SIL-V

Voltage & Frequency Protection / Synchronism Relay

- The SIL-V is a voltage and frequency protection relay and represents the best and precise protection soluctions for transformers and electrical machines, in high, medium and low voltage distribution systems. Also protects decoupling, load shedding and loss of main (islanding).

- It requires auxiliary power supply of 24-220 Vdc/48-230Vac.

- It uses a circuit breaker as a cut-off element to protect a feeder.

- Capability of measuring up to 1.000 volts when it is connected directly to the low voltage line.

- Protects decoupling, load shedding and loss of main (islanding).

  Loss of Mains (islanding) occurs when part of the 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-V protection relay detects this situation thanks to its voltage and frequency functions focused on the Rate of change of frequency (ROCOF) method.
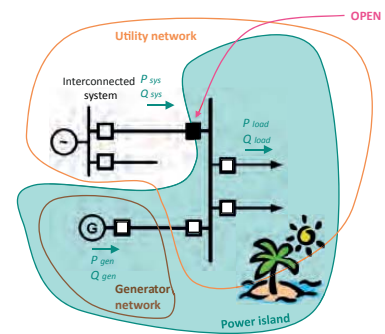
- Protection functions: 27(2), 27V1, 59(2), 47, 59N(2), ΔV/ΔT, 74TCS, BF, 52, 79, 81O/U(4), 81R(2), 86, 78 and optionally 25.

  Function 25 (Synchronism): Voltage difference, frequency slip, angle differences, DLDB, DLLB, LLDB, LLLB.

- 79 protection function (Recloser) allows up to 5 attempts of reclosing which can be programmed by the user.

- Direct signalling/control both of the circuit breaker (52 function), both of the recloser (79 function).

- Metallic box with high electromagnetic compatibilitu level (EMC) and wide range of operating temperature.

- To allow the communication it has a local ModBus RTU port on the front.
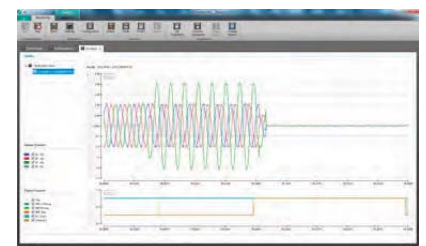
- Depending on the model there are different options for communicartion rear ports:
    - RS485 rear port with IEC60870-103 or Modbus RTU protocol selectable by settings.
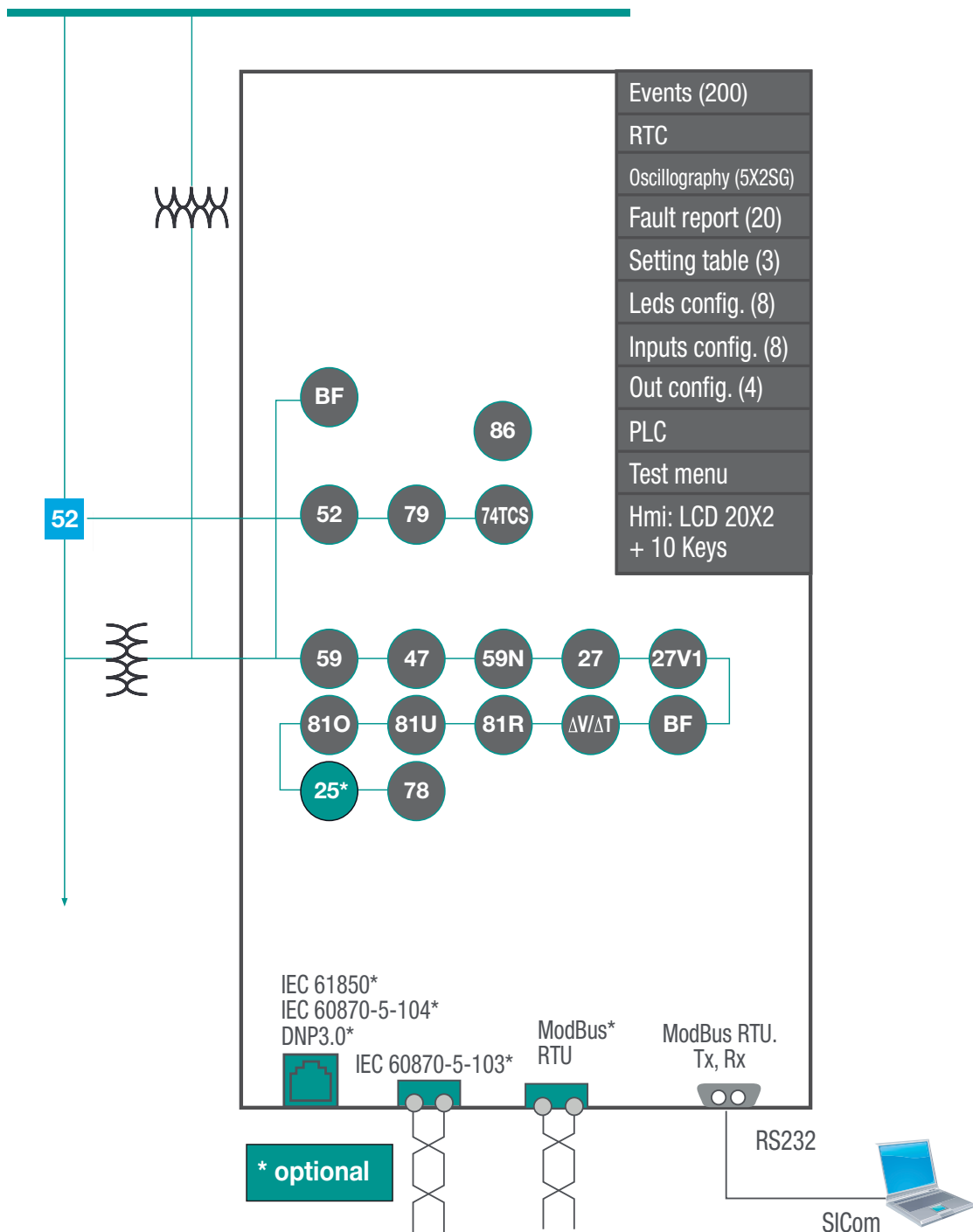   - RJ45 rear port with IEC61850, DNP3.0, Modbus TCP/IP or IEC60870-104, depending on the model.

