

SIL-D

Overcurrent and Directional Earth Fault Protection



Main specifications

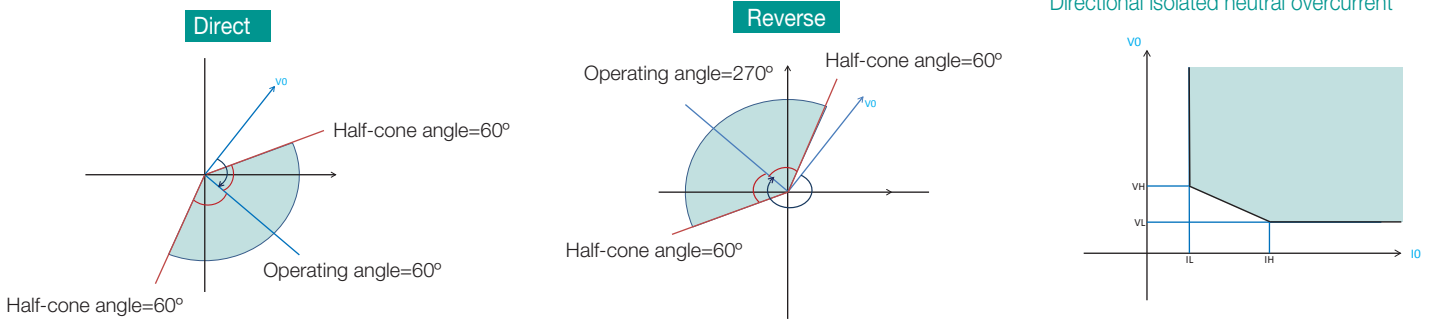
- SIL-D relay is an overcurrent and directional earth fault protection relay for Primary and Secondary Distribution.
- Auxiliary power supply (24-220 Vdc / 48-230 Vac).
- Protection functions: (2) 50 + 50/51 + (2) 50N/G + (2) 50N/51N/67N(1) + 52 + 50BF + 79 + 74TCS + CLP + 86 + 49T + 59N. Optionally, directional isolated neutral overcurrent(2) : 67NI_1 and 67NI_2.
- It includes switch disconnector protection function by means of trip blocking.
- Function 67NI. Directional neutral isolated overcurrent with two neutral directional units: 67NI_1 and 67NI_2.

This function is based on two supervisions: The analogue to the one that uses the 67N to check that the residual current is inside the defined area by the settings of directionality, operation angle and halfcone, and the second supervision of the modules of the residual voltage and current.

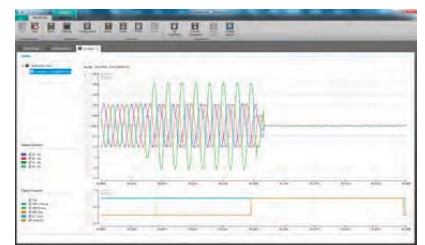
To perform the directional detection, the residual voltage is used as polarization magnitude and the residual current as an operating magnitude. The intervention sector in forward direction is defined in the following way: the operating angle is rotated anticlockwise from the negative residual voltage, $-V_0$ which gives us the maximum torque direction. A cone is drawn, with the half-cone angle adjusted, over this maximum torque direction. In the same way, the intervention sector in reverse direction is defined in the following way: the operating angle is rotated anticlockwise from the positive residual voltage, V_0 which gives us the maximum torque direction. A cone is drawn, with the half-cone angle adjusted, over this maximum torque direction.

When 67NI is not activated the functions works like 50/51G.

Graphical example for an Operating angle of 90° and a half-cone angle of 60°



- 5 attempts of reclosing with 79 protection function (Recloser). Direct signalling/control of function 52 (Circuit breaker) and function 79 (Recloser).
- Metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- 1 rear port on the back with the following options respect to communication protocols:
 - One rear port RS485 with IEC60870-103 or Modbus RTU selectable by settings.
 - One rear port RJ45 with IEC 61850, DNP 3.0 TCP/IP or IEC 60870-5-104 (depending on the model).
- 5 Oscillographic records, non-volatile RAM memory in order to store up to 200 events and 20 fault reports, without power supply thanks to its internal RTC (Real Time Clock).

