SIEMENS

Line protection relay 7SA513 (Version V2)

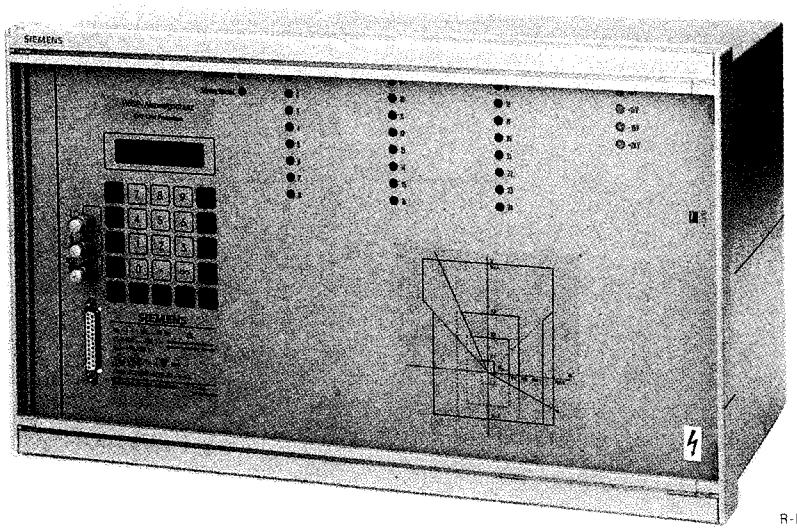


Fig. 1
Line protection relay 7SA513

Application

The 7SA513 is a 6-measurement loop, non-switched line protection relay and provides fast, reliable and selective clearance of faults on overhead lines and cables, being fed from one or multiple points. The network can be solidly earthed or low-resistance earthed.

The relay incorporates all functions normally required for the protection of extra-high-voltage lines and includes the following independent functions:

- Distance protection with comprehensive teleprotection interface
- Weak infeed protection with echo facility
- Power swing trip or block
- Switch-on-to-fault protection
- Overcurrent protection
- Directional earth-fault protection
- Earth-fault protection
- Overvoltage protection
- Compensated overvoltage protection

The following additional functions are also available:

- Single and/or three-pole auto-reclosing, with/without check synchronism
- Circuit-breaker failure protection
- Fault location
- Fault and event recording
- Real-time clock

The 7SA513 can also be applied as a time-graded back-up protection for all types of differential protection schemes.

The 7SA513 can be incorporated in both conventional switchgear systems and modern substation control systems, e.g. Siemens LSA 678.

Construction

With its compact construction, the 7SA513 contains all the components required for:

- Current and voltage measurement using a digital signal processor for protection scheme logic, fault recording, fault location and on-line measurements
- Operator panel with display field
- Event/alarm and command/tripping outputs
- Binary (contact) inputs
- Serial interfaces
- Power supply with DC/DC converter

The relay can be supplied in two case variations. The version for flush mounting or cubicle mounting has rear connection terminals. The model for surface mounting is supplied with 200 terminals accessible from the front.

Mode of operation

All data processing within the 7SA513 is digital, from the measurement of voltages and currents to the trip 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.

The measurement errors due to load current and parallel lines are also eliminated with load compensation and parallel line compensation, respectively in the distance protection.

The measurement difficulties found with capacitive voltage transformers are eliminated by powerful algorithms.

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. An operator program DIGSI is available, as an option, to enable user-friendly parameter setting, analysis of fault data and records, and commissioning.

The fibre optic system interface is available for connection to the Siemens substation control system LSA 678, or to a central data acquisition system.

Settings

All settings can be input by means of the integrated operator panel and display field, or via a PC. All settings 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.

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.

Distance protection

Distance protection is the main function of the 7SA513 line protection relay. The distinguishing features of the relay are as follows:

- Independent 6-loop, non-switched measurement for fault detection and tripping.
- Polygonal impedance fault detection characteristic $Z<$ (see Fig. 3). The impedances of all 6 measurement loops are continuously and independently calculated. The effect of apparent impedances in unfaulted phases is eliminated by a compensation method.
- Specially developed algorithms for series compensated lines.
- Earth faults are detected with earth current I_E detection, residual voltage measurement U_E, or by dual polarization.
- Polygonal tripping characteristics with separate settings for reactance X and resistance R (see Fig. 2). 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, together with the teleprotection interface.
- 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 auto-reclosing schemes.
- Fault location is provided through calculation of the fault impedance and distance-to-fault. The distance-to-fault may be output in ohms, kilometres or percentage of the line length. An optional parallel line compensation function is available.
- Automatic blocking of the distance protection function is provided, following loss of the V.T. voltage inputs, to prevent incorrect distance measurement.

