SIEMENS

SIPROTEC 7SS50 V1.2
Busbar / Circuit-Breaker Failure Protection Relay
(Summation Current Transformer Version)

Protection Systems

Catalog
SIPROTEC 5.1 · 1999

C E R T I F I C A T E

DQS Deutsche Gesellschaft zur Zertifizierung von Managementsystemen mbH
Qualitäts- und Umweltgutachter

hereby certifies that the company

SIEMENS AG
Power Transmission and Distribution Group (EV)
Protection and Substation Control Systems (EV S)
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Protection Relays, Substation Control
RemoteTerminal Units, Fault Recorders

has implemented and maintains a

quality system.

A quality audit, documented in an audit report, has verified that this quality system fulfils the requirements of the following standard

DIN EN ISO 9001
August 1994 edition

This certificate is valid until	2001-09-04
Certificate Registration No.	876-03
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SIEMENS

SIPROTEC 7SS50 V1.2 Busbar / Circuit-Breaker Failure Protection Relay (Summation Current Transformer Version)

Differential protection

Catalog SIPROTEC 5.1 · 1999

Supersedes: Catalog LSA 2.2.5 · March 1997

SIPROTEC 7SS50 V1.2
Busbar / Circuit-Breaker Failure Protection Relay

Description

Application

The 7SS50 numerical busbar protection/circuit-breaker failure protection is a selective, reliable and fast protection for busbar short circuits and breaker failure in medium, high and extra-high-voltage substations with various possible busbar configurations.

The 7SS50 is suitable for all switchgear types with iron-core or linearized current transformers. The short tripping time is especially advantageous for applications with high short-circuits levels or where fast fault clearance is required for power system stability reasons.

The modular hardware construction allows an optimal matching of the protection to the busbar configuration.

The version utilizing summation transformers 7SS50 is designed to include up to 8 busbar sections and 32 measured currents. The busbar may have a max. of 16 sectionalizing isolators and 4 bus couplers (one bus coupler is equivalent to two bays).

Construction

The 7SS50 includes in its modular construction all the components for acquisition and evaluation of measured values, operator panel and display, alarm and command outputs, binary input options, serial interface and DC/DC converter.

The modules are mounted in a standard 8MF cubicle with swing frame (H x W x D = 2200 x 900 x 600 mm, see Fig. 1).

The complete hardware is divided into four subsystems:

The first subsystem performs the protection functions incorporated in the processor modules.

The second subsystem located below the processing rack includes the measurement modules and the input/output modules. The connection between these modules is provided via bus backplane (printed circuit-board) and plug-in connectors.

The third subsystem provides application specific extensions, for example inclusion of additional relays for TRIP command contact multiplication.

The fourth subsystem consists of modules for the auxiliary supply DC/DC converter.

The processor modules, the measurement modules and the input/output modules are constructed in the double-height Eurocard format.

The contact multiplication and auxiliary power supply modules are constructed in the single-height Eurocard format.

Mode of operation

The 7SS50 uses numerical processing from the input sampling and analog-to-digital conversion through to the circuit-breaker tripping decision. Sufficient heavy-duty contacts are provided per bay to allow direct tripping of the circuit-breaker.

In the 7SS50 a maximum of 9 processor modules may be included. The microprocessors used are the 16 bit type and the modern 32 bit type.

For each busbar section two independent, time staggered measurements and processing are carried out by separate processors. The protection algorithm is identical to the one used in the Siemens analog busbar protection type 7SS1 and also ensures the highest stability under the conditions of high short-circuit currents and c.t. saturation.

Through inclusion of the additional "check-zone" feature (with measurement and logic independent of the isolator status), security against maloperation is further increased.

The integrated isolator replica is laid out for a triple busbar (max.) with sectionalizing isolators, a transfer bus and 4 bus couplers (max. 32 bays including bus couplers). A bus coupler is treated as two bays.

The protection is adapted to the busbar configuration through human-machine interface (integrated user interface with keypad or portable PC).

The isolator status is monitored using "normally-open" and "normally-closed" contacts to enable plausibility checks for both status and change-over time. The voltage supply to the contacts is also monitored.

Fig. 1
7SS50 busbar protection/circuit-breaker failure protection

If the external voltage supply to the isolator status contacts fails, the old isolator position is stored. This situation is also annunciated.

The allocation of the feeder currents to the respective bus zones is software-controlled using the isolator replica, without contact switching of c.t. currents.

The isolator replica is used for busbar protection and circuit-breaker failure protection. The replica is used for bus-selective tripping following failure of circuit-breaker to clear a feeder fault.

Settings

With the help of the integrated operator and display panel (7XR51) or a PC all setting parameters may be entered or modified. The operator is guided through the setting process. The parameters are written into non-volatile memories to ensure that they are retained during loss of auxiliary voltage.

Operation

The 7SS50 is equipped with a serial interface. The operator interface at the front is suitable for connection of a PC. An operator program is available for convenient and clear setting, evaluation of fault records as well as for commissioning.

The serial interface is isolated.

Self-monitoring

Hardware and software are continuously monitored and any irregularities are immediately detected and alarmed.

