording memory.

All equipment variants can be used in earthed and in compensated/isolated networks. In accordance with the functional scope of the individual equipment variants, the main applications are stated in the following table.

Functions	Versions				
	Basic version	Medium voltage		High voltage	
		Isolated, compensated, earthed network	Earthed network	Isolated/compensated network	Earthed network
Distance protection with 3 + 2 zones, 7 time steps	+	+	+	+	+
Direction detection with voltage or sound phase polarization	+	+	+	+	+
Overcurrent starting	+	+	+	+	+
V/I starting	–	+	+	+	+
Impedance starting	–	–	–	+	+
Fault location	+	+	+	+	+
Parallel–line mutual compensation for fault location	–	–	–	+	+
Power swing	–	–	–	+	+
Teleprotection interface	+	+	+	+	+
Emergency definite time overcurrent protection for measuring voltage failure	+	+	+	+	+
Thermal overload	+	+	+	+	+
Earth–fault detection in non-earthed network	–	+	–	–	–
Back–up earth–fault protection (earthed network)	–	–	+	–	+
Reclosing, 3-pole	–	+	+	+	+
Reclosing, 1/3-pole	–	–	–	–	+
Synchronism check	–	+	+	+	+
Protection for switch–on–to–fault	+	+	+	+	+
Fault recording	+	+	+	+	+
Parameter changeover facility	–	+	+	+	+
Transient earth–fault detection	o	o	o	o	o
Fault location output, analog/BCD	o	o	o	o	o

- + Function included
- Function not included
- o Function possible with add-on

# Overcurrent and Distance Relays

## SIPROTEC 7SA511 distance protection relay (Version V3)

### Selection and ordering data for the special device versions

<b>Distance protection relay</b>	Order No. 7SA511 □ - □ □ A □ - □ □ □ □
Rated current at 50/60 Hz 1 A 5 A	↑ 1 5
Rated auxiliary voltage 24, 48 V DC 60, 110, 125 V DC 220, 250 V DC	↑ 2 4 5
Construction For panel surface mounting For panel flush mounting/cubicle mounting For panel flush mounting/cubicle mounting without glass cover	↑ B C E
Language Operating language German Operating language English	↑ 6 7
Special device versions Basic version Medium-voltage version: isolated, compensated, earthed network (sensitive current transducer for $I_E$ ) earthed network High-voltage version: isolated, compensated network earthed network	↑ 1 0 A 0 3 1 F 0 3 0 F 2 2 2 F 1 2 2 G 3
Serial interface Without Isolated, V.24/RS232C Integrated fibre-optic interface	↑ A B C

### Accessories for the distance protection relay 7SA511

<b>Transient earth fault relay</b>	Order No. 7SN7100 - □ □ A 0 0
Rated auxiliary voltage 100 to 110/220 V, AC, 50 Hz 24 V DC 48 V DC 60 V DC 110/125 V DC 220/250 V DC	↑ 0 1 2 3 4 5
Construction For panel surface mounting For panel flush mounting/cubicle mounting	↑ B C
<b>Fault location output equipment</b>	Order No. 7SM7 □ 0 0 - □ □ □ 0 0
Device type Analog output unit BCD output unit	↑ 0 1
Rated auxiliary voltage 24 V DC 48 V DC 60 V DC 110/125 V DC 220/250 V DC	↑ 1 2 3 4 5
Construction For panel surface mounting For panel flush mounting/cubicle mounting	↑ B C
Binary input For BCD output unit 7SM71: no binary input For analog output unit 7SM70: 24/48/60 V DC 110/125/220 V DC	↑ A A C

