Description

The SIPROTEC 7SJ82 overcurrent protection has specifically been designed for a cost-effective and compact protection of feeders and lines in medium-voltage and high-voltage systems. With its flexibility and the powerful DIGSI 5 engineering tool, SIPROTEC 7SJ82 offers future-oriented system solutions with high investment security and low operating costs.

Main function	Feeder and overcurrent protection for all voltage levels
Inputs and outputs	4 current transformers, 4 voltage transformers (optional), 11 or 23 binary inputs, 9 or 16 binary outputs, or 8 current transformers, 7 binary inputs, 7 binary outputs
Hardware flexibility	Different hardware quantity structures for binary inputs and outputs are available in the 1/3 base module. Adding 1/6 expansion modules is not possible; available with large or small display.
Housing width	1/3 × 19"

Benefits

- Compact and low-cost overcurrent protection
- Safety due to powerful protection functions
- Data security and transparency over the entire lifecycle of the plant save time and money
- Purposeful and easy handling of devices and software thanks to a user-friendly design
- Increased reliability and quality of the engineering process
- Consistent implementation of high safety and security mechanisms
- Powerful communication components ensure safe and effective solutions
- Full compatibility between IEC 61850 Editions 1 and 2
- High investment security and low operating costs due to future-oriented system solution.

Functions

DIGSI 5 permits all functions to be configured and combined as required.

- Directional and non-directional overcurrent protection with additional functions
- Optimized tripping times due to directional comparison and protection data communication
- Detection of static, intermittent and transient ground faults (fleeting contact function) in arc-suppression-coil-ground and isolated power systems
- Arc protection
- Overvoltage and undervoltage protection
- Frequency protection and frequency change protection for load shedding applications
- Power protection, configurable as active or reactive power protection

[SIP5_7xx82_GD_W3, 1, --_--]

Figure 2.4/2 SIPROTEC 7SJ82

- Protection functions for capacitor banks, such as overcurrent, overload, current unbalance, peak overvoltage, or differential protection
- Reactive power-undervoltage protection (QU protection)
- Control, synchrocheck and switchgear interlocking protection, circuit-breaker failure protection
- Circuit-breaker failure protection
- Circuit-breaker reignition monitoring
- Graphical logic editor to create powerful automation functions in the device
- Recognition of current and voltage signals up to the 50th harmonic with high accuracy for selected protection functions (such as peak overvoltage protection for capacitors) and operational measured values
- Single line representation in small or large display
- Integrated electrical Ethernet RJ45 for DIGSI 5 and IEC 61850 (reporting and GOOSE)
- Two optional pluggable communication modules, usable for different and redundant protocols (IEC 61850, IEC 60870-5-103, IEC 60870-5-104, Modbus TCP, DNP3 (serial and TCP))
- Serial protection data communication via optical fibers, two-wire connections and communication networks (IEEE C37.94, and others), including automatic switchover between ring and chain topology.
- Redundancy protocols PRP and HSR
- Cyber security in accordance with NERC CIP and BDWE Whitepaper requirements
- Whitepaper Phasor Measurement Unit (PMU) for synchrophasor measured values and IEEE C37.118 protocol
- Time synchronization with IEEE 1588
- Powerful fault recording (buffer for a max. record time of 80 s at 8 kHz or 320 s at 2 kHz)
- Auxiliary functions for easy tests and commissioning.

Feeder and Overcurrent Protection – SIPROTEC 7SJ82

Applications

- Detection and selective 3-pole tripping of short circuits in electrical equipment of star networks, lines with infeed at one or two ends, parallel lines and open or closed ring systems of all voltage levels
- Detection of ground faults in isolated or arc-suppression-coil-ground power systems in star, ring, or meshed arrangement
- Backup protection for differential protection devices of all kind for lines, transformers, generators, motors, and busbars
- Protection and monitoring of simple capacitor banks
- Phasor Measurement Unit (PMU)
- Reverse-power protection
- Load shedding applications
- Automatic switchover

Application templates

Application templates are available in DIGSI 5 for standard applications. They comprise all basic configurations and default settings.

