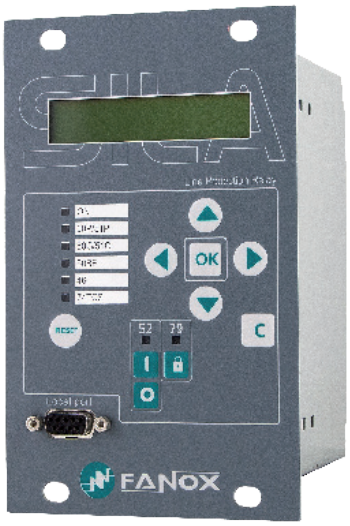
SIL-A

Feeder Protection Relay

SIL-A relays installed in Azadi Football Stadium's electrical substation.



ANSI CODE PROTECTIONS	
50	Instantaneous phase overcurrent
51	Inverse time phase overcurrent
50N	Instantaneous calculated neutral overcurrent
50G	Instantaneous measured neutral overcurrent
51N	Inverse time calculated neutral overcurrent
51G	Inverse time measured neutral overcurrent
46	Phase balance current protection
46BC	Broken Conductor Detection
37	Instantaneous phase undercurrent
60CTS	Phase CT supervision
49	Thermal overload
SHB	Second Harmonic Blocking
52	Breaker Wear Monitoring
50BF	Circuit breaker failure
74TCS	Trip Circuit Supervision
79	AC Reclosing device
CLP	Cold Load Pickup
49T	External Trip
86	Trip lockout
68	Zone selection interlocking
TB	Trip block for switch disconnector
PGC	Programmable logic control

Overcurrent and Earth Fault Protection Relay

Distribution and Transformation Substations and SF6 insulated Switchgears

- The SIL-A is an overcurrent and earth fault protection relay for primary and secondary distribution with auxiliary power supply 24-220 Vdc/ 48-230 Vac). The current measurement is obtained either by standard current transformers /1 or /5, or by special Low Power Current Transformers (LPCT).
- Many protection functions: 50(2), 50N/G (2)(1), 50/51, 50/51N/G(1), 50BF, 46, 52, 79, 74TCS, COLD LOAD PICK-UP, 86, 49T and optionally 49, 74CT, 37, 46 BC, trip block for switch disconnector.
- Metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Direct signalling/control both of the circuit breaker (52 function), both of the recloser (79 function).
- Trip bus protection function is available through configurable inputs and outputs thanks to the programmable logic.
- To allow the communication, relays have a communication port on the front of the equipment and remote communication with different options:

  One rear port on the back with the following options respect to communication protocols:

  - RS 485 PORT: IEC60870-103 or Modbus RTU selectable by settings
  - RJ 45 PORT: IEC 61850, DNP 3.0 or IEC 60870-5-104 (depending on model).
- The SIL-A has configurable inputs and outputs: 6 inputs (74TCS through configurable inputs) - and 4 outputs
- SIL-A is fitted with the demand of current with the following characteristics:

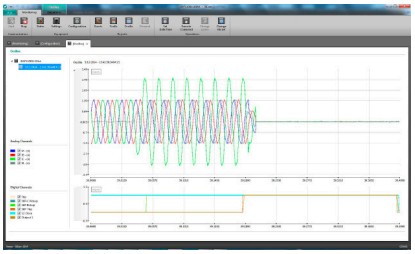
  Number of records: 168

  Recording mode circular

  Sampling rate (interval): configurable through communications: 1 – 60 min

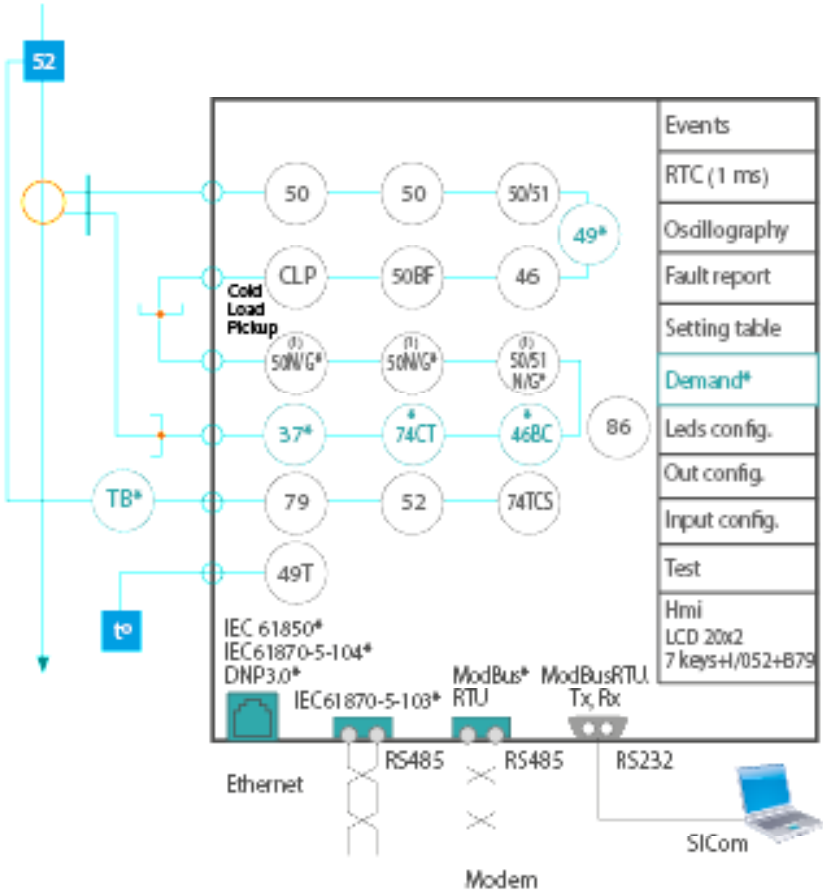
(1) Note:
- LPCT model: neutral current is calculated so overcurrent protection functions are 50N(2) and 50/51N
- Compact model: neutral current is measured so overcurrent protection functions are 50N/G(2) and 50/51 N/G

- 5 Oscillographic records, 20 fault reports and 200 events saved in non-volatile RAM memory with date / time even without power supply thanks to its internal RTC (Real Time Clock).



Additional information to fault reports

Functions diagram SIL-A



(1) Nota:

- Modelo LPCT: La corriente de neutro es calculada por lo que las protecciones de sobrecorriente de neutro son 50N(2) y 50/51N
- Modelo compacto: La corriente de neutro es medida por lo que las protecciones de sobrecorriente de neutro son 50N/G(2) y 50/51 N/G

* optional

Technical parameters SIL-A

Function 50_1 **Function 50_2 (*)**	Function enable: - Adaptation “B”: Yes/No - Adaptation “C”: Yes/No/SHB
	Current tap: 0.10 to 30.00 xIn (step 0.01 xIn)
	Time delay: - Adaptation “B”: 0.02 to 300.00 s (step 0.01 s) - Adaptation “C”: 0.00 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 0.5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 0.5%
Function 50N/G_1 **Function 50N/G_2 (*)**	Function enable: - Adaptation “B”: Yes/No - Adaptation “C”: Yes/No/SHB
	Current tap: - Adaptation “B”: 0.10 to 30.00 xIn (step 0.01 xIn) - Adaptation “C”: 0.05 to 30.00 xIn (step 0.01 xIn)
	Time delay: - Adaptation “B”: 0.02 to 300.00 s (step 0.01 s) - Adaptation “C”: 0.00 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 0.5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 0.5%
Function 49 (*)	Function enable: Yes/No
	Tap: 0.10 to 2.40 xIn (step 0.01xIn)
	ζ heating: 3 to 600 min (step 1 min)
	ζ cooling: 1 to 6 x ζ heating (step 1)
	Alarm: 20 to 99% (step 1%)
	Trip level: 100%
	Trip reset: 95% of alarm level
	Timing accuracy: ± 5% respect of theorical value.
	Trip time curves are valid under 20 times the adjusted tap. With currents higher than 20 times the adjusted tap, trip time and thermal image value are truncated to 20 times the adjusted tap.
Function SHB (*)	Function enable: Yes/No
	Current tap: 5% to 50% (step 1%)
	Reset time: 0.00 to 300 s (step 0.01 s)
	Block threshold: 0.10 to 30.00 xIn (step 0.01 xIn)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation

Function 51_1 **Function 51_2 (*)**	Function enable: - Adaptation “B”: Yes/No - Adaptation “C”: Yes/No/SHB
	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: - Adaptation “B”: 0.02 to 300. s (step 0.01 s) - Adaptation “C”: 0.00 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 ± 5% (greater of both). Timing accuracy for defined time curve selection: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 5%
Function 46	Function enable: - Adaptation “B”: Yes/No - Adaptation “C”: Yes/No/SHB
	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: - Adaptation “B”: 0.02 to 300. s (step 0.01 s) - Adaptation “C”: 0.00 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 ± 5% (greater of both). Timing accuracy for defined time curve selection: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 5%

Technical parameters SIL-A

Function 51N/G	Function enable: - Adaptation “B”: Yes/No - Adaptation “C”: Yes/No/SHB
	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: - Adaptation “B”: 0.02 to 300. s (step 0.01 s) - Adaptation “C”: 0.00 to 300. s (step 0.01 s)
	Time dial (TMS): 0.02 to 2.20 (step 0.01)
	Current tap: - Adaptation “B”: 0.10 to 7.00 xIn (step 0.01 xIn) - Adaptation “C”: 0.05 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 ± 5% (greater of both). Timing accuracy for defined time curve selection: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 5%
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 46BC (*)	Function enable: Yes/No
	Current tap: 15 to 100 % (step 1%)
	Time delay: 0.00 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Timing accuracy: - If Time delay 0.00 to 0.02 s: ± 50 ms or ± 0.5% - If Time delay 0.02 to 300 s: ± 30 ms or ± 0.5%
Function 37 (*)	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: 105%
	Instantaneous deactivation
	Timing accuracy: ± 30 ms or ± 0.5%
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 for 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% In
	Open circuit breaker reset threshold: 10% In
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 74CT (*)	Function enable: Yes/No
	Time delay: 0.02 to 300.00 s (step 0.01 s)
	Timing accuracy: ± 30 ms or ± 0.5% (greater of both).
Function 50BF (*)	Function enable: Yes/No
	Time delay: 0.02 to 1.00 s (step 0.01 s)
	Open circuit breaker activation threshold: 8% In
	Open circuit breaker reset threshold: 10% In
	Configurable pickup option
FunctionTRIPBLOCK(*)	Function enable: Yes/No
	Current tap: 1.5 to 20.00 xIn (step 0.01)
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

