

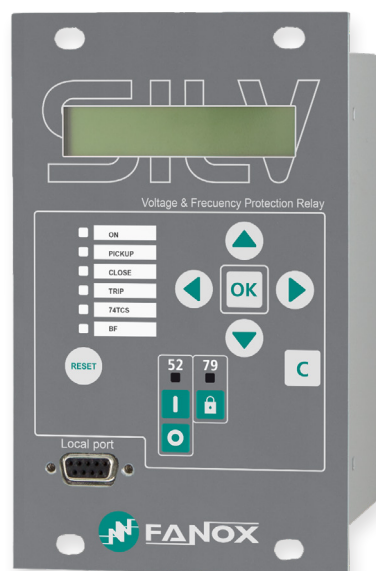
SIL-V

Synchrocheck Protection Relay

ANSI CODE PROTECTIONS	
59	Instantaneous phase overvoltage
59N/G	Instantaneous Calculated/ Measured neutral overvoltage
47	Phase Balance voltage protection
27	Instantaneous Phase undervoltage
27V1	Instantaneous Positive sequence undervoltage
81O/U	Under/Overfrequency
81R	Rate of change of Frequency (ROCOF)
78	Out of Step (Vector Shift)
$\Delta V/\Delta t$	Rate of change of voltage
79	AC Reclosing device
52	Breaker Wear Monitoring
25	Synchro Check
BF	Circuit Breaker Failure
74TCS	Trip Circuit Supervision
86	Trip Lockout
PGC	Programmable logic control



Additional information to fault reports



Voltage & Frequency Protection Relay

Protection for Primary and Secondary Distribution

- The SIL-V is a voltage and frequency protection relay for transformers and electrical machines, in high, medium, and low voltage distribution systems. Also protects decoupling, load shedding and loss of main (islanding), with auxiliary power supply of 24-230 Vdc/ac.
- Capability of measuring up to 1.000 volts when it is connected directly to the low voltage line.
- 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).
- Protection of decoupling, load shedding and loss of main (islanding). Loss of Main (islanding) occurs when part of the public utility network loses connection with the rest of the system. If this situation is not detected, then the generator could remain connected, causing a safety hazard within the network. Automatic reconnection of the generator to the network may occur causing damage to the generator and the network. SIL-G protection relay detects this situation thanks to its voltage and frequency functions focused on the Rate of change of frequency (ROCOF) method.
- Zone selection interlocking - ZSI (68 function) is available through configurable inputs and outputs thanks to the programmable logic (PGC).



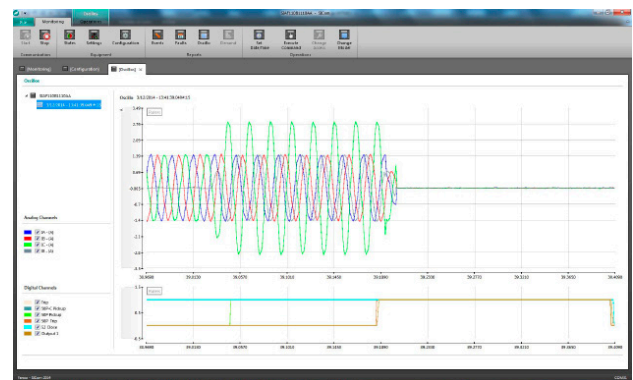
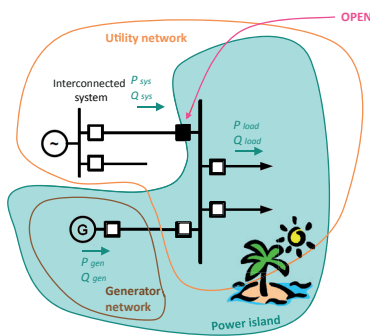
- To allow the communication, relays are provided with a local RS232 front port and with remote communication with different options (ports and protocols) on the rear side:

- 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).

