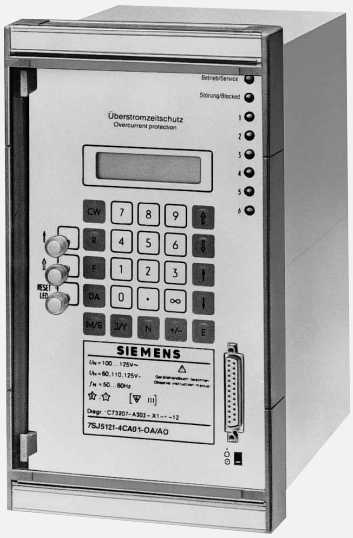
7SJ512 Numercial overcurrent–time protection (Version V3.1, IEC)



Scope of functions

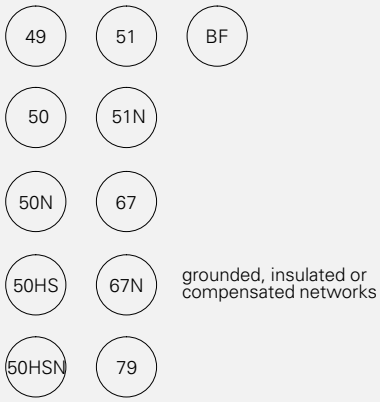


Fig. 1
7SJ512 numerical overcurrent–time protection relay

Application

The 7SJ512 is a numerical relay used for definite–time or inverse–time overcurrent protection in medium–voltage distribution systems. It is also used in back–up protection schemes applied to lines, transformers and generators. The system which the 7SJ512 is protecting, can be solidly earthed, unearthed or compensated. The relay can be implemented in conventional switchgear as well as with the substation control system SINAUT LSA.

Construction

Within its compact design, the device contains:

- All components for analog value acquisition and numeric evaluation
- Operator panel with display field
- Event/alarm and trip/command output contacts
- Binary input options
- Serial interfaces
- Auxiliary voltage converter (DC/DC converter).

The device can be supplied in three case variations. The variants for panel surface mounting is supplied with two–tier terminals accessible from the front. The variants for panel flush mounting or cubicle mounting have rear connection terminals and are available with or without glass cover.

Implemented functions/features

The following functions are available:

- Definite–time/inverse–time overcurrent protection
- Reverse interlocking (busbar protection scheme)
- Overload protection (with memory)
- Circuit–breaker failure protection
- Trip test, reclose test
- Earth–fault protection, optical definite–time/IDMT
- Sensitive earth–fault protection and directional function using the sensitive earth–current input for compensated and isolated networks, as well as high impedance starpoint earthing
- Auto–reclosure
- Optional directional element
- Inrush stabilization
- Dynamic parameter switching
- Parameter–set switching
- Display of on–load measured current values
- Fault recording.

Mode of operation

With the application of a powerful microcontroller and digital filtering, the influence of high–frequency transients, displacement voltages and current components can be suppressed to a large degree.

When the definite–time characteristic is selected, the measured values are calculated using Fourier analysis. When using the inverse definite minimum time characteristic, either effective (r.m.s.) values or fundamental values (from a Fourier analysis) can be selected for grading.

Serial interfaces

The device is equipped with two serial interfaces.

The operating interface on the front panel is suitable for the connection of a WINDOWS capable PC. The DIGSI operating program under the DOS operating system extension WINDOWS allows easy setting, fault recording evaluation and commissioning.

The system interface is an 820 nm fibre–optic interface for linking to the SINAUT LSA substation control and protection system or a protection master unit (protocol to IEC 870–5–103). The operating PC with DIGSI can also be connected to the system interface.

Settings

Using the integrated operating panel the individual parameters can be set under user guidance. The PC program DIGSI permits configuration and parameterization of the 7SJ512 in advance on the PC. The data stored can be read onto the protection device via the interfaces. They are written to non–volatile memories so that setting values are backed–up even if the power supply should fail.

Self monitoring

All important hardware and software components are monitored continuously. Any irregularities in the hardware or program sequence are immediately detected and alarmed. As a result, a very high security, reliability and availability of the protection relay is achieved.

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Overcurrent–time protection

The function is based on a phase–selective measurement of the three phase currents and the earth current. According to the specific requirement, either the definite–time or the inverse–time overcurrent mode can be selected. Both the definite–time and the inverse–time protection modes have two levels of operation, i.e. apart from the overcurrent element ($I>$), a high–set element ($I\gg$) is also provided.

The following inverse–time characteristics are available in the relay (according to BS 142 or IEC 255–4):

- normal inverse

$$t = \frac{0.14}{(I/I_p)^{0.02} - 1} \cdot t_p$$

- very inverse

$$t = \frac{13.5}{I/I_p - 1} \cdot t_p$$

- extremely inverse

$$t = \frac{80}{(I/I_p)^2 - 1} \cdot t_p$$

- user specific

Characteristics defined by 60 current/time pairs, entered by the user

Only for earth–faults:

