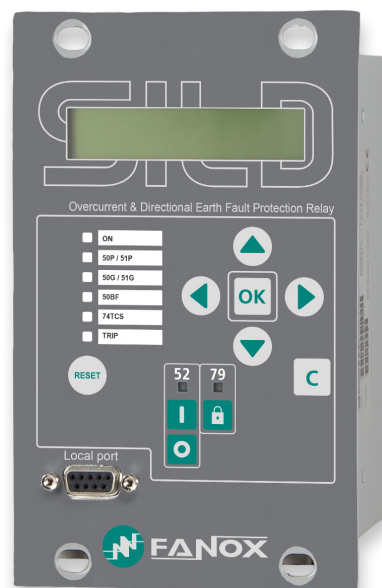


SIL-D

Directional Protection Relay



ANSI CODE PROTECTIONS	
50	Instantaneous phase overcurrent
51	Inverse time phase overcurrent
50G	Instantaneous measured neutral overcurrent
67G/51G	Inverse time directional measured neutral overcurrent
67GI	Inverse time directional isolated measured neutral overcurrent
59G	Instantaneous measured neutral overvoltage
52	Circuit Breaker monitoring
50BF	Circuit breaker failure
74TCS	Trip Circuit Supervision
79	AC Reclosing device
CLP	Cold Load Pickup
49T	External trip
86	Trip lockout
TB	Trip block for switch disconnecter
68	Zone selection interlocking
PGC	Programmable logic control

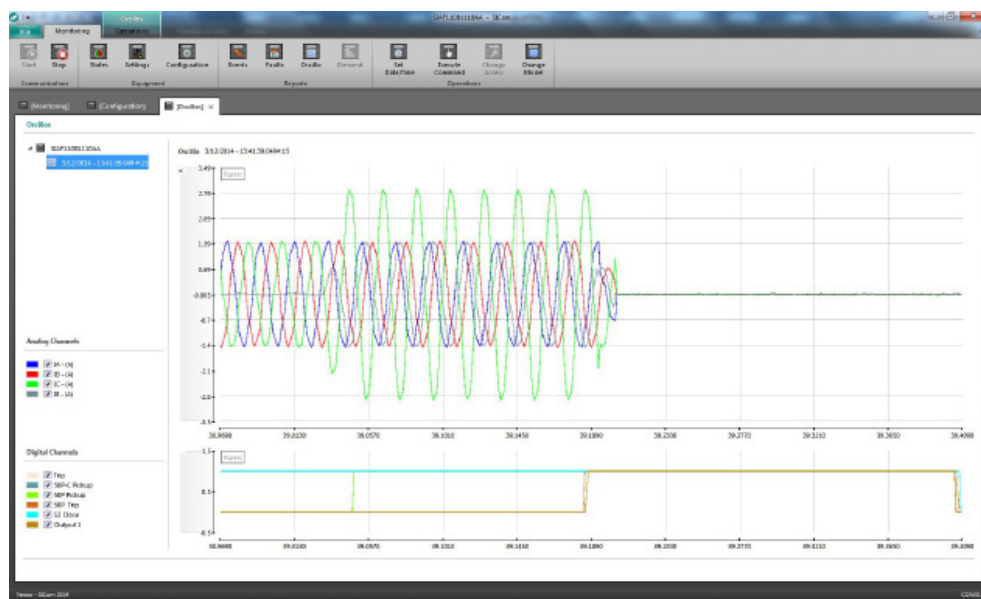
* ANSI 67G function can be converted into ANSI 51G by setting the "Directionality" parameter to NO.

Overcurrent & Directional Earth Fault Protection Relay for Primary & Secondary Distribution