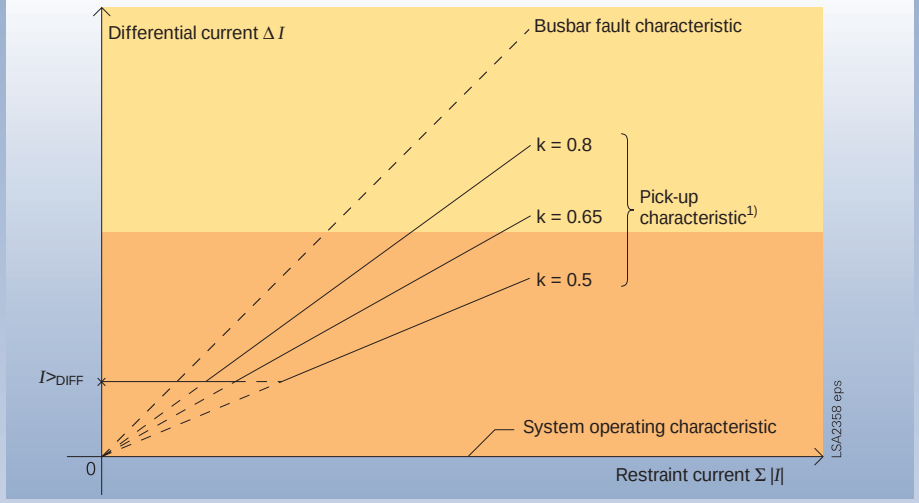
The self monitoring feature improves both the security and the availability of the 7SS50. The following quantities are monitored:

- all internal supply voltages
- the current measurement circuits
- the analog-to-digital conversion of measured values
- the program memory
- the program run
- the isolator status.

Busbar protection

The main function of the 7SS50 is busbar protection, and features the following characteristics:

- Evaluation of differential currents, with stabilization by through currents based on the proven performance of the Siemens busbar protection 7SS1, currently in service all around the world (see Fig. 2)
- Independent protection zones for busbars with up to 8 busbar sections and 32 input currents.
- Integrated „check zone“ (evaluation of all busbar section currents without use of the isolator replica)
- Tripping time approximately 15 ms
- Matching of different c.t. ratios without interposing c.t.s, (if the c.t. ratio mismatch is greater than 1 : 5, interposing c.t.s are required)
- Selective detection of short-circuits and also of faults on the transfer bus, with trip to the bay remote end
- Detection and clearance of faults between the current transformer and the circuit-breaker in the bus coupler via current measurement and selective polarity reversal
- Busbar tripping only when all three fault detection modules recognize a fault (2 measurement processors and check zone processor)
- No special c.t. requirements (stability is guaranteed, even when the c.t. saturates after 3 ms)
- Selective TRIP control per feeder, actuated directly from the measuring systems.



1) The pick-up characteristic can be set independently for selective busbar protection, for the "check zone" (isolator independent busbar protection) and for the circuit-breaker failure protection.

Fig. 2
Pick-up characteristic of the busbar protection/ circuit-breaker failure protection

Circuit-breaker failure protection

The 7SS50 includes an integrated circuit-breaker failure protection with the following features:

- Three selectable circuit-breaker failure protection methods for external feeder faults:
  1. Following the issue of a TRIP command from a feeder protection, the busbar protection monitors the trip signal. If the feeder current is not interrupted before a set time delay the polarity of the feeder current is reversed, which results in a differential current in the corresponding section of the bus protection. For this function, an own parameter set is used.
  2. Following a TRIP command from a feeder protection a TRIP command will be output after a settable time delay from the station protection to the corresponding feeder-tripping relay.

     If even this second TRIP command is unsuccessful, the polarity-changing procedure according to item 1 will take place.
  3. If external stand-alone circuit-breaker failure protection is provided, the isolator replica of the 7SS50 may be used to selectively TRIP the busbar section, to which the line with the faulty breaker is connected.
- Determination for a breaker failure condition for a busbar fault via current comparison with a low set value.
- For all types of circuit-breaker failure protection, a transfer trip command output contact is provided for each feeder to initiate remote tripping.

Isolator replica

The isolator replica is used for both the busbar protection and the circuit-breaker failure protection.

The following features characterize the isolator replica function:

- Includes up to 32 bays and 8 busbar sections (see page 4, Fig. 3).
- Integrated bistable isolator status characteristic (status stored on loss of auxiliary power).
- Isolator change-over time supervision.
- Through the assignment "NOT OPEN = CLOSED" the isolator is taken to be CLOSED during the travelling time. Accurate matching of the isolator status contacts with the main contact is not required.
- Menu-driven parameter setting for the busbar configuration at commissioning.
- LEDs at the I/O-modules indicate the actual status of the busbar isolators.