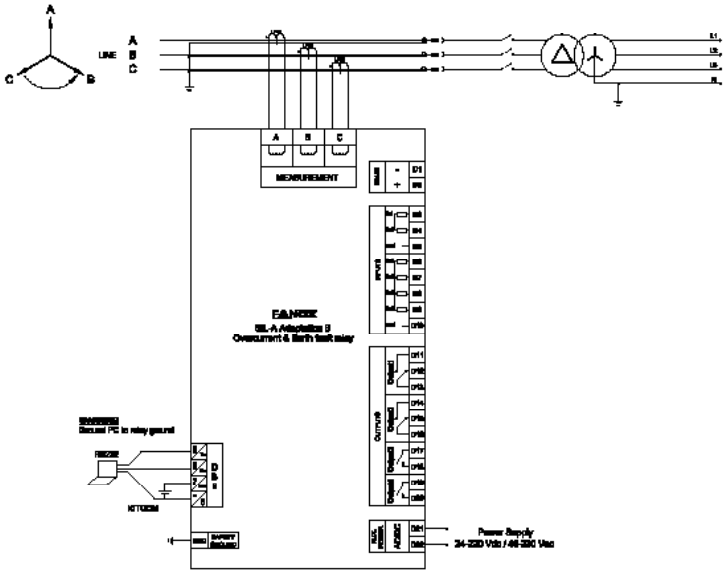
Technical parameters SIL-A

LoadDataProfiling(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) Imax (at the moment of the record) IA IB IC IN
Inputs	Same voltage as the auxiliary power supply: - Adaptation “B”: 6 configurable DI - Adaptation “C”: 4 configurable DI + 2 dedicated DI
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
Currentmeasurements	Adaptation “B”: - Phase current (IA, IB, IC), neutral (IN), positive sequence (I1), negative sequence(I2), maximum current (Imax) and thermal image (TI) Adaptation “C”: - Phase current (IA, IB, IC), neutral (IN), positive sequence (I1), negative sequence(I2), phase second harmonic current (IA-2H, IB-2H and IC-2H), maximum current (Imax) and thermal image (TI)
	Fundamental values (DFT)
	Sampling: 16 samples/cycle
	Measurement accuracy: - Adaptation “B”: ±2% accuracy over a band of ±20% over the nominal current and 4% over the rest of the range - Adaptation “C”: ±2% Accuracy over a band of ±20% over the nominal current and 4% or ±5 mA (greater of both) over the rest of the range
	Saturation limit: 30 times rated current
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. (IEC 60870-5-104 only for adaptation “B”) (*)
Power supply	24-230 Vdc / Vac -20%/+10%
Environmentalconditions	Operating temperature: -10 to 70ºC
	Storage temperature: -20 to 80 ºC
	Relative humidity: 95%
Transformers	Measurement 3 or 4 CT /5 or /1
	Measurement 3 LPCT (current transformers with voltage output. (only for adaptation “B”))