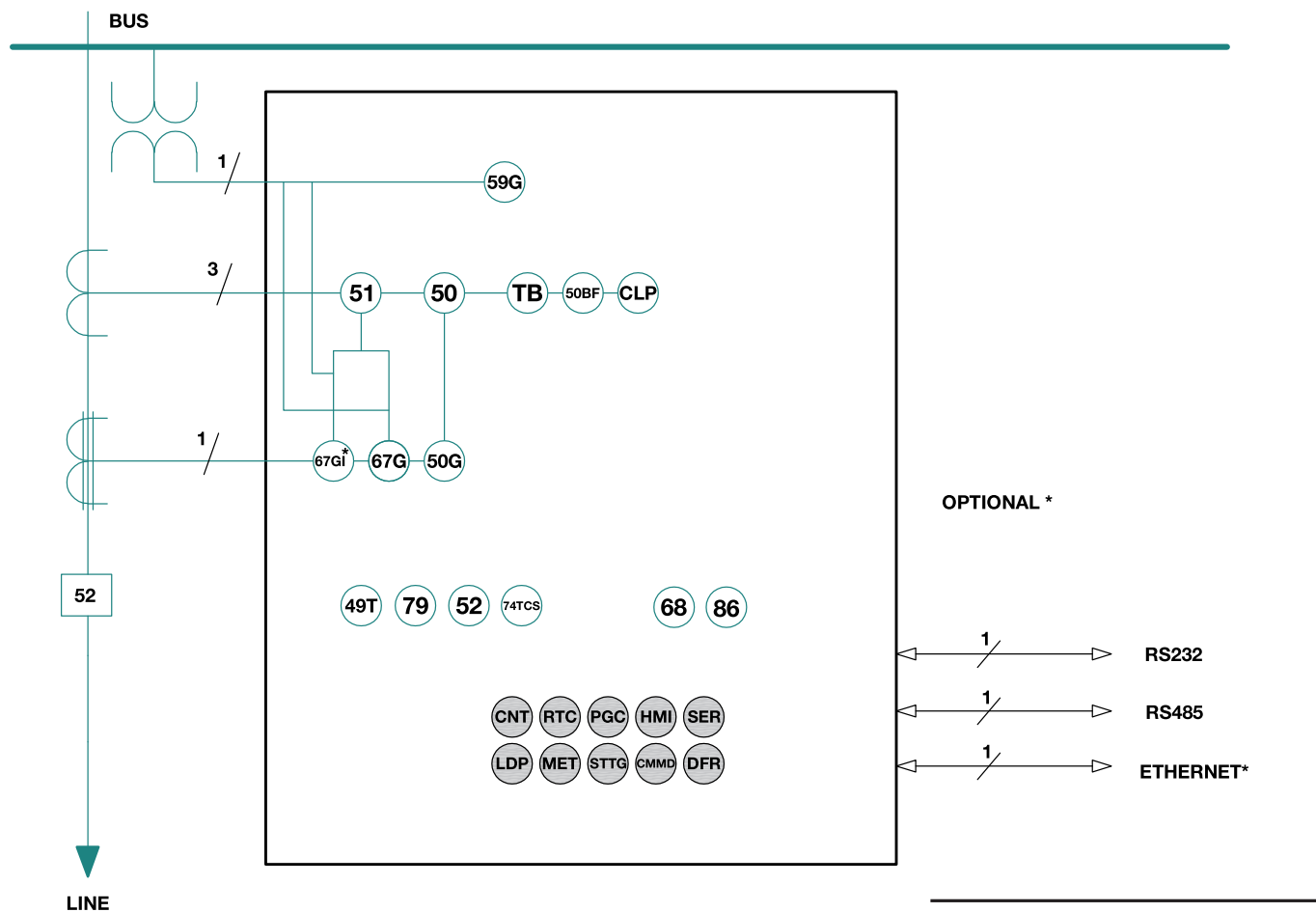
Distribution and Transformation Substations and SF6 insulated Switchgears

- The SIL-D relay is an overcurrent and directional earth fault protection relay for Primary and Secondary Distribution with auxiliary power supply (24-230 Vac/dc). The current measurement is obtained by standard current transformers /1 or /5.
- Metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Direct signalling/control of the circuit breaker (52 function) and the recloser (79 function).
- Zone selection interlocking - ZSI (68 function) is available through configurable inputs and outputs thanks to the programmable logic (PGC).
- To allow the communication, relays are provided with a local RS232 front port and with remote communication with different options (ports and protocols) on the rear side:
 - 1 RS485 Port: IEC60870-5-103, Modbus RTU or DNP3.0 Serial (depending on model selectable by general settings).
 - 1 RJ45 Port: IEC61850, Modbus TCP/IP, DNP3.0 TCP/IP or IEC60870-5-104 (depending on model).
- The SIL-D has 6 configurable inputs and 4 configurable outputs.