SIPROTEC 7SS50 V1.2
Busbar / Circuit-Breaker Failure Protection Relay

Functions

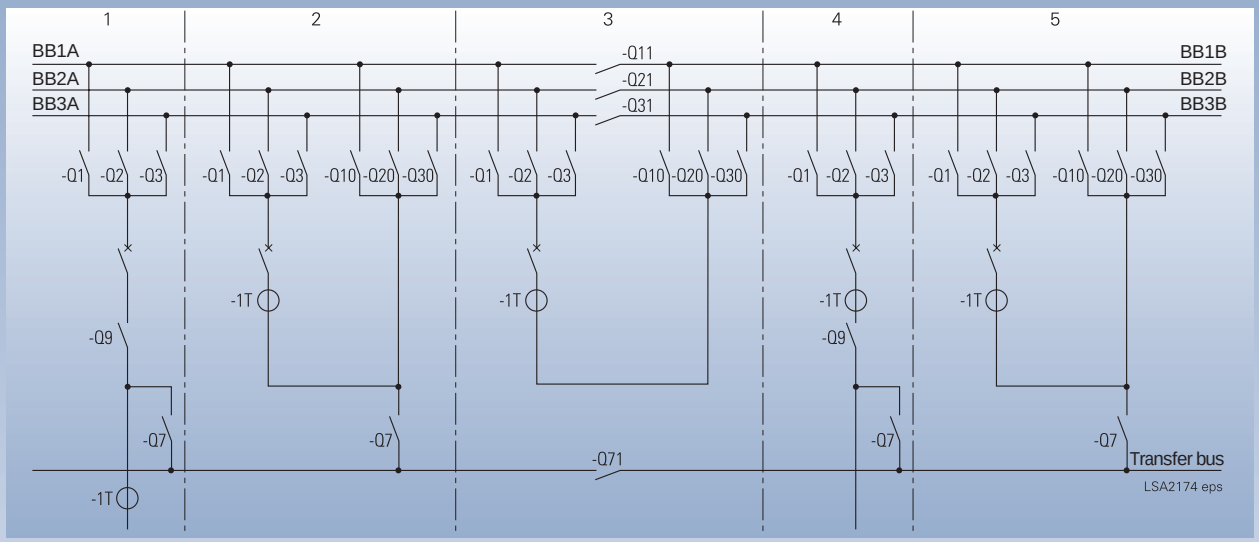


Fig. 3
Switchgear configuration for design of isolator replica

TRIP command output / reset

The command processing for the 7SS5 station protection has the following features:

- Feeder selective TRIP command
- Settings provided for overcurrent release of the TRIP command (to enable selective tripping of infeeding circuits only)
- Settable minimum time for the TRIP command.
- Current-dependent reset of the TRIP command.

Fault recording

The digitized values from the feeder summation c.t. current and the differential and stabilizing currents for the busbar sections and check zone are stored following TRIP decision by the 7SS50 or following an external initiation via a binary input. The record includes pre-fault data of 30 ms (prior to initiation) and record data of 70 ms after the TRIP command i.e. a total recording period of 100 ms. The fault records may be input to a PC for analysis using a menu-assisted program.

Command relays, binary inputs, marshallable alarm relays and LEDs

The 7SS50 is equipped with feeder dedicated command relays. Each feeder tripping may be provided with 2, 4 or 6 contacts.

User-specific indications are provided with 16 alarm relays and LEDs. Many individual alarms or event indications may be grouped together. Allocation of the events to the relays and parameterized LEDs is made via the serial interface in an interactive mode.

The following binary inputs are provided:

- Breaker failure protection initiation
- Reset of LED flags
- Bay out of service
- Freeze/release fault record data
- CB auxiliary contacts from the bus couplers and sectionalizers
- Isolator position OPEN and CLOSE.

Measurement and monitoring functions

In the 7SS50 there are many measurement and monitoring functions provided for commissioning and maintenance. These functions include:

- Measurement and display of the differential and stabilizing currents via operator interface
- Monitoring of the busbar selective differential current with selective blocking
- Monitoring of the differential currents of the check zone with provision to select between alarming with or without blocking
- Operator-initiated trip circuit testing with transfer tripping
- Removal of a feeder from the busbar measurement processing during feeder service and maintenance.

Event recording

The 7SS50 provides complete data for analysis of protection performance following a trip or any other abnormal condition and for monitoring the state of the relay in normal service.

Up to 40 events may be stored in two independent buffers.

- Operational indications
  This group includes plant operation events, for example isolator switching, isolator status discrepancies (changeover time limit exceeded, loss of auxiliary voltage, etc.). Discrepancies detected by the cyclic tests and other monitoring will be entered into the indication buffer.
- Event/alarm indications
  TRIP commands following a busbar short-circuit fault or breaker failure.

Technical data

Input circuits	Rated current I_N		1 or 5 A
	Rated frequency f_N		50 Hz/60 Hz
	Thermal overload capability in current path,	continuous	4 x I_N
		10 s	20 x I_N
		1 s	80 x I_N
	Dynamic overload capability		250 x I_N
	Burden of current inputs	at I_N = 1 A	1 VA } including summation c.t.
		at I_N = 5 A	1.2 VA } including summation c.t.
Voltage supply via integrated DC/DC converter	Rated auxiliary voltage V_{aux}		60, 110, 125 V DC 220 V DC
	Permissible tolerance V_{aux}		-20 to +15 %
	Maximum ripple		≤ 12 %
	Power consumption (configuration dependent)	quiescent	approx. 100 W
		energized	approx. 150 W
	Max. bridging time during loss of voltage supply		≥ 50 ms for all voltages
Binary inputs	Number (configuration dependent)		324
	Voltage range		60 to 250 V DC
	Current consumption		approx. 2.5 mA/input
Alarm/event contacts[1]	Number of relays	marshallable	16 NO
		fixed	1 C/O
	Switching capacity make/break		20 W/ VA
	Switching voltage		250 V AC/DC
	Permissible current,	continuous	1 A
Command contacts	Number of relays, each having 2 NO contacts per feeder		3 (can also be supplied with 1 or 2)
	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	Operation indication	green	1
	Device failure	red	1
	Marshallable[2]	red	16
	Isolator status, (configuration dependent)	red/green (colour allocatable)	256 max.
	TRIP/intertripping command indication , (configuration dependent)		64 max.
Serial interfaces	Operator interface		on front panel, 2 kV isolated, 25-pin submin. connector ISO 2110, for connection to PC
	Baud rate		1200 to 38400 Bd
Construction of unit	Mounted in Siemens standard 8MF cubicle with swing frame		
	Dimensions of standard cubicle		2200 x 900 x 600 mm (H x W x D)
	Weight		on request, configuration dependent
	Degree of protection according to EN 60 0529		IP 51
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 60255 and the national standard DIN 57 435/VDE 0435.		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 and standard EN 60255-6 for the low-voltage directive.
	The unit has been developped and manufactured for use in industrial areas in accordance with the EMC standard.		
Insulation tests IEC 60255-5, DIN VDE 0435 part 303 IEC 60255-6, EN 60255-6	High-voltage test (routine test)		2 kV (rms), 50/60 Hz, 1 min; alternative 2.8 kV DC, 1 min
	Impulse voltage test (routine test), class III		5 kV (peak), 1,2/50 µs, 0.5 J, 3 positive and 3 negative shots at intervals of 5 s
EMC-tests; emission (type test) Standard: EN 50081-2 (European generic standard for industrial environment)	Conducted interference voltage, auxiliary voltage only CISPR 11, EN 55011 and DIN VDE 0875 part 11		150 kHz to 30 MHz, device class 1 class A
	Interference field strength CISPR 11, EN 55011 and DIN VDE 0875 part 11		30 to 1000 MHz, device class 1 class A

