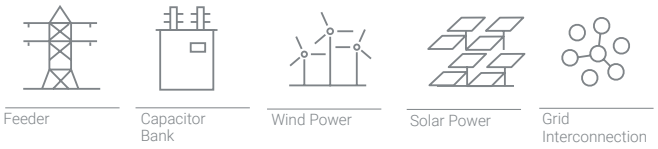
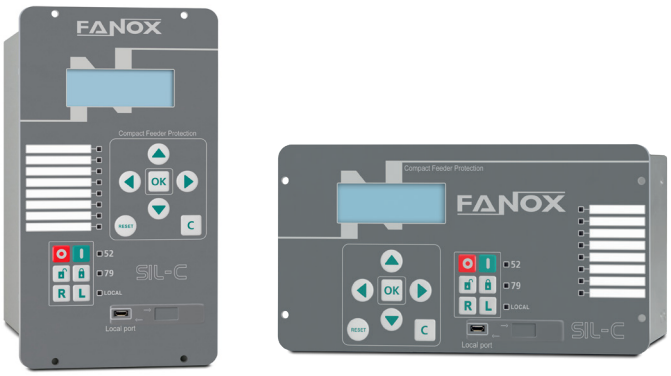
SIL-C

LINE, FEEDER & GENERATOR PROTECTION RELAY

Primary & Secondary Distribution Protection



PM I V f CI Std. CTs /1 /5 VI Conv. VTs

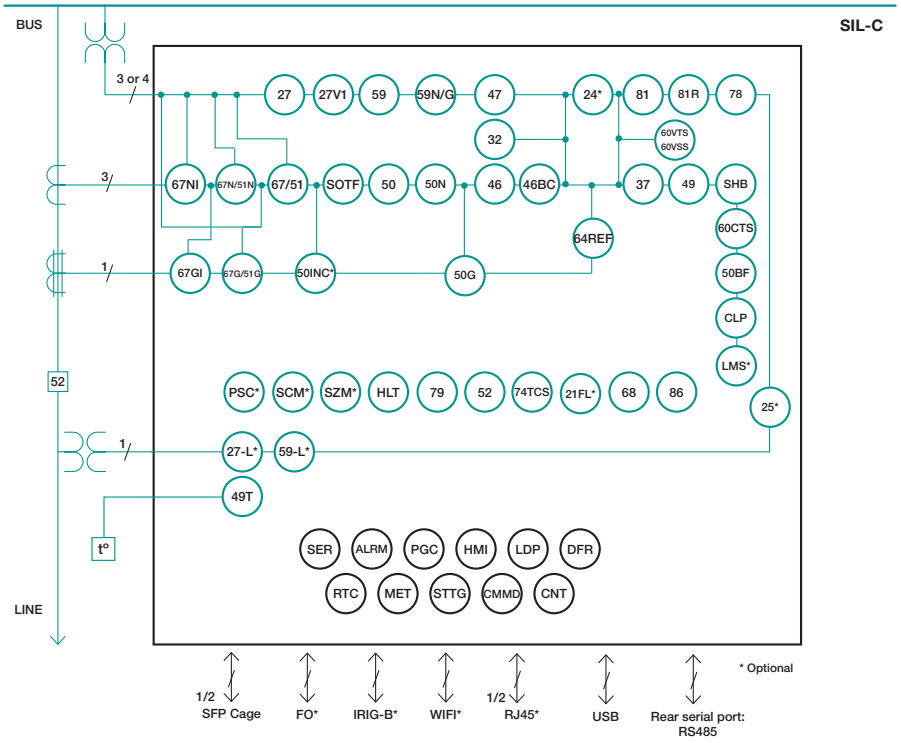


KEMA Labs

G99 Compliant

- The SIL-C is a feeder relay with current, voltage, and frequency functions for primary and secondary distribution with an auxiliary power supply of 24- 230 Vdc/ac.
- 4 current channels for conventional /1 and /5 current transformers and 5 voltage channels for conventional VTs or 6 voltage channels for capacitive and resistive low power voltage sensors (LEAs) depending on model.
- Capability of measuring up to 1.000 volts when it is connected directly to the low voltage line.
- Metal housing with a high electromagnetic compatibility level (EMC) and a wide range of operating temperature.
- Protection against 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. In case this situation is not detected, a network safety hazard can be present if the generator remains connected since an automatic reconnection of the generator may occur, causing damage to the generator and the network. SIL-C relay detects this hazardous situation thanks to its voltage and frequency functions based on the Rate Of Change Of Frequency (ROCOF) method.
- Signaling/control of the circuit breaker (52 function) and the recloser (79 function).
- The front part of the SIL-C relays is provided with a navigation keypad made of 7 keys (including the RESET key), 6 programmable hot keys that by default are configured: two (2) keys to open and close the CB, two (2) keys to block and unblock the recloser and two (2) keys to put the relay in local or remote mode with their associated three (3) configurable control LEDs. Besides, eight (8) programmable alarm LEDs.
- In case a CB is manually closed, a switch on to an existing fault may occur. This fault condition is critical if the overcurrent protection function does not clear the fault until the adjusted time delay is finished. In those cases, it is necessary to clear the fault quickly through the SOTF function.
- To allow the communication, the SIL-C relays are provided with a local micro-USB front port and with remote communication options (ports and protocols) on the rear side:
  - » Rear Serial Port (RS485): Modbus RTU, DNP3.0 Serial or IEC60870-5-103 (selectable by general settings).
  - » Rear Ethernet Port (RJ45, FO-LC, SFP Cage or HSR/PRP SFP Cages): Modbus TCP/IP, DNP3.0 TCP/IP, IEC60870-5-104 or IEC61850 (selectable by general settings) + SNTP Protocol + Web Server.
  - » HSR/PRP (RJ45 or SFP Cages): Modbus TCP/IP, DNP3.0 TCP/IP, IEC60870- 5-104 or IEC61850 (selectable by general settings) + SNTP Protocol + Web Server.
- Wireless communication (Wi-Fi) and synchronization through IRIG-B are optional (depending on the model).
- Alarms panel is available.
- The SIL-C is provided with (depending on the model):
  - » 8 configurable inputs and 7 configurable outputs.
  - » 11 configurable inputs and 5 configurable outputs.
- The SIL-C is fitted with demand of power (LDP - Load Data Profiling) with the following characteristics:
  - » Number of records: 2160.
  - » Circular recording mode.
  - » Sampling rate (interval): configurable through communications (1-60 min).
- SIL-C is provided with non-volatile RAM memory in order to store up to 3072 events and the disturbance fault recording (DFR), maintaining date & time thanks to its internal RTC (Real Time Clock). The configurable options are:
  - » 5 records in data and COMTRADE format (300 cycles each record): 1 to 8 pre-fault cycles + 292 to 299 post-fault cycles.
  - » 25 records in data and COMTRADE format (60 cycles each record): 1 to 8 pre-fault cycles + 52 to 59 post-fault cycles.
  - » 50 records in data and COMTRADE format (30 cycles each record): 1 to 8 pre-fault cycles + 22 to 29 post-fault cycles.
  - » 100 records in data and COMTRADE format (15 cycles each record): 1 to 8 pre-fault cycles + 7 to 14 post-fault cycles.
- Each oscillographic record contains 10 analogue channels and up to 96 configurable digital channels. The oscillography is downloaded by a 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-C