- long–time earth–fault

$$t = \frac{120}{I/I_p - 1} \cdot t_p$$

t	tripping time
t_p	time multiplier
I	fault current
I_p	current setting

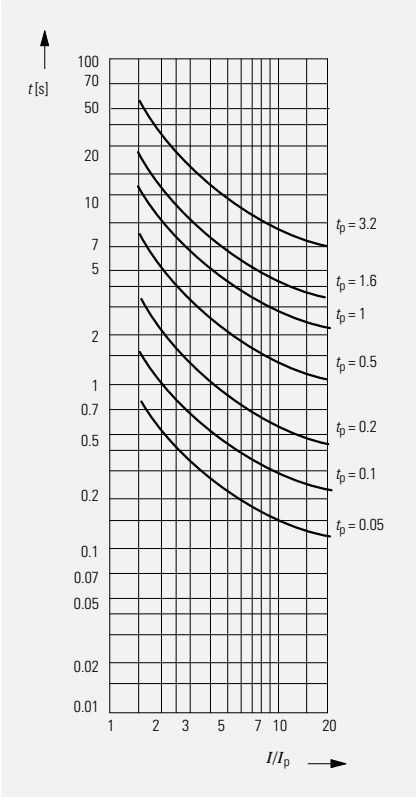

Fig. 2
Tripping time characteristics, normal inverse (IEC 255–4)

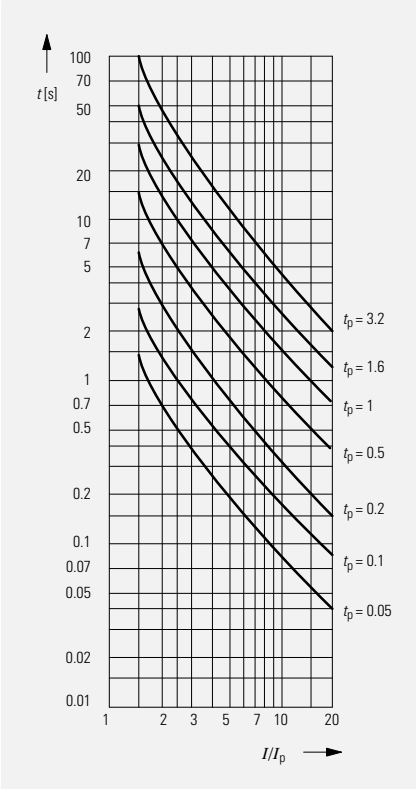

Fig. 3
Tripping time characteristics, very inverse (IEC 255–4)

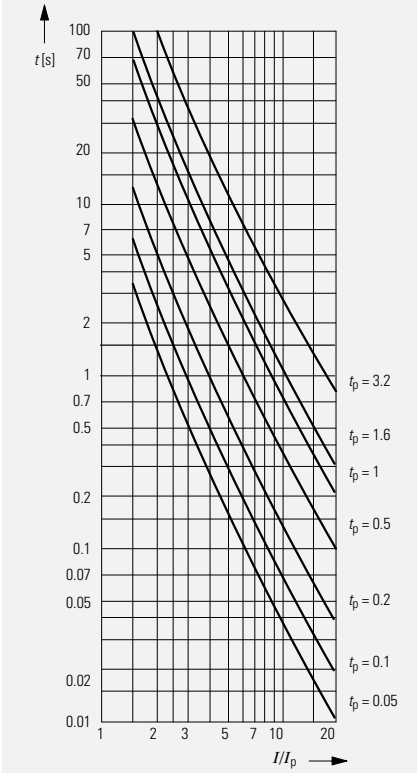

Fig. 4
Tripping time characteristics, extremely inverse (IEC 255–4)

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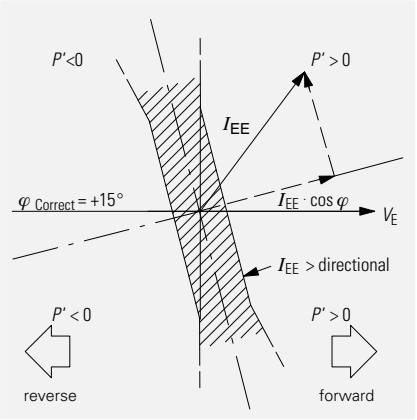

Fig. 5
Directional determination using cosine measurements

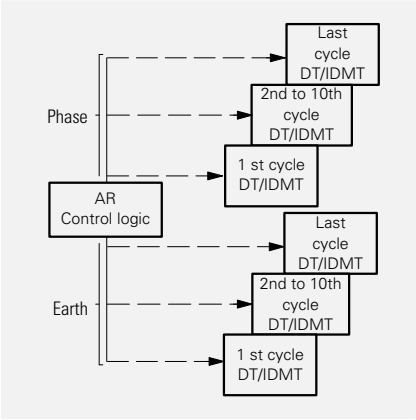

Fig. 6
Auto–reclose function

Sensitive earth–fault protection

A sensitive earth–fault current input is provided for isolated and compensated networks. The sensitive earth current I_{EE} and the displacement voltage V_e are measured and used to determine the direction of the fault current.

The designation of the fault direction is achieved using a reactive power measurement (a sine measurement with imaginary earth current for isolated networks) and an active power measurement (a cosine measurement with real earth current for compensated networks). The influence of harmonics and the DC component are considerably removed through filtering. The earth–fault detection can be directly allocated to alarm contacts or trip contacts. To adapt to special network conditions, the directional characteristic can be adjusted with a correction angle (see Fig. 5). The directional determination made by the relay when using the correction angle results from the sign of the active power *P'*(the power as defined by the directional characteristic). In order for the relay to decide on the direction of a fault, the directional earth element must first pick up.