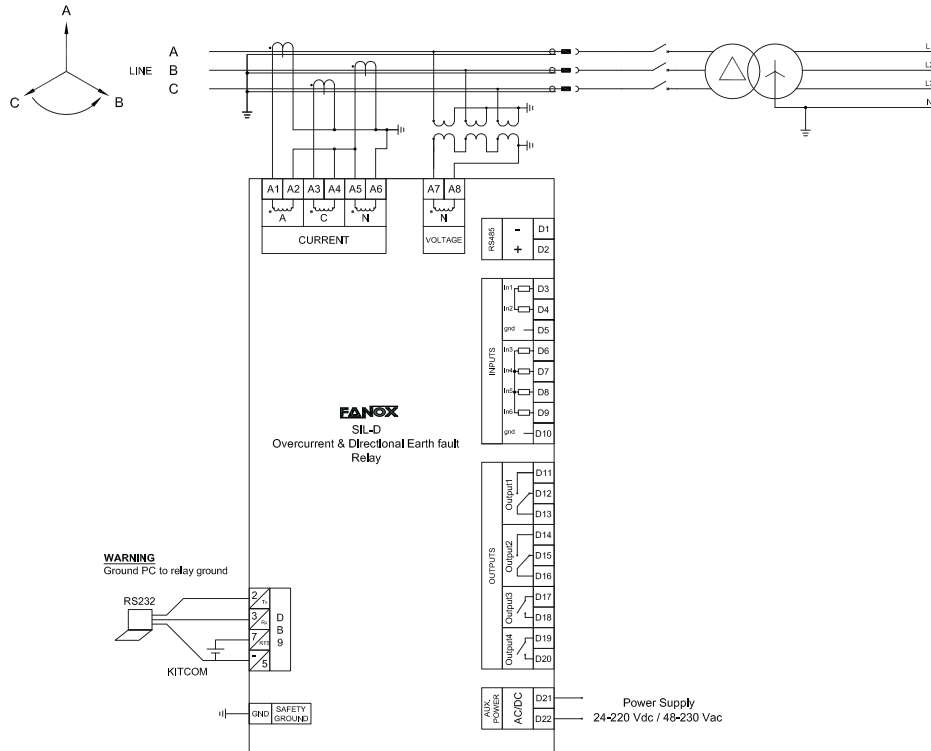


Additional information to fault reports

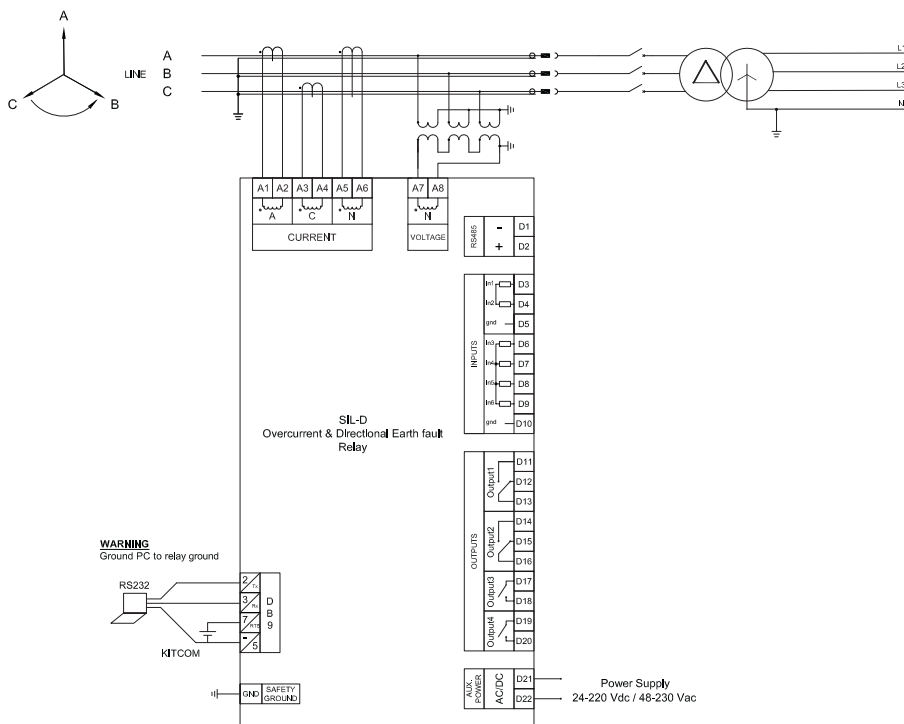
Technical specifications SIL-D

Connections diagram SIL-D

• 3 CT Phase Current



• 2 CT Phase Current + 1 Neutral CT



Technical specifications

Technical parameters SIL-D

50(2)	Function permission: Yes/No	
	Operating range: 0.10 to 30 xIn (step 0.01)	
	Time delay: 0.02 to 300 s (step 0.01 s)	
	Activation level 100%	
	Deactivation level 95%	
	Instantaneous deactivation	
	Timing accuracy: ± 30 ms or $\pm 0.5\%$ (greater of both)	
50N/G(2)	Function permission: Yes/No	
	Operating range: 0.10 to 30 xIn (step 0.01)	
	Time delay: 0.02 to 300 s (step 0.01 s)	
	Activation level 100%	
	Deactivation level 95%	
	Instantaneous deactivation	
	Timing accuracy: ± 30 ms or $\pm 0.5\%$ (greater of both)	
50/51	Function permission: Yes/No	
	Operating range: 0.10 to 7 xIn (step 0.01)	
	Curves IEC 60255-151 and ANSI	
	Time delay: IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve IEC long time inverse, ANSI Inverse curve, ANSI very inverse curve, ANSI extremely inverse curve.	
	Defined time : 0.02 to 300 s (step 0.01 s)	
	Dial: 0.02 to 2.20 (step 0.01)	
	Curve, activation level 110%	
	Curve, deactivation level 100%	
	Defined time, activation level 100%	
	Defined time, deactivation level 95%	
	Instantaneous deactivation	
	Timer accuracy: $\pm 5\%$ or ± 30 ms (whichever is greater)	
67N(2)	Function permission: Yes/No	
	Operating range: 0.10 to 7 xIn (step 0.01)	
	V Operating range: 2 -65V (step 1V)	
	Curves IEC 60255-151 and ANSI-IEEE	
	Time delay: IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve IEC long time inverse, ANSI Inverse curve, ANSI very inverse curve, ANSI extremely inverse curve.	
	Definite time: 0.02 to 300s (step 0.01)	
	Dial: 0.02 to 2.20 (step 0.01)	
	Directionality: No/ Forward/ Reverse	
	Operation angle: 0 to 359° (step 1°)	
	Halfcone angle: 1 to 170° (step 1°)	
	Curve, activation level 110%	
	Curve, deactivation level 100%	
	Defined time, activation level 100%	
	Defined time, deactivation level 95%	
	Instantaneous deactivation	
	Timer accuracy: $\pm 5\%$ or ± 30 ms (whichever is greater)	
67NI*(2)	Function permission: Yes/No	
	Operating range: 0.10 to 7.00 xIn (step 0.01)	
	V Operating range: 2 -65V (step 1V)	