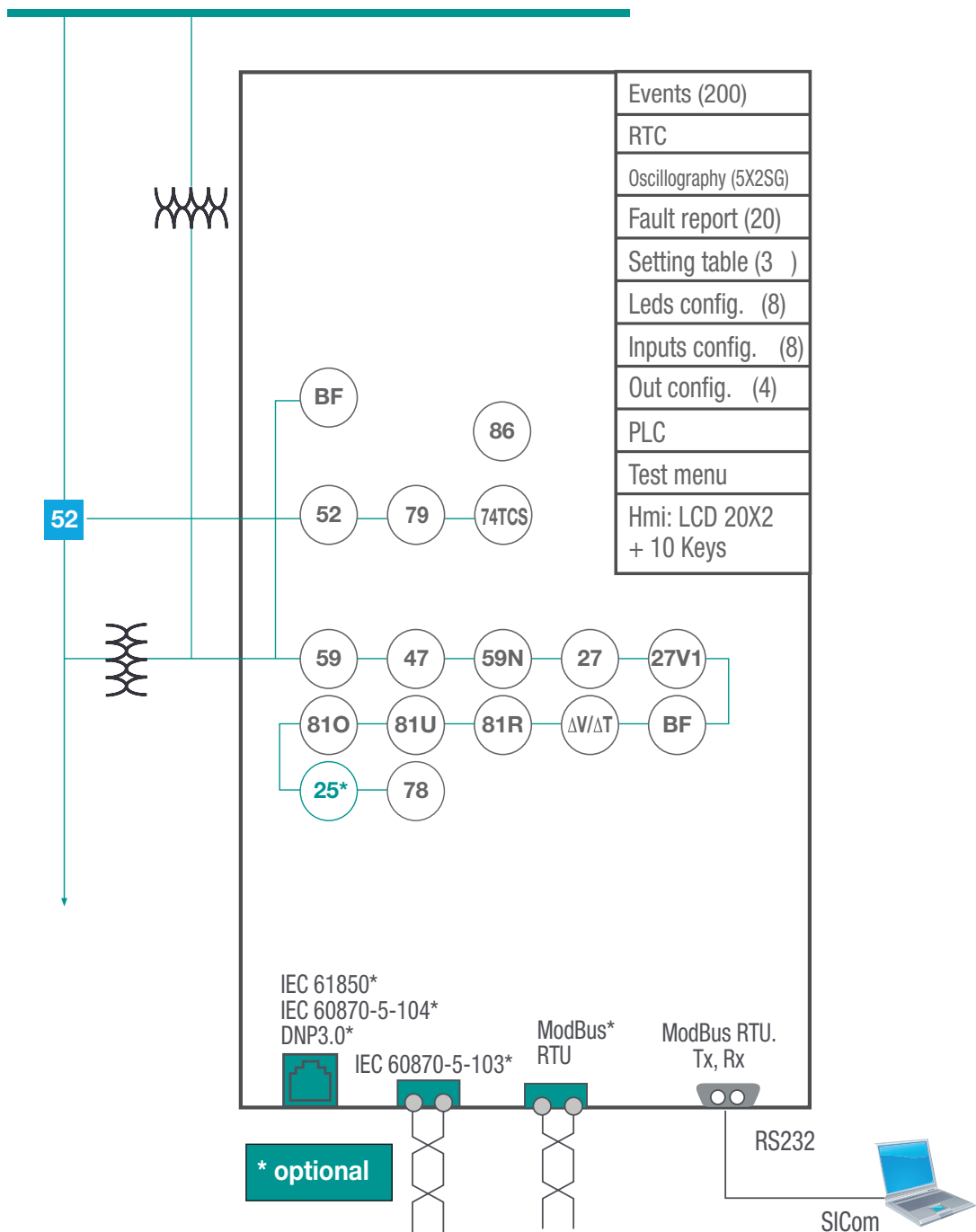
- The SIL-V has 6 configurable inputs and 4 configurable outputs.
- SIL-V is provided with non-volatile RAM memory in order to store up

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).

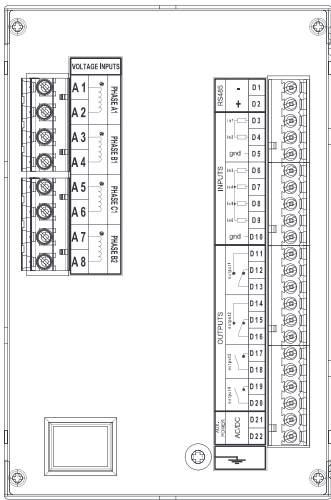
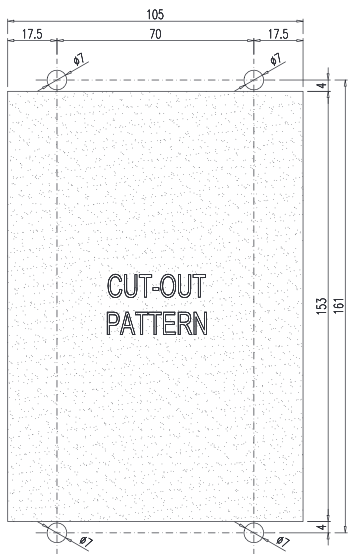
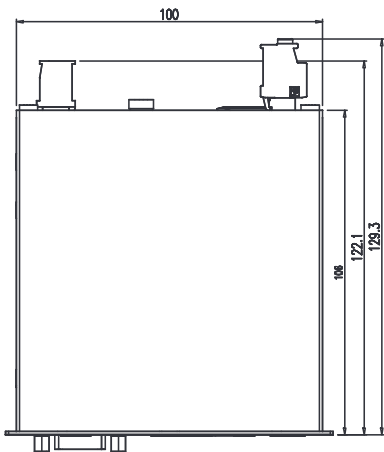
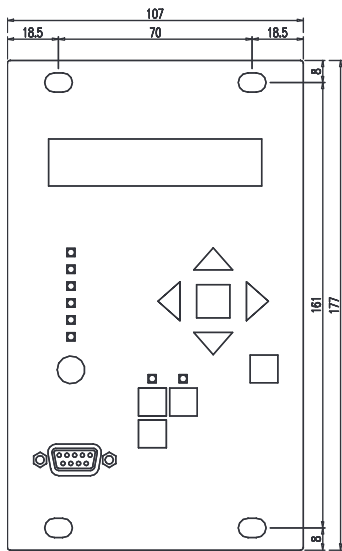
- The oscillography is downloaded by communications port. The SiCom communications program allows the oscillography record to be downloaded and saved in COMTRADE format (IEEE C37.111-1991).