The sensitive earth–fault function can be used in the following four ways:

- Sensitive earth–fault (SEF) overcurrent (I_{EE}>) with the following definite–time or inverse–time characteristics:
  Normal inverse
  Very inverse
  Extremely inverse
  Long–time earth–fault
  User specific
- SEF "high–set" overcurrent ($I_{EE}\gg$) with definite–time
- Directional earth–fault protection with instantaneous and high–set instantaneous overcurrent
- Tripping due to displacement voltage.

Auto–reclose function

The 7SJ512 is equipped with an auto–reclose function. The relay trips three–pole and can make up to ten reclose attempts, one rapid autoreclose (RAR), and up to nine delayed auto–reclosures (DAR). If the fault still exists after the last set reclose attempt, the relay trips without reclosing (see Fig. 6).

The following functions are possible:

- AR with every type of fault
- Separate settings for ph–ph and ph–gnd faults
- Multiple AR (1 RAR, and up to 9 DARs with different dead times for RAR and DAR
- Separate protection configurations and reclose triggers for the RAR and DARs for the following functions:
  – High–set phase overcurrent
  – Normal phase overcurrent (directional and/or non–directional)
  – High–set earth–fault
  – Normal earth–fault (directional or non–directional)
  – Second stage sensitive earth–fault ("high–set" sensitive earth element)
  – Sensitive earth–fault (directional or non–directional)
- Blocking of AR with binary input and high–set pick–up.

Directional element (option)

The directional element of the 7SJ512 is phase–selective and separate for the earth–fault protection. These directional earth–fault and phase overcurrent elements work in parallel to the non–directional (overcurrent and high–set over–current) elements. The non–directional overcurrent element serves as a back–up protection. The following functions are possible with directional option:

- Independently set tripping direction for phase and earth overcurrent
- Definite–time or inverse–time characteristics selectable for directional tripping or pick–up
- Calculation of the displacement voltage from the line voltage without using an open delta winding
- Directional determination using the measured currents and the sound phase line–line voltages.
  The corresponding phase voltage is dependent upon the type of fault that the relay detects. The relay determines the type of fault by using voltage memory or actual voltage.

Inrush stabilization

When switching on a transformer the 7SJ512 can distinguish between inrush and real short–circuits. Inrush is particularly noticeable by its relatively high second harmonic content. In the case of a short–circuit, the second harmonic content is almost non–existent. The harmonic stabilization operates independently for each of the three phases. When using inrush stabilization on one phase, it is also possible to block the remaining phases (cross block). When using inrush detection the pick–up of the high–set element stays active, and the normal overcurrent element is blocked.

Intermittend earth–fault protection with firmware V3.1

Intermittend (re–striking) faults occur due to insulation weaknesses in cables or as a result of water penetrating cable joints. Such faults either simply cease at some stage or develop into lasting short–circuits. During intermittent activity, however, starpoint resistors in networks that are impedance–earthed may undergo thermal overloading. The normal earth–fault protection cannot reliably detect and interrupt the current pulses, some of which can be very brief.

The selectivity required with intermittent earth faults is achieved by summating the durations of the individual pulses and by triggering when a (settable) summed time is reached. The response threshold I_{IE}> evaluates the rms value, referred to one systems period.

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Thermal overload protection (IEC 255–8)

For the protection of cables or machines, an overload protection with a pre–warning stage for temperature and current is implemented. The temperature of the equipment to be protected is determined using a thermal homogeneous body model that contains energy input to the equipment and energy output to the environment. In this way currents that change over time and pre–loading can be taken into account (overload protection with memory).

Using a parameter, it is possible to select whether the maximum of the phase–related conductor temperature or the mean value of these is to be taken as the determining value. It is also possible to calculate the temperature from the maximum value of the conductor current.

Circuit–breaker failure protection

After the issue of a trip command by the relay or upon the excitation of a binary input by an external protection, the breaker–failure current check function is initiated.

If current is still detected after the set time (e.g. in the case of a breaker failure), an alarm relay or a command relay (for breaker–failure tripping) can be energized.

In addition, a trip command can be issued to a higher–level circuit–breaker.

Dynamic parameter switching

With the help of binary inputs or the integrated operator panel, the pick–up values of the relay can be quickly switched to a new set of values. It is thereby possible to match certain parameters to specific system conditions, even during a fault. The following fault detectors can be changed in this manner:

- High–set element for phase and earth
- Normal overcurrent element for phase and earth
- High–set element for sensitive earth
- Normal overcurrent element for sensitive earth.

Parameter set switching

With the help of a binary input, the integrated operator panel or with the PC, 4 completely separate sets of parameter settings are switchable. When changing a network configuration with a contact, it is possible to simultaneously match the relay's parameter settings via a binary input on the relay.

Fault recording

The digitized analog values of phase currents, earth current and line voltages are stored in the event of a fault. The analog values recorded can be transferred to a PC where they can be displayed, analyzed and archived using DIGSI. As an option they can be read out by the LSA 678 substation control and protection system.

The serial interface complies with IEC 870–5—103 protocol standards. Up to eight fault recordings can be stored. The fault recording buffer is a ring buffer with a maximum length so that when it is full every new network fault overwrites the oldest recorded fault. A total of 5 seconds are available for the recording duration.

Marshalling of command and alarm/ event relays, LEDs and binary inputs

The relay is supplied with a number of trip/command and alarm/event output relays. For user specific alarms, flags and trips, all command relays, signal relays and LEDs are freely marshallable. A number of annunciations can be grouped together to create a special annunciation for flags, alarms and trips. The LEDs can be allocated to show instantaneous conditions (self– resetting), or to stay lit until the LEDs are manually reset (latched). All LED information, which is set to remain lit until the LEDs are manually reset (latched), are restored at power–up if the relay loses auxiliary power. All binary inputs can also be freely marshalled.