	Time delay: 0.02 to 300 s (step 0.01 s)	
	Directionality: No/ Forward/ Reverse	
	Operation angle: 0 to 359° (step 1°)	
	Halfcone angle: 1 to 170° (step 1°)	
	Defined time, activation level 100%	
	Defined time, deactivation level 95%	
		Timer accuracy: $\pm 5\%$ or ± 30 ms (whichever is greater)

59N	Function permission: Yes/No
	V Operating range: 2 -65 V (step 1V)
	Operating range: 0.10 to 7.00 xIn (step 0.01)
	Reset time: 0.02 to 300s (step 0.01s)
Circuit breaker monitoring	Excessive number of openings: 1 to 10000 (step 1)
	Maximum accumulated amps: 0 to 100000 (M(A ²)) (step 1)
	Opening time: 0.02 to 30 s (step 0.01 s)
	Closing time: 0.02 to 30 s (step 0.01 s)
	Excessive repeated openings: 1 to 10000 (step 1)
	Time Excessive repeated openings: 1 to 300 min (step 1 min)
50BF	Function permission: Yes/No
	Opening fault time: 0.02 to 1.00 s (step 0.01 s)
	Open circuit breaker activation threshold: 8% In
	Open circuit breaker reset threshold: 10% In
	Function Pickup configurable: Equipment trip, activation of the opening fault input, circuit breaker open control activation.
79	Function permission: Yes/No
	Hold permission: Yes/No
	Number of reclosings: 1 to 5
	Reclosing time 1, 2, 3, 4, 5 : 0.02 to 300 s (step 0.01 s)
	Hold time: 0.02 to 300 s (step 0.01 s)
	Locking possibilities: pulse inputs, level inputs, commands.
	Replacement time: 0.02 to 300 s (step 0.01 s)
	Definitive opening time: 0.02 to 300 s (step 0.01 s)
74TCS	Function permission: Yes/No
	Time delay: 0.02 to 300 s (step 0.01 s)
	Trip continuity, in circuits A and B
	Configurable inputs
CLP	Function permission: Yes/No
	Settings group: 1 to 4 (step 1)
	No load Time: 0.02 to 300 s (step 0.01 s)
	Cold load Time: 0.02 to 300 s (step 0.01 s)
	CLP activation threshold: 8% In
	CLP reset threshold: 10% In
PLC	OR4, OR4_LATCH, OR4_PULSES, OR4_TIMERUP, OR4_PULSE, NOR4, NOR4_LATCH, NOR4_TIMERUP, NOR4_PULSE, AND4, AND4_PULSES, AND4_TIMERUP, AND4_PULSE, NAND4, NAND4_TIMERUP, NAND4_PULSE
86	Allows to latch (lock out) the contact trip due to programmable logic (PLC: LATCH).
49T	Available through configurable inputs thanks to the programmable logic
Trip Block	Blocking: Yes/No
	Blocking limit: 1.5 to 20 x In (step 0.01)
Settings tables	4 settings tables
	Activated by inputs or by general settings.