The following application templates are available:

Non-directional overcurrent protection

- Overcurrent protection (non-directional) for phases and ground
- Transformer inrush current detection

Directional overcurrent protection – grounded system

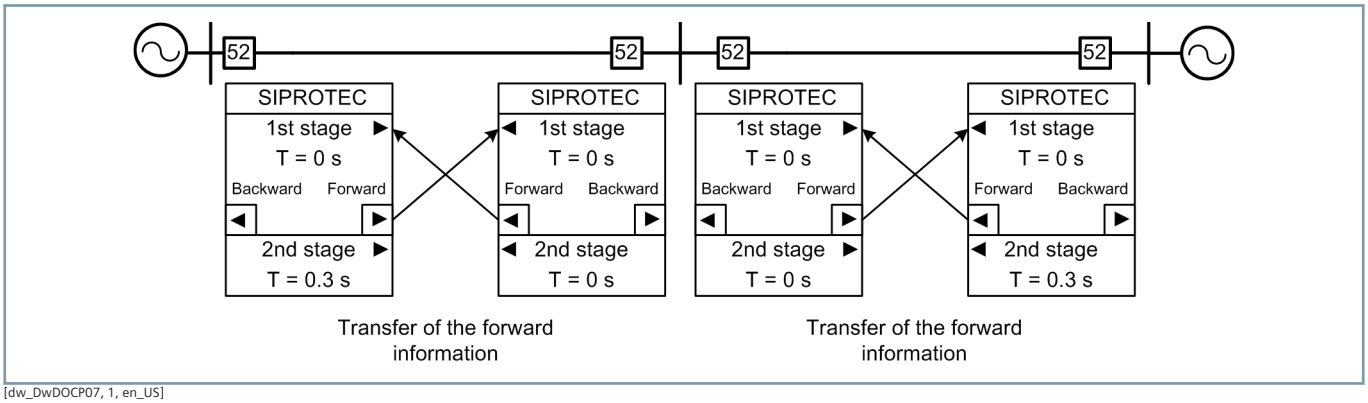
- Overcurrent protection (directional and non-directional) for phases and ground
- Transformer inrush current detection
- Measuring voltage failure supervision.

Directional overcurrent protection – resonant-grounded / isolated system

- Overcurrent protection (directional and non-directional) for phases
- Sensitive directional ground fault detection for static ground faults
- Sensitive directional ground fault detection for transient and static ground faults (≙transient" function)
- Transformer inrush current detection
- Measuring voltage failure supervision.

Capacitor bank: H connection

- Overcurrent protection for phase and ground
- Current-unbalance protection for capacitor banks
- Peak overvoltage protection
- Overload protection
- Undercurrent protection.



[dw_DwDOCP07, 1, en_US]

Figure 2.4/3 Application example: Principle of directional comparison protection for power line runs with infeed at two ends