1) Indications also apply for the intertripping relay contacts (1 NO contact per feeder).

2) Together with alarm relay.

Technical data (continued)

EMC-tests; immunity (type test) Standards: IEC 60255-22 (international product standard) EN 50082-2 (European generic standard for industrial environment) DIN VDE 0435 part 303 (German product standard)	High-frequency test with 1 MHz interference IEC 60255-22-1, class III			2.5 kV longitudinal voltage,1 kV transverse voltage, 1 MHz, τ = 15 µs, 400 shots/s, duration 2 s, R_i = 200 Ω
	DIN VDE 0435 part 303, class III EN 61000-4-12, class III; IEC 61000-4-12, class III			on measuring circuit 2.5 kV longitudinal and transverse voltage
	Electrostatic discharge IEC 60255-22-2, class III; IEC 61000-4-2, class III; EN 61000-4-2, class III			4/6 kV contact discharge, 8 kV air discharge, both polarities 150 pF, R_i = 330 Ω
	Radio-frequency electromagnetic field, amplitude-modulated IEC 61000-4-3, class III; EN 61000-4-3, class III			10 V/m, 80 to 1000 MHz, AM 80 %, 1 kHz
	Radio-frequency electromagnetic field, pulse-modulated ENV 50204, class III; IEC 60077 B (Sec.) 136			10 V/m, 900 MHz, repetition frequency 200 Hz, duty cycle 50 %
	Fast transients/bursts IEC 60255-22-4, class III, IEC 61000-4-4, class IV EN 61000-4-4, class IV			4 kV on power supply line, 2 kV on other connections, 5/50 ns, 5 kHz, burst length = 15 ms, 2.5 kHz, repetition 300 ms, both polarities, R_i = 50 Ω, duration 1 min
	Surge EN 61000-4-5, class IV; IEC 61000-4-5, class IV			2 kV; 4 kV symmetrical/asymmetrical
	Conducted disturbances induced by radio-frequency fields, amplitude-modulated IEC 61000-4-6, class III ; EN 61000-4-6, class III			10 V (rms), 150 kHz to 80 MHz, AM 80 %, 1 kHz; R_i = 150 Ω
	Power frequency magnetic field IEC 61000-4-8, class III; EN 61000-4-8, class IV			30 A/m, continuous, 50 Hz
Climatic stress tests	Permissible ambient temperature	during service during storage during transport		-5 to +40 °C -25 to +55 °C -25 to +70 °C
	Permissible humidity			mean value per year ≤ 75 % relative humidity, on 30 days per year up to 95 % relative humidity, condensation not permissible
Mechanical stress tests IEC 60255-21-1, IEC 60068-2	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
Busbar protection				
Tripping	Setting ranges			
	Overcurrent I/I_{Norm} [1]	Step	0.01	0.2 to 4
	Stabilizing factor k			
	– for busbar sections and transfer bus		0.01	0.1 to 0.8
	– for check zone		0.01	0 to 0.8
	– for bus-coupler differential protection		0.01	0.5 to 0.8
Differential current supervision	Setting ranges			
	Current limit I/I_{Norm} [1]		0.01	0.05 to 0.8
	Time delay		1 s	1 to 10 s
Tripping time	Minimum trip time			approx. 15 ms
Circuit-breaker failure protection				
Tripping valid for setting "destabilize bus protection"	Setting ranges			
	Overcurrent I/I_N [2]	Step	0.01	0.2 to 4
	Stabilizing factor k		0.01	0 to 0.8
	Time delay for unbalancing		0.01 s	0.05 to 1 s
	TRIP repetition		0.01 s	0 to 1 s
Operating mode	Unbalancing			–
	Unbalancing with TRIP repetition			–
	External breaker failure protection (Tripping via isolator replica of the station protection)			–
Circuit-breaker failure protection for busbar short-circuit	Setting value Overcurrent I/I_N [2]		0.1	0.2 to 2
Common data for busbar and circuit-breaker failure protection				
Min. time of TRIP commands	Setting range	Step	0.01 s	0.02 to 1 s
	Min. current for command reset I/I_N [2]		0.1	0.2 to 2
Overcurrent interlock of TRIP commands	Setting range I/I_N [2]		0.01	0 to 25
Isolator change-over time	Setting range		0.01 s	1 to 180 s
Busbar configuration	Busbar section arrangement (max.)			Quadruple or triple busbars with transfer busbar, up to 4 bus couplers and 16 sectionalizing isolators, 8 busbar sections and 8 tie-bus sections [3]
	Number of bays including the sectionalizers and bus couplers			32

Foot notes see page 7.