Mechanicalcharacteristics	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	

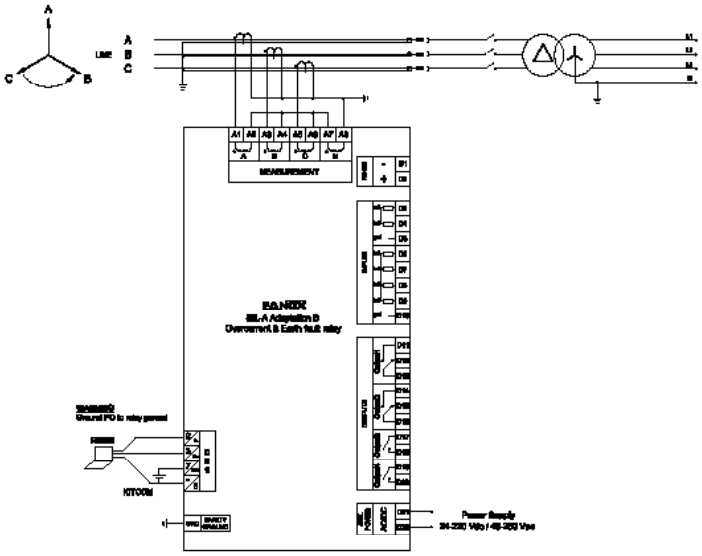
Connections diagram SIL-A

• 3 LPCT Transformers

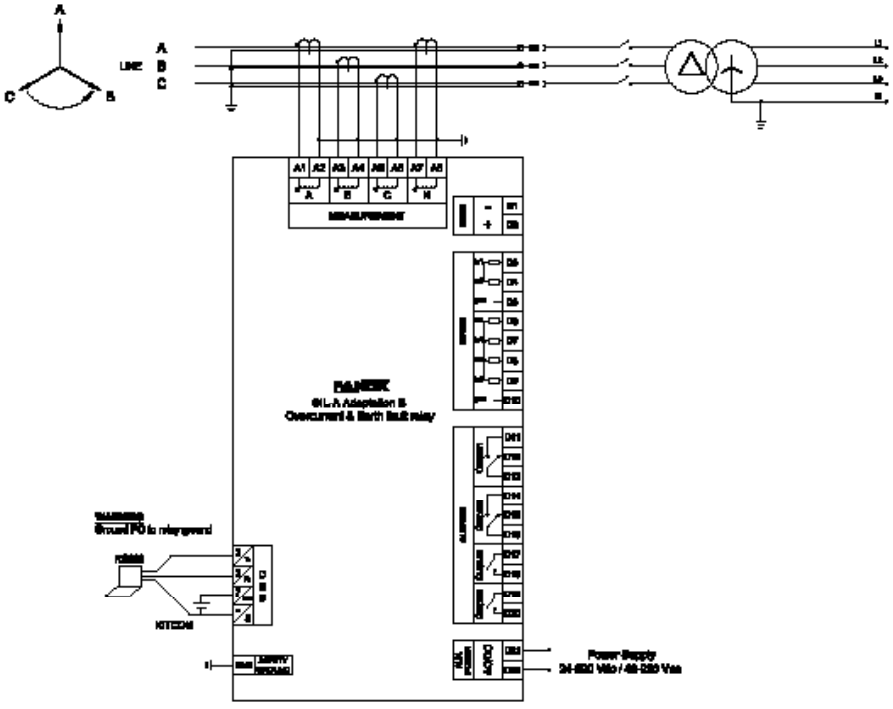


LPCT

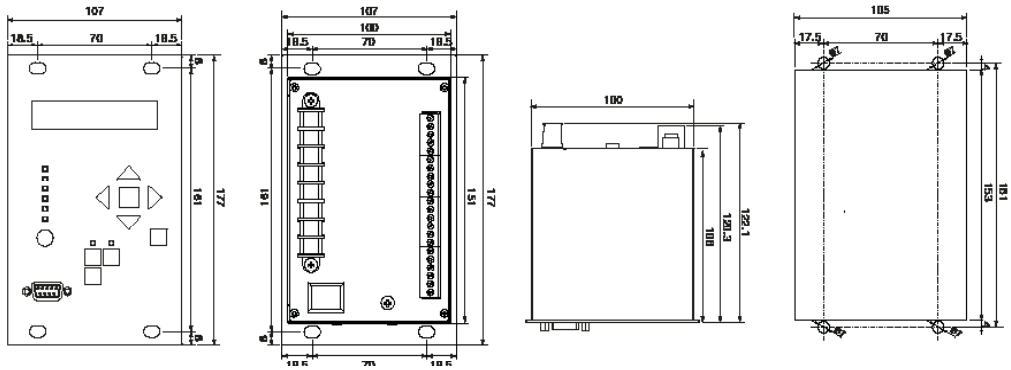
• 3 Standard Current Transformers



• 4 Standard Current Transformers



Dimensions and cutout SIL-A



Selection & Ordering data SIL-A

SIL-A	Overcurrent & Earth Fault Protection Relay for Primary & Secondary Distribution	
X 0 S		**PHASE CURRENT MEASUREMENT** LPCT (Primary In = 50- 800 A) Standard: 1 A or 5 A Sensitive 0.5 A or 2.5 A
X 0 S		**NEUTRAL CURRENT MEASUREMENT** LPCT (Neutral internally calculated) Standard: 1 A or 5 A Sensitive 0.1 A or 0.5 A
0		**NET FREQUENCY** Defined by General Settings
C		**POWER SUPPLY** 24-230 Vac/dc
0 2 4		**ADDITIONAL FUNCTIONS** - + 49 + 60CTS + 37 + 46BC + Trip Block + 49 + 46BC + SHB (Available only for Adaptation “C”)
A B C 7 8		**COMMUNICATIONS** RS232 (Modbus RTU) + RS485: (Modbus RTU or IEC60870-5-103) RS232 (Modbus RTU) + RJ45 (IEC61850) RS232 (Modbus RTU) + RJ45 (IEC60870-5-104) RS232 (Modbus RTU) + RS485 (Modbus RTU or DNP3.0 serial) RS232 (Modbus RTU) + RJ45 (Modbus TCP/IP or DNP3.0 TCP/IP)
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 Turkish and Russian
	B C	**ADAPTATION** Default Functions: 50_1 + 50_2 + 51 + 50G_1 + 50G_2 + 51G + 52 + 50BF + 46 + 79 + 74TCS + CLP + 86 + 49T Default functions: 50 + 51 + 50G + 51G + 52 + 46 + 79 + 74TCS (with dedicated inputs) + CLP + 86 + 49T

Example of ordering code:

SIL-A	0	0	0	C	2	A	1	2	A	B	*SILA000C2A12AB*