Technical parameters SIL-D

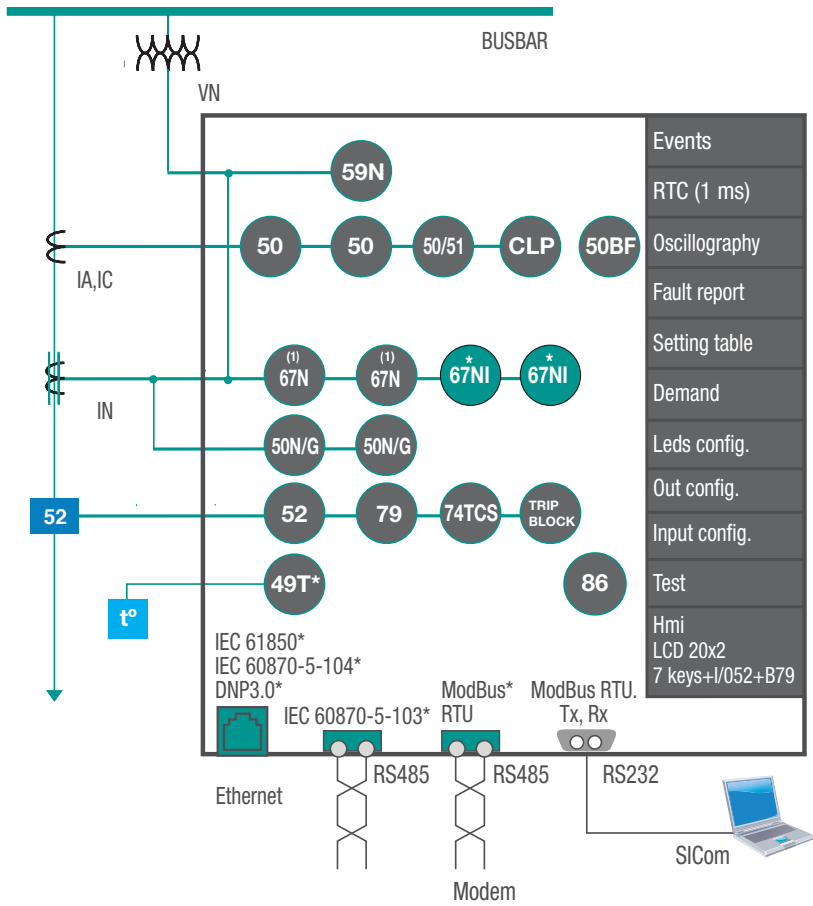
RTC	Capacitor charge time: 10 minutes
	Operation with no auxiliary voltage: 72 hours
Oscillography	16 samples/cycle
	Fault init configurable
	5 records of 100 cycles: 3 pre-fault and 97 post-fault cycles
	COMTRADE IEEE C37.111-1991
Fault reports	4 analog channels y 48 digital channels
	20 fault reports with 24 events each one
Demand of current	Demand of current with the following characteristics: <ul style="list-style-type: none"> • Number of records: 168 • Recording mode circular • Sampling rate (interval): configurable through communications: 1 – 60 min
	Record format: Date/Time IMAX (in interval) IMAX (actual) IA IB IC IN
Configurable inputs	Same voltage as the auxiliary power supply 6 configurable inputs
Configurable outputs	250 Vac – 8 A 30 Vdc – 5 A
	4 configurable outputs <ul style="list-style-type: none"> • Output 1 and output 2: NC + NO • Output 2 and output 4: NO
Frequency	50/60 Hz selectable by general settings
Current measurement	Phase current (IA, IB, IC), neutral (IN) and maximum current (Imax)
	Real RMS
	Sampling: 16 samples/cycle
	±2% Accuracy over a band of ±20% over the nominal current and 4% over the rest of the range
	The measurement of IB is calculated and it is necessary a minimum of 0.25xIn for a correct measurement.
Voltage measurement	Saturation limit: 30 times rated current
	Residual voltage (VR)
	Real RMS
	Sampling: 16 samples/cycle
Angle between VR and IR	±2% Accuracy in the range of 2 - 65V
	±2° Accuracy angle
	Minimum current for a correct angle measurement: 0.3 x In Minimum voltage for a correct angle measurement: 2V
Communications	LOCAL COMMUNICATION 1 Local port RS232: ModBus RTU
	REMOTE COMMUNICATION (*) 1 remote port with the following options : <ul style="list-style-type: none"> • 1 Remote port RS485: ModBus RTU or IEC 60870-5-103 (by general settings) • 1 Remote port RJ45: IEC 61850, DNP3.0 TCP/IP or IEC 60870-104