ANSI CODE PROTECTIONS

50	Instantaneous phase overcurrent
67/51	Inverse time directional* phase overcurrent
50N	Instantaneous calculated neutral overcurrent
50G	Instantaneous measured neutral overcurrent
67N/51N	Inverse time directional* calculated neutral overcurrent
67G/51G	Inverse time directional* measured neutral overcurrent
67NI	Directional isolated calculated neutral overcurrent
67GI	Directional isolated measured neutral overcurrent
50INC[3]	Incipient/Intermittent Fault detection
SOTF	Switch On To Fault
46	Phase balance current protection
46BC	Broken Conductor Detection
64REF	Restricted Earth Fault
37	Instantaneous phase undercurrent
49	Thermal overload
49T	External trip
SHB	Second Harmonic Blocking
59	Instantaneous phase overvoltage (Bus Bar)
59N/G	Instantaneous calculated/measured neutral overvoltage (Bus Bar)
59L	Instantaneous phase overvoltage (Line)
47	Phase balance voltage protection (Bus Bar)
27	Instantaneous phase undervoltage (Bus Bar)
27L	Instantaneous phase undervoltage (Line)
27V1	Instantaneous positive sequence undervoltage (Bus Bar)
32	Directional overpower
81O/U[2]	Under/Overfrequency
81R[2]	Rate of Change of Frequency (ROCOF)
78	Out of Step (Vector Shift)
24[1]	Overfluxing
CLP	Cold Load Pickup
79	AC Reclosing device
52	Breaker wear monitoring
25	Synchro Check
SCM[2]	Sequence Coordination Mode
SZM[2]	Sectionalizer Mode
HLT	Hot Line Tag
50BF	Circuit Breaker Failure
74TCS	Trip Circuit Supervision
60CTS	Phase CT Supervision
60VTS	Phase VT Supervision
60VSS[2]	Phase LPVT Supervision
21FL[3]	Fault Locator
86	Trip lockout
68	Zone Selection Interlocking (ZSI)
PSC[2]	Power Supply Control
PGC	Programmable logic control
LMS[1]	Load Management System

* ANSI 67, ANSI 67G, and ANSI 67N can be converted into ANSI 51, ANSI 51G, and ANSI 51N, respectively, by setting the “Directionality” parameter to NO.

ANSI 50G, ANSI 67G and ANSI 67GI will be converted into ANSI 50GS, ANSI 67GS and ANSI 67GSI in the model with neutral current measurement digit 1 (IN = 0.1A or 1A)

[1] Available in models with conventional VTs (50G not available for voltage sensors).[2] Only for the models with voltage sensors (“voltage measurements” digits 1, 2, 3, 4). Available from fw version 1.21.00 onwards.[3] Available from FW version 1.21.00 onwards for models with voltage sensors and from 3.00.00 onwards for models with conventional CTs

ADDITIONAL FUNCTIONS

CNT	Counters
RTC	Real Time Clock
ALRM	Alarm panel
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

TECHNICAL PARAMETERS SIL-C

Function 50-1 **Function 50-2**	Function enable: No/Alarm/Trip/SHB Trip
	Current tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 35 ms or ± 0.5% (greater of both)
Function 50N	Function enable: No/Alarm/Trip/SHB Trip
	Current tap: 0.050 to 30.000 xIn (step 0.001xIn)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 35 ms or ± 0.5% (greater of both)
Function 50G	Function enable: No/Alarm/Trip/SHB Trip
	Current tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 35 ms or ± 0.5% (greater of both)
Function 67/51-1 **Function 67/51-2** **Function 67/51-3** **Function 67/51-4**	Function enable: No/Alarm/Trip/SHB Trip
	Curve Type: IEC 60255-151 (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse)
	For IEC Definite time curve, time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.01 to 25.00 (step 0.01) If Curve type IEC: 0.01 to 1.00 (step 0.01) If Curve type IEEE: 0.01 to 25.00 (step 0.01)
	Current tap: 0.010 to 20.000 xIn (step 0.001xIn)
	Directionality: No/Forward/Reverse
	Polarization voltage: 0.08 to 2.00 xUn (step 0.01xUn)
	Operating angle: 0 to 359º (step 1º)
	Halfcone angle: 10 to 170º (step 1º)
	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%
	Temporized deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or ± 5% (greater of both) Timing accuracy for defined time curve selection: ± 35 ms or ± 0.5% (greater of both)

Function 67N/51N-1 **Function 67N/51N-2**	Function enable: No/Alarm/Trip/SHB Trip
	Curve Type: IEC 60255-151 (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse)
	For IEC Definite time curve, time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.01 to 25.00 (step 0.01) If Curve type IEC: 0.01 to 1.00 (step 0.01) If Curve type IEEE: 0.01 to 25.00 (step 0.01)
	Current tap: 0.050 to 20.000 xIn (step 0.001xIn)
	Directionality: No/Forward/Reverse
	Polarization voltage: 0.08 to 2.00 xUn (step 0.01xUn)
	Operating angle: 0 to 359º (step 1º)
	Halfcone angle: 10 to 170º (step 1º)
	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%
	Temporized deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or ± 5% (greater of both) Timing accuracy for defined time curve selection: ± 35 ms or ± 0.5% (greater of both)
Function 67G/51G-1 **Function 67G/51G-2**	Function enable: No/Alarm/Trip/SHB Trip
	Curve Type: IEC 60255-151 (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse)
	For IEC Definite time curve, time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.01 to 25.00 (step 0.01) If Curve type IEC: 0.01 to 1.00 (step 0.01) If Curve type IEEE: 0.01 to 25.00 (step 0.01)
	Current tap: 0.010 to 20.000 xIn (step 0.001xIn)
	Directionality: No/Forward/Reverse
	Polarization voltage: 0.08 to 2.00 xUn (step 0.01xUn)
	Operating angle: 0 to 359º (step 1º)
	Halfcone angle: 10 to 170º (step 1º)
	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%
	Temporized deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or ± 5% (greater of both) Timing accuracy for defined time curve selection: ± 35 ms or ± 0.5% (greater of both)