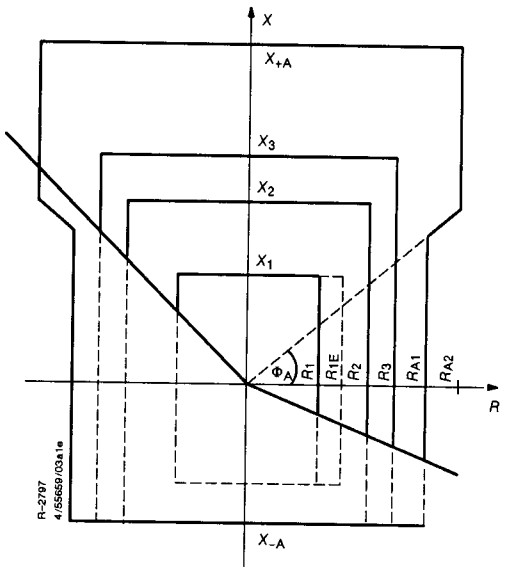


Fig. 2
Tripping characteristics of the distance protection

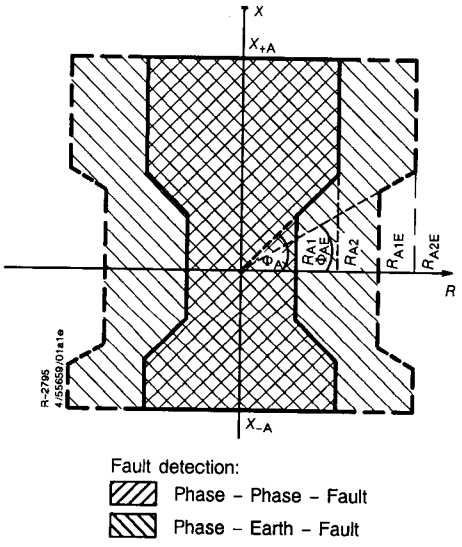


Fig. 3
Characteristics of the impedance fault detector (Z<)

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:

- Permissive underreach transfer tripping (PUTT)
- Zone extension (Carrier accelerator)
- Permissive overreach transfer tripping (POTT)
- Directional comparison
- Unblocking with zone 1B extension
- Blocking
- Directional pilot wire
- Reverse interlock function (busbar protection).

Weak infeed function with echo and transient blocking

A complete weak infeed function allows for single and/or three-phase tripping.

For instances where a blocking scheme would be delayed by weak infeed from one end, an echo function is provided to allow fast clearance of faults over the complete line.

A transient block function is provided for overreaching protection schemes to prevent mal-operation through current reversal conditions during fault clearance on parallel lines. Both of these functions are integrated in the applicable schemes.

Overcurrent protection/ emergency overcurrent

The line protection relay 7SA513 also has a 2-stage overcurrent protection. One stage is a high set/instantaneous, and the other is selectable between definite time (DTL) and inverse time (IDMTL). This can be used as back-up protection to the distance protection. The relay may be programmed to automatically changeover to the emergency overcurrent mode (which is independently selectable) following detection of V.T. circuit failure. The V.T. failure is detected either via an external contact (m.c.b. trip) or by the relay's internal monitoring and "plausibility" checks.

Switch-on-to-fault protection

Fast and reliable fault clearing when closing onto faults is provided with this function. Switch-on recognition is achieved with our without the use of circuit-breaker auxiliary contacts. Switch-on recognition without the use of auxiliary contacts is achieved with a phase-selective open-pole detector.

Directional earth-fault protection in earthed networks

In earthed networks which are subject to extreme high-resistance earth-faults, it is possible for the fault impedance to lie outside the distance protection impedance characteristic. The 7SA513 may include the following optional functions for high-resistance earth-fault protection:

- Directional earth-fault protection with back-up definite-time, or inverse-time overcurrent protection function.
- Earth-fault overcurrent protection function with definite or 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.

Power swing blocking/tripping

The 7SA513 relay utilizes the impedance fault detection characteristic for the detection of 3-phase power swings (see Fig. 4). The response to the detection of a power swing may be chosen from the following two options:

- 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.

Overvoltage protection

The overvoltage protection in the 7SA513 consists of a local overvoltage function, as well as a compensated overvoltage function for the remote line end. Overvoltage protection is therefore ensured for the complete line.

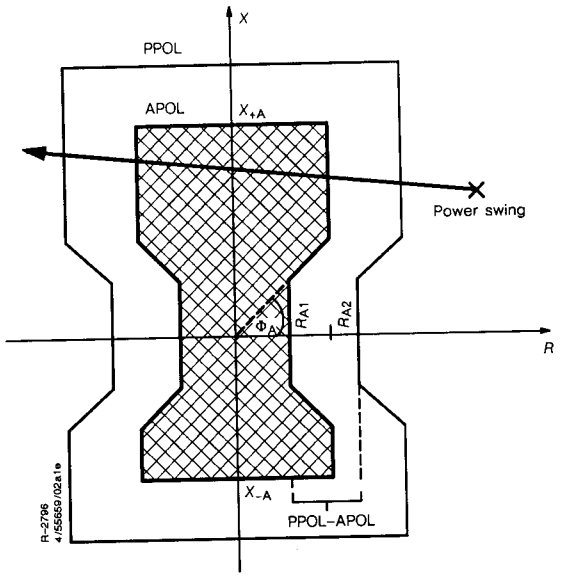


Fig. 4
Characteristics for the detection of power swings

Auto-reclose (AR) function

The 7SA513 is equipped with an auto-reclose (AR) facility. The range of functions include:

- 1-pole and/or 3-pole AR
- Single or multi-shot AR (up to 10 shots)
- Integration with external AR equipment with communication via binary (contact) inputs and outputs
- Control of the 7SA513 AR function from an external protection scheme
- AR inhibit for CB charging
- Monitoring of the complete AR cycle.

Check synchronism function

The 7SA513 is equipped with a complete check synchronism function. It can function with the integrated auto-reclose function mentioned above, or with an external auto-reclosure.

The range of functions within the check synchronism are:

- Voltage input matching (for different phases and/or voltages)
- Live busbar, dead line closing
- Dead busbar, live line closing
- Live busbar, live line (synchronism) closing
- Minimum differences (Δf, ΔU, $\Delta \varphi$) settable
- Separate settings for manual close condition
- CB closing time considered (settable)

Circuit-breaker failure protection

The circuit-breaker failure protection is a phase-selective single-stage function. It is used for the detection of the failure of the circuit-breaker to trip after receiving a trip command.

