Overcurrent Protection as Backup Protection for Line Protection – SIPROTEC 7SJ86

Description

The SIPROTEC 7SJ86 overcurrent protection has specifically been designed as backup or emergency protection for the line protection devices. With its modular structure, flexibility and the powerful DIGSI 5 engineering tool, SIPROTEC 7SJ86 offers future-oriented system solutions with high investment security and low operating costs.

Main function	Overcurrent protection (V/inverse time-overcurrent protection)
Tripping	3-pole
Inputs and outputs	3 predefined standard variants with 4/4 current transformers/voltage transformers, 11 to 23 binary inputs, 9 to 25 binary outputs
Hardware flexibility	Flexibly adjustable and expandable I/O quantity structure within the scope of the SIPROTEC 5 modular system
Housing width	1/3 × 19" to 2/1 × 19"

[SIP5_GD_W3, 1, --_--]

Figure 2.10/1 SIPROTEC 7SJ86

Functions

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

- Overcurrent protection as backup / emergency line protection for all voltage levels with 3-pole tripping
- Optimized tripping times due to directional comparison and protection data communication
- Recognition 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
- Protection functions for capacitor banks, such as overcurrent, overload, current unbalance, peak overvoltage, or differential protection
- Reactive power-undervoltage protection (QU protection)
- Detection of current and voltage signals up to the 50th harmonic with high accuracy for selected protection functions (such as thermal overload protection) and operational measured values
- Control, synchrocheck and switchgear interlocking protection
- Circuit-breaker failure protection
- Circuit-breaker reignition monitoring
- Graphical logic editor to create powerful automation functions in the device
- Single line representation in small or large display
- Integrated electrical Ethernet RJ45 for DIGSI 5 and IEC 61850 (reporting and GOOSE)
- 4 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
- Phasor measurement unit (PMU) for synchrophasor measured values and IEEE C37.118 protocol
- Time synchronization using 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 simple tests and commissioning
- Flexibly adjustable I/O quantity structure within the scope of the SIPROTEC 5 modular system

Applications

- Backup and emergency protection for line protection
- 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
- Utilization in switchgear with breaker-and-a-half configuration
- 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 capacitor banks
- Phasor Measurement Unit (PMU)
- Reverse-power protection