Measured values and watchdog functions

A large number of measured value and monitoring functions are integrated in the 7SJ512:

- Monitoring of current sum, current symmetry, voltage sum, voltage symmetry, phase sequence
- Operational measurements of I_{L1}, I_{L2}, I_{L3}, I_E (active I_{EE} and reactive I_{EE})
- Operational measurements of V_{L1}, V_{L2}, V_{L3}, V_E
- Active, reactive and apparent power measurements
- Frequency measurement
- Trip monitoring with the circuit–breaker
- cos φ measurement.

Indications

The relay saves an events list (operational record), fault reports and a wave form for analysis of disturbances. All of the following signal memories are backed up in case of power failure.

- Time
  The relay contains an internal clock with battery back–up which can be synchronized using a binary input. All alarms are time and data stamped.
- Fault indications
  The fault indications of the last three disturbances are always available.
- Operational indications
  All annunciations which do not belong to the fault indications are saved in the operational indications.
- Earth–fault recording
  If the sensitive earth–fault element is enabled, this record will be available for each earth fault.
- Switching statistics
  The number of three–pole trips, RARs and DARs as well as the sum of currents interrupted in each phase are indicated.

Automatic display on the LCD

An operating mode exists, where 2 operational measured values can be displayed on the LCD. These values are regularly updated by the relay. After a fault, two user– selectable fault event data can be automatically displayed on the LCD.

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Technical data

Input circuits	Rated current I_N		1 or 5 A
	Rated voltage V_N		100 to 125 V
	Rated frequency f_N		50 or 60 Hz
	Thermal overload capability	in voltage path, continuous	140 V
		in current path, continuous	4 x I_N
		1 s	100 x I_N
		in current path for sensitive earth–fault detection	
		continuous	15 A
		10 s	100 A
		1 s	300 A
	Dynamic overload capability (half cycle)		250 x I_N
	Burden,	voltage inputs	approx. 0.5 VA
		current inputs at I_N = 1 A	approx. 0.1 VA
		at I_N = 5 A	approx. 0.2 VA
	Earth–fault detection at 1 A		approx. 0.3 VA
Voltage supply via integrated DC/DC converter	Rated auxiliary voltage V_{aux}/permissible tolerance		24, 48 V DC 19 to 56 V DC 60, 110, 125 V DC 48 to 144 V DC 220, 250 V DC 176 to 288 V DC
	Max. ripple at rated voltage		≤ 12 %
	Power consumption,	quiescent	approx. 12 W
		energized	approx. 23 W
	Max. bridging time during loss of auxiliary voltage		≥ 50 ms for V_{aux} ≥ 110 V DC
Binary inputs	Number	without directional option	8 (marshallable)
		with directional option	5 (marshallable)
	Voltage range		24 to 250 V DC
	Current consumption independent of operating voltage		approx. 2.5 mA
Alarm/event contacts	Number of relays		8 (marshallable)
		with 1 C/O contact each	6 (marshallable)
		with 1 NO contact each	2 (marshallable)
	Alarm/event relay with C/O contact		1
	Switching capacity make/break		20 W/VA
	Switching voltage		250 V AC/DC
	Permissible current, continuous		1 A
Command contacts	Number of relays,	with 2 NO contacts each	2 (marshallable)
		with 1 NO contact each	2 (marshallable)
	Switching capacity	make	1 000 W/VA
		break	30 W/VA
	Switching voltage		250 V AC/DC
	Permissible current	continuous	5 A
		0.5 s	30 A
LEDs	Ready indication	green	1
	Blocked indication	red	1
	Marshallable LEDs	red	6
Serial interfaces	Operator interface		Not isolated
	Connection		on the front, 25–pole D–type submin. front port (ISO 2110) for connection to a PC
	Potential–free interface for data transmission to a central unit		Isolated
	Standard		Similar to V.24/V.28 (RS232C) to EIA, protocol acc. to DIN 19 244/IEC 870–5–103
	Transmission rate		9600 Bauds setting as supplied; max. 19,200 Bauds, min. 4800 Bauds
	Transmission reliability		Hamming distance d = 4
	Connection, electrical	on flush–mounted housing	at rear, 4–pole module connector
		on surface–mounted housing	at two–tier terminal at the top and bottom of the housing
			Cable with 2 core pairs, with individual and common screening, e.g. LIYCY–CY/ 2 x 2 x 0.25 mm^2
		Distance	max. 1 km
		Test voltage	2 kV with rated frequency for 1 min
	Fibre–optic cable		integrated FSMA connectors for FO connection on flush–mounted housing: at rear on surface–mounted housing: at the bottom of the housing
		Optical wavelength	820 nm
		Permissible attenuation	max. 8 dB with glassfibre 62.5/125 µm
		Distance	max. 2 km
	No characters		switchable, "light off" setting as supplied

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Technical data (continued)