Technical specifications

The busbar protection must meet the following technical features:

The busbar protection must ensure fast, reliable and selective fault clearing of all kinds of fault.

A low-impedance measuring principle must be applied for protection of single, double and triple busbar systems, with or without transfer bus.

The measuring system must be based on a differential current principle. By virtue of phase-segregated measurement, both phase-to-phase and phase-to-earth faults should be reliably identified. The protection relay should – in case of external faults – ensure high stability, even in case of c.t. saturation. This is achieved by adaptable tripping characteristic.

Selective tripping of a busbar section should only take place if a busbar fault has been identified by at least two independent processors. An additional security feature is a tripping decision by a check zone, functioning independently of the isolator replica.

The requirements for the current transformers must be kept to a minimum.Various transformer types (iron-cored and linearized) must be applicable.Various transformer ratios must be adaptable by way of software configuration. The stability limit of each measuring system must not be less than the rated breaking capacity of the system.

The tripping time must not exceed 15 ms at five times the set value. A sufficient number of high-performance tripping contacts must be provided for direct activation of the circuit-breaker coil.

Tripping must be selective for all faults, without additional delay from sequential tripping of coupler breakers. All circuit-breakers on the faulted busbar must trip simultaneously, optionally combined with a current threshold. Sequential tripping is permitted only for faults in the "dead zone" between the coupler circuit-breaker and the current transformer.

The measuring current circuits must be continuously monitored. If a preset threshold is exceeded, busbar-selective blocking or signaling must be provided. The tripping circuits within the device must be monitored continuously. A test function of the tripping paths of the circuit-breakers must be provided. The isolator positions and change-over times must be monitored and any faults indicated selectively.

Circuit-breaker failure protection, suitable for all voltage levels, must be integrated. Feeder-specifically preset functions should make separate breaker failure protection unnecessary. The duty of c.-b. failure protection is clearing of a fault that has been identified by the allocated protection, but not disconnected by the assigned circuit-breaker. It should be possible for breaker failure protection to take one or two-stage form. Intertrip commands to disconnect the remote end must be provided on a feeder-selective basis. If separate circuit-breaker failure protection is provided, it should be possible to use the isolator replica of the busbar protection for issuing trip commands.

Foot notes for page 6

1) I_{Norm} = normalized rated current being referred to the transformer with the highest ratio.

2) Rated current of the feeder transformer (100 mA).

3) Sections only for coupling the busbar sections; these sections don´t have parent fields.
Note: 1 sectionalizing (without current transformer) = 1 bay; 1 bus sectionalizer or bus coupler unit = 2 bays.

SIPROTEC 7SS50 V1.2
Busbar / Circuit-Breaker Failure Protection Relay

Selection and ordering data

Description	Order No..							
SIPROTEC 7SS50 V1.2 Busbar/Circuit-breaker failure protection (with summation current transformer)	**7SS50**	□	**0-**	□	□	□	**0-**	□	**A**	□
Single busbar										
2 tripping contacts per bay, bay out of service	0								A	
4 tripping contacts per bay, bay out of service	0								B	
6 tripping contacts per bay, bay out of service	0								C	
2 tripping contacts per bay, bay out of service and intertrip	0								D	
4 tripping contacts per bay, bay out of service and intertrip	0								E	
6 tripping contacts per bay, bay out of service and intertrip	0								F	
Duplicate busbar without transfer bus										
2 tripping contacts per bay, bay out of service	1								A	
4 tripping contacts per bay, bay out of service	1								B	
6 tripping contacts per bay, bay out of service	1								C	
2 tripping contacts per bay, bay out of service and intertrip	1								D	
4 tripping contacts per bay, bay out of service and intertrip	1								E	
6 tripping contacts per bay, bay out of service and intertrip	1								F	
Duplicate busbar with transfer bus										
2 tripping contacts per bay, bay out of service and intertrip	2								A	
4 tripping contacts per bay, bay out of service and intertrip	2								B	
6 tripping contacts per bay, bay out of service and intertrip	2								C	
Triple busbar without transfer bus										
2 tripping contacts per bay, bay out of service and intertrip	3								A	
4 tripping contacts per bay, bay out of service and intertrip	3								B	
6 tripping contacts per bay, bay out of service and intertrip	3								C	
Triple busbar with transfer bus, quadruple busbar without transfer bus										
2 tripping contacts per bay, bay out of service and intertrip	4								A	
4 tripping contacts per bay, bay out of service and intertrip	4								B	
6 tripping contacts per bay, bay out of service and intertrip	4								C	
Auxiliary voltage supply for DC/DC converter and for binary inputs										
60 V DC			2							
110 V DC			3							
125 V DC			4							
220 V DC			5							
Please indicate the converter voltage and the indication input voltage in plain text			9							
Construction										
Busbar protection in one 8MF cubicle				A						
Busbar protection in two 8MF cubicles (for 17 bays and up)				B						
Equipped for										
4 bays					A					
8 bays					B					
12 bays					C					
16 bays					D					
20 bays					E					
24 bays					F					
28 bays					G					
32 bays					H					
Wired-up for a maximum of:										
4 bays						0				
8 bays						1				
12 bays						2				
16 bays						3				
20 bays						4				
24 bays						5				
28 bays						6				
32 bays						7				
Mounting location of interposing transformers										
in station protection cubicle							0			
accommodated externally							1			
Language										
German										0
English										1