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Function 67NI	Function enable: No/Alarm/Trip/SHB Trip
	Directionality: No/Forward/Reverse
	Low Current Tap: 0.050 to 30.000 xIn (step 0.001xIn)
	High Current Tap: 0.050 to 30.000 xIn (step 0.001xIn)
	Low Voltage Tap: 0.08 to 2.00 xUn (step 0.01xUn)
	High Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Operating angle: 0 to 359º (step 1º)
	Halfcone angle: 10 to 170º (step 1º)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 5% (greater of both)
Function 67GI	Function enable: No/Alarm/Trip/SHB Trip
	Directionality: No/Forward/Reverse
	Low Current Tap: 0.010 to 30.000 xIn (step 0.001xIn)
	High Current Tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Low Voltage Tap: 0.08 to 2.00 xUn (step 0.01xUn)
	High Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.000 to 300.000 s (step 0.001 s)
	Operating angle: 0 to 359º (step 1º)
	Halfcone angle: 10 to 170º (step 1º)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 5% (greater of both)
Function 50INC (*)	Function enable: No/Alarm/Trip
	Phase Current Tap: 0.500 to 20.000 xIn (step 0.001xIn)
	Pickup Peaks number; 1 to 10 (step 1)
	Trip Peak number: 1 to 10 (step 1)
Function 64REF	Function enable: No/Alarm/Trip/ SHB Trip
	Current tap: 0.050 to 20.000 xIn (step 0.001xIn)
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Neutral SHB Tap: 5 to 50% (step 1%)
	Activation level: 100%
	Deactivation level: 90%
	Temporized deactivation
	Timing accuracy: ± 35 ms or ± 5% (greater of both)
Function SOTF	Function enable: No/Alarm/Trip/SHB Trip
	Current tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Time delay: 0.000 to 295.000 s (step 0.001 s)
	Safe Time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ± 35 ms or ± 0.5% (greater of both)

Function 49	Function enable: No/Alarm/Trip
	Current tap: 0.100 to 2.400 In (step 0.001xIn)
	ζ heating: 3 to 600 min (step 1 min)
	ζ cooling: 1 to 6 xζ heating (step 1)
	Alarm: 20 to 99% (step 1%)
	Trip level: 100%
	Deactivation level: 95% of alarm level
	Timing accuracy: ± 5% respect of theorical value.
Function SHB	Function enable: No/Yes
	Current Tap: 5 to 50% (step 1%)
	Reset Time: 0.000 to 300.000 (step 0.001 s)
	Block Threshold: 0.010 to 30.000xIn (step 0.001xIn)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
Function CLP	Function enable: Yes/No
	Settings group: 1 to 4 (step 1)
	No load time: 0.020 to 300.000 s (step 0.001 s)
	Cold load time: 0.020 to 300.000 s (step 0.001 s)
	Open breaker activation 0.8% In and reset threshold: 1% In
Function 46	Function enable: No/Alarm/Trip/SHB Trip
	Curve Type: IEC 60255-151 (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse)
	For IEC Definite time curve, time delay: 0.000 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.01 to 25.00 (step 0.01) If Curve type IEC: 0.01 to 1.00 (step 0.01) If Curve type IEEE: 0.01 to 25.00 (step 0.01)
	Current tap: 0.050 to 20.000 xIn (step 0.001xIn)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Temporized deactivation
	Timing accuracy for IEC and IEEE curves selection: ± 30 ms or ± 5% (greater of both) Timing accuracy for defined time curve selection: ± 35 ms or ± 0.5% (greater of both)
Function 46BC	Function enable: No/Alarm/Trip/
	Tap: 15 to 100 % (step 1%)
	Time delay: 0.030 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)

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Function 37	Function enable: No/Alarm/Trip
	Current tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Minimum level: 0.000 to 1.000 xIn (step 0.001xIn)
	Time delay: 0.060 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 27-1[3] **Function 27-2**[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)
	Time delay: 0.060 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 99%
	Deactivation level: 101%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 27L (*)[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)
	Time delay: 0.060 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 99%
	Deactivation level: 101%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 27V1	Function enable: No/Alarm/Trip
	Voltage tap: 0.15 to 2.00 xUn (step 0.01xUn)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)
	Time delay: 0.060 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 99%
	Deactivation level: 101%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 59-1[3] **Function 59-2**[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.045 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 101%
	Deactivation level: 99%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)

Function 59L (*)[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.045 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 101%
	Deactivation level: 99%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 59N/G[1]**-1**[3] **Function 59N/G**[1]**-2**[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.045 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 101%
	Deactivation level: 99%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 47[3]	Function enable: No/Alarm/Trip
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time delay: 0.045 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 101%
	Deactivation level: 99%
	Temporized deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 32-1 **Function 32-2** **Function 32-3** **Function 32-4**	Function enable: No/Alarm/Trip
	Activation level: 0.02 to 2.00 xSn (step 0.01xSn)
	Operating angle: 0 to 359º (step 1º)
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
Function 81-1 **Function 81-2** **Function 81-3** **Function 81-4** **Function 81-5**[2] **Function 81-6**[2]	Function enable: No/Alarm/Trip
	Type: Underfrequency or Overfrequency
	Activation level: 45.000 to 65.000 Hz (step 0.001 Hz)
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)
	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 accuracy of the Time Delay is the adjusted value plus the necessary time to achieve the measurement during 8 cycles.

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Function 81R-1 **Function 81R-2** **Function 81R-3**[1] **Function 81R-4**[1]	Function enable: No/Alarm/Trip
	Type: Increase/Decrease
	Activation level: 0.100 to 5.000 Hz/s (step 0.001 Hz/s)
	Time delay: 0.060 to 40.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)
	Activation level: 100%
	Temporized deactivation
	The frequency measurement is an average value of the frequency measured during 8 cycles. The accuracy of the Time Delay is the adjusted value plus the necessary time to achieve the measurement during 8 cycles.
Function 78	Function enable: No/Alarm/Trip
	Activation level: 1 to 25º (step 1º)
	Reset time: 0.020 to 300.000 s (step 0.001 s)
	Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)
	Temporized deactivation
	Measurement accuracy: ±1º or ±10% (greater of both)
Function 24-1[1] **Function 24-2**[1]	Function enable: No/Alarm/Trip
	Curve Type: Inverse A, Inverse B, Inverse C, and Defined Time.
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Time dial (TMS): 0.05 to 300.00 (step 0.01)
	Activation level: 0.50 to 2.00 xUn/Fn (step 0.01 xUn/Fn)
	Time delay: 0.020 to 300.000 s (step 0.01 s)
	Reset Time: 0.000 to 300.000 s (step 0.01 s)
	Curve, activation level: 110%
	Curve, deactivation level: 100%
	Defined time, activation level: 100%
	Defined time, deactivation level: 95%
	Temporized deactivation
	Timing accuracy for curves selection: ± 30 ms or ± 5% (greater of both) Timing accuracy for defined time curve selection: ± 30 ms or ± 0.5% (greater of both)
Function 25 (*)	Dead tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Live tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Voltage supervision time: 0.060 to 300.000 s (step 0.001 s)
	Voltage difference: 0.05 to 2.00 xUn (step 0.01xUn)
	Phase difference: 2 to 90 º (step 1º)
	Frequency difference: 0.060 to 10.000 Hz (step 0.001 Hz)
	Synchro check time: 0.020 to 300.000 s (step 0.001 s)