CE–conformity, standards	This product is in conformity with the directives of the Council of the European Communities on the approximation of the laws of the Member States relating to the electromagnetic compatibility (EMC Council Directive 89/336/EEC) and concerning electrical equipment for use within specified voltage limits (low–voltage directive 73/23/EEC). The product conforms with the international standard IEC 255 and the national standard DIN 57 435 part 303 (corresponding to VDE 0435 part 303). The relay is designed for use in an industrial environment, for installation in standard relay rooms and compartments so that with proper installation electro–magnetic compatibility (EMC) is ensured.	Conformity is proved by tests performed by Siemens AG in line with article 10 of the Council Directives in accordance with the generic standards EN 50081 and EN 50082 for the EMC directive 89/336/EEC and standard 60255–6 for the low–voltage directive.
Insulation tests IEC 255–5, DIN 57 435 part 303	High–voltage test (routine test), except d.c. voltage supply input High–voltage test (routine test), only d.c. voltage supply input Impulse voltage test (type test), all circuits, class III	2 kV (rms), 50 Hz 2.8 kV DC 5 kV (peak), 1.2/50 μs, 0.5 J, 3 positive and 3 negative shots at intervals of 5 s
EMC–tests; immunity (type test) Standards: IEC 255–6, IEC255–22 (international product standard) EN 50082–2 (generic standard) VDE 0435 part 303 (German product standard)	High–frequency test with 1 MHz interference IEC 255–22–1, class III and VDE 0435 part 303, class III Electrostatic discharge IEC 255–22–2, class III and IEC 1000–4–2, class III Radio–frequency electromagnetic field, non–modulated report IEC 255–22–3, class III Radio–frequency electromagnetic field, amplitude modulated IEC 1000–4–3, class III Radio–frequency electromagnetic field, puls modulated ENV 50204, class III Fast transients IEC 255–22–4 class III, IEC 1000–4–4 class III Conducted disturbances induced by radio–frequency fields, amplitude modulated IEC 1000–4–6, class III Power frequency magnetic field IEC 1000–4–8, class IV IEC 255–6	2.5 kV (peak), 1 MHz, τ = 15 μs, 400 shots/s, duration 2 s 4/6 kV contact discharge, 8 kV air discharge, both polarities, 150 pF, R_i = 330 Ω 10 V/m, 27 to 500 MHz 10 V/m, 80 to 1 000 MHz, AM 80 %, 1 kHz, 10 V/m, 900 MHz, repetition frequency 200 Hz, duty cycle 50 % 2 kV, 5/50 ns, 5 kHz, burst length = 15 ms, repetition rate 300 ms, both polarities, R_i = 50 Ω, duration 1 min 10 V, 150 kHz to 80 MHz, AM 80 %, 1 kHz, 30 A/m, continuous, 300 A/m for 3 s, 50 Hz 0.5 mT; 50 Hz
EMC–tests; emission (type test) Standard: EN 50081–* (European generic standard)	Conducted interference voltage, auxiliary voltage CISPR 22, EN 55022 and VDE 0878 part 22 Interference field strength CISPR 11, EN 55011 and VDE 0875 part 11	150 kHz to 30 MHz class B 30 to 1 000 MHz class A
Climatic conditions	Permissible ambient temperature — in service during storage during transport Humidity rating	–5 to +55 °C –25 to +55 °C –25 to +70 °C average per year ≤ 75 % relative humidity; on 30 days per year up to 95 % relative humidity; condensation not permissible
Mechanical stress tests IEC 255–21–1, IEC 68–2	Permissible mechanical stress — in service during transport	10 to 60 Hz; 0.035 mm amplitude 60 to 500 Hz; 0.5 *g* acceleration 5 to 8 Hz; 7.5 mm amplitude 8 to 500 Hz; 2 *g* acceleration
Construction of unit	Case, dimensions Weight — flush mounting/cubicle mounting surface mounting Degree of protection according to EN 60 529	7XP20, see dimension drawings approx. 9.5 kg approx. 11 kg IP 51
Earth–fault detection	Earth–fault detection with displacement voltage V_E> Faulted phase indication (only with directional option) $V_{PH–E}$ < the faulted phase $V_{PH–E}$ > the healthy phase Measuring tolerance according to VDE 0435, part 303 (for sinusoidal quantities) Directional determination Measuring principle Earth–fault current I_{EE}>/I_{EEP} (active and reactive) Angle correction for core balance CT error Adjustment of directional characteristic Measuring tolerance according to VDE 0435, part 303 (for sinusoidal quantities)	3 to 130 V 10 to 100 V 10 to 100 V ≤ 5 % of set value Active/reactive power calculation 3 to 1 600 mA 0 to 5° for 2 CT operating points –45 to +45° ≤ 10 % of set value

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Technical data (continued)