- The SIL-V has 6 inputs and 4 outputs salidas configurables by the user.

- 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).

Technical specifications SIL-V

Functions diagram SIL-V

Events (200)
RTC
Oscillography (5X2SG)
Fault report (20)
Setting table (3)
Leds config. (8)
Inputs config. (8)
Out config. (4)
PLC
Test menu
Hmi: LCD 20X2 + 10 Keys

52

BF

86

52 79 74TCS

59 47 59N 27 27V1

81O 81U 81R ΔV/ΔT BF

25* 78

IEC 61850*
IEC 60870-5-104*
DNP3.0*

IEC 60870-5-103*

ModBus*
RTU

ModBus RTU.
Tx, Rx

RS232

* optional

SICom

27_1 27_2	Function permission : yes/no
	Operating range: 3 to 555V (step 0.1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
	Timing accuracy: ±30 ms or ± 0.5% (greater of both).

27V1	Function permission : yes/no
	Operating range: 3 to 555V (step 0.1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
	Timing accuracy: ±30 ms or ± 0.5% (greater of both).

59_1 59_2	Function permission : yes/no
	Operating range: 6 to 999V (step 0.1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ±30 ms or ± 0.5% (greater of both).

59N_1 59N_2	Function permission : yes/no
	Operating range: 6 to 999V (step 0.1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ±30 ms or ± 0.5% (greater of both).

47	Function permission : yes/no
	Operating range: 6 to 999V (step 0.1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ±30 ms or ± 0.5% (greater of both).

ΔV/Δt	Function permission : 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 ± 5% (greater of both).

81_1 81_2 81_3 81_4	Function permission : yes/no
	Type: Underfrequency or overfrecuency
	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%
	Underfrequency reset level: activation level + 50mHz Overfrequency reset level: activation 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.

81R_1 81R_2	Function permission : yes/no
	Type: Incremento r Decrement
	Level: 0.1 to 5 Hz/s (step 0.1 Hz/s)
	Operating time: 0.06 to 40 s (step 0.01 s)
	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.

78_1 78_2	Function permission : yes/no
	Level: 1 to 25. (step 1°)
	Reset time: 0.02 to 300 s (step 0.01 s)
	Level accuracy: ±0.5°
	Blocked function if phase b voltage is lower than 45 volts

Circuit breaker monitoring	Maximum number of openings: 1 a 10000
	Opening time: 0.02 to 30 s (step 0.01 s)
	Closing time: 0.02 to 30 s (step 0.01 s)
	Excess repeated openings: 1 a 10000
	Repeated openings excess time: 1 to 300 min

BF	Function permission : yes/no
	Opening failure time: 0.02 to 1.00 s (step 0. 01 s)
	Function start: configurable by the user