Function 79	Number of recloses: 0 to 4 (step 1)
	Reclose time 1, 2, 3, 4: 0.020 to 2000.000 s (step 0.01 s)
	Hold Enable: No/Yes/No Time
	Hold time: 0.02 to 2000.000 s (step 0.01 s)
	Reset time: 0.02 to 2000.000 s (step 0.01 s)
	Safe time: 0.020 to 2000.000 s (step 0.01 s)
	Locking possibilities: pulse inputs, level inputs, commands.
Function SCM[2]	Number of shots: 0 to 4 (step 1)
	Reset time: 0.020 to 2000.000 s (step 0.001 s)
Function SZM[2]	Number of shots: 0 to 4 (step 1)
	Reset time: 0.020 to 2000.000 s (step 0.001 s)
	Max open time: 0.020 to 2000.000 s (step 0.001 s)
	Max close time: 0.020 to 2000.000 s (step 0.001 s)
	Fault current: 0.010 to 20.000 s (step 0.001 xIn)
	Voltage supervision time: 0.000 to 300.000 s (step 0.001 s)
	Dead tap: 0.04 to 2.00 xUn (step 0.01 xUn)
Function 52	Maximum number of openings: 1 to 100,000 (step 1)
	Maximum accumulated amperes: 1 to 100,000 M(A2) (step 1)
	Repetitive number of openings: 1 to 100,000 (step 1)
	Time for a repetitive number of openings: 1 to 300 min (step 1 min)
	Maximum opening time: 0.020 to 300.000 s (step 0.001 s)
	Maximum closing time: 0.020 to 300.000 s (step 0.001 s)
	Circuit breaker status monitoring: Current measurements: Open breaker activation and reset threshold: 0.8% In (Without using contacts) Using contacts: 52a or 52b and 52a and 52b
Function 74TCS	Function enable: No/Yes
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Continuity in coils A and B through configurable inputs
Function 60CTS	Function enable: No/Yes
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)
	Open breaker activation and reset threshold: 0.8% In
	Detection of the loss of one phase CT
Function 60VTS **Function 60VSS**[2]	Function enable: No/Yes
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	V1, V2 and VP Tap: 0.08 to 2.00 xUn (step 0.01xUn)
	I1, I2 and 3I0 Tap: 0.010 to 20.000 xIn (step 0.001xIn)
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both)

TECHNICAL PARAMETERS SIL-C

Function 50BF	Function enable: No/Yes
	Time delay: 0.020 to 1.000 s (step 0.001 s)
	Open breaker activation and reset threshold: 0.8% In
	From fw version 3.01.00 onwards:
	Phase Current Tap: 0.008 to 30 xIn (step 0.001xIn)
	Neutral Current Tap: 0.008 to 30 xIn (step 0.001xIn)
	Time Delay: 0.020 to 1.000 s (step 0.001 s)
	Back Period: 0.020 to 1.000 s (step 0.001 s)
	50BF Start PGC
Function 21FL (*)	Function enable: No/Yes
	Line length 0.1 to 100.0 km (step 01 km)
	Z1 line magnitude: 0.001 to 5.000 (step 0.001 Ω/km)
	Z1 line angle: 0 to 90º (step 1º)
	Z0 line magnitude: 0.001 to 5.000 (step 0.001 Ω/km)
	Z0 line angle: 0 to 90º (step 1º)
LMS (*)	Function enable: No/Yes
	No Peak Mode: Alarm/Trip
	Peak mode: Alarm/Trip
	Peak period starting month: January to December
	Peak period starting day: 1 to 31 (step 1)
	Peak period ending month: January to December
	Peak period ending day: 1 to 31 (step 1)
	Peak period starting hour: 0 to 23 (step 1 hour)
	Peak period starting minute: 0 to 59 (step 1 minute)
	Peak period ending hour: 0 to 23 (step 1 hour)
	Peak period ending minute: 0 to 59 (step 1 minute)
	Peak period starting day of week: Monday to Sunday
	Peak period ending day of week: Monday to Sunday
	Reset Time: 0 to 18000 s (step 1 s)
	Peak period Tap: 0.010 to 30.000 xIn (step 0.001xIn)
	Peak trip Time 1: 0 to 18000 s (step 1 s)
	Peak trip Time 2: 0 to 18000 s (step 1 s)
	Peak trip Time 3: 0 to 18000 s (step 1 s)
	Peak trip Time 4+: 0 to 18000 s (step 1 s)
	Peak Number of recloses: 0 to 247 (Step 1)
	Peak Interval Time 1: 0 to 18000 s (Step 1 s)
	Peak Interval Time 2: 0 to 18000 s (Step 1 s)
	Peak Interval Time 3: 0 to 18000 s (Step 1 s)
	Peak Interval Time 4+: 0 to 18000 s (Step 1 s)
	No Peak period Tap: 0.010 to 30.000 xIn (step 0.001xIn)
	No Peak trip Time 1: 0 to 18000 s (step 1 s)
	No Peak trip Time 2: 0 to 18000 s (step 1 s)
	No Peak trip Time 3: 0 to 18000 s (step 1 s)
	Peak trip Time 4+: 0 to 18000 s (step 1 s)
	No Peak Number of recloses: 0 to 247 (Step 1)
	No Peak Interval Time 1: 0 to 18000 s (Step 1 s)
	No Peak Interval Time 2: 0 to 18000 s (Step 1 s)
	No Peak Interval Time 3: 0 to 18000 s (Step 1 s)
	No Peak Interval Time 4+: 0 to 18000 s (Step 1 s)