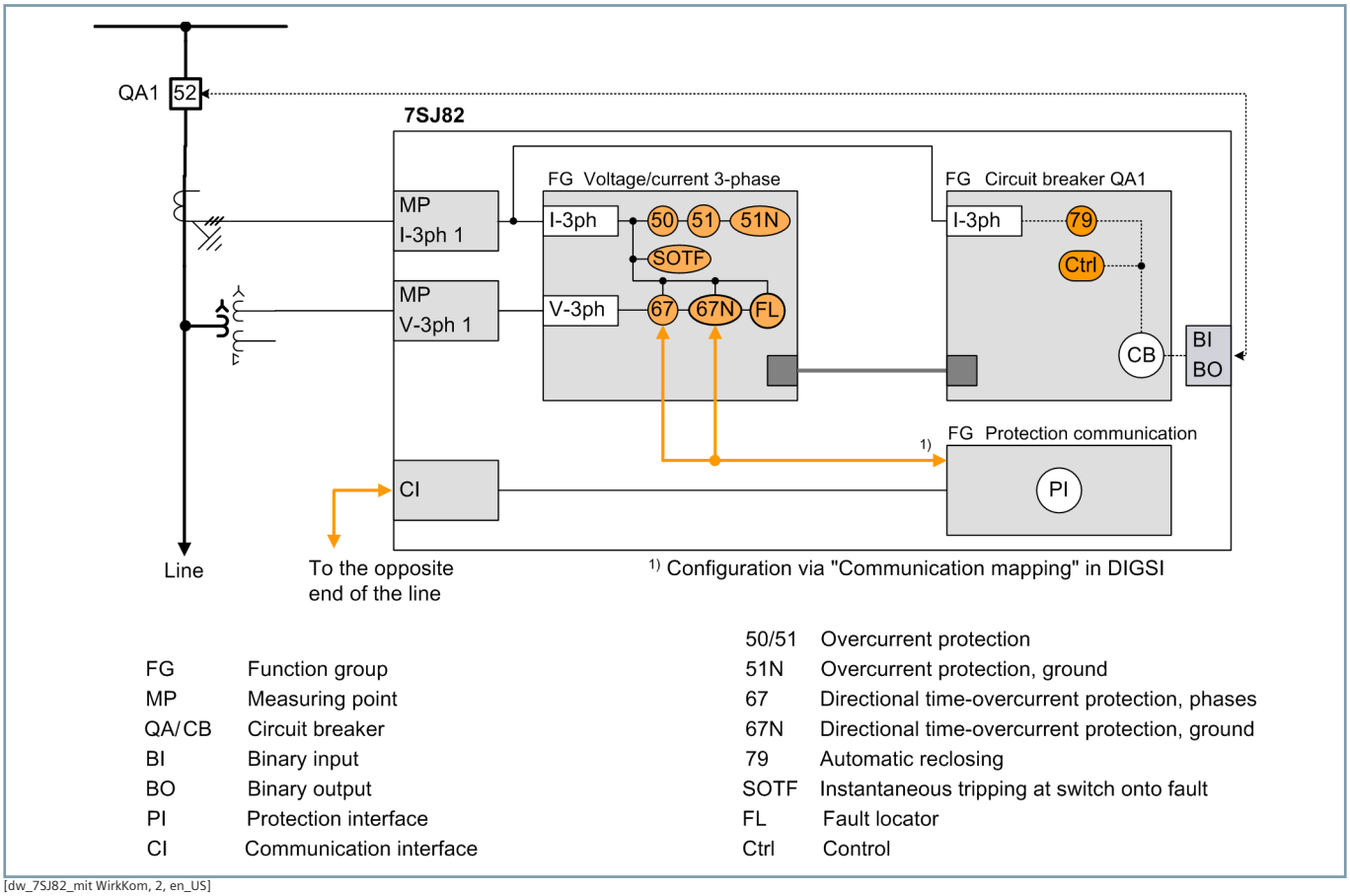
Application examples

Directional comparison protection via protection interface for power line runs with infeed at two ends

Using the direction determination of the directional overcurrent protection, you can implement directional comparison protection for power line runs with infeed at two ends. Directional comparison protection is used for the selective isolation of a faulty line section (subsections of closed rings, for example). Sections are isolated in fast time, that is, they do not suffer the disadvantage of long grading times. This technique requires that directional information can be exchanged between the individual protection stations. This information exchange can, for example, be implemented via a protection interface. Alternatives of the protection interface are IEC 61850 GOOSE or, via pilot wires for signal transfer, with an auxiliary voltage loop.