Functions diagram SIL-V



Dimensions and cutout SIL-V



Technical parameters SIL-V

Function 27-1 Function 27-2	Function enable: Yes/No
	Voltage tap: 3 to 555 V (step 0.1 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)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
Function 27V1	Timing accuracy: $\pm 0.5\%$ or ± 30 ms (greater of both)
	Function enable: Yes/No
	Voltage tap: 3 to 555 V (step 0.1 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)
	Activation level: 100%
	Deactivation level: 105%
Function 59-1 Function 59-2	Temporized deactivation
	Timing accuracy: $\pm 0.5\%$ or ± 30 ms (greater of both)
	Function enable: Yes/No
	Voltage tap: 6 to 999 V (step 0.1 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)
	Activation level: 100%
Function 59N/G-1 Function 59N/G-2	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: $\pm 0.5\%$ or ± 30 ms (greater of both)
	Function enable: Yes/No
	Voltage tap: 6 to 999 V (step 0.1 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)
Function 47	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: $\pm 0.5\%$ or ± 30 ms (greater of both)
	Function enable: Yes/No
	Voltage tap: 6 to 999 V (step 0.1 V)
	Time delay: 0.02 to 300.00 s (step 0.01 s)
Function $\Delta V/\Delta t$	Reset time: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Timing accuracy: $\pm 0.5\%$ or ± 30 ms (greater of both)
	Function enable: Yes/No
	Type: Increment or Decrement
	Activation level: 1 to 200 V/s (step 1 V/s)
	Operating time: 1.00 to 40.00 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Timing accuracy: ± 60 ms or $\pm 5\%$ (greater of both).

Function 81-1 Function 81-2 Function 81-3 Function 81-4	Function enable: Yes/No
	Type: Underfrequency or overfrequency
	Operating range: 45.00 a 65.00 Hz (step 0.01 Hz)
	Operating time: 0.06 a 300 s (step 0.01 s)
	Reset time: 0.02 a 300 s (step 0.01 s)
	Blocked function if phase b voltage is lower than 45 volts
	Activation level: 100%
Function 81R-1 Function 81R-2	Underfrequency reset level: + 50mHz Overfrequency reset level: -50 mHz
	Temporized deactivation
	The frequency measurement is an average value of the frequency measured during 8 cycles. The operating time will be the adjusted value plus a maximum of 160 ms (50Hz) or 133 ms (60 Hz) corresponding to the necessary 8 cycles to achieve the frequency measurement.
	Function enable: Yes/No
	Type: Increment or Decrement
	Level: 0.1 to 5 Hz/s (step 0.1 Hz/s)
	Operating time: 0.06 to 40 s (step 0.01 s)
Function 78-1 Function 78-2	Reset level: 0.06 to 40 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 90%
	Blocked function if phase b voltage is lower than 45 volts
	The frequency measurement is an average value of the frequency measured during 8 cycles. The operating time will be the adjusted value plus a maximum of 160 ms (50Hz) or 133 ms (60 Hz) corresponding to the necessary 8 cycles to achieve the frequency measurement.
	Function enable: Yes/No
	Level: 1 to 25. (step 1°)
Function 79	Reset time: 0.02 to 300 s (step 0.01 s)
	Level accuracy: $\pm 0.5^\circ$
	Blocked function if phase b voltage is lower than 45 volts
	Function enable: Yes/No
	Hold enable: Yes/No
	Number of recloses: 1 to 5 (step 1)
	Reclosing time: 0.02 to 300.00 s (step 0.01 s)
Function 52	Hold time: 0.02 to 300.00 s (step 0.01 s)
	Reset time: 0.02 to 300.00 s (step 0.01 s)
	Definitive opening Time: 0.02 to 300.00 s (step 0.01 s)
	Locking possibilities: pulse inputs, level inputs, commands.
	Maximum number of openings: 1 to 10000 (step 1)
	Maximum number of repetitive openings: 1 to 10000 (step 1)
	Time of repetitive openings: 1 to 300 min (step 1 min)
Function 74TCS	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)
	Function enable: Yes/No
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Continuity in circuits A and B
	Function start: configurable by the user