Selectable parameter changeover setting groups

Through binary (contact) inputs or via the relay setting facilities (front panel or PC interface) it is possible to change between 4 complete and independent sets of previously stored parameter settings. This allows the rapid modification of relay settings to match pre-planned configuration changes in the protected network.

Fault recording

The digitized measured values of phase currents, earth current, phase voltages and residual earth voltage are stored in the relay memory starting at 100 ms before fault detection for 50 Hz or 83 ms before fault detection for 60 Hz. The maximum total recording period is 3 seconds. Time marks for particular protection events, e.g. fault detection, output contact operation and fault detector resetting, ease the task of fault analysis. A previously saved fault recording is overwritten by a later fault to ensure that the data for the last fault is always available. The recorded fault data may be transferred via the substation control system LSA 678, or via the local serial interface to a portable PC for analysis.

Function allocation for input and output contacts and LEDs

The 7SA513 is equipped with 6 heavy duty (trip) output relays and 27 normal duty (alarm) output relays.

The allocation of protection tripping, reclosing and indication functions, and indicating LEDs is completely user selectable. Functions may also be grouped in any combination to operate a common output relay or indicating LED.

The 7SA513 is also equipped with 24 binary (contact) inputs which may be freely allocated and grouped to initiate the appropriate input functions (e.g. indication of manual C.B. closing operation to initiate switch-on-to fault).

The status of indicating LEDs following operation of the relay is stored in non-volatile memory to prevent loss of information if the auxiliary supply is interrupted.

Measurement and test functions

The 7SA513 provides a large number of test and measurement functions, including the following:

- Measurement of the (in-service) impedance of 6 impedance loops and indication of direction, reactance and resistance
- Monitoring of the phase sequence
- Measurement and indication of the (in-service) phase currents and phase-to-phase voltages
- Active and reactive power measurement
- Frequency measurement
- Trip circuit test facility including single-pole operation
- Auto-reclose test facility including single-pole operation.

Non-volatile storage of operational records

The 7SA513 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 the front panel. All events are recorded with a date and time tag.
- Event records
  The fault event records (e.g. fault type, distance-to-fault etc.) for the last 3 fault operations are stored in the relay. All other events, which are not part of the fault event record, are stored in the operating event records.
- Tripping statistics
  For each pole of a circuit-breaker it is possible to record the progressive total of tripping/opening operations, as well as the summation of the breaking current.
- Automatic data display
  An operation mode may be selected in which 2 (normal service) measured values are continuously updated on the integrated LCD display. Following a fault operation 2 (previously selected) stored fault information values are displayed.

Line protection relay 7SA513 (Version V2)

Technical data

Input circuits	Rated current I_N	1 or 5 A
	Rated voltage U_N	100 to 125 V AC
	Rated frequency f_N	50 or 60 Hz
	Thermal overload capacity, in v.t. circuits, continuous	140 V AC
	in c.t. circuits, continuous	4 x I_N
	for 1 s	100 x I_N
	Dynamic overload	250 x I_N
	Burden, voltage inputs	Approx. 0.5 VA
	current inputs for $I_N = 1$ A	Approx. 0.1 VA
	for $I_N = 5$ A	Approx. 0.2 VA
Voltage supply via integrated DC/DC converter	Rated auxiliary voltage U_H	48, 60 V DC 110, 125 V DC 220, 250 V DC
	Tolerance	-20 to +15 %
	Permissible maximum ripple (pk-pk)	≤ 12 %
	Power consumption, quiescent	Approx. 15 W
	energized	Approx. 30 W
	Max. operating time after auxiliary voltage failure	≥ 50 ms at $U_H \geq 110$ V
Input/output modules	Number	2 or 3
Binary inputs	Number per input/output module	8 (allocatable)
	Voltage range, settable	48, 60 V DC 110, 125 V DC 220, 250 V DC
	Current drain on activation	Approx. 3 mA per input
Indication (alarm) contacts (trip relays)	Number of relays per input/output module, each with 1 C/O contact	9 standard relays or 6 standard relays and 1 fast reed relay; all relays are allocatable
	Switching capacity make/break (standard relay)	20 W/VA
	Permissible current, continuous (standard relay)	1 A
	Switching voltage (standard relay)	250 V AC/DC
	Switching capacity make/break (reed relay)	15 W/VA
	Permissible current, continuous (reed relay)	0.3 A
	Switching voltage (reed relay)	220 V AC/DC
	Capacitive switching capacity (reed relay)	Max. 5 nF
Heavy duty command contacts	Number of relays per input/output module, each with 2 NO contacts	2 (allocatable)
	Switching capacity make	1000 W/VA
	break	30 W/VA
	Switching voltage	250 V AC/DC
	Permissible current continuous	5 A
	0.5 s	30 A
LED displays	Relay ready/healthy, green	1
	Relay failure, red	1
	Control voltage display for converter, green	3
	Number of LED's allocatable per input/output module, red	8
Serial interfaces	Operator interface	On the front panel, not galvanically isolated, suitable for PC connection
	Baud rate	1200 to 19200 Bd
	System interface	Control system interface (galvanically isolated)
	Baud rate	4800 to 19200 Bd
	Fibre optic connection	Integrated FSMA connector for fibre optic connection
	Optical wave length	820 nm
	Permissible line attenuation	Max. 8 dB (for 62.5/125 µm fibre)
	Transmission distance	Max. 2 km
Construction	Case, dimensions	7XP20, see dimension drawings
	Degree of protection according to EN 60529 Case	IP 51
	Terminals	IP 21
Standards	DIN VDE 0435, Part 303 and IEC 255-5 or IEC 255-6	–

Technical data (contin.)

