

SIPROTEC 5 Devices and Fields of Application

Line Differential Protection – SIPROTEC 7SD82

Description

The SIPROTEC 7SD82 line differential protection has been designed particularly for the cost-optimized and compact protection of lines in medium-voltage and high-voltage systems. With its flexibility and the powerful DIGSI 5 engineering tool, SIPROTEC 7SD82 offers future-oriented system solutions with high investment security and low operating costs.

Main function	Differential protection for medium-voltage and high voltage applications
Tripping	3-pole, minimum tripping time: 19 ms
Inputs and outputs	4 current transformers, 4 voltage transformers (optional), 11 or 23 binary inputs, 9 or 16 binary outputs
Hardware flexibility	Two different quantity structures for binary inputs and outputs are available in the 1/3 base module. Adding 1/6 expansion modules is not possible; housing width available with large or small display.
Housing width	1/3 × 19"

Benefits

- Compact and low-cost line differential protection
- Safety due to powerful protection functions
- Data security and transparency over the entire lifecycle of the plant save time and money
- Purposeful and simple operation of the devices and software thanks to 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.

- Minimum tripping time: 19 ms
- Main protection function is differential protection with adaptive algorithm for maximum sensitivity and stability even with the most different transformer errors, current-transformer saturation and capacitive charging currents
- Directional backup protection and various additional functions
- Recognition of static, intermittent and transient ground faults (fleeting contact function) in arc-suppression-coil-ground and isolated power systems
- Detection of current-transformer saturation
- Arc protection
- Power protection, configurable as active or reactive power protection



[SIP5_7xx82_GD_W3, 1, --]

Figure 2.7/1 Line differential protection device SIPROTEC 7SD82

- 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
- 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)
- 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 White-paper 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 easy tests and commissioning.

Applications

- Line protection for all voltage levels with 3-pole tripping
- Phase-selective protection of overhead lines and cables with single-ended and multi-ended infeed of all lengths with up to 6 line ends