Technical parameters SIL-V

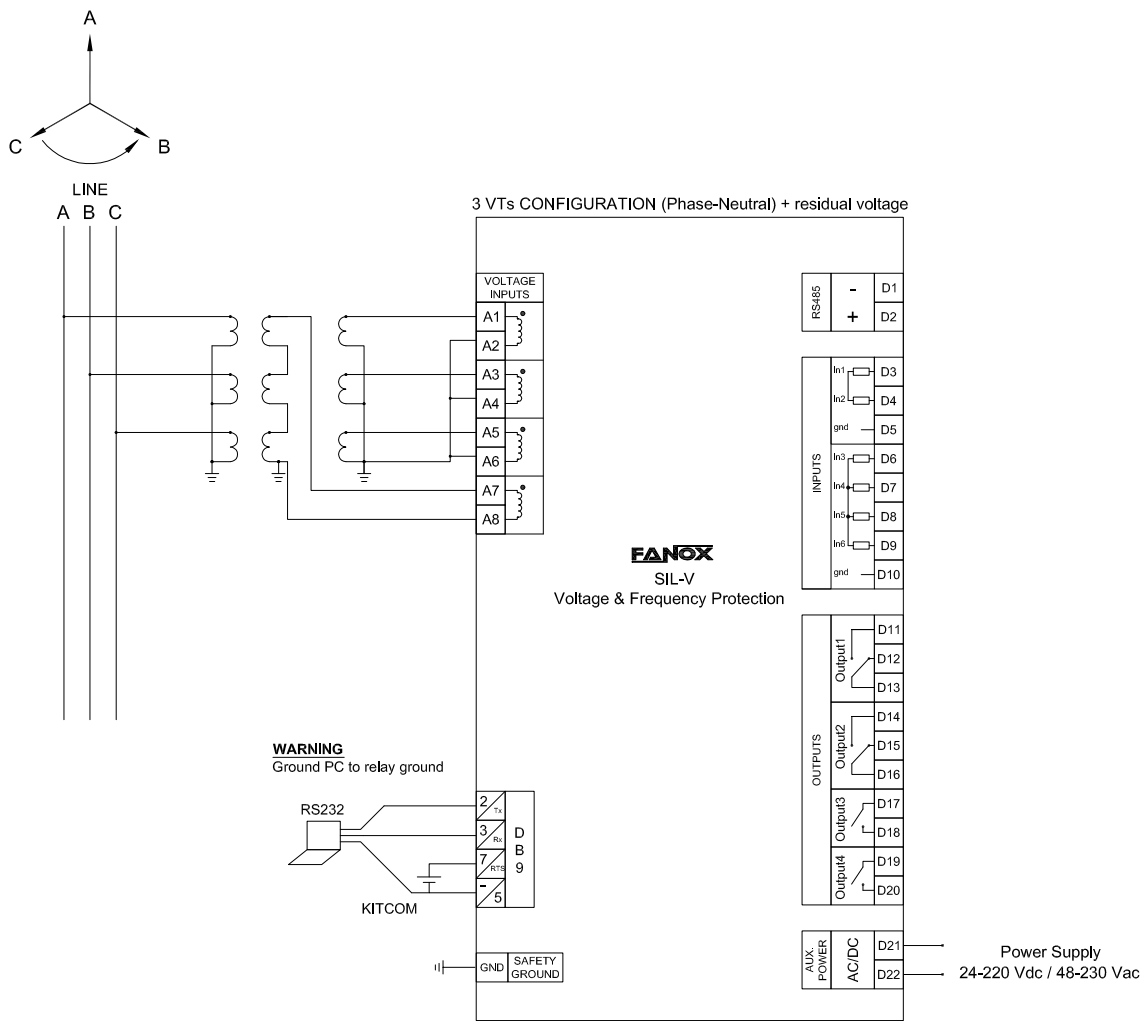
Function BF	Function enable: Yes/No
	Time delay: 0.02 to 1.00 s (step 0.01 s)
	Function start: configurable by the user
Function 25 (*)	Dead voltage level: 3 to 555 V (step 0.1 V)
	Live voltage level: 6 to 999 V (step 0.1 V)
	Voltage supervision time: 0.02 to 300 s (step 0.01 s)
	Line-Bar voltage difference: 4 to 50 V (step 0.1 V)
	Line-Bar phase difference: 2 to 90 ° (step 0.1 °)
	Line-Bar frequency difference: 0.06 to 10 Hz (step 0.01 Hz)
	Synchronism Time: 0.02 to 300 s (step 0.01 s)
	Phase B line voltage and busbar voltage. Modules and phases using DFT Frequency using hardware circuit with the passing through zero detection. Permission signal minimum time 150 ms
Function 49T	Available through configurable inputs thanks to the programmable logic
Function 86	Allows to latch (lock out) the contact trip due to programmable logic (PLC: OR_LATCH).
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	3 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 (88 cycles): 3 pre-fault cycles + 85 postfault cycles. COMTRADE IEEE C37.111-1991
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
Voltage measurements	Phase voltages (V-A, V-B, V-C), calculated neutral voltage (3V-0), residual voltage (V-R) (*), Busbar voltage (V-BB) (*), positive sequence voltage (V-1), negative sequence voltage (V-2), maximum voltage (Vmax) and minimum voltage (Vmin)
	Measurement range: Low scale (rated voltage<250 V)→3-250 V
	High scale (rated voltage>250V)→12-1000 V

