SIL-B

Feeder Protection Relay for Primary Distribution

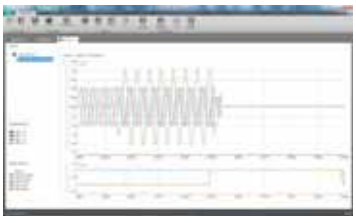
Main characteristics

- The SIL-B is a relay for primary distribution which is able to protect a feeder by means of current and voltage functions.

  It is normally used with a circuit breaker as cutting element.
- SIL-B is used with auxiliary power supply (110-230 Vac/ 90-300 Vdc and optionally 24-48 Vdc).
- Protection functions available in SIL-B are the following:

  50P (2), 50N/G (2), 67P (2), 67N (2), 46, 59P (2), 59N (2), 27P (2), 32/40 (4), 79, 50BF, 52, 49, 86 Cold Load Pick-up, 49T, 74TCS.

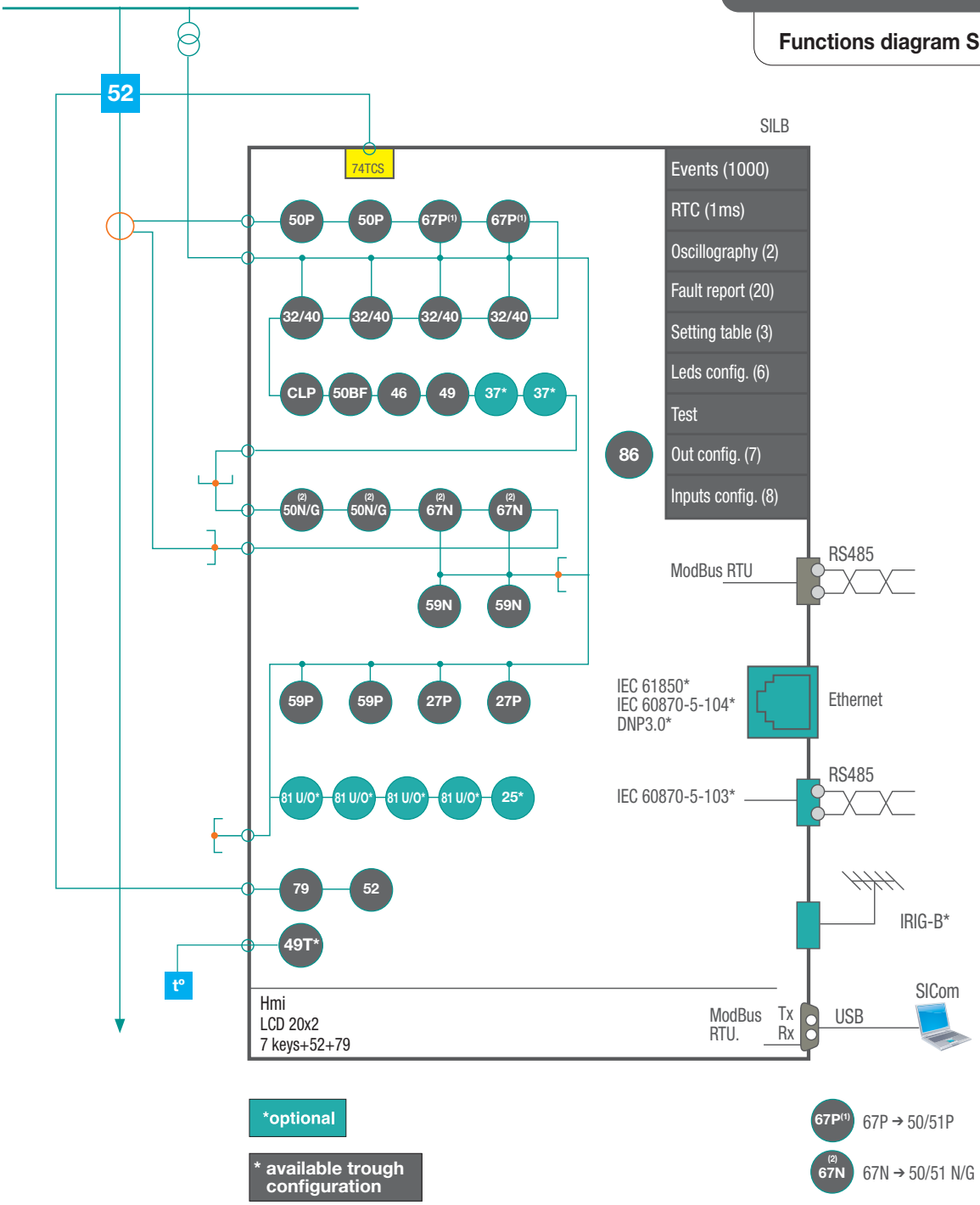
  Optionally: 81 U/O, 25, 37 and IRIG-B.
- 79 protection function (Recloser) allows up to 5 attempts of reclosing which can be programmed by the user.
- SIL-B has metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Its reduced size makes the SIL-B relay easy to install and its light weight helps the customer to save costs in transport.
- Direct signalling/control both of the circuit breaker (52 function), both of the recloser (79 function).
- To allow the communication relays have a communication port on the front of the equipment
- Two rear ports on the back for remote communication. Two communication protocols can be used simultaneously:
  - MODBUS RTU
  - IEC 60870-5-103, IEC 61850, DNP 3.0 or IEC 60870-5-104
- SIL-B can show different measurements like:
  - Phase r.m.s. currents, neutral r.m.s. current, positive / negative sequence currents
  - Phase r.m.s. voltages, residual neutral voltage r.m.s, voltage between phases and Busbar phase voltage
  - Angle current of each phase respect to phase A voltage
  - Cos Phi (power factor and each phase power factor)
  - Active power, reactive and apparent power (Total power and each phase power)
  - Line frequency and Busbar frequency
  - Phase difference between phase B line voltage and busbar voltage
- The SIL-B has 8 configurable inputs and 7 configurable outputs.
- 2 oscillographic records, 20 fault reports and non-volatile RAM memory: stores 1.000 events with date/time event without power supply thanks to its internal RTC (Real Time Clock).