Auxiliary power	24-110 Vdc /48-230 Vac ±20%
Environmental conditions	Operating temperature : -10 to 70°C
	Storage temperature: -20 to 80°C
	Relative humidity: 95%
Transformers	Measurement 3 or 4 CT /5 or /1
Mechanical Characteristics	Metallic box
	Panel mounted.
	Height x Width: 177 x 107 mm
	Depth: 122.1 mm
	IP-54 on pannel

(*) Optional depending on model

Technical specifications

Functions diagram SIL-D

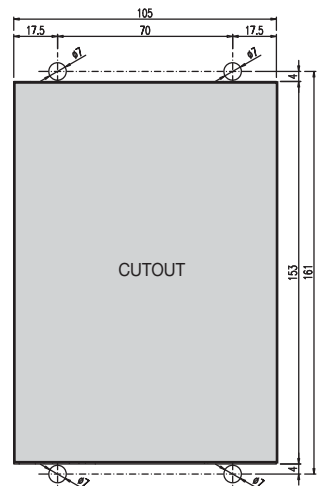
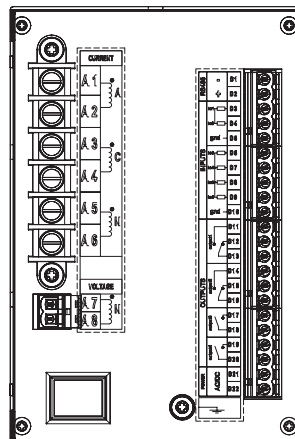
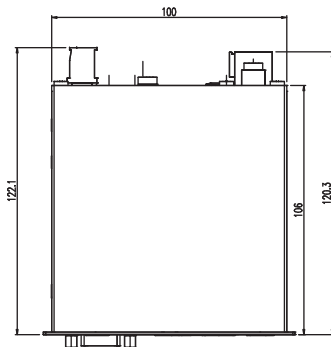
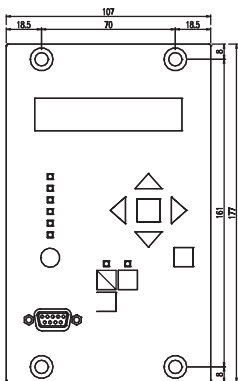


* optional

* available trough configuration

⁽¹⁾ 67N --> 50/51N

Dimensions and cut-out pattern SIL-D



Selection & Ordering Data SIL-D

SIL-D	Overcurrent & Directional Earth Fault Protection Relay										PROTECTION FUNCTIONS (2) 50 + 50/51 + (2) 50N/G + (2) 50N/51N/67N + 52 + 50BF + 79 + 74TCS + CLP + 86 + 49T + 59N + Trip block for switch disconnecter
	X										NOMINAL PHASE MEASUREMENT LPCT (Primary = 50 – 800A) Standard In = 1A (0.1-30.A) or 5A (0.5-150A) Sensitive In = 0.5A (0.05-15A) or 2.5A (0.25-75A)
	O										NOMINAL NEUTRAL MEASUREMENT LPCT (Neutral internally calculated) Standard In = 1A (0.1-30A) or 5A (0.5-150A) Sensitive In = 0.1A (0.01-3A) or 0.5A (0.05-15A)
	S										NET FREQUENCY (50Hz / 60Hz). Defined by Setting
			0								POWER SUPPLY 24-220 Vcc / 48-230 Vca
				C							ADDITIONAL FUNCTIONS - +67NI_1 + 67NI_2
					0						REMOTE COMMUNICATIONS RS232 (Modbus RTU) + RS485 (Modbus RTU or IEC 60870-5-103)
					1						INPUTS AND OUTPUTS 6 Inputs + 4 Outputs
						A					MECHANICS Vertical assembly
						B					LANGUAGES English, Spanish and German
						C					English, Spanish and Turkish
						D					English, Spanish and French
							1				English, Turkish and Russian
								2			ADAPTATION -
									A		

Example of ordering code:

SIL-D	0	0	0	C	1	A	1	2	B	A	SILD000C1A12BA
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