Frequency measurements	Starting from phase B line voltage, passing through zero detection to line frequency Starting from phase B busbar voltage, passing through zero detection to busbar frequency.
	Line Phase B frequency
	Frequency derivative respect to the time
	Busbar phase B frequency (*)
	Busbar and line frequency difference (*)
	Minimum voltage (to achieve the measurement): 40V
	Accuracy: ±0.01 Hz
Communications	Local port (RS232 DB9): Modbus RTU
	1 remote port with the following options - 1 Remote port RS485: ModBus RTU or IEC 60870-5-103 (*) - 1 Remote port RJ45: IEC 61850, DNP3.0 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%
VT connection	Phase-Neutral/Phase-Neutral + Vr
	Phase-Phase/Phase-Phase+ Vr
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

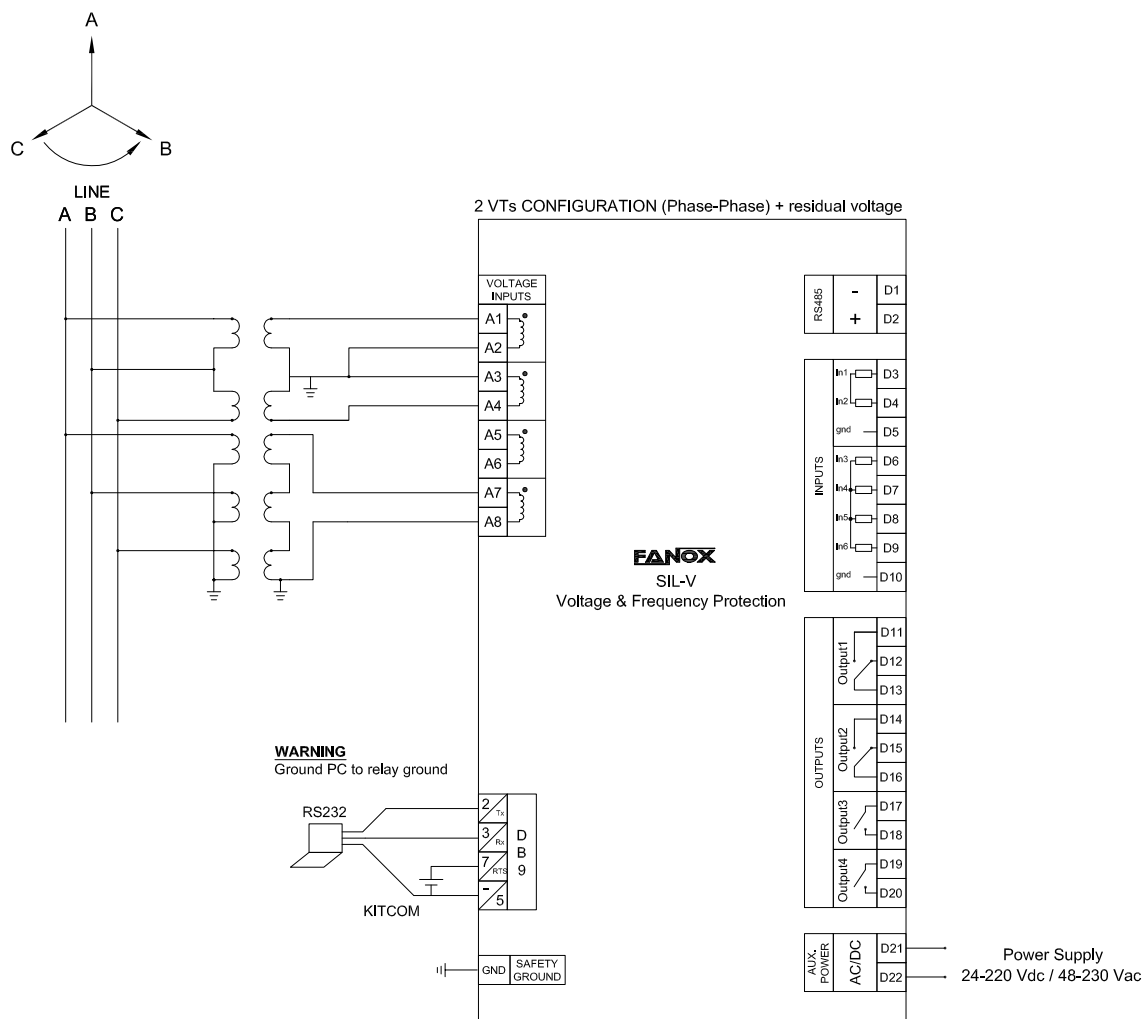
Connections diagram SIL-V

3 VT Configuration (phase-neutral) + residual voltage



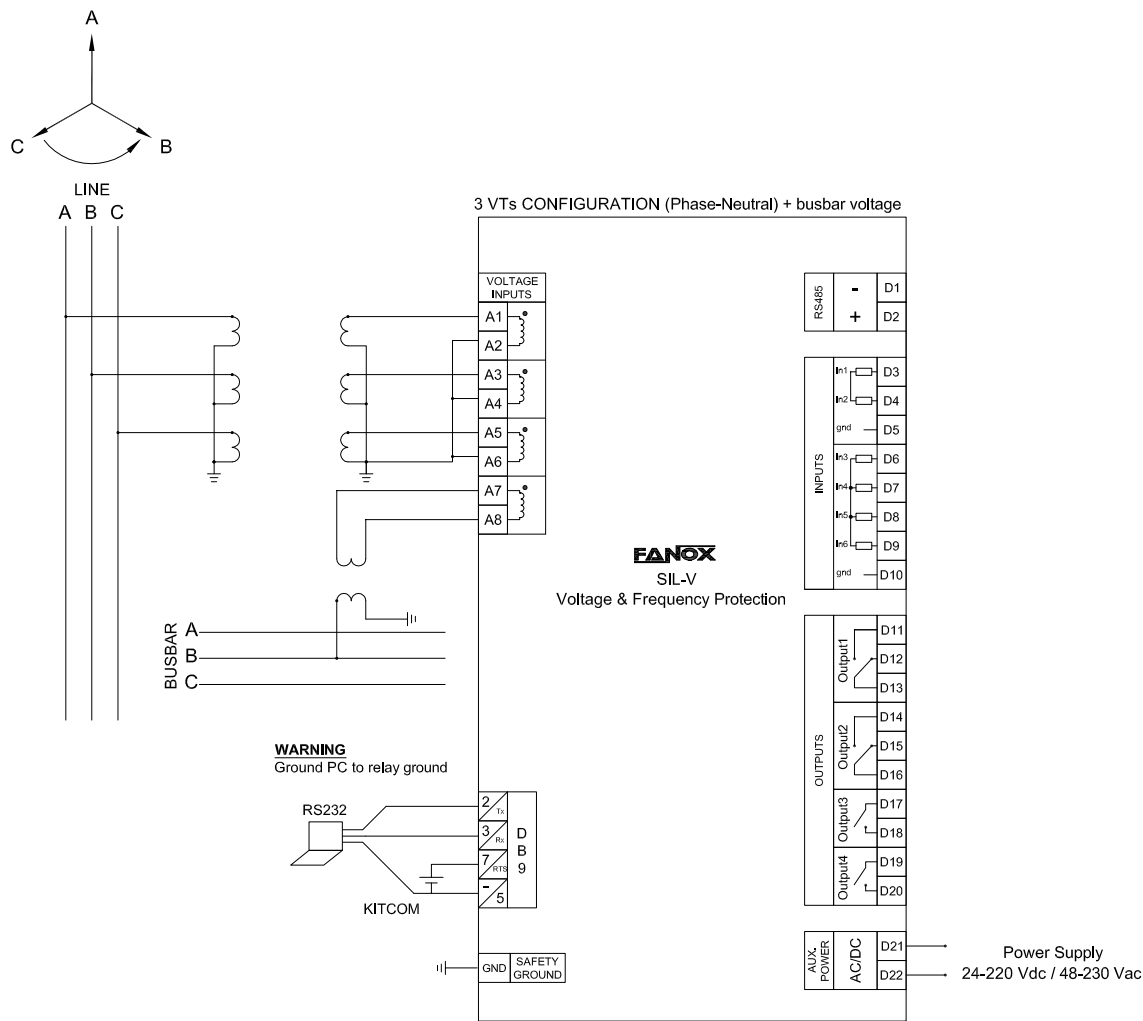
Connections diagram SIL-V

2VT Configuration (phase-phase) + residual voltage