Additional information to fault reports

Technical specifications SIL-B

Functions diagram SIL-B



*optional

* available trough configuration

67P(1) 67P → 50/51P

(2) 67N 67N → 50/51 N/G

Technical parameters SIL-B

Function 50P(2)	Function permission : yes/no
	Operating range: 0.10 to 30 xIn (step 0.01)
	Operating time: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: ±0.5% or ±30 ms
Function 50N/G(2)	Function permission : yes/no
	Operating range: 0.10 to 30 xIn (step 0.01)
	Operating time: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: ±0.5% or ±30 ms
Function 67P(2)	Function permission : yes/no
	Operating range I: 0.10 to 7 xIn (step 0.01)
	Operating range V: 4 to 170V (step 1 V)
	IEC 60255-151 and ANSI curves
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 2.20 (step 0.01)
	Directionality: yes/no
	Operating angle: 0 to 359º (step 1º)
	Half cone angle: 0 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%
	Instantaneous deactivation
	Timing accuracy: 5% or 30 ms (whichever is higher)
Function 67N(2)	Function permission : yes/no
	Operating range I: 0.10 to 7 xIn (step 0.01)
	Operating range V: 4 to 170 V (step 1 V)
	IEC 60255-151 and ANSI curves
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 2.20 (step 0.01)
	Directionality: yes/no
	Operating angle: 0 to 359º (step 1º)
	Half cone angle: 0 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%
	Instantaneous deactivation
	Timing accuracy: 5% or 30 ms (whichever is higher)
Function 46	Function permission : yes/no
	Operating range: 0.10 to 1 xIn (step 0.01)
	IEC 60255-151 and ANSI curves
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 2.20 (step 0.01)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Instantaneous deactivation
	Timing accuracy: 5% or 30 ms (whichever is higher)