Insulation tests	High voltage test		2 kV (rms), 50 Hz; 1 min or alternatively 2.8 kV DC; 1 min
	Impulse voltage test		5 kV (peak); 1.2/50 µs; 0.5 J; 3 positive and 3 negative shots at 5 s intervals
Disturbance tests	High frequency test (1 MHz test) IEC 255-22-1, Class III		2.5 kV (peak); 1 MHz; $\tau = 15$ µs; 400 shots per s; duration 2 s
	Electrostatic discharge test (ESD test) IEC 255-22-2, Class III		8 kV (peak); 5/30 ns; 10 positive discharges
	Radiated electromagnetic field test IEC 255-22-3, Class III		Frequency 27 MHz to 500 MHz, 10 V/m
	Fast transient test IEC 255-22-4, Class III		2 kV (peak); 5/50 ns; 5 kHz, 4 mJ per shot; 1 min per polarity
Radio interference	DIN VDE 0871, limit class B		–
Climatic conditions	Permissible ambient temperature	during service during storage during transport	– 5 to +55°C –25 to +55°C –25 to +70°C
	Humidity class		Code letter F to DIN 40040; condensation not permitted
Mechanical stress test to DIN 40046	Permissible mechanical stress,	during service	10 to 60 Hz: 0.035 mm amplitude 60 to 500 Hz: 0.5 *g* acceleration
		during transport	5 to 8 Hz: 7.5 mm amplitude 8 to 500 Hz: 2 *g* acceleration
Distance protection	Setting ranges		
	Earth-fault detection		
	Earth current I_E/I_N	Step 0.01	0.1 to 1
	Earth voltage U_E	1 V	10 to 100 V
	Impedance fault detection ($Z<$)		
	Characteristic		Polygonal
	Forward reach X_+	0.01 Ω	0.1 to 200 Ω [1]
	Reverse reach X_-	0.01 Ω	0.1 to 200 Ω [1]
	Resistance	0.01 Ω	0.1 to 200 Ω [1]
	Minimum current I_{PH}/I_N	0.01	0.1 to 4
	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)
	Resistance reach X	0.01 Ω	0.05 to 200 Ω [1]
	Resistance tolerance R		
	for phase-to-phase faults	0.01 Ω	0.05 to 65 Ω [1]
	for phase-to-earth faults	0.01 Ω	0.05 to 130 Ω [1]
	Time delays		7 for multi-phase faults 3 for single-phase faults
	Time delay range	0.01 s	0 to 32 s or infinite
	Residual compensation		
	$\frac{X_E}{X_L}$, $\frac{R_E}{R_L}$	0.01	–7 to +7
	Parallel line compensation		
	$\frac{X_M}{X_L}$, $\frac{R_M}{R_L}$	0.01	–7 to +7

1) Secondary values related to $I_N = 1$ A; for $I_N = 5$ A divide the values by 5.

Technical data (contin.)

Distance protection (contin.)	Parallel line compensation Load current compensation Directional determination for all fault types Directional sensitivity Operating times Shortest trip time Reset time: after trip without trip Tripping function for 2-phase faults Tolerances Measurement tolerances according to DIN VDE 0435, Part 303 (for sinusoidal quantities) for impedance fault detection for distance measurement for amplitude measurement Timer accuracy	Selectable Selectable With sound phase polarization and voltage memory Dynamically unlimited Approx. 18 ms Approx. 25 ms Approx. 30 ms 1or 3-pole tripping $\frac{\Delta X}{X} \leq 5$ % for $30° \leq \varphi_k \leq 90°$ $\frac{\Delta R}{R} \leq 10\%$ for $0° \leq \varphi_k \leq 60°$ $\frac{\Delta X}{X} \leq 5$ % for $30° \leq \varphi_k \leq 90°$ $\frac{\Delta R}{R} \leq 5$ % for $0° \leq \varphi_k \leq 60°$ $\pm 5\,\%$ $\leq 1\,\%$ of set value or 10 ms
Switch-on-to-fault protection	Shortest trip time	Approx. 10 ms
Fault location	Distance to fault Start signal Reactance per unit length Step 0.01 Ω/km Parallel line compensation Load current compensation Measurement tolerances according to DIN VDE 0435, Part 303 (for sinusoidal quantities)	Secondary Ω, primary Ω, km, or % of line length On tripping, or fault detector reset, or via binary input 0.01 to 5 Ω/km Selectable Selectable $\leq 2.5\%$ line length for $30° \leq \varphi_k \leq 90°$ and $U_K/U_N \geq 0.1$
Power swing function	Power swing detection principle Functions Difference between power swing and fault detector polygons Step 0.01 Ω Rate of change (impedance) 1 Ω/s Operating time 0.01 s	Measurement of the rate of change of impedance vector between power swing and fault detector polygons Power swing blocking or Power swing tripping 0.1 to 50 Ω 0 to 200 Ω/s 0.01 to 32 s or until end of power swing
Teleprotection	Modes Permissive underreach transfer trip Permissive overreach transfer trip Zone extension (carrier acceleration) Directional comparison Unblocking Blocking Directional pilot wire Reverse interlocking	
Weak infeed function	Echo function Tripping (1 or 3-phase)	With permissive and blocking function With carrier receive no fault detection, and undervoltage (phase selective)

Technical data (contin.)