- SIL-D is fitted with the demand of current (Load Data Profiling) with the following characteristics:
 - Number of records: 168.
 - Recording mode circular.
 - Sampling rate (interval): configurable through communications (1-60 min).
- SIL-D is provided with non-volatile RAM memory in order to store up to 200 events and disturbance fault recording (DFR - 20 fault reports and 5 oscillographic records in COMTRADE format), maintaining date & time thanks to its internal RTC (real Time Clock).
 - The oscillography is downloaded by communications port. The SICom communications program allows the oscillography record to be downloaded and saved in COMTRADE format (IEEE C37.111-1991).



Functions diagram SIL-D



ADDITIONAL FUNCTIONS	
CNT	Counters
RTC	Real Time Clock
PGC	Programmable Logic Control
HMI	Human Machine Interface
SER	Sequential Event Recording
DFR	Disturbance Fault Recording
LDP	Load Data Profiling
MET	Metering
STTG	Settings Groups
CMMD	Commands

ANSI CODE PROTECTIONS	
50	Instantaneous phase overcurrent
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CLP	Cold Load Pickup
49T	External trip
86	Trip lockout
TB	Trip block for switch disconnect
68	Zone selection interlocking
PGC	Programmable logic control

* ANSI 67G function can be converted into ANSI 51G by setting the “Directionality” parameter to NO.

Technical parameters SIL-D

Function 50_1 Function 50_2 (*)	Function enable: Yes/No
	Current tap: 0.10 to 30.00 xIn (step 0.01 xIn)
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
Function 50G_1 Function 50G_2 (*)	Timing accuracy: ± 30 ms or $\pm 0.5\%$
	Function enable: Yes/No
	Current tap: 0.10 to 30.00 xIn (step 0.01 xIn)
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
Function 51	Instantaneous deactivation
	Timing accuracy: ± 30 ms or $\pm 0.5\%$
	Function enable: Yes/No
	Curve Type: IEC 60255-151 and IEEE curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse and IEEE (Moderately inverse, very inverse, extremely inverse).
	Time delay: 0.02 to 300. s (step 0.01 s)
	Time dial (TMS): 0.02 to 2.20 (step 0.01)
	Current Tap: 0.10 to 7.00 xIn (step 0.01 xIn)
	Curve, activation level: 110%
	Curve, deactivation level: 100%
	Defined time, activation level: 100%
	Defined time, deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or $\pm 5\%$ (greater of both).
	Timing accuracy for defined time curve selection: ± 30 ms or $\pm 0.5\%$ (greater of both).

Function 67G/51G	Function enable: Yes/No
	Curve Type: IEC 60255-151 and IEEE curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse).
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.02 to 2.20 (step 0.01)
	Current Tap: 0.10 to 7.00 xIn (step 0.01 xIn)
	Directionality: No/Forward/Reverse
	Polarization voltage: 2-65 V (step 1V)
	Operating angle: 0 to 359° (step 1°)
	Halfcone angle: 10 to 170° (step 1°)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Voltage activation level: 100%
	Voltage deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or $\pm 5\%$ (greater of both)
	Timing accuracy for defined time curve selection: ± 35 ms or $\pm 0.5\%$ (greater of both)
Function 67GI_1 (*) Function 67GI_2 (*)	Function enable: Yes/No
	Curve Type: IEC 60255-151 and IEEE curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse).
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.02 to 2.20 (step 0.01)
	Current Tap: 0.10 to 7.00 xIn (step 0.01 xIn)
	Directionality: No/Forward/Reverse
	Polarization voltage: 2-65 V (step 1V)
	Operating angle: 0 to 359° (step 1°)
	Halfcone angle: 10 to 170° (step 1°)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Voltage activation level: 100%
	Voltage deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or $\pm 5\%$ (greater of both)
	Timing accuracy for defined time curve selection: ± 35 ms or $\pm 0.5\%$ (greater of both)
Function 59G	Function enable: Yes/No
	Voltage tap: 2 to 65 V (step 1 V)
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Reset Time: 0.02 to 300.00 s (step 0.01 s)