Overload protection	Factor k		0.1 to 4
	Time constant r		1 to 999.9 min
	Warning temperature Θ_{Alarm}		50 to 100%
	Current warning stage I_{Alarm}		0.1 to 4 x I/I_N
Breaker–failure protection	Pick–up threshold $I>$		0.1 to 4 x I/I_N
	Delay time $t_{break.fail.prot.}$		0.06 to 60 s and infinity
Setting ranges			
Definite–time overcurrent protection	Overcurrent	phase $I>$ earth $I_E>$	I/I_N = 0.05 to 25 = 0.05 to 25
	High–set current	phase $I\gg$ earth $I_E\gg$	I/I_N = 0.05 to 25 = 0.05 to 25
	Delay times		0 to 60 s or infinity
	Tolerances		
	Current pick–up value		± 5 % of set value
	Time		± 1 % or ± 10 ms
	Reset time		approx. 30 ms
Inverse–time overcurrent protection	Overcurrent	phase $I_P>$ earth $I_{EP}>$	I_p/I_N = 0.1 to 4 I_{EP}/I_N = 0.1 to 4
	High–set current	phase $I\gg$ earth $I_E\gg$	I/I_N = 0.05 to 25 = 0.05 to 25
	Time multiplier t_p		0 to 10 s
	Pick–up value		1.1 x I_p
	Characteristics according to IEC 255–4, Section 3.5.2 or BS 142		Normal inverse, very inverse, extremely inverse, I/I_p = 1 to 20, definite–time characteristic above 20 x I_p
	User specific characteristic		Input of 60 current/time pairs
	Additional characteristics for earth faults		
	Long time inverse		I/I_p = 1 to 20, definite–time characteristics above 20 x I_p
	Pick–up value		1.1 x I_p
	Linear current range		25 x I_N
	Tolerances		
	Pick–up value		± 5 %
	Time		≤ 5 % for 2 ≤ (I/I_p>) ≤ 20 and t_p = 1
Directional elements	Directional definite–time and inverse–time overcurrent protection with back–up non–directional high–set element		
	Pick–up for	definite–time phase definite–time earth inverse–time phase inverse–time earth	I/I_N = 0.05 to 25 = 0.05 to 25 I_P/I_N = 0.1 to 4 = 0.1 to 4
	Characteristics according to IEC 255–4, Section 3.5.2 or BS 142		Normal inverse, very inverse, extremely inverse
	Additional characteristics for earth faults		Long time inverse, residual dependent time
	Directional determination		
		phase I_{L1} phase I_{L2} phase I_{L3} earth I_E	With I_{L1} and $V_{L3} - V_{L2}$ With I_{L2} and $V_{L1} - V_{L3}$ With I_{L3} and $V_{L2} - V_{L1}$ With I_E and $V_E/V_{L1} + V_{L2} + V_{L3}$
	Times		
		shortest tripping time reorientation time after current reversal tripping time delay timer tolerance	approx. 30 ms approx. 30 ms 0 to 320 s ≤ 1 % of set value or 10 ms
	Tolerances		
		current pick–up value time	5 % of set value ≤ 5 % for 2 ≤ (I/I_E>) ≤ 20 and 1 s ≤ t_{IE} ≤ 30 s
Fault recording	Measured values		i_{L1}, i_{L2}, i_{L3}, i_E, v_{L1}, v_{L2}, v_{L3}, v_E
	Trigger		Trip, fault detection, binary input, LSA, integrated operator panel
	Recording duration		max. 5 s
	Holding time		Until fault–recording buffer full. New fault entries overwrite the oldest recorded faults.

7SJ512 Numercial overcurrent–time protection (Version V3.1, IEC)

Technical data (continued)

Auto–reclose function	Number of possible auto–reclosures, 3–pole		1 RAR (rapid auto–reclose), and up to 9 DARs (delayed auto–reclose)
	Configuration modes for phase faults		
	initiation possible with		High–set overcurrent $I\gg$ Normal overcurrent definite–time $I>$, or inverse–time I_p non–directional
	with directional option		Normal overcurrent definite–time $I>$ or inverse–time I_p directional
	Configuration modes for earth faults		
	initiation possible with		High–set overcurrent $I_E\gg$ Normal overcurrent definite–time $I_E>$, or inverse–time I_{EP} non–directional
	with sensitive earth–fault		High–set overcurrent $I_{EE}\gg$, directional or non–directional Normal overcurrent definite–time $I_{EE}>$, or inverse–time I_{EEp} directional or non–directional
	with directional option		Normal overcurrent definite–time $I_E>$ or inverse–time I_{EP} directional
	Action time, dead time RAR		0.01 to 320 s
	Dead time DAR		0.01 to 1 800 s
	Reclaim time		0.5 to 320 s
	Close command duration		0.01 to 320 s
Additional functions	Operating values for		
	Current		I_{L1}, I_{L2}, I_{L3}, I_E
	Voltage		V_{L1}, V_{L2}, V_{L3}, V_E
	Power		Active/Reactive/Apparent
	Frequency		f
	Power factor		cos φ
	Active/Reactive I_{EE}		I_{EEw}, I_{EEb}
	Effective range	Current	10 to 240 % I_N
		Voltage	10 to 120 % V_N
		Power	10 to 120 % P_N
	Tolerance		≤ 2 % of respective rated value

7SJ512 Numercial overcurrent–time protection (Version V3.1, IEC)

Selection and ordering data

7SJ512 numercial overcurrent–time protection relay			Order No. 7SJ512 □ – □ □ A □ □ – □ □ A 0
Rated current at 50/60 Hz AC			
1 A			**1**
5 A			**5**
Rated auxiliary voltage V_{aux} for integrated DC/DC converter			
24, 48 V DC			**2**
60, 110, 125 V DC			**4**
220, 250 V DC			**5**
Construction			
7XP2030–1 housing for panel surface mounting			**B**
7XP2030–2 housing for panel flush mounting or cubicle mounting with two tier terminals			**C**
7XP2030–2 housing for panel flush mounting or cubicle mounting, without glass cover			**E**
7XP2030–2 housing for flush or cubicle mounting, Weidmüller terminals, US foil for front panel [1]			**F**
7XP2030–2 housing for flush or cubicle mounting, ring cable lugs, US foil for front panel [1]			**G**
Language, country–specific presettings			
German/English; 50 Hz (Europe)			**0**
American ANSI/IEC V3.6; 60 Hz (US–version)			**2**
Real–time clock	non–volatile alarm memory	software generation	
with clock	with non–volatile memory	Version V1.1x (not for US–version)	**1**
with clock	with non–volatile memory	Version V3	**3**
Optional functions			
Without directional elements, without intermittend earth–fault protection			**0**
With directional elements, without intermittend earth–fault protection			**1**
Without directional elements, with intermittend earth–fault protection (not for US–version)			**2**
With directional elements, with intermittend earth–fault protection (not for US–version)			**3**
Serial system interface (isolated, hard–wired on request)			
Without			**A**
With isolated RS232C (V.24) interface (wire connected)			**B**
With integrated fibre–optic interface (820 nm)			**C**