Power supply control[2]	Function enable: No/Yes
	V supply alarm 1: 19 to 220 Vdc (step 1 V)
	V supply alarm 2: 19 to 220 Vdc (step 1 V)
Function 49T	Available through configurable inputs thanks to the programmable logic
Function 86	It allows latching (lockout) the contact trip due to programmable logic (PGC: RSFF or SRFF).
Function 68	Available through configurable inputs and outputs thanks to the programmable logic (PGC).
Programmable logic control (PGC)	OR, OR_1PULSE, OR_PULSES, OR_BLINKING, OR_TIMER UP, OR_TIMER DOWN
	NOR, NOR_1PULSE, NOR_PULSES, NOR_ BLINKING, NOR_TIMER UP, NOR_TIMER DOWN
	AND, AND_1PULSE, AND_PULSES, AND_ BLINKING, AND_TIMER UP, AND_TIMER DOWN
	NAND, NAND_1PULSE, NAND_PULSES, NAND_ BLINKING, NAND_TIMER UP, NAND_TIMER DOWN
	XOR, OR_1PULSE, XOR_PULSES, XOR_BLINKING, XOR_TIMER UP, XOR_TIMER DOWN
	SRFF, SRFF_1PULSE, SRFF_PULSES, SRFF_ BLINKING, SRFF_TIMER UP, SRFF_TIMER DOWN and NON-VOLATILE FF.
	RSFF, RSFF_1PULSE, RSFF_PULSES, RSFF_ BLINKING, RSFF_TIMER UP, RSFF_TIMER DOWN and NON-VOLATILE FF
	R_EDGE, R_EDGE_1PULSE
	F_EDGE, F_EDGE_1PULSE
Settings tables	4 settings groups
	6 settings groups[2]
	Selectable by input, communications, user commands or general setting.
SER	3072 events
Disturbance fault recording (DFR)	32 samples/cycle
	10 analog channels and 96 configurable digital channels
	Configurable DFR start
	The configurable number of records depending on the size:
	5 records in data and COMTRADE format (300 cycles each record): 1 to 8 pre-fault cycles + 292 to 299 post-fault cycles.
	25 records in data and COMTRADE format (60 cycles each record): 1 to 8 pre-fault cycles + 52 to 59 post-fault cycles.
	50 records in data and COMTRADE format (30 cycles each record): 1 to 8 pre-fault cycles + 22 to 29 post-fault cycles.
	100 records in data and COMTRADE format (15 cycles each record): 1 to 8 pre-fault cycles + 7 to 14 post-fault cycles.)
	COMTRADE IEEE C37.111-1991
	Up to 100 fault reports (data format) with a maximum 29 events, each one
Load Data Profiling (LDP)	Demand of power with the following characteristics:
	- Number of records: 2160
	- Circular recording mode
	- Sampling rate (interval): configurable through communications (1-60 min)

TECHNICAL PARAMETERS SIL-C

Inputs (*)	Depending on Model: - 8 configurable inputs - 11 configurable inputs The voltage of the inputs is the same as the auxiliary power supply Burden: 24 Vdc: <20 mW 230 Vdc: <200 mW 24 Vac: <50 mW 230 Vac: <500 mW
Outputs (*)	Depending on Model: - 5 configurable outputs - 7 configurable outputs 250 V AC – 8 A; 30 V DC – 8 A Contact current short duration: 30A – 200ms
	Output 1: NO-NC; the rest of the outputs: NO Model with 7 outputs: Output 1 NC; the rest of the outputs: NO
Frequency	50/60Hz
Energizing Quantities	Burden of current inputs: <0.015 VA (1 A) & <0.375 VA (5 A) Burden of voltage inputs: < 70 mVA Burden of power supply unit: 24-230 Vdc/Vac: < 12 VA Burden for binary inputs: 24 Vdc: <20 mW 230 Vdc: <200 mW 24 Vac: <50 mW 230 Vac: < 500 mW
Current measurements	Phase currents (IA, IB, IC), neutral (IN, 3I0), positive sequence (I1) and negative sequence (I2), I2/I1, maximum current (Imax), thermal image (TI), second harmonic (IA2H, IB2H IC2H), current total harmonic distortion (THD-A, THD-B, and THD-C).
	Fundamental values (DFT)
	Sampling: 32 samples/cycle
	Phase and Neutral (1 A or 5 A): ±2% precision in a band covering ±20% of nominal current and ±4% or ±5 mA in the rest of the range Neutral (0.1 A): ±2% precision in a band covering ±20% of nominal current and ±4% or ±0.5 mA in the rest of the range
	Current measurement range: From 0.01 to 30 times the nominal current

Voltage measurements	Phase voltage (V-A, V-B, V-C), line voltage (VL)*, phase-phase voltage (UAB, UBC, UCA), neutral voltage (VR, 3-V0), positive sequence voltage (V-1) and negative sequence voltage (V-2), maximum voltage (VMAX) and V/f[1].
	Fundamental values (DFT)
	Sampling: 32 samples/cycle
	Conventional VTs: Measured voltage: 1% precision in a band covering ±20% of nominal voltage and 4% in the rest of the range (ambient temperature) Calculated voltage: 2% precision in a band covering ±20% of nominal voltage and 4% in the rest of the range (ambient temperature) Range: With VTs: 3-250 V measured voltage (6-250 V calculated voltage). Direct connection: From 12 to 1000 V
	Voltage sensors (LEAs): 1% precision in a band covering ±20% of nominal voltage and 4% in the rest of the range. Voltage sensors: LEA of 2.8Vrms LEA of 8Vrms, LEA of 5.2Vrms or LEA of 16Vrms. Range: Measured voltage: From (0.01282 x LEA Maximum voltage x Ratio) to 2.4xUn. Calculated voltage: From (0.013 x LEA Maximum voltage x Ratio) to 2.4xUn.
Angle measurements	Current Angles: IA, IB, IC, IN and 3I0. Voltage Angles: VA, VB, VC, VR, VL*, 3V0, UAB, UBC and UCA. Power factor: Cos PHI-A, Cos-PHI-B, and Total Cos-PHI-C
	Accuracy: ±2º
	Angle measurement range: From 0 to 359º
Power measurements	Total and per-phase active power
	Total and per-phase reactive power
	Total and per phase apparent power
	2% accuracy in rated values with power factor between 1 and 0.7 (phase shift from 0 to ±45º).
Energy measurement	Positive and negative active energy
	Positive and negative reactive energy
Frequency measurements	Busbar Frequency, Line Frequency, df/dt, V/Hz
	Minimum required voltage: 20V P-N (35 P-P)
	Accuracy: ±0.005 Hz
	Frequency measurement range: From 45 to 65 Hz

TECHNICAL PARAMETERS SIL-C

Communications	Local port (micro-USB): Modbus RTU
	Wireless communication (Wi-Fi) (*)
	Rear Serial Port (RS485) (*)
	IRIG-B (*)
	Remote Ethernet Port (*): RJ45 (10/100 Base-Tx) FO-LC(10/100 Base-Fx) SFP Cage HSR/PRP SFP Cages
	Protocols : WiFi: Modbus RTU RS485 : Modbus RTU, DNP3.0 and IEC60870-5-103 (selectable by general settings) RJ45, FO-LC or SFP Cage: Modbus TCP/IP, DNP3.0 TCP/IP, IEC60870-5-104 or IEC61850 (selectable by general settings) + SNTP Protocol HSR/PRP Cages: IEC61850
Power supply	24-230 Vac/dc (24-220 Vdc (±20%) / 100-230 Vac (±15%)) Burden: 24-230 Vdc/Vac: < 20 VA
Environmental conditions	Operating temperature: -40 to 70ºC
	Storage temperature: -40 to 80ºC
	Relative humidity: 95%
Mechanical characteristics	Metallic box
	Panel mounted
	Vertical assembly: HxWxD: 198x107x145.01 (mm) Horizontal assembly: HxWxD: 107x198x145.01 (mm)
	IP-54
	The required screws to fix the relay should be M4

(*) Optional depending on model

NOTE: ANSI 67, ANSI 67G, and ANSI 67N can be converted into ANSI 51, ANSI51G, and ANSI 51N respectively by setting the “Directionality” parameter to NO.