Overcurrent protection	Characteristic			Definite time lag (DTL) Inverse definite minimum time lag (IDMTL)
	Functional possibilities (separately settable)			– as back-up protection function – as an emergency protection function automatically activated with loss of voltage (fuse failure monitor) or v.t. m.c.b. trip
	Setting ranges: Definite time (DTL)			
	Highset	Phase $I_{PH}>>/I_N$	Step 0.01	0.1 to 9.99
		Earth $I_E>>/I_N$	0.01	0.1 to 4
	Overcurrent	Phase $I_{PH}>/I_N$	0.01	0.1 to 9.99
		Earth $I_E>/I_N$	0.01	0.1 to 4
	Time delays $t_{I>}$, $t_{IE>}$, $t_{I>>}$		0.01 s	0 to 32 s or infinite
	Shortest tripping time			Approx. 28 ms
	Setting ranges: Inverse time (IDMTL)			
	Highset (DTL)	Phase $I_{PH}>>/I_N$	0.01	0.1 to 9.99
		Earth $I_E>>/I_N$	0.01	0.1 to 4
	Overcurrent (IDMTL)	Phase I_P/I_N	0.01	0.1 to 4
		Earth I_{EP}/I_N	0.01	0.1 to 4
	Time multiplier t_p			0.05 to 32
	Pick-up point			1.1 x I_p
	Characteristic according to IEC 255-4, paragraph 3.5.2 or BS 142			Normal, very and extremely inverse
	Measuring tolerance according to DIN VDE 0435, Part 303 (for sinusoidal quantities)			
	Pick-up values	DTL		± 5%
		IDMTL		Pick-up at $1.05 < I/I_P < 1.15$
	Operating times	DTL		1% of set value or 10 ms
		IDMTL		≤ 5% ± 15 ms for $2 \leq I/I_P \leq 20$ and $1\text{ s} \leq t_P \leq 20\text{ s}$
Earth-fault protection (high-resistance faults in earthed networks)	Directional earth-fault protection with back-up non-directional function			Definite time lag (DTL) or Inverse definite minimum time lag (IDMTL)
	Directional determination			With I_E and U_E
	Carrier signalling			Directional comparison
	Times			
	Shortest tripping time			Approx. 30 ms
	Current reversal time			Approx. 30 ms
	Definite time characteristic (DTL)			
	Earth-fault detection $I_E>/I_N$		Step 0.01	0.1 to 4
	Tripping time delay		0.01 s	0 to 32 s
	Timer tolerance			≤ 1 % of set value or 10 ms
	Inverse time characteristic (IDMTL)			
	Characteristic according to IEC 255-4, paragraph 3.5.2 or BS 142			Normal, very and extremely inverse
	Pick-up value $I_E>/I_N$		0.01	0.1 to 4
	Time multiplier $t_{IEP>}$		0.01 s	0 to 32 s
	Tolerances			
	Current pick-up			Pick-up at $1.05 < I/I_{EP} < 1.15$
	Operating times			≤ 5% for $2 \leq (I/I_{E>}) \leq 20$ and $1\text{ s} \leq t_{IEP} \leq 20\text{ s}$
Auto-reclose function	Number of possible auto-reclosures			Up to 10
	Possible modes			Only single-pole Only three-pole Single and/or three-pole
	Action time window		Step 0.01 s	0.01 to 320 s
	Dead time RAR (RAR – Rapid auto-reclose)		0.01 s	0.01 to 320 s
	Dead time DAR (DAR – Delayed auto-reclose)		0.01 s	0.01 to 1800 s
	Reclaim time		0.01 s	0.5 to 320 s
	Close command duration		0.01 s	0.01 to 32 s
Check synchronism function	Possible modes			
	Dead line/Live busbar			$U_1</U_2>$
	Live line/Dead busbar			$U_1>/U_2<$
	Dead line/Dead busbar			$U_1</U_2<$
	Synchronism			$U_1>/U_2>$
	Voltage difference ΔU		Step 1 V	1 to 50 V
	Frequency difference Δf		0.01 Hz	0.01 to 1 Hz
	Angle difference $\Delta\varphi$		1°	1 to 60°

Technical data (contin.)