Technical parameters SIL-D

Function CLP	Function enable: Yes/No
	Settings group: 1 to 4 (step 1)
	No load time: 0.02 to 300.00 s (step 0.01 s)
	Cold load time: 0.02 to 300.00 s (step 0.01 s)
Function 79	Function enable: Yes/No
	Number of recloses: 1 to 5 (step 1)
	Reclosing time: 0.02 to 300.00 s (step 0.01 s)
	Hold enable: Yes/No/No time
	Hold time: 0.02 to 300.00 s (step 0.01 s)
	Reset time: 0.02 to 300.00 s (step 0.01 s)
	Safe time: 0.02 to 300.00 s (step 0.01 s)
	Locking possibilities: pulse inputs, level inputs, commands.
Function 52	Maximum number of openings: 1 to 10000 (step 1)
	Max. accumulated amps: 0 to 100000 (M(A ²)) (step 1)
	Maximum number of repetitive openings: 1 to 10000 (step 1)
	Time of repetitive openings: 1 to 300 min (step 1 min)
	Maximum opening time 0.02 to 30.00 s (step 0.01 s)
	Maximum closing time 0.02 to 30.00 s (step 0.01 s)
	Open circuit breaker activation threshold: 8% I _n
	Open circuit breaker reset threshold: 10% I _n
Function 74TCS	Function enable: Yes/No
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Continuity in circuits A and B
	Inputs: - Adaptation "B": Configurable digital inputs - Adaptation "C": Dedicated digital inputs
Function 50BF	Function enable: Yes/No
	Time delay: 0.02 to 1.00 s (step 0.01 s)
	Open circuit breaker activation threshold: 8% I _n
	Open circuit breaker reset threshold: 10% I _n
	Configurable pickup option
Function TRIP BLOCK	Function enable: Yes/No
	Current tap: 1.5 to 20.00 xI _n (step 0.01)
Function 49T	Available through configurable inputs thanks to the programmable logic
Function 86	Available through configurable inputs and outputs thanks to the programmable logic (PGC).
Function 68	Available through configurable inputs and outputs thanks to the programmable logic (PGC).
Programmable logic control (PGC)	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.
Settings Groups	4 settings groups
	Selectable by input or general setting

Sequential Events Recording (SER)	200 events
Disturbance fault recording (DFR)	16 samples/cycle
	Fault start configurable
	20 fault reports with 24 events each one
	5 COMTRADE records (100 cycles): 3 pre-fault cycles + 97 postfault cycles.
	COMTRADE IEEE C37.111-1991: - Adaptation "B": 4 analog channels and 48 digital channels - Adaptation "C": 4 analog channels and 36 digital channels
Load Data Profiling (LDP)	Demand of current with the following characteristics: - Number of records: 168 - Recording mode circular - Sampling rate (interval): configurable through communications (1-60 min) - Record format: Date/Time IMAX (in interval) I _{max} (at the moment of the record) IA IB IC IN
Inputs	6 Configurable inputs The voltage of the inputs is the same as the auxiliary power supply
Outputs	4 Configurable outputs 250 V AC – 8 A 30 V DC – 5 A
	Output 1 and Output 2: NC - NO
	Output 3 and Output 4: NO
Frequency	50/60Hz
Current measurements	Phase current (IA, IB, IC), neutral (IN), maximum current (I _{max})
	Fundamental values (DFT)
	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 phase B current is calculated and it is necessary a minimum of 0.25xI _n for a correct measurement.
Voltage measurements	Saturation limit: 30 times rated current
	Residual Voltage (VR)
	Fundamental values (DFT)
	Sampling: 16 samples/cycle
	2% accuracy in the range of 2-65 V