74TCS	Function permission: yes/no
	Operating time: 0.02 to 300 s (step 0.01 s)
	Trip continuity, in circuits A and B
	Configurable inputs

|	
79	Function permission : yes/no
	Hold permission: yes/no
	Number of reclosings: 1 to 5
	Reclosure times 1, 2, 3, 4, 5 : 0.02 to 300.00 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 300.00 s (step 0.01 s)
	Definitive opening time: 0.02 to 300 s (step 0.01 s)
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)
	Synchro temporization: 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
49T	Available through configurable inputs
Programmable logic control (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: OR_LATCH).
Settings tables	3 settings tables
	Activated by general settings or by inputs
RTC	Capacitor charge time: 10 minutes
	Operation without auxiliary voltage: 72 hours
Oscillography	16 samples/cycle
	Oscillo starting configuration
	5 records: 3 cycles pre-fault and 85 post-fault
	COMTRADE IEEE C37.111-1991
	4 analogue channels and 64 digital channels
Fault report	20 fault reports with 24 events in each
configurable inputs	6 configurable inputs. The voltage of the inputs is the same as the auxiliary power supply
configurable outputs	4 configurable outputs: 250 V AC – 8 A 30 V DC – 5 A
	Output 1 and output 2: Commuted (NC + NO) Output 3 and Output 4: NO
Frequency	50/60Hz
Voltage measurement	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 measurement	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 COMMUNICATION 1 Local port RS232: ModBus RTU
	REMOTE COMMUNICATION (*) Remote ports with the following options : • 1 Remote port RS485: ModBus RTU or IEC 60870-5-103 (by general settings) • 1 RJ45 port: IEC 61850, DNP3.0 or IEC 60870-5-104
Auxiliary power supply	24-220 Vdc /48-230 Vac ±20%
Environmental conditions	Operating temperature: -10 to 70ºC
	Storage temperature: -20 to 80 °C
	Relative humidity: 95%
Mechanical characteristics	Metal case
	Panel mounting
	Height x Width: 177 x 107 mm
	Depth: 122.1 mm
	IP-54

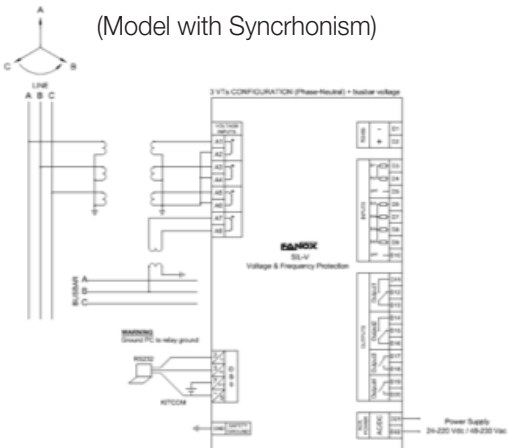(*) Depending on model

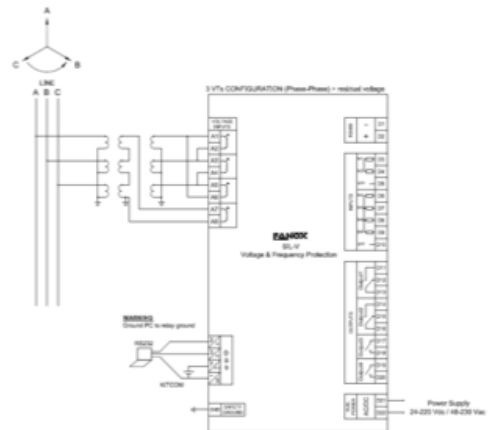3 VT Configuration (phase-neutral) + residual voltage
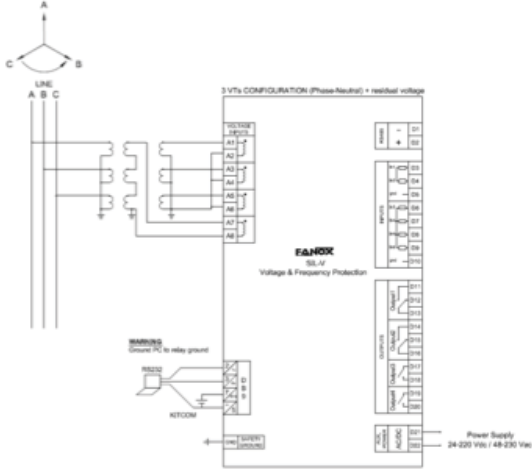
2VT Configuration (phase-phase) + residual voltage
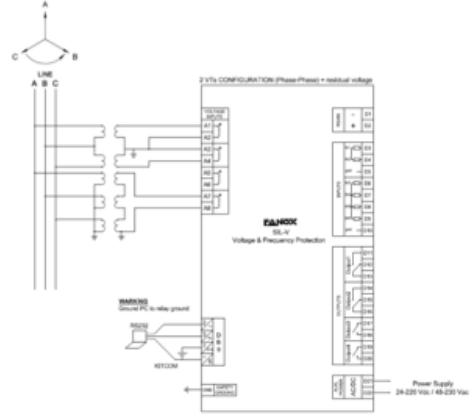
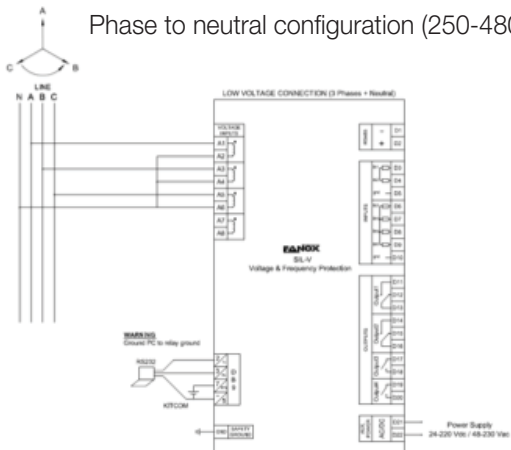3 VT Configuration (phase-neutral) + busbar voltage