Figure 2.4/4 shows the functional scope and the basic configuration of a SIPROTEC 7SJ82 for this application. The "Directional V /inverse time-overcurrent protection – grounded system" application template is used as the basis. In addition, the device must obviously be equipped with a communication module for protection communication. The protection communication function group is created automatically when the module is configured. The "Communication mapping" editor in DIGSI 5 is used to determine the information that must be transferred to the opposite end and received from the opposite end. The received information can directly be combined with the binary input signals of

the directional overcurrent protection. Additional logic with a CFC chart is not necessary.



FG	Function group
MP	Measuring point
QA/CB	Circuit breaker
BI	Binary input
BO	Binary output
PI	Protection interface
CI	Communication interface

50/51	Overcurrent protection
51N	Overcurrent protection, ground
67	Directional time-overcurrent protection, phases
67N	Directional time-overcurrent protection, ground
79	Automatic reclosing
SOTF	Instantaneous tripping at switch onto fault
FL	Fault locator
Ctrl	Control

[dw_7SJ82_mit WirkKom, 2, en_US]

Figure 2.4/4 Application example: Directional comparison protection for power line runs with infeed at two ends and protection communication

Feeder and Overcurrent Protection – SIPROTEC 7SJ82

Functions, application templates

ANSI	Functions	Abbr.	Available	Template				
				1	2	3	4	5
	Protection functions for 3-pole tripping	3-pole	■	■	■	■	■	■
24	Overexcitation protection	V/f	■					
25	Synchrocheck, synchronizing function	Sync	■					
27	Undervoltage protection: "3-phase" or "pos.seq. V1" or "universal Vx"	V<	■					
	Undervoltage-controlled reactive power protection	Q>/V<	■					
32, 37	Power protection active/reactive power	P<>, Q<>	■					
32R	Reverse power protection	- P<	■					
37	Undercurrent	I<	■					■
38	Temperature Supervision	θ>	■					
46	Negative sequence overcurrent protection	I2>	■					■
46	Unbalanced-load protection (thermal)	$I2^2$ t>	■					
46	Negative sequence overcurrent protection with direction	I2>, ∠(V2,I2)	■					
47	Overvoltage protection, negative-sequence system	V2>	■					
49	Thermal overload protection	θ, I^2t	■					■
49	Thermal overload protection for RLC filter elements of a capacitor bank	θ, I^2t	■					
50/51 TD	Overcurrent protection, phases	I>	■	■	■	■	■	■
50N/ 51N TD	Overcurrent protection, ground	IN>	■	■	■	■		■
50HS	High speed instantaneous overcurrent protection	I>>>	■					
	Instantaneous tripping at switch onto fault	SOTF	■					
50N/ 51N TD	Overcurrent protection, 1-phase	IN>	■					
50Ns/ 51Ns	Sensitive ground-current protection for systems with resonant or isolated neutral	INs>	■					
	Intermittent ground fault protection	Iie>	■					
50/51 TD	Overcurrent protection for RLC filter elements of a capacitor bank	I>	■					
50BF	Circuit-breaker failure protection, 3-pole	CBFP	■					
50RS	Circuit-breaker restrike protection	CBRS	■					
51V	Voltage dependent overcurrent protection	t=f(I,V)	■					
	Peak overvoltage protection, 3-phase, for capacitors	V> cap.	■					■
59, 59N	Overvoltage protection: "3-phase" or "zero seq. V0" or "pos.seq. V1" or "universal Vx"	V>	■					
60C	Current-unbalance protection for capacitor banks	Iunbal>	■					■
67	Directional overcurrent protection, phases	I>, ∠(V,I)	■			■	■	
67N	Directional overcurrent protection, ground	IN>, ∠(V,I)	■			■		
67Ns	Dir. sensitive ground-fault detection for systems with resonant or isolated neutral incl. a) 3I0>, b) V0>, c) Cos-/SinPhi, d) Transient fct., e) Phi(V,I), f) admittance		■				■	
	Directional intermittent ground fault protection	Iie dir>	■					
74TC	Trip circuit supervision	TCS	■					
79	Automatic reclosing, 3-pole	AR	■					
81	Frequency protection: "f>" or "f<" or "df/dt"	f>,<; df/dt>,<	■					
86	Lockout		■	■	■	■	■	■
87N T	Restricted ground-fault protection	ΔIN	■					
87C	Differential protection, capacitor bank	ΔI	■					