Overvoltage protection	Functional possibilities (separately settable)		Local overvoltage, and compensated overvoltage
	Voltage measurement selection		3 x phase-earth voltages 3 x phase-phase voltages
	Pick-up of $U>>$ stage		– with AND logic of the phases – with OR logic of the phases
	Setting ranges		
	Overvoltage stage $U>/U_N$	Step 0.01	1 to 1.9
	Drop-off ratio $U_{reset}/U>$	0.01	0.5 to 0.99
	Overvoltage stages $U>>/U_N$	0.01	1 to 1.9
	Drop-off ratio $U_{reset}/U>>$	0.01	0.5 to 0.99
	Time delays		
	$t_{U>}$	0.01	0 to 32 s
	$t_{U>>}$ C.B. ON	0.01	0 to 32 s
	$t_{U>>}$ C.B. OFF	0.01	0 to 32 s
	Trip time		Approx. 30 ms
	Trip action		Local, and/or remote
	Measuring tolerance according to DIN VDE 0435, Part 303 (for sinusoidal quantities)		± 5%
Circuit-breaker failure protection	Setting ranges		
	Current pick-up I/I_N	Step 0.01	0.1 to 4
	Time delay	0.01 s	0.05 to 1 s
	Fastet drop-off time		Approx. 10 ms
	Delay time tolerance		≤ 1% of set value or 10 ms
	Measuring tolerance according to DIN VDE 0435, Part 303 (for sinusoidal quantities)		± 5%
Disturbance recording	Measured values		i_{L1}, i_{L2}, i_{L3}, i_E, u_{L1}, u_{L2}, u_{L3}, u_E
	Start signal		Tripping, fault detection, binary input
	Recording period (50 Hz)		–100 ms to max. 2900 ms
	Recording period (60 Hz)		–83 ms to max. 2416 ms
	Sampling rate (50 Hz)		1 instantaneous value/ms
	Sampling rate (60 Hz)		1 instantaneous value/0.83 ms
	Holding time		Until next fault
Additional functions	Operating values for		
	Current		I_{L1}, I_{L2}, I_{L3}
	Voltage		U_{L1-L2}, U_{L2-L3}, U_{L3-L1}
	Power		Active (P)/Reactive (Q)
	Frequency		f
	Effective range	Current	0 to 240 % I_N
		Voltage	0 to 120 % U_N
		Power	0 to 120 % P_N
		Frequency	96 to 104 % f_N
	Tolerance		≤ 2 % of respective rated value

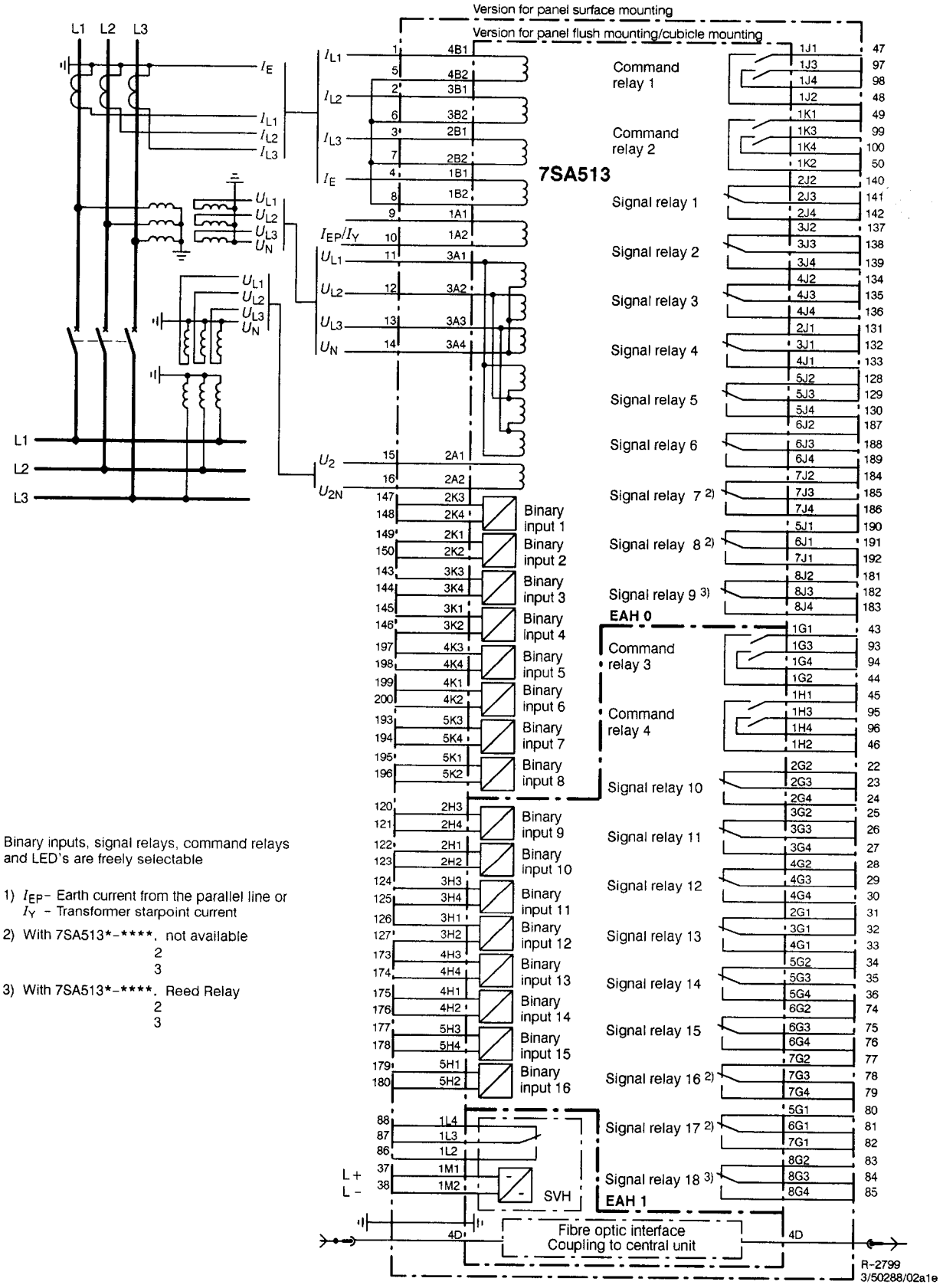
Line protection relay 7SA513 (Version V2)