## SIPROTEC 7SA511 distance protection relay (Version V3)

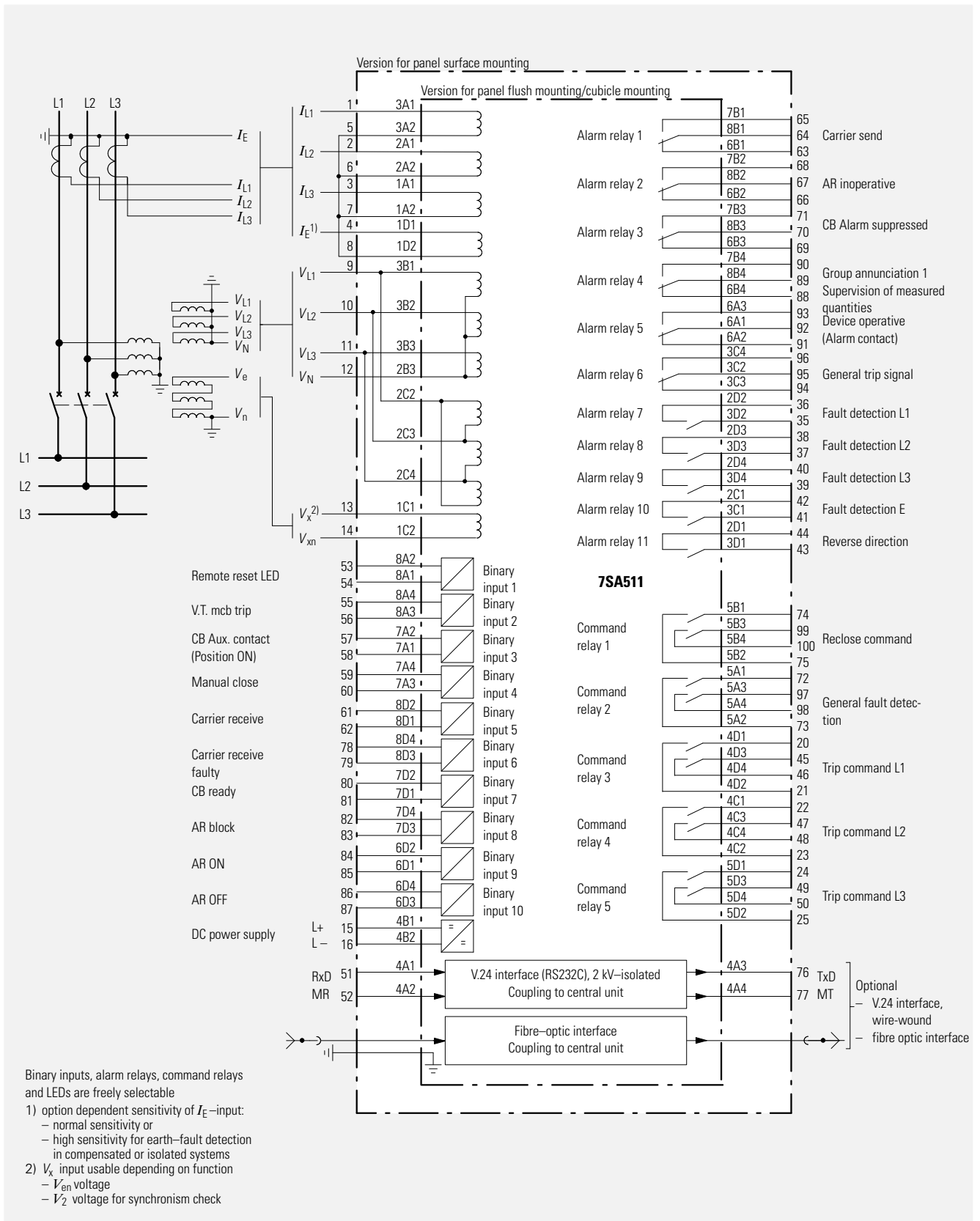


Fig. 5 Connection diagram for distance protection relay 7SA511 (Version V3), state of development FF