ANSI	Functions	Abbr.	Available	Template				
				1	2	3	4	5
90V	Automatic voltage control for 2 winding transformer		■					
FL	Fault locator, single-ended measurement	FL-one	■					
PMU	Synchrophasor measurement (1 PMU can be used for max. 8 voltages and 8 currents)	PMU	■					
AFD	Arc-protection (only with plug-in module ARC-CD-3FO)		■					
	Measured values, standard		■	■	■	■	■	■
	Measured values, extended: Min, Max, Avg		■					
	Switching statistic counters		■					
	Circuit breaker wear monitoring	ΣIx, I²t, 2P	■					
	CFC (Standard, Control)		■	■	■	■	■	■
	CFC arithmetic		■					
	Switching sequences function		■					
	Inrush current detection		■	■	■	■	■	
	External trip initiation		■					
	Control		■	■	■	■	■	■
	Fault recording of analog and binary signals		■	■	■	■	■	■
	Monitoring and supervision		■	■	■	■	■	■
	Protection interface, serial		■					
	Circuit Breaker		■	■	■	■	■	■
	Disconnector		■	■	■	■	■	
Function-points class:				0	0	30	50	100
The configuration and function points for your application can be ascertained in the SIPROTEC 5 order configurator under: *www.siemens.com/siprotec*								

Table 2.4/1 SIPROTEC 7SJ82 - Functions and application templates

1 Non-directional OC (4*I)

2 Non-directional OC (4*I, 4*V)

3 Directional OC - grounded system

4 Directional OC - resonant-grounded / isol. system

5 Capacitor bank: H-bridge

Standard variants

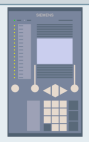
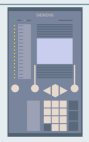
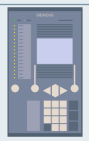
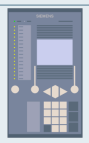
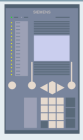
Standard variants for SIPROTEC 7SJ82		
U1	1/3, 11 BI, 9 BO, 4 I	
	Housing width 1/3 x 19” 11 binary inputs, 9 binary outputs (1 life contact, 8 standard) 4 current transformer inputs Contains the modules: Base module with PS101 and IO101	
U2	1/3, 23 BI, 16 BO, 4 I	
	Housing width 1/3 x 19” 23 binary inputs, 16 binary outputs (1 life contact, 15 standard), 4 current transformer inputs Contains the modules: Base module with PS101, IO101 and IO110	
U3	1/3, 11 BI, 9 BO, 4 I, 4 V	
	Housing width 1/3 x 19” 11 binary inputs, 9 binary outputs (1 life contact, 8 standard), 4 current transformer inputs 4 voltage transformer inputs Contains the modules: Base module with PS101 and IO102	
U4	1/3, 23 BI, 16 BO, 4 I, 4 V	
	Housing width 1/3 x 19” 23 binary inputs, 16 binary outputs (1 life contact, 15 standard), 4 current transformer inputs, 4 voltage transformer inputs Contains the modules: Base module with PS101, IO102 and IO110	
U5	1/3, 7 BI, 7 BO, 8 I	
	Housing width 1/3 x 19” 7 binary inputs, 7 binary outputs (1 life contact, 6 standard), 8 current transformer inputs, Contains the modules: Base module with PS101 and IO103	

Table 2.4/2 Standard variants for SIPROTEC 7SJ82

The technical data of the devices can be found in the manual
www.siemens.com/siprotec