Selection and ordering data

Line protection relay	Order No. 7SA513 □ – □ □ A □ □ – OCH1
Rated current at 50/60 Hz AC	
1 A	1
5 A	5
Rated auxiliary voltage	
48, 60 V DC	2
110, 125 V DC	4
220, 250 V DC	5
Construction	
for panel surface mounting	B
for panel flush mounting/cubicle mounting	C
Scope of functions	
Firmware version V2	1
Input/output modules	
2 input/output modules: 18SR, 4CR, 16BI	0
3 input/output modules: 27SR, 6CR, 24BI	1
2 input/output modules: 12SR, 2RR, 4CR, 16BI	2
3 input/output modules: 18SR, 3RR, 6CR, 24BI	3

SR – Signal/alarm relay, switching capacity 20 W, 1 A
RR – Reed relay, switching capacity 15 W, 0.3 A
CR – Command/trip relay, switching capacity 1000 W, 5 A
BI – Binary input, voltage range 24 to 250 V DC

Line protection relay 7SA513 (Version V2)



Binary inputs, signal relays, command relays and LED's are freely selectable

1) I_{EP} - Earth current from the parallel line or
I_Y - Transformer starpoint current

2) With 7SA513*-****, not available
2
3

3) With 7SA513*-****, Reed Relay
2
3

Fig. 5
Connection diagram for line protection relay 7SA513, development state BB, with 2 input/output modules (for 7SA513 with 3 input/output modules see Fig. 6)

Binary inputs, signal relays, command relays and LED's are freely selectable

2) With 7SA513*-****, not available
2
3

3) With 7SA513*-****, Reed Relay
2
3

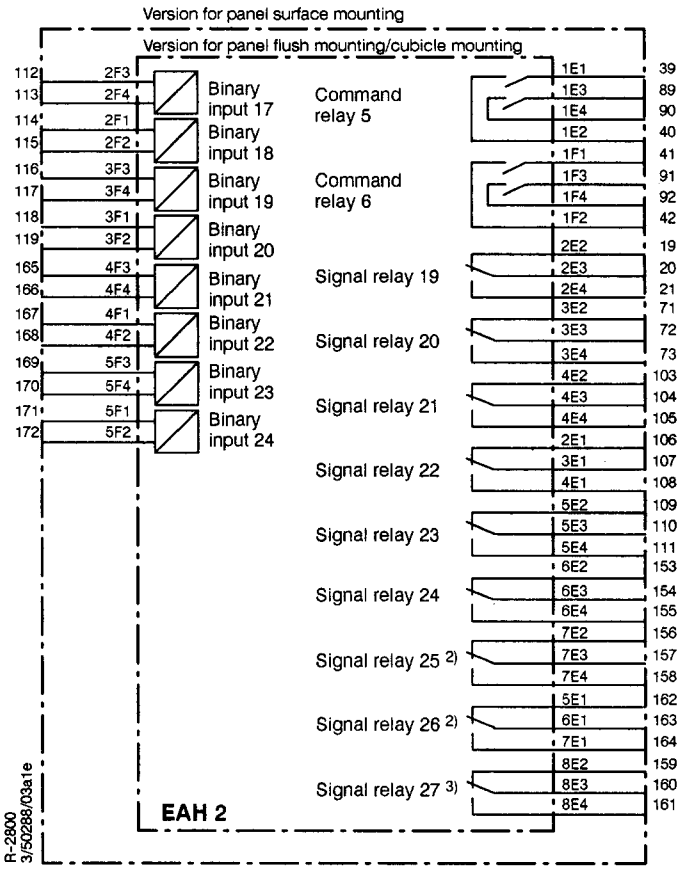


Fig. 6 Additional connection diagram to Fig. 5
Input/output module EAH2 for line protection relay 7SA513, with 3 input/output modules, development state BB