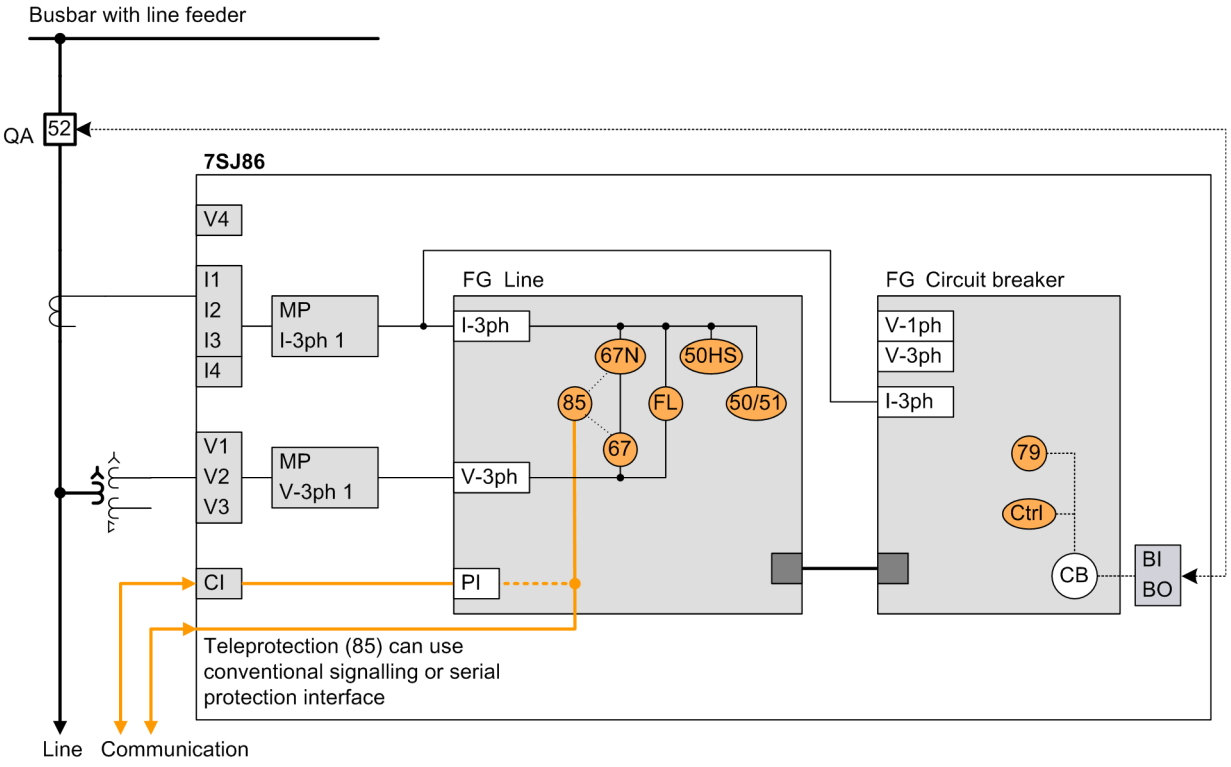
Application templates

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

The following application templates are available:

- SIPROTEC 7SJ86 non-directional overcurrent protection
- SIPROTEC 7SJ86 directional overcurrent protection

Figure 2.10/2 shows an application example for directional protection for overhead line. The functional scope is based on the application template directional overcurrent protection. In addition the functions fault locator and automatic reclosing were loaded from the DIGSI 5 library.



FG	Function group	50/51	Overcurrent protection, phases, ground
MP	Measuring point	50HS	Instantaneous high-current tripping
PI	Protection interface	67	Directional time-overcurrent protection, phases
CI	Communication interface	67N	Directional overcurrent protection for ground faults
CB	Circuit breaker	79	Automatic reclosing
BI	Binary input	85	Teleprotection schemes for 21 and/or 67N
BO	Binary output	Ctrl	Control
		FL	Fault locator

[dw_7SJ86_Ltg, 1, en_US]

Figure 2.10/2 Application example: directional overcurrent protection for overhead line

Functions and application templates

ANSI	Functions	Abbr.	Available	Template	
				1	2
	Protection functions for 3-pole tripping	3-pole	■	■	■
	Hardware quantity structure expandable	I/O	■	■	■
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<>	■		
37	Undercurrent	I<	■		
38	Temperature Supervision	θ>	■		
46	Negative sequence overcurrent protection with direction	I2>, ∠(V2,I2)	■		
47	Overvoltage protection, negative-sequence system	V2>	■		
49	Thermal overload protection	θ, I²t	■		
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>	■		
50BF	Circuit-breaker failure protection, 3-pole	CBFP	■		
50RS	Circuit-breaker restrike protection	CBRS	■		
51V	Voltage dependent overcurrent protection	t=f(I,V)	■		
59, 59N	Overvoltage protection: "3-phase" or "zero seq. V0" or "pos.seq. V1" or "universal Vx"	V>	■		
67	Directional overcurrent protection, phases	I>, ∠(V,I)	■		■
67N	Directional overcurrent protection for ground faults in grounded systems	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>,<	■		
85/67N	Teleprotection for directional ground fault protection		■		
86	Lockout		■		■
87N T	Restricted ground-fault protection	ΔIN	■		
90V	Automatic voltage control for 2 winding transformer		■		
90V	Automatic voltage control for 3 winding transformer		■		
90V	Automatic voltage control for grid coupling 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	■		

ANSI	Functions	Abbr.	Available	Template	
				1	2
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, I^2t, 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		■		■
	Region France: Overload protection for lines and cables 'PSL-PSC'		■		
	Region France: Overcurrent protection 'MAXI-L'		■		
	Region France: Net decoupling protection 'PDA'		■		
	Region France: Overload protection for trans-formers		■		
Function-points class:				0	50
The configuration and function points for your application can be ascertained in the SIPROTEC 5 order configurator under: *www.siemens.com/siprotec*					

Table 2.10/1 SIPROTEC 7SJ86 - Functions and application templates

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

2 Directional OC - grounded system