Operating program (German and Englisch are standard, other languages on request)		Order No.
DIGSI Version V3 for Windows, full version for 10 PCs and update for 3 years,	German	**7XS5020–0AA00**
	English	**7XS5020–1AA00**
DIGSI Version V3 for Windows, demo–/testversion,	German	**7XS5021–0AA00**
	English	**7XS5021–1AA00**

Documentation			Order No.
German:	Katalogblatt LSA 2.1.4	Digitaler Überstromzeitschutz 7SJ512 (Version V3.1)	**E50001–K5712–A141–A3**
	Gerätehandbuch	Digitaler Überstromzeitschutz 7SJ512 (Version V1)	**C73000–G1100–C89–2**
	Gerätehandbuch	Digitaler Überstromzeitschutz 7SJ512 (Version V3.1)	**C53000–G1100–C102–2**
English:	Catalog LSA 2.1.4	7SJ512 Numercial overcurrent–time protection (Version V3.1 IEC)	**E50001–K5712–A141–A3–7600**
	Manual	7SJ512 Numercial overcurrent–time protection (Version V1.0)	**C73000–G1176–C89–5**
	Manual	7SJ512 Numercial overcurrent–time protection (Version V3.1)	**C53000–G1176–C102–2**
US–Engl.:	Catalog LSA 2.1.30	7SJ512 Numercial feeder protection (version V3.6)	**E50001–K5712–A411–A1–4A00**
	Manual	7SJ512 Numercial feeder protection (version V3.6)	**C53000–G1140–C102–1**

1) Housing with US front–foil (9th digit of order no. **F** or **G**) are to be ordered only for US–version (11th digit = **2**). See also catalog LSA 2.1.30, 7SJ512 Numerical feeder protection (Version V3.6), Order No. E50001–K5712–A411–A1–4A00

7SJ512 Numercial overcurrent–time protection (Version V3.1, IEC)