Schematic diagram

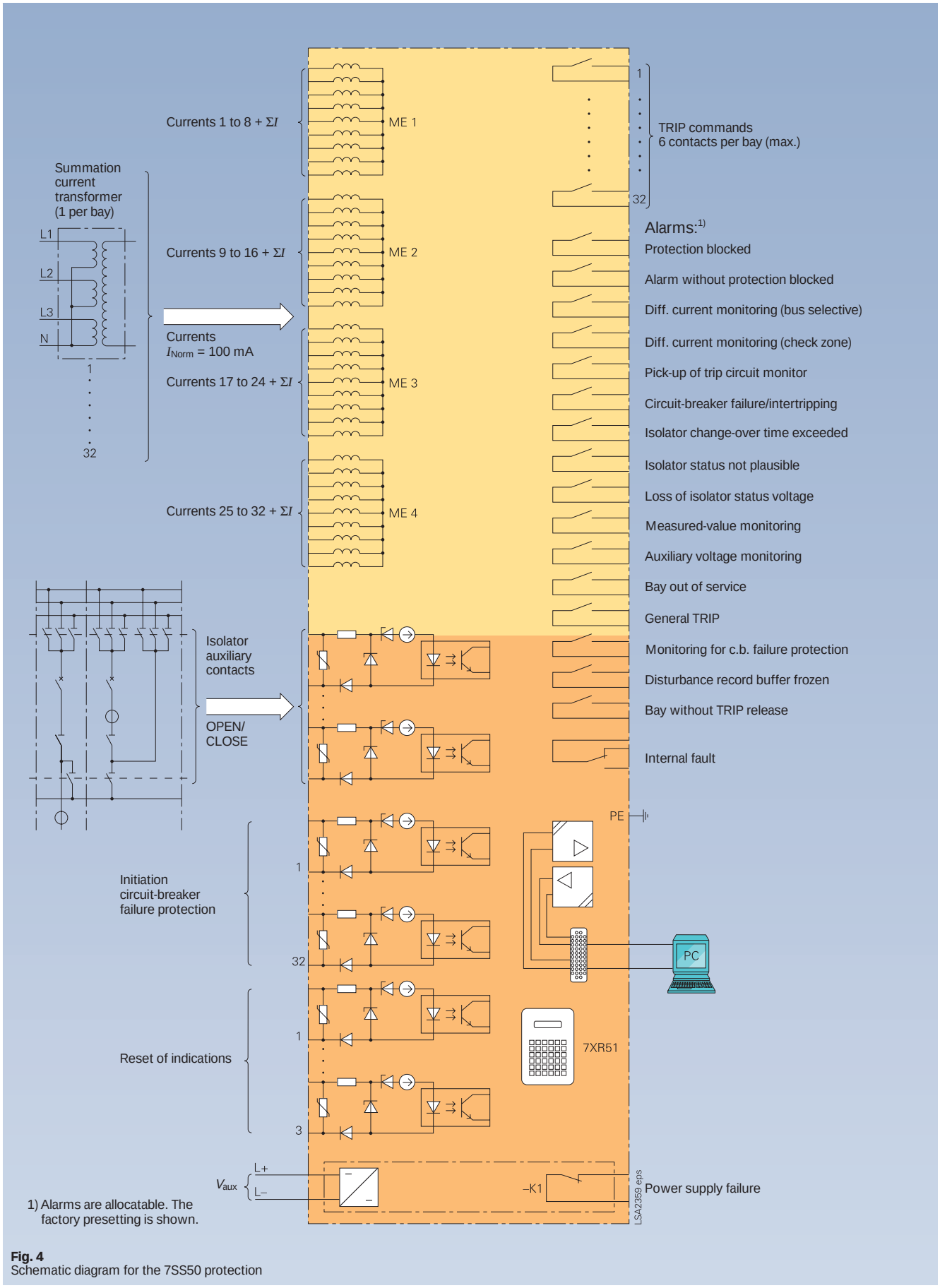


Fig. 4
Schematic diagram for the 7SS50 protection

Catalog Index of the Power Transmission and Distribution Group (Protection and Substation Control Systems)