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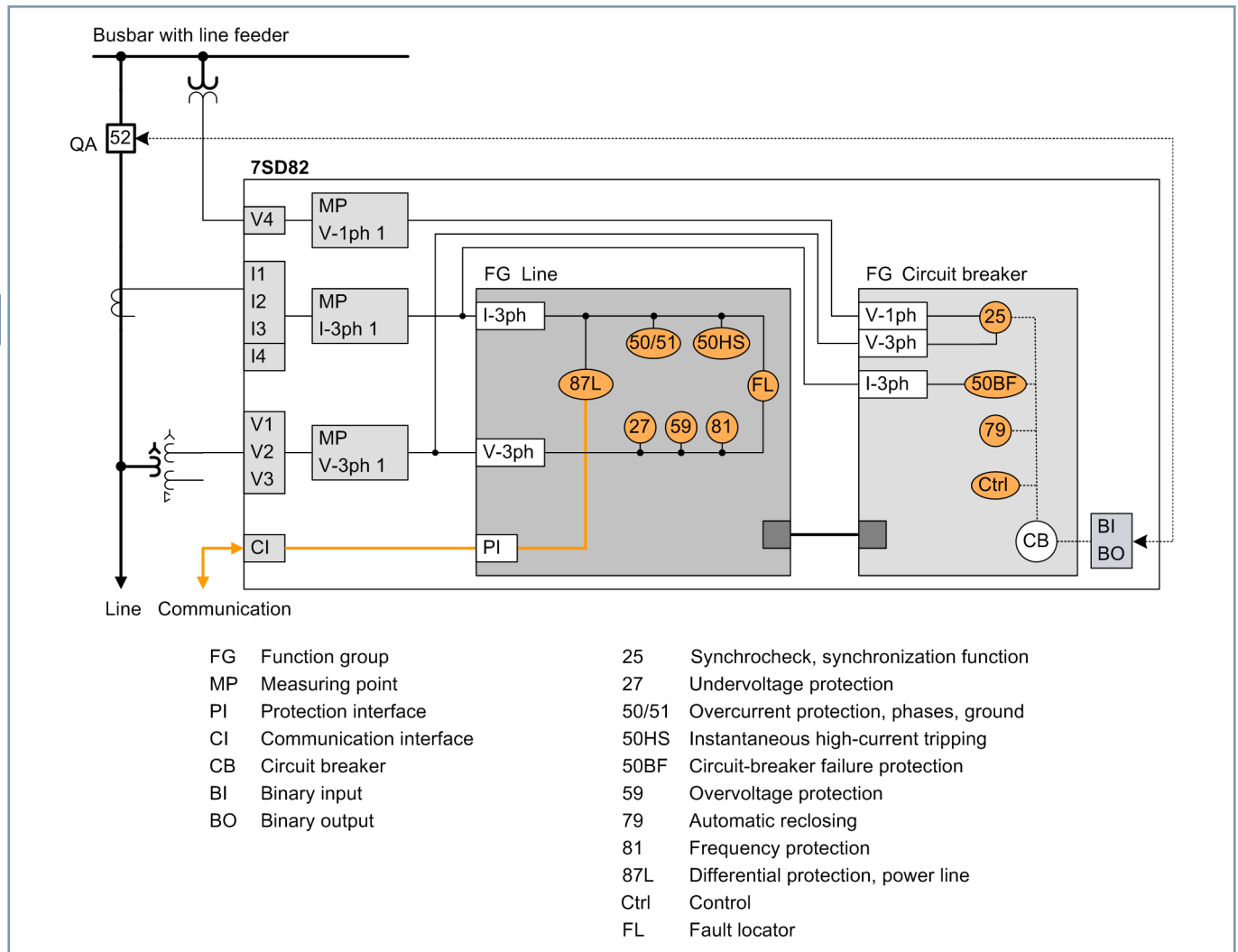
- Transformers and compensating coils in the protection zone
- Detection of ground faults in isolated or arc-suppression-coil-ground power systems in star, ring, or meshed arrangement
- Serial protection data communication over different distances and media, such as optical fiber, two-wire connections, and communication networks
- Phasor measurement unit (PMU).

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:

- Basic differential protection
- Differential protection for overhead line.



[dw_7SD82_Ltg, 1, en_US]

Figure 2.7/2 Application example: Line differential protection for overhead line

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Functions, application templates

ANSI	Functions	Abbr.	Available	Template	
				1	2
	Protection functions for 3-pole tripping	3-pole	■	■	■
87L	Line differential protection for 2 line ends	ΔI	■	■	■
87L	Line differential protection for 3 to 6 line ends (dependent on Significant properties)	ΔI	■	■	■
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	$\theta>$	■		
46	Negative sequence overcurrent protection with direction	$I2>, \angle(V2, I2)$	■		
47	Overvoltage protection, negative-sequence system	V2>	■		
49	Thermal overload protection	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	lie>	■		
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	$I>, \angle(V, I)$	■		
67N	Directional overcurrent protection for ground faults in grounded systems	$IN>, \angle(V, I)$	■		
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) $\text{Phi}(V, I)$, f) admittance		■		
	Directional intermittent ground fault protection	lie 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	■		
87L/ 87T	Option for line differential protection: including power transformer	ΔI	■		
	Option for line differential protection: charging-current compensation	ΔI	■		
	Broken-wire detection for differential protection		■		
90V	Automatic voltage control for 2 winding transformer		■		
90V	Automatic voltage control for 3 winding transformer		■		

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ANSI	Functions	Abbr.	Available	Template	
				1	2
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	■		
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	$\Sigma I_x, I^2t, 2P$	■		
	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		■	■	■
	Disconnecter		■		
	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 transformers		■		
Function-points class:				0	150
The configuration and function points for your application can be ascertained in the SIPROTEC 5 order configurator under: www.siemens.com/siprotec					

Table 2.7/1 SIPROTEC 7SD82 - Functions and application templates

- 1 DIFF Basic
- 2 DIFF overhead line