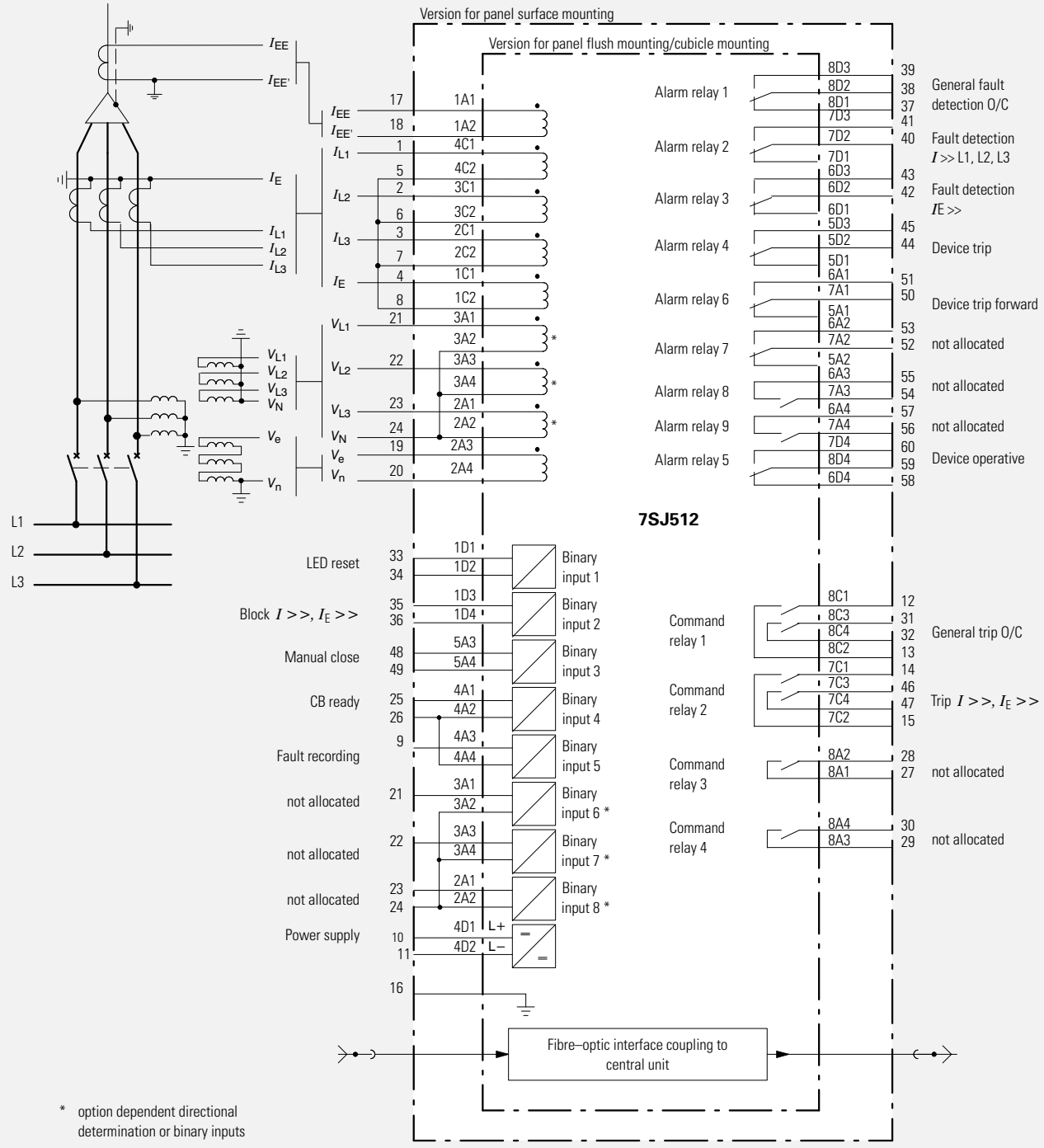

Fig. 7
Connection diagram, 7SJ512 numerical overcurrent–time protection relay

Dimension drawings in mm

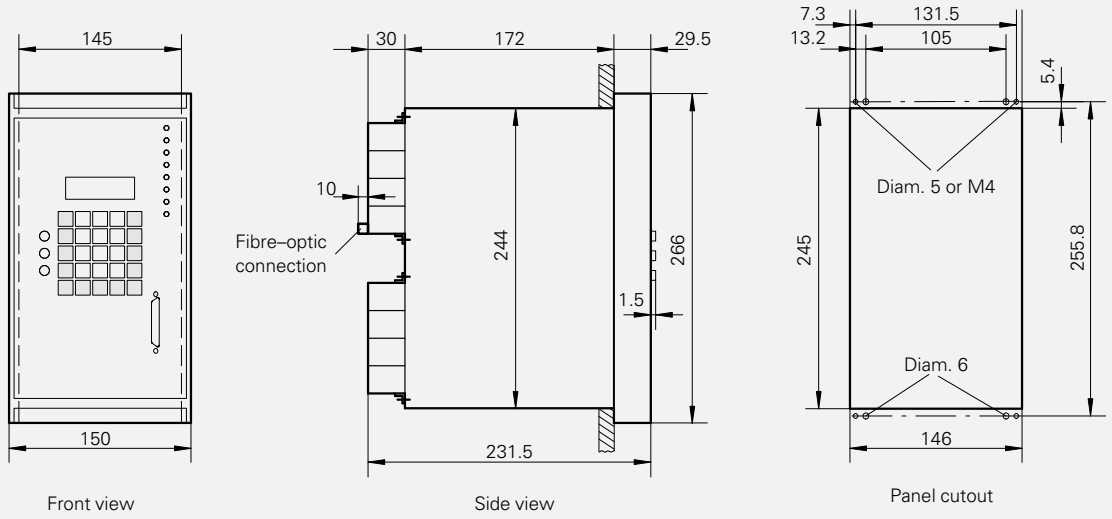

Fig. 8
7SJ512 with housing 7XP2030–2 (for panel flush mounting or cubicle mounting)

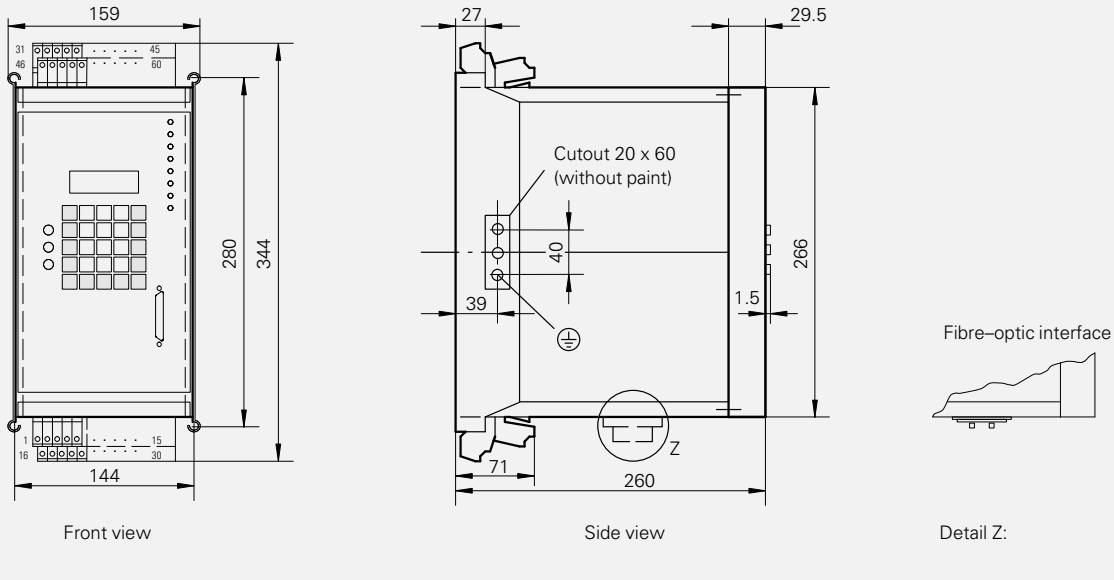

Fig. 9
7SJ512 with housing 7XP2030–1 (for panel surface mounting with two–tier terminals)

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