NOTE: ANSI 50G, ANSI 67G and ANSI 67GI will be converted into ANSI 50GS, ANSI 67GS and ANSI 67GSI in the model with neutral current measurement digit 1 (IN = 0.1A or 1A)

[1]Available in models with conventional VTs (50G not available for voltage sensors).

[2] Available only in models with voltage sensors. 81-5 available for models with VTs too from fw version 3.01.00 onwards.

[3] Voltage setting from 0.04 instead of 0.08 for models with voltage sensors.

For communication digits E, J, U and V SFP transceivers will be installed by the user, and the following specifications must be complied:

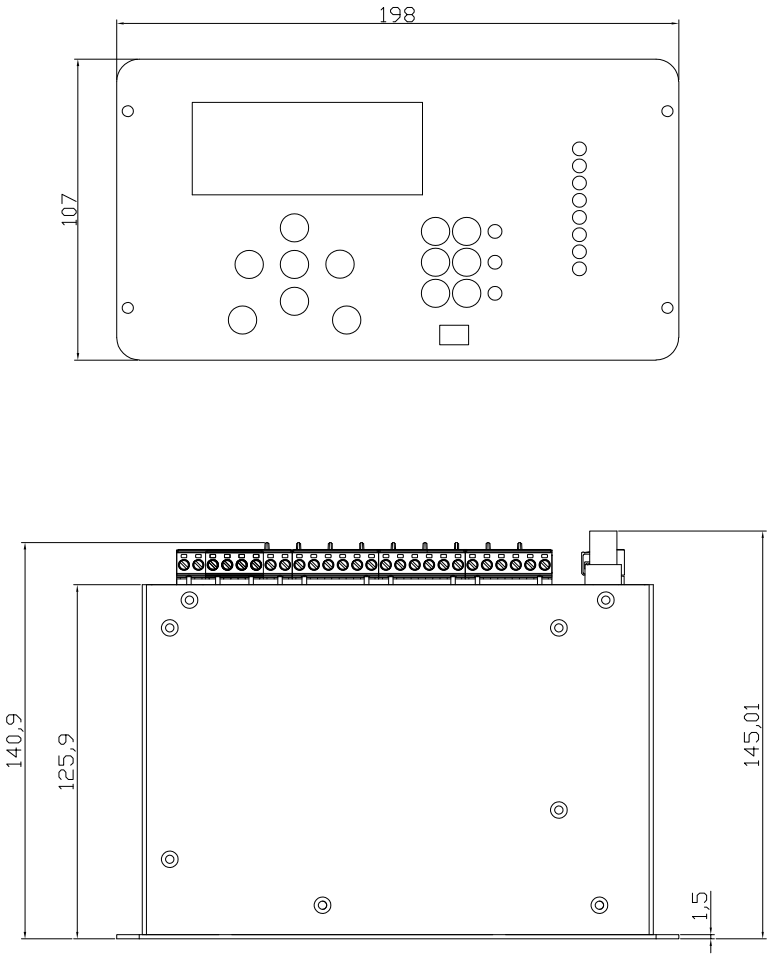
Supply: 3.3v.

Speed: 100BASE-FX, Fast Ethernet.