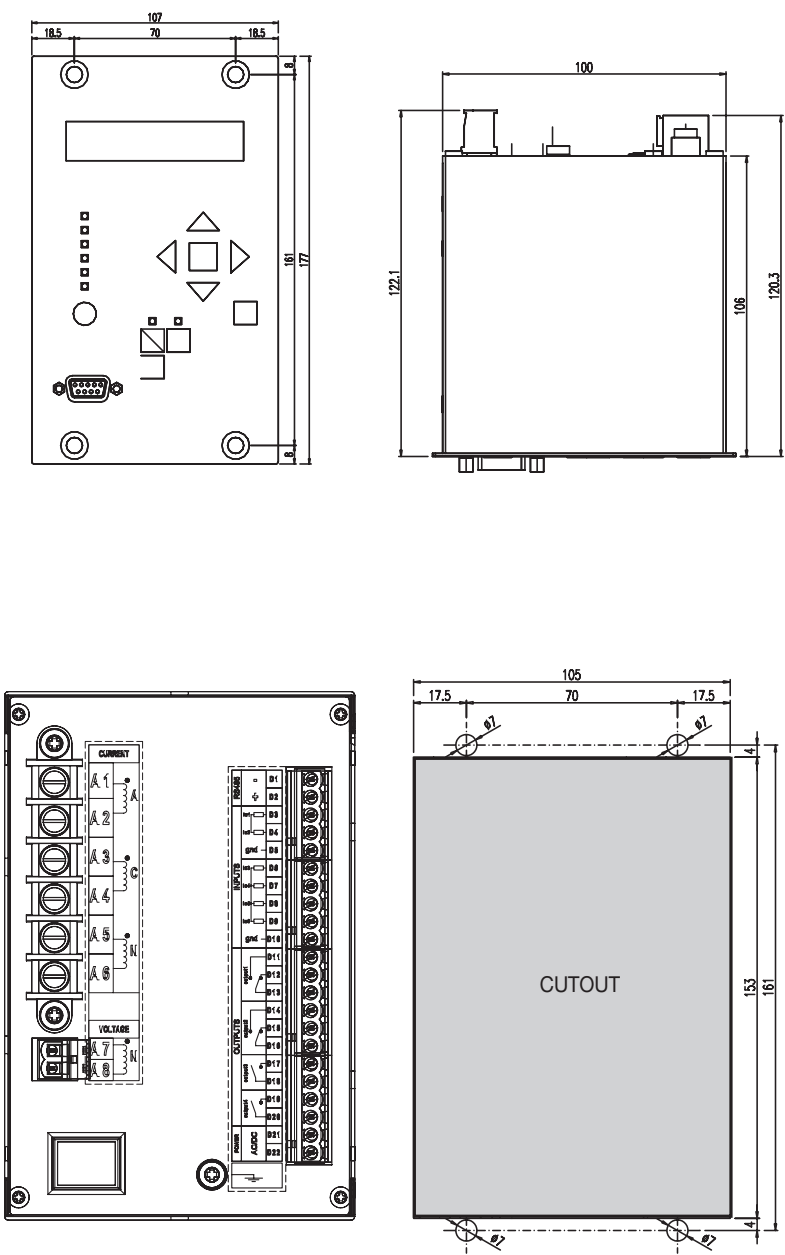
Technical parameters SIL-D

Communications	Local port (RS232 DB9): Modbus RTU
	1 remote port with the following options
	- 1 Remote port RS485: ModBus RTU, IEC 60870-5-103 or DNP3.0 Serial (*).
	- 1 Remote port RJ45: IEC 61850, DNP3.0 TCP/IP, Modbus TCP/IP or IEC 60870-5-104. (*)
Power supply	24-230 Vdc / Vac -20%/+10%
Environmental conditions	Operating temperature: -10 to 70°C
	Storage temperature: -20 to 80 °C
	Relative humidity: 95%
Current 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
	Weight: 1,5 kg