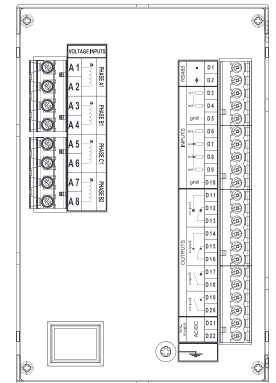(Model with Syncrhonism)

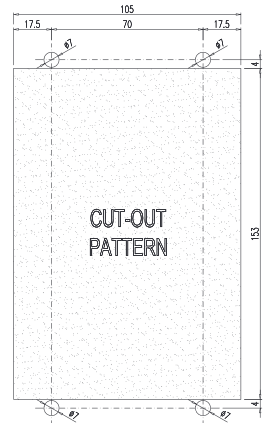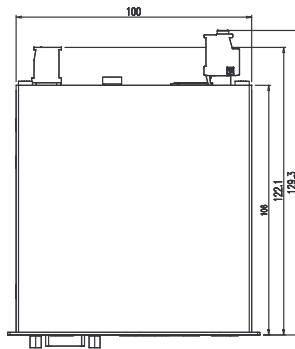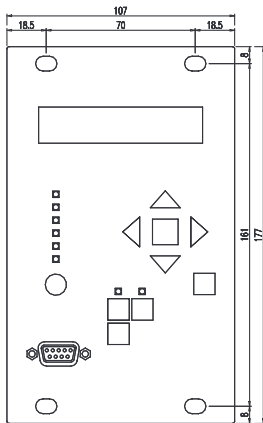3 VT Configuration (phase-phase) + residual voltage

Connecting the relay directly to Low Voltage line

Phase to neutral configuration (250-480 V)

FANOX
power T&D

CUT-OUT PATTERN

Selection & Ordering data SIL-V

SIL-V	Voltage & Frequency Protection / Synchronism Check Relay										PROTECTION FUNCTIONS
											(27(2) + 27V1 + 59(2) + 47 + 59N(2) + ΔV/ΔT + 74TCS + BF + 52 + 79 +81 U/O(4)+81R(2) + 86 + 78
	0										**NOMINAL PHASE MEASUREMENT** Defined by General Settings
		0									**NOMINAL NEUTRAL MEASUREMENT** Defined by General Settings
			0								**NET FREQUENCY** (50Hz / 60Hz). Defined by Setting
				C							**POWER SUPPLY** 24-220 Vcc/48-230 Vac
					0 2						**ADDITIONAL FUNCTIONS** - + 25
						A B C D					**REMOTE COMMUNICATIONS** RS232 (Modbus RTU) + RS485 (Modbus RTU or IEC 60870-5-103) 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 OUTPUS** 6 Inputs 4 Outputs
								2			**MECHANICS** Vertical assembly
									A B C E		**LANGUAGES** English, Spanish and German English, Spanish and Turkish English, Spanish and French English, Turkish and Russian
										A	**ADAPTATION** -

Example of ordering code:

SIL V	0	0	0	C	2	A	1	2	B	A		*SILV 0 0 0 C 2 A 1 2 B A*