The SFP module must support SerDeS

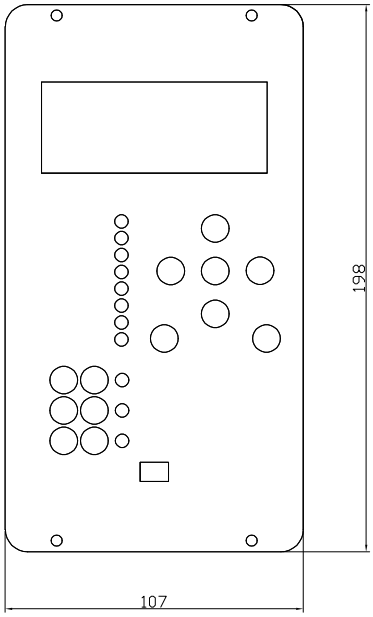
DIMENSIONS AND CUTOUT SIL-C

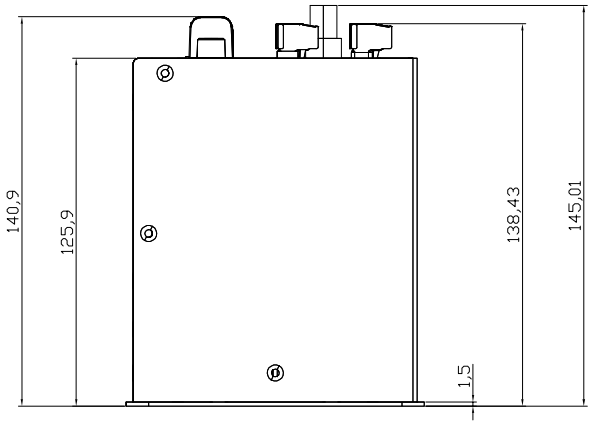
Horizontal assembly

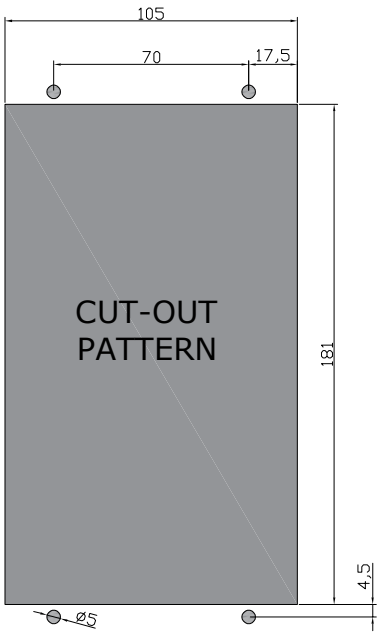


DIMENSIONS AND CUTOUT SIL-C

Vertical assembly

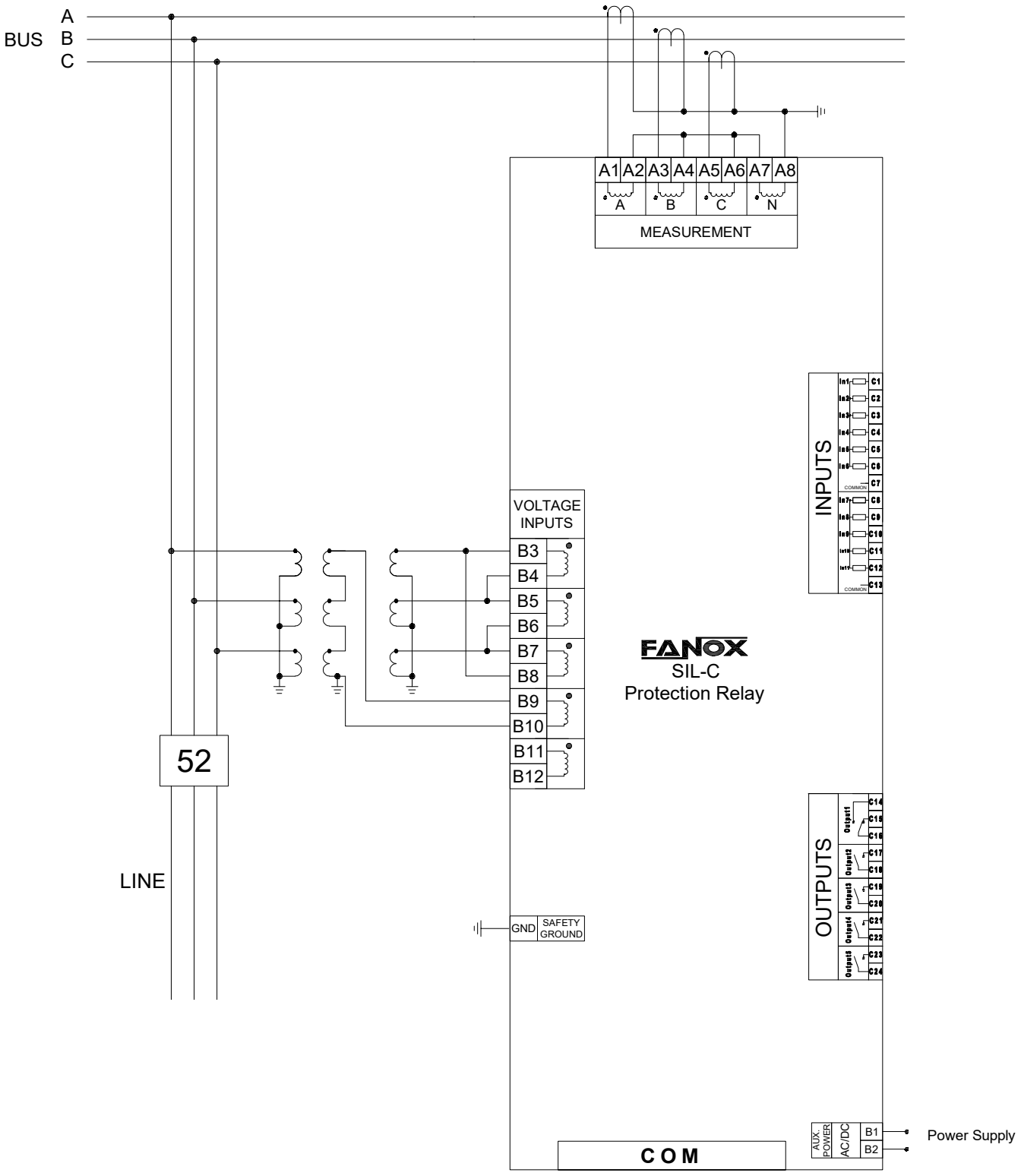






CONNECTIONS DIAGRAM SIL-C

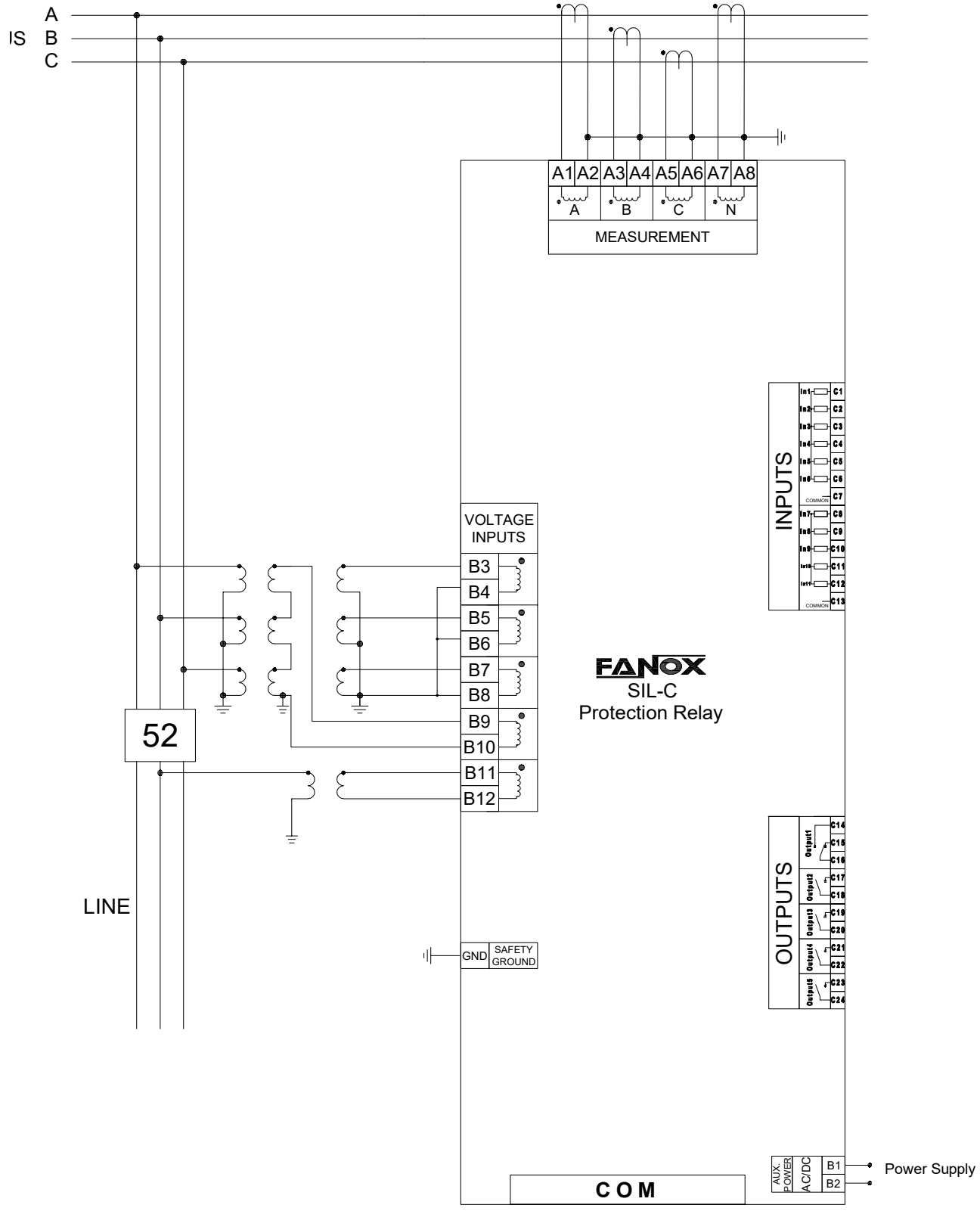
Phase-phase + residual voltage, 3 current transformers