(*) Optional depending on model

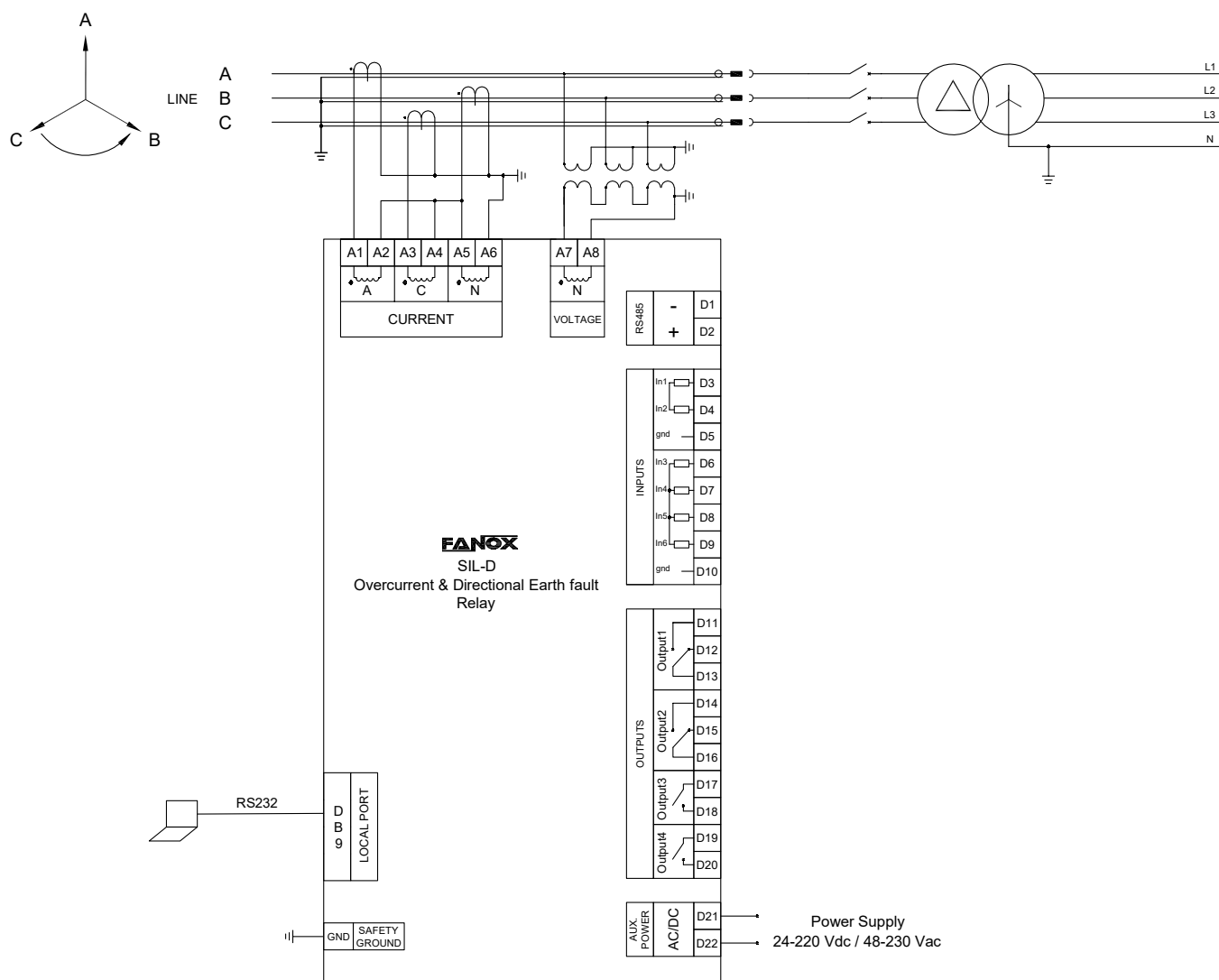
NOTE: ANSI 67G function can be converted into ANSI 51G by setting the "Directionality" parameter to NO.