Title	Designation	Order No.
Numerical Protective Relaying and Bay Units		
Numerical Protection Devices	LSA 2.0.1	E50001-K5702-A011-A1-7600
Operation and Evaluation Software for Numerical Protection Devices	LSA 2.0.2	E50001-K5702-A121-A1-7600
Relay Selection Guide	LSA 2.0.3	E50001-K5702-A031-A2-7600
SIPROTEC 7SJ600 Overcurrent, Motor and Overload Protection	LSA 2.1.15	E50001-K5712-A251-A2-7600
SIPROTEC 7SJ601 Overcurrent Protection	LSA 2.1.16	E50001-K5712-A261-A1-7600
7SJ41 Definite-Time Overcurrent Protection Relay	LSA 2.1.10	E50001-K5712-A201-A2-7600
7SJ511 Numerical Overcurrent-Time Protection (Version V3)	LSA 2.1.3	E50001-K5712-A131-A2-7600
7SJ512 Numerical Overcurrent-Time Protection (Version V3)	LSA 2.1.4	E50001-K5712-A141-A3-7600
7SJ512 Numerical Feeder Protection	LSA 2.1.30	E50001-K5712-A411-A1-7600
SIPROTEC 7SJ531 Numerical Line and Motor Protection with Control Function	LSA 2.1.9	E50001-K5712-A191-A4-7600
7SJ551 Multi-Function Protection Relay	LSA 2.4.2	E50001-K5742-A121-A3-7600
SIPROTEC 7SA510 Distance Protection Relay (Version V3)	LSA 2.1.17	E50001-K5712-A271-A1-7600
SIPROTEC 7SA511 Distance Protection Relay (Version V3)	LSA 2.1.11	E50001-K5712-A211-A2-7600
7SA513 Line Protection Relay (Version V3)	LSA 2.1.12	E50001-K5712-A221-A1-7600
7SA518/519 Overhead Control-Line Protection Relay (Version V3)	LSA 2.1.14	E50001-K5712-A241-A2-7600
3VU13 Miniature Circuit-Breaker	LSA 2.1.8	E50001-K5712-A181-A2-7600
7SD502 Line Differential Protection with Two Pilot Wires	LSA 2.2.1	E50001-K5722-A111-A2-7600
7SD503 Line Differential Protection with Three Pilot Wires	LSA 2.2.2	E50001-K5722-A121-A2-7600
7SD511/512 Current Comparison Protection Relay (Version V3) for Overhead Lines and Cables	LSA 2.2.3	E50001-K5722-A131-A2-7600
SIPROTEC 7SD60 Numerical Current Differential Protection Relay for Two Pilot-Wire Link	SIPROTEC 5.2	E50001-K4405-A121-A1-7600
7UT512/513 Differential Protection Relay (Version V3) for Transformers, Generators and Motors	LSA 2.2.4	E50001-K5722-A141-A2-7600
7SS5 Station Protection	LSA 2.2.5	E50001-K5722-A151-A2-7600
SIPROTEC 7SS50 Busbar/Circuit-Breaker Failure Protection Relay	SIPROTEC 5.1	E50001-K4405-A111-A1-7600
Auxiliary Current Transformers 4AM50, 4AM51, 4AM52 and Isolating Transformers 7XR95	LSA 2.2.6	E50001-K5722-A161-A1-7600
Introduction to Earth-Fault Detection	LSA 2.3.1	E50001-K5732-A111-A2-7600
7SN71 Transient Earth-Fault Relay	LSA 2.3.2	E50001-K5732-A121-A1-7600
7XR96 Toroidal Current Transformer	LSA 2.3.3	E50001-K5732-A131-A1-7600
7VC1637 Earth-Leakage Monitor	LSA 2.3.4	E50001-K5732-A141-A1-7600
7SK52 Motor Protection	LSA 2.4.1	E50001-K5742-A111-A1-7600
Introduction to Generator Protection	LSA 2.5.1	E50001-K5752-A111-A1-7600
7UM511 Generator Protection Relay (Version V3)	LSA 2.5.2	E50001-K5752-A121-A2-7600
7UM512 Generator Protection Relay (Version V3)	LSA 2.5.3	E50001-K5752-A131-A2-7600
7UM515 Generator Protection Relay (Version V3)	LSA 2.5.4	E50001-K5752-A141-A2-7600
7UM516 Generator Protection Relay (Version V3)	LSA 2.5.5	E50001-K5752-A151-A1-7600
7UW50 Tripping Matrix	LSA 2.5.6	E50001-K5752-A161-A1-7600
7VE51 Synchronizing Unit	LSA 2.5.7	E50001-K5752-A171-A1-7600
7VP151 Three-Phase Portable Test Set (Omicron CMC56)	LSA 2.6.1	E50001-K5762-A111-A2-7600
7XV72 Test Switch	LSA 2.6.2	E50001-K5762-A121-A1-7600
7SV50 Numerical Circuit-Breaker Failure Protection Relay	LSA 2.7.1	E50001-K5772-A111-A1-7600
7SV512 Numerical Circuit-Breaker Failure Protection Relay	LSA 2.7.2	E50001-K5772-A121-A1-7600
7VK512 Numerical Auto-Reclose/Check-Synchronism Relay	LSA 2.7.3	E50001-K5772-A131-A1-7600
7SM70 Analog Output Unit	LSA 2.7.5	E50001-K5772-A151-A1-7600
7SM71 Analog Output Unit	LSA 2.7.6	E50001-K5772-A161-A1-7600
7SV7220 Power Supply Unit	LSA 2.7.9	E50001-K5772-A191-A1-7600
SIPROTEC 7RW600 Numerical Voltage, Frequency and Overexcitation Relay	LSA 2.7.10	E50001-K5772-A201-A1-7600
Communication for Protection Devices		
Centralized and Remote Control of Siemens Protection Relays (Overview)	SIPROTEC 8.1	E50001-K4408-A111-A1-7600
Operating and Analysis Software DIGSI V3	LSA 2.8.2	E50001-K5782-A121-A1-7600
6MB525 Mini Bay Unit for Energy Automation with SICAM	SIPROTEC 7.1	E50001-K4407-A111-A1-7600
Energy Automation		
Substation SICAM RTU System	SICAM 2.1.1	E50001-K5602-A111-A1-7600
PS20A-6EP8090 Power Supply Module	SICAM 5.1.1	E50001-K5605-A111-A1-7600
DI32-6MD1021 Digital Input Functional Module	SICAM 5.2.1	E50001-K5605-A211-A1-7600
AI32-6MD1031 Analog Input Functional Module	SICAM 5.2.2	E50001-K5605-A221-A1-7600
AI16-6MD1032 Analog Input Functional Module	SICAM 5.2.3	E50001-K5605-A231-A1-7600
CO32-6MD1022 Command Output Functional Module	SICAM 5.3.1	E50001-K5605-A311-A1-7600
CR-6MD1023 Command Release Functional Module	SICAM 5.3.2	E50001-K5605-A321-A1-7600