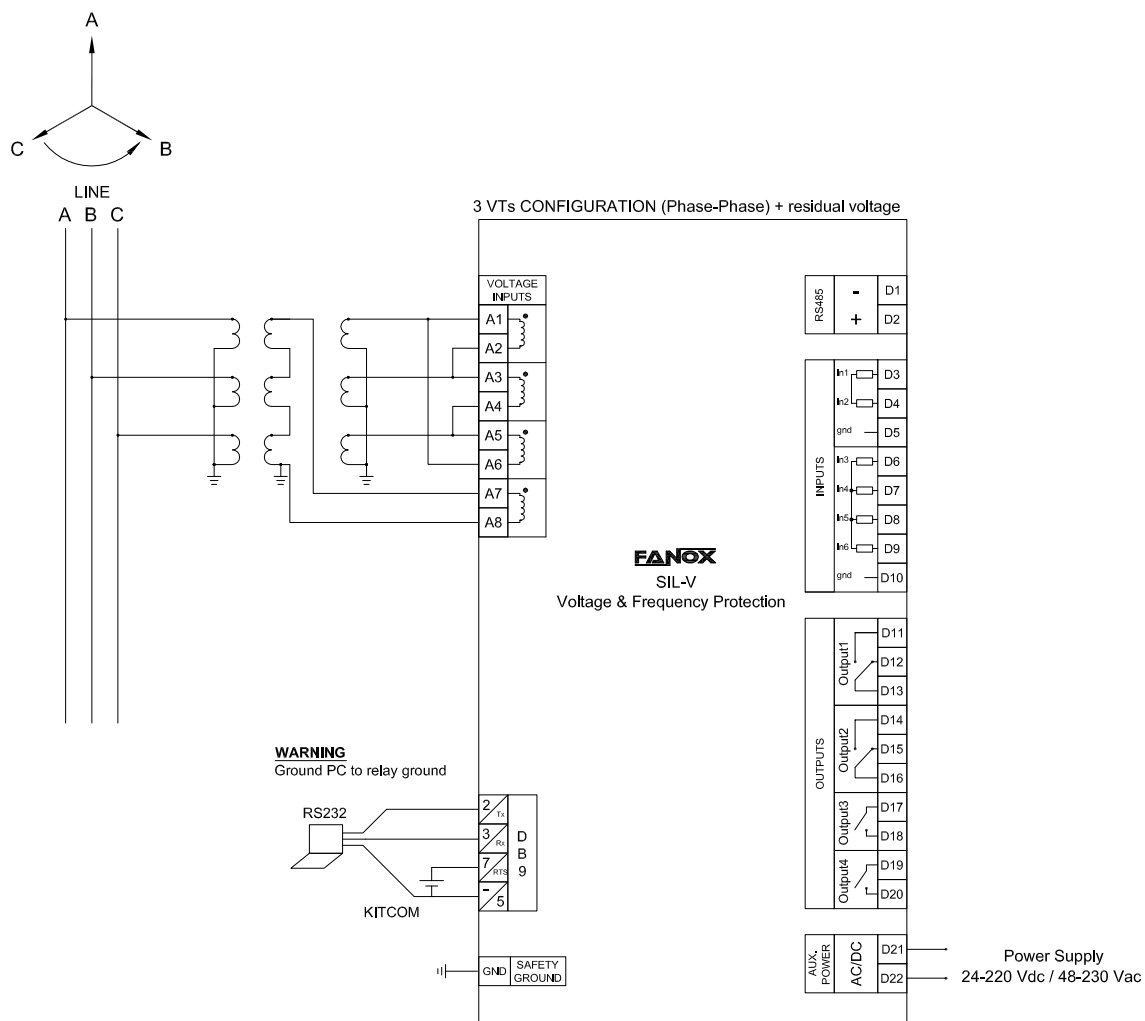
Connections diagram SIL-V

3 VT Configuration (phase-neutral) + busbar voltage
(Model with Synchronism)



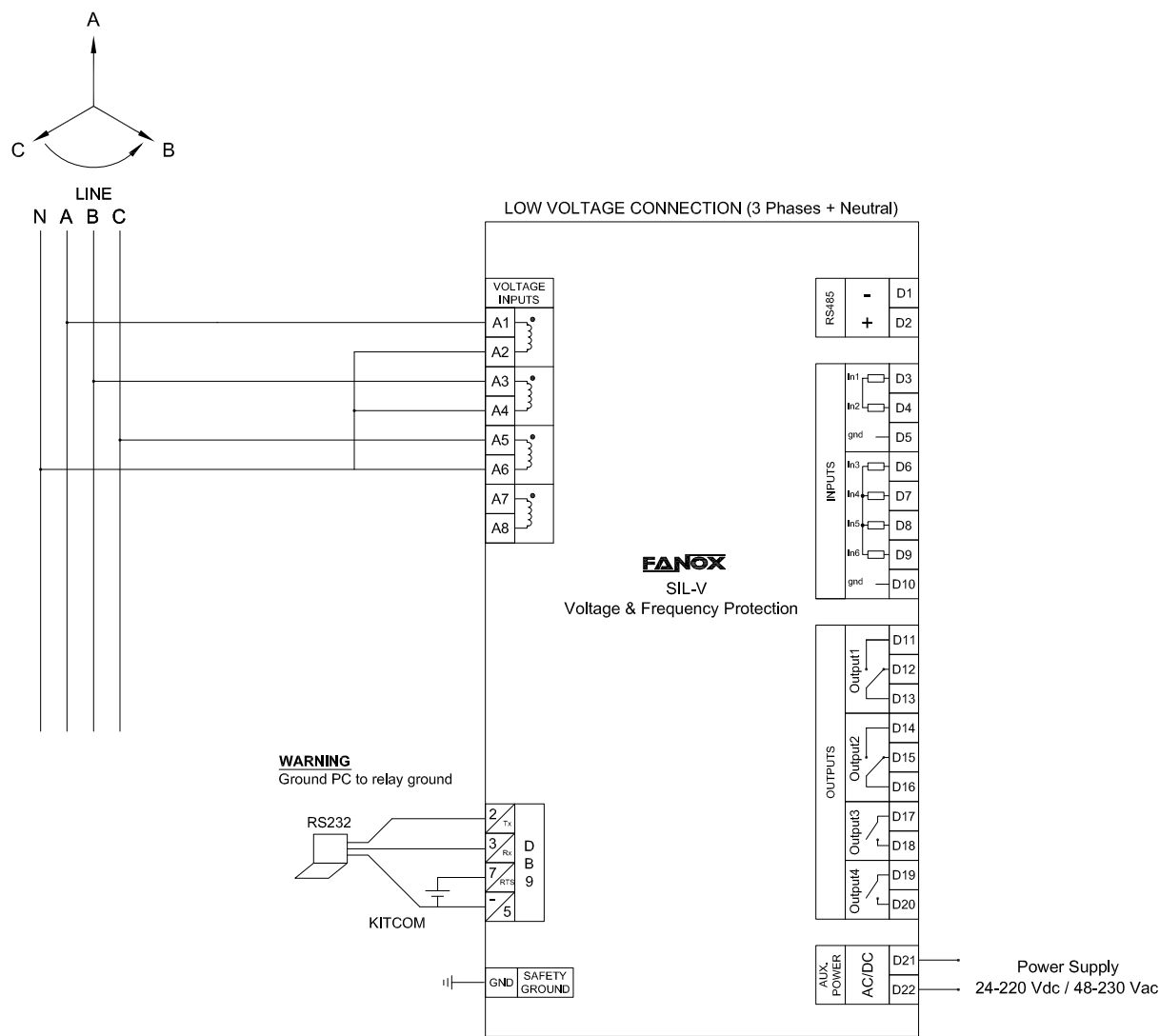
Connections diagram SIL-V

3 VT Configuration (phase-phase) + residual voltage



Connections diagram SIL-V

Connecting the relay directly to Low Voltage line
Phase to neutral configuration (250-480 V)



Selection & Ordering data SIL-V

SIL-V	Voltage & Frequency Protection / Synchronism Check Relay									
0										PHASE MEASUREMENT Defined by General Settings
	0									NEUTRAL MEASUREMENT Defined by General Settings
		0								NET FREQUENCY Defined by Settings
			C							POWER SUPPLY 24-230 Vac/dc
				0 2						ADDITIONAL FUNCTIONS - + 25
					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 $27(2) + 27V1 + 59(2) + 47 + 59N/G(2) + \Delta V/\Delta T + 74TCS$ $+ BF + 52 + 79 + 81U/O(4) + 81R(2) + 78 + 86$

Example of ordering code:

SIL-V	0	0	0	C	2	A	1	2	B	A	SIL V 0 0 0 C 2 A 1 2 B A
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