Dimensions and cutout SIL-D



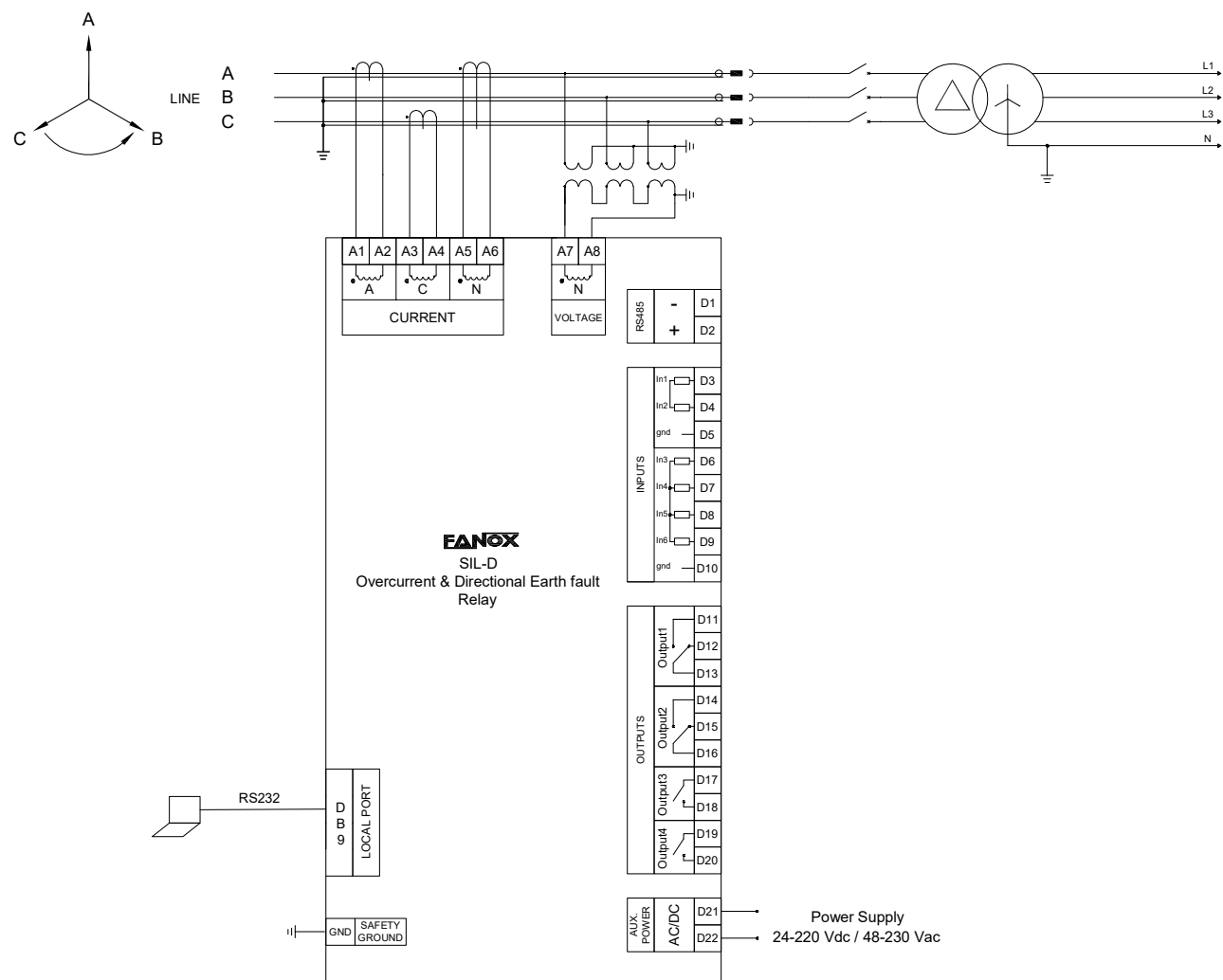
Connections diagram SIL-D

- 3 CT Phase Current



Connections diagram SIL-D

- 2 CT Phase Current + 1 Neutral CT



Selection & Ordering data SIL-D

SIL-D	Overcurrent & Directional Earth Fault Protection Relay									
0 S										PHASE CURRENT MEASUREMENT Standard In= 1 A or 5 A Sensitive In= 0.5 A or 2.5 A
	0 S									NEUTRAL CURRENT MEASUREMENT Standard: 1 A or 5 A Sensitive: 0.1 A or 0.5 A
		0								NET FREQUENCY Defined by Setting
			C							POWER SUPPLY 24-230 Vdc / Vac
				0 1						ADDITIONAL FUNCTIONS - + 67G1 (2)
					A B C D					REMOTE COMMUNICATIONS RS232 (Modbus RTU) + RS485 (Modbus RTU or IEC60870-5-103) RS232 (Modbus RTU) + RJ45 (IEC 61850) RS232 (Modbus RTU) + RJ45 (DNP3.0 TCP/IP) RS232 (Modbus RTU) + RJ45 (IEC 60870-5-104)
						1				INPUTS AND OUTPUTS 6 Inputs + 4 outputs
							2			MECHANICAL ASSEMBLY Vertical Assembly
								A B C E		LANGUAGE English, Spanish and German English, Spanish and Turkish English, Spanish and French English, Spanish and Russian
									A	ADAPTATION Default functions: 50 (2) + 50G (2) + 51 + 67G/51G (2) + 52 + 50BF + 79 + 74TCS + CLP + 86 + 49T + 59G + TB

Example of ordering code:

SIL-D	0	0	0	C	1	A	1	2	B	A	SIL D 0 0 0 C 1 A 1 2 B A
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* ANSI 67G function can be converted into ANSI 51G by setting the "Directionality" parameter to NO.