Title	Designation	Order No.
Power Quality		
Fault and Digital Recorder SIMEAS R	SR 10.1.1	E50001-K4011-A101-A1-7600
Central Fault Data Unit DAKON	SR 10.1.2	see Intranet
OSCOP P The Program for Power Quality Recorders	SR 10.1.3	E50001-K4013-A101-A1-7600
Power System Quality Analysis OSCILLOSTORE	SR 10.2	E50001-K4020-A101-A1-7600
SIMEAS Q Quality Recorder	SR 10.2.5	E50001-K4025-A101-A1-7600
SIMEAS P Power Meter	SR 10.2.6	E50001-K4026-A101-A1-7600
SIMEAS T Transducers for Power Variables	SR 10.4	E50001-K4040-A101-A1-7600
Active Filter and Power Conditioner for Distribution Networks SIPCON P/S	SR 10.5	E50001-K4050-A201-A1-7600
Low-Voltage Capacitors and Power Factor Correction Units SIPCON T	SR 10.6	E50001-K4060-A101-A1-7600
Analog Protective Relaying		
Static Analog Network Protection Relays	R 1.1	E50001-K4501-A111-A1-7600
Static Analog Machine Protection Relays	R 1.2	E50001-K4501-A121-A1-7600
Static Analog Ancillary Protection Equipment	R 1.3	E50001-K4501-A131-A1-7600
Hand and Electrical Reset Tripping Relay 7PA20	R (Extract)	E86010-K4500-A151-A1-7600
Trip Circuit Supervision Relay 7PA21	R (Extract)	E86010-K4500-A161-A1-7600
Pilot-Wire Differential Relay 7SD24	R (Extract)	E86010-K4500-A131-A1-7600
Microprocessor Based Overcurrent Relay 7SJ55	R (Extract)	E50001-K4500-A361-A2-7600
High-Speed Busbar Differential Relay 7SS10	R (Extract)	E50001-K4500-A241-A2-7600
High Impedance Differential Relay 7VH80	R (Extract)	E86010-K4500-A321-A1-7600
Auto-Reclose Relay 7VK14	R (Extract)	E86010-K4500-A141-A1-7600
Substation Control and Protection		
Input/Output Unit 6MB522	LSA 1.1.1	E50001-K5701-A111-A4-7600
Input/Output Unit 6MB523	LSA 1.1.2	E50001-K5701-A121-A2-7600
6MB511/6MB512 Substation Control Master Unit and 7SW511/7SW512 Relay Data Concentrator	LSA 1.1.3	E50001-K5701-A131-A2-7600
6MB520/6MB521 Input/Output Units	LSA 1.1.4	E50001-K5701-A141-A1-7600
6MB513/514 Compact Control Master Unit and Relay Data Concentrator	LSA 1.1.6	E50001-K5701-A161-A1-7600
6MB524 Bay Control Unit	LSA 1.1.7	E50001-K5701-A171-A2-7600
6MB525 Mini Bay Unit (MBU)	LSA 1.1.8	E50001-K5701-A181-A1-7600
6MB5510 Station Control Unit	LSA 1.2.1	E50001-K5701-A211-A2-7600
6MB552 Compact Remote Terminal Unit	LSA 1.2.2	E50001-K5701-A221-A1-7600
6MB5530-0 Minicompact Remote Terminal Unit	LSA 1.2.3	E50001-K5701-A231-A1-7600
6MB5530-1 Minicompact Remote Terminal Unit for Cable Shield Communication	LSA 1.2.4	E50001-K5701-A241-A1-7600
6MB5540 SINAUT LSA COMPACT Remote Terminal Unit	LSA 1.2.5	E50001-K5701-A251-A1-7600
6MB5515 Station Control Unit	LSA 1.2.6	E50001-K5701-A261-A1-7600
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Status Indications in SINAUT LSA Substation Control and Protection	LSA 1.4.2	E50001-K5701-A421-A1-7600
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Metering in SINAUT LSA Substation Control and Protection	LSA 1.4.4	E50001-K5701-A441-A1-7600
Voltage Control with Input/Output Units 6MB520/6MB521	LSA 1.4.5	E50001-K5701-A451-A1-7600
Network Synchronization with Input/Output Units 6MB520/521	LSA 1.4.6	E50001-K5701-A461-A1-7600
Operation with Two Control Master Units	LSA 1.4.7	E50001-K5701-A471-A1-7600
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LSADIAG - Testing and Diagnostics System for SINAUT LSA Substation Control and Protection	LSA 1.5.2	E50001-K5701-A521-A1-7600
LSACONTROL - Control and Monitoring	LSA 1.5.3	E50001-K5701-A531-A1-7600
LSAPROCESS - Process Information Analysis	LSA 1.5.5	E50001-K5701-A551-A1-7600
LSA 678 Standard Cubicle	LSA 1.6.1	E50001-K5701-A611-A1-7600

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