# Overcurrent and Distance Relays

## Dimension drawings in mm

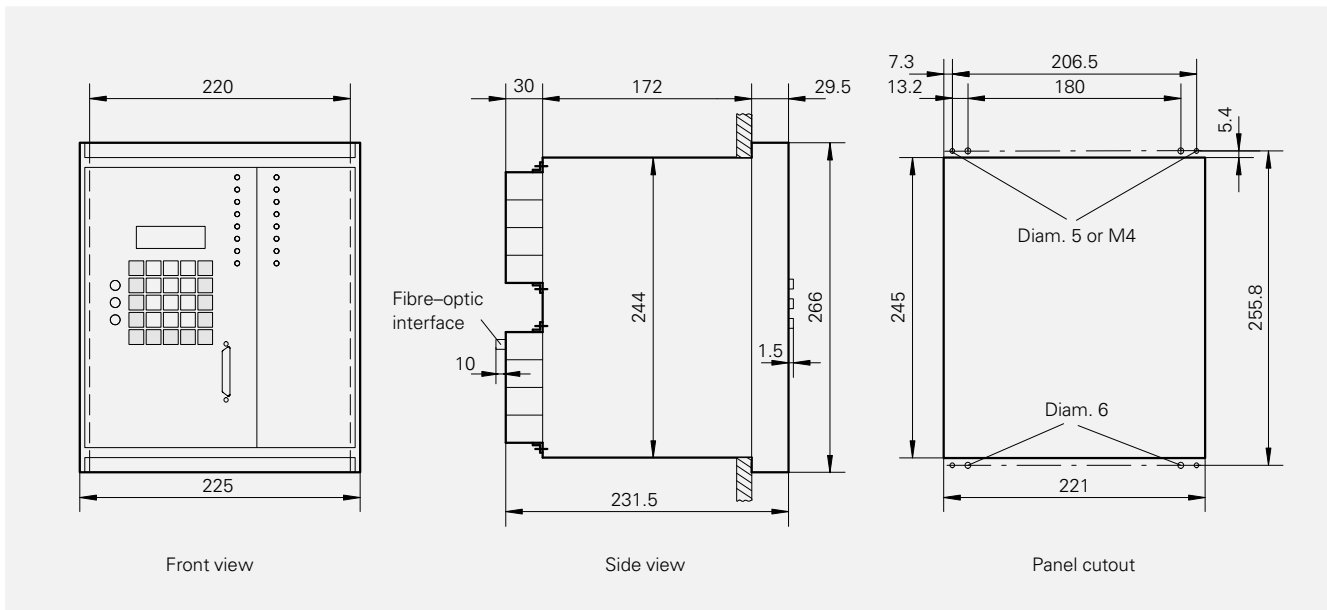


Fig. 6  
7SA511 (Version V3) with housing 7XP2040-2 (for panel flush mounting/cubicle mounting)

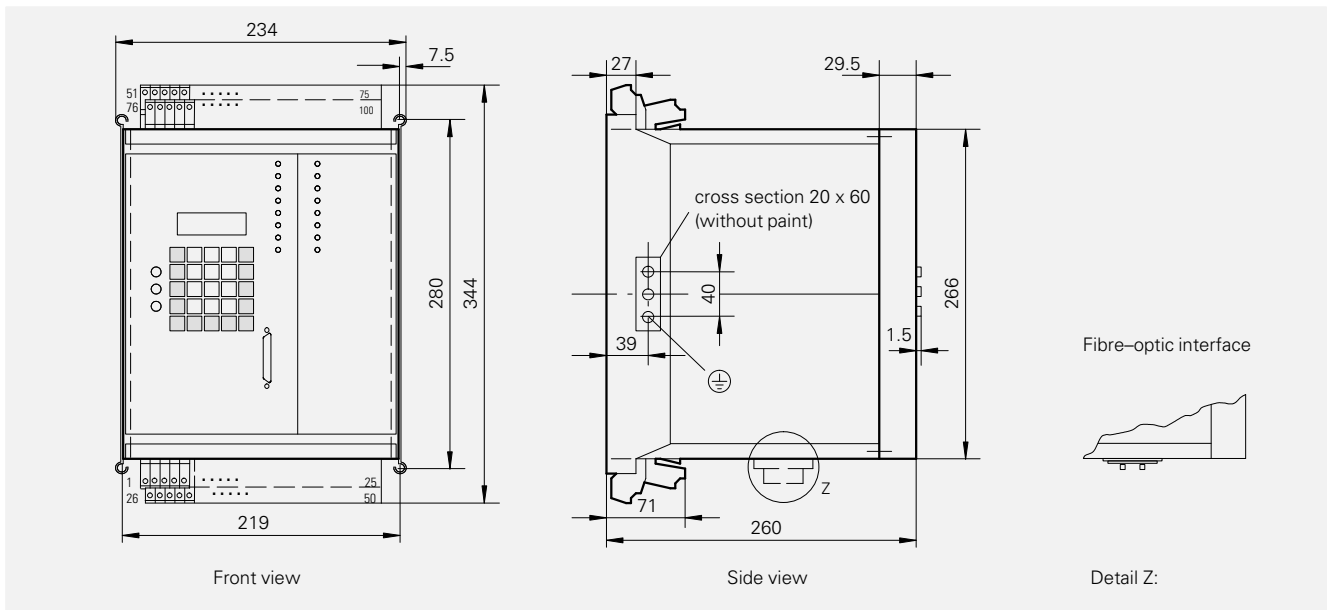


Fig. 7  
7SA511 (Version V3) with housing 7XP2040-1 (for panel surface mounting)

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**Conditions of Sale and Delivery • Export Regulations • Trademarks • Dimensions**

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