(*) Example of connections diagram

CONNECTIONS DIAGRAM SIL-C

3 VTs (Phase-neutral) + residual voltage + 1 VT for synchonism , 4 current transformers



(*) Example of connections diagram

SELECTION & ORDERING DATA SIL-C

SIL-C

Feeder & Generator Protection Relay

0										PHASE CURRENT MEASUREMENT 1 A or 5 A
	0 1									NEUTRAL CURRENT MEASUREMENT 1 A or 5 A (Only for phase current measurement digit 0) 1 A or 0.1 A
		0 1 2 3 4								VOLTAGE MEASUREMENT Up to 1000 V (direct connection) or 250 V (with VTs) 8 Vrms LEA maximum, 1 MOhm 5.2 Vrms LEA maximum, 2 MOhm 16 Vrms LEA maximum, 2 MOhm 2.8 Vrms LEA maximum, 20 MOhm
			C							POWER SUPPLY 24-220 Vdc / 100-230Vac
				0 1 2 3 4						ADDITIONAL FUNCTIONS - +25 + 27-L + 59-L + LMS[1] + 21FL[3] + 50INC[3] + 21FL[3] + 50INC[3] + LMS
					A B 2 E G 3 J M N O P Q R U V					COMMUNICATIONS A: 1xUSB + 1xRS485 B: 1xUSB + 1xRS485 + 1xRJ45 + IRIG-B 2 : 1xUSB + 1xRS485 + 1xRJ45 + HSR/PRP RJ45 + IRIG-B E: 1xUSB + 1xRS485 + 1xRJ45 + HSR/PRP SFP Cages + IRIG-B G: 1xUSB + WiFi + 1xRS485 + 1xRJ45 + IRIG-B 3 : 1xUSB + WiFi + 1xRS485 + 1xRJ45 + HSR/PRP RJ45 + IRIG-B J: 1xUSB + WiFi + 1xRS485 + 1xRJ45 + HSR/PRP SFP Cages + IRIG-B M: 1xUSB + 1xRS485 + 2xRJ45 + IRIG-B N: 1xUSB + WiFi + 1xRS485 + 2xRJ45 + IRIG-B O: 1xUSB + 1xRS485 + 1xRJ45 + IRIG-B P: 1xUSB + WiFi + 1xRS485 + 1xRJ45 + IRIG-B Q: 1xUSB + 1xRS485 + 1xFO-LC+ IRIG-B R: 1xUSB + WiFi + 1xRS485 + 1xFO-LC + IRIG-B U: 1xUSB + 1xRS485 + 1xRJ45 + 1xSFP Cage + IRIG-B V: 1xUSB + WiFi + 1xRS485 + 1xRJ45 + 1xSFP Cage + IRIG-B
						0 1				INPUTS AND OUTPUTS 8 Inputs + 7 Outputs 11 Inputs + 5 Outputs
							C D E F			MECHANICAL ASSEMBLY Vertical Assembly Horizontal Assembly Vertical Assembly with anticorrosive treatment Horizontal Assembly with anticorrosive treatment
								A E F		LANGUAGE English, Spanish, German and French English, Spanish, Turkish and Russian English, Spanish, German and Portuguese
									B	ADAPTATION (2) 50 + SOTF + 50G + 50N + (4) 67/51 + (2) 67G/51G + (2) 67N/51N + 67GI + 67NI + 64REF + 46 + 46BC + 49 + 49T + 37 + (2) 27+ 27V1 + (2) 59 + (2) 59N/G[1] + 47 + (4) 32 + (4) 81U/O_(6) 81U/O[2] + (4) 81R_(2) 81R[2] + 78 + (2) 24[1] + 79 + 74TCS + 60CTS + 60VTS/VSS[2] + 50BF + SHB + CLP + 52 + 86 + SCM[2] + SZM[2] + HLT + Power Supply Control[2]

SELECTION & ORDERING DATA SIL-C

Example of ordering code:

0	0	0	C	0	A	1	C	A	B	SIL C 0 0 0 C 0 A 1 C A B
SIL-C										

PORTS	PROTOCOLS	
USB	Modbus RTU	
WiFi	Modbus TCP	
RS485	Modbus RTU, IEC60870-5-103 or DNP3.0 Serial	
FO-LC	Modbus TCP or DNP3.0 TCP, IEC60870-5-104 or IEC61850 + SNTP Protocol	
SFP Cage	Modbus TCP, DNP3.0 TCP, IEC60870-5-104 or IEC61850, SNTP Protocol	
RJ45	Communications digits B and G RJ45: Modbus TCP, DNP3.0 TCP or IEC60870-5-104 + SNTP Protocol	Communications digits 2, E, 3, J, M, N, O, P, U and V: RJ45: Modbus TCP or DNP3.0 TCP, IEC60870-5-104 or IEC61850, SNTP Protocol

Not all combinations are possible. Please, confirm with Fanox chosen model.

NOTES:

- ANSI 67, ANSI 67G and ANSI 67N can be converted into ANSI 51, ANSI 51G and ANSI 51N respectively by setting the “Directionality” parameter to NO.
- ANSI 50G, ANSI 67G and ANSI 67GI will be converted into ANSI 50GS, ANSI 67GS and ANSI 67GSI in the model with neutral current measurement digit 1 (IN = 0.1A or 1A).
- [1] Available in models with conventional VTs (50G not available for voltage sensors).
- [2] Only for the models with voltage sensors (“voltage measurements” digits 1, 2, 3, 4). Available from FW version 1.21.00 onwards.
- [3] Available from FW version 1.21.00 onwards for models with voltage sensors and from 3.00.00 onwards for models with conventional CTs.
- For communication digits E, J, U and V, SFP transceivers will be installed by the user, and the following specifications must be fulfilled:

  Supply: 3.3v.

  Speed: 100BASE-FX, Fast Ethernet.

  The SFP module must support SerDes.