Dimension drawings in mm

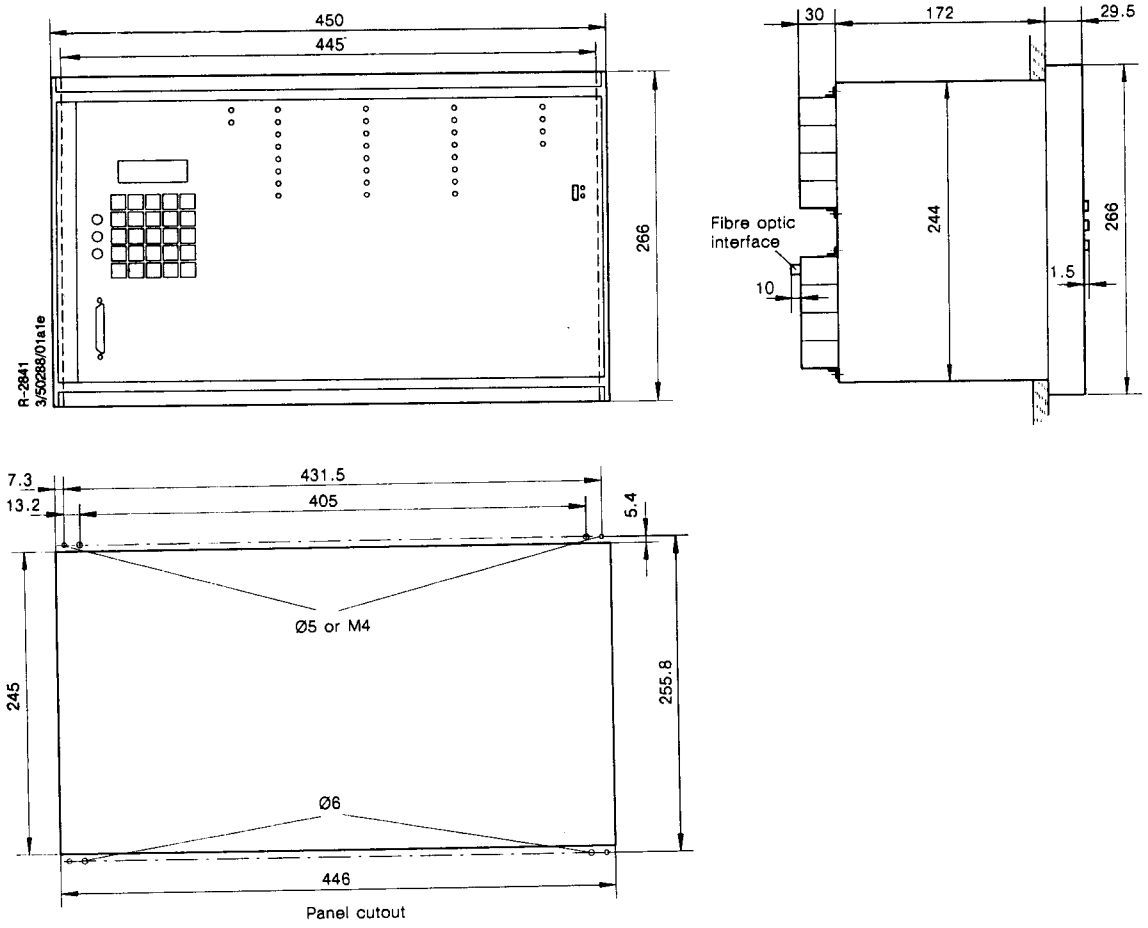


Fig. 7
7SA513 with housing 7XP2050-2 (for panel flush mounting/cubicle mounting)

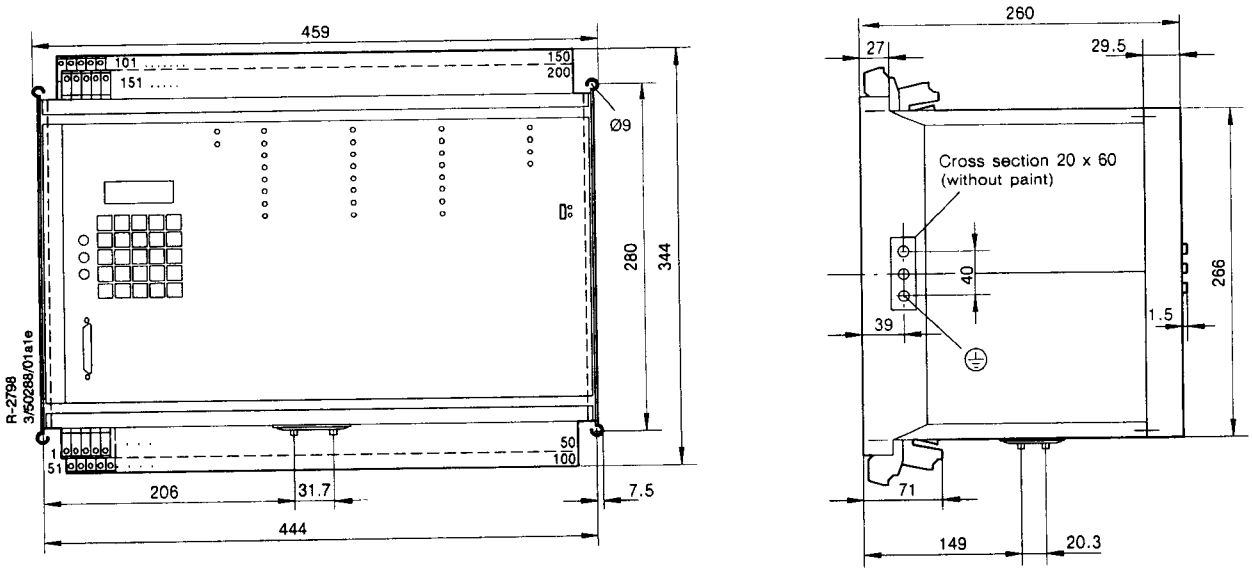


Fig. 8
7SA513 with housing 7XP2050-1 (for panel surface mounting)

Conditions of Sale and Delivery

Subject to the General Conditions of Supply and Delivery for Products and Services of the Electrical and Electronic Industry and to any other conditions agreed upon with the recipients of catalogs.

■

The technical data, dimensions and weights are subject to change unless otherwise stated on the individual pages of this catalog.

The illustrations are for reference only.

We reserve the right to adjust the prices and shall charge the prices applying on the date of delivery.

A En 1.91a

Export Regulations

In accordance with present German and US export regulations export licences (dated 08.93) are not required for the products listed in this catalog. Export and re-export are therefore permissible without the approval of the relevant authorities except where current German export regulations contain country-specific restrictions.

Subject to change.
Relevant are the criteria stated in the delivery note and the invoice.
An export licence may be required due to country-specific application of the product.

Trademarks

DIGSI is a Siemens trademark.

Bereich Energieübertragung und -verteilung
Geschäftsgebiet Zähler, Sekundär- und Netzleittechnik
P.O. Box 4806, D-90026 Nuernberg
Federal Republic of Germany

Power
Transmission
and Distribution

Siemens Aktiengesellschaft

Order No.: **E50001-K4502-A291-A1-7600**
Printed in the Federal Republic of Germany
KGK 1093 5.0 BR 14 En 321127