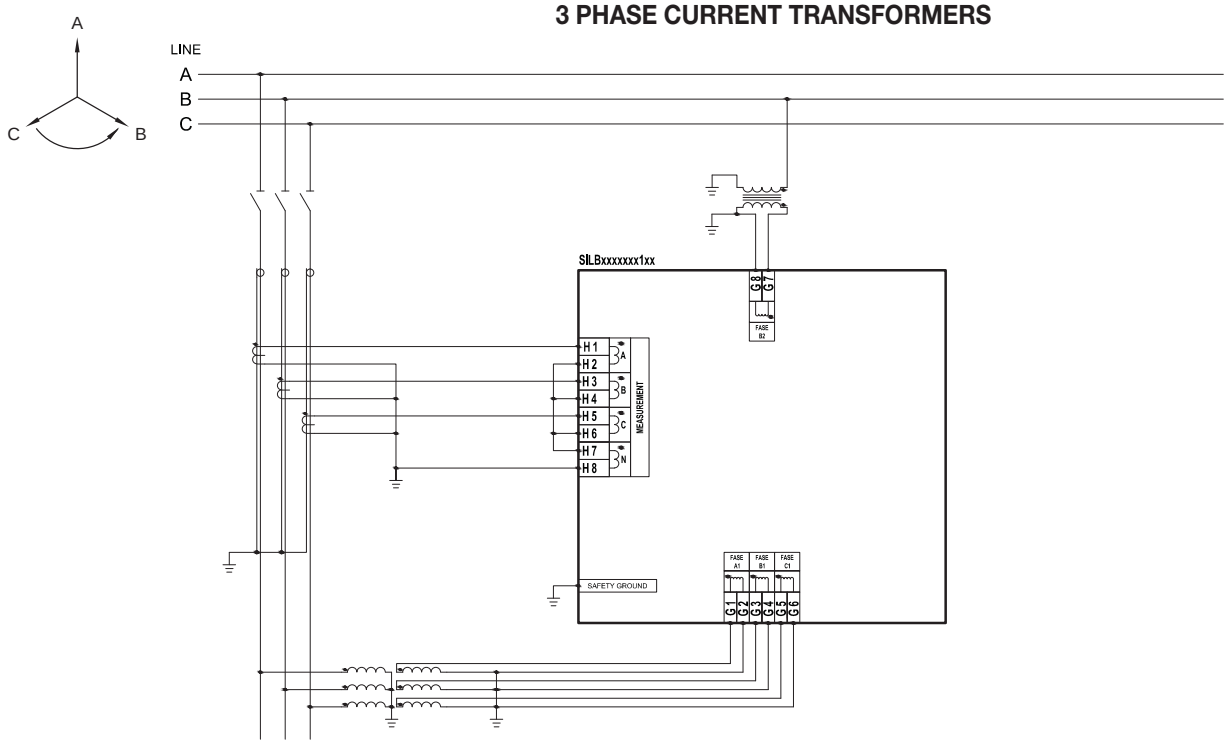
Function 49	Function permission : yes/no
	Tap: 0.10 a 2.40 Inominal (step 0.01)
	heating: 3 a 600 minutos (step 1 min)
	cooling: 1 a 6 veces heating (step 1)
	Alarm level: 20 a 99% (step 1%)
	Trip level: 100%
	Deactivation level: 95% of alarm level
	Timing accuracy: ± 5% respect of theorical value.
	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 49T	Available through configurable inputs
Function 37(2) (*)	Function permission : yes/no
	Operating range: 0.10 to 30 xIn (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 105%
	Instantaneous reset
	Timing accuracy: ±0.5% or ±30 ms
Function 59P(2)	Function permission : yes/no
	Operating range: 4 to 170V (step 1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.2 to 1200.0 s (step 0.1 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ±0.5% or ±30 ms
Function 59N(2)	Function permission : yes/no
	Operating range: 4 to 170V (step 1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.2 to 1200.0 s (step 0.1 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation
	Timing accuracy: ±0.5% or ±30 ms
Function 27P(2)	Function permission : yes/no
	Operating range: 4 to 170V (step 1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.2 to 1200.0 s (step 0.1 s)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
	Timing accuracy: ±0.5% or ±30 ms
Function 32(4)	Function permission : yes/no
	Operating range: 0 to 10000 VA (step 1 VA) – secondary values
	Operating angle: 0 to 359º (step 1º)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
Function 81(4) (*)	Function permission : yes/no
	Type: Underfrequency or overfrecuency
	Operating range: 45.00 to 65.00 Hz (step 0.01 Hz)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Reset time: 0.2 to 1200.0 s (step 0.1 s)
	Block function if phase b voltage is lower than 30 volts
	Activation level: 100%
	Underfrequency reset level: activation level + 50mHz Overfrequency reset level: activation level – 50 mHz
	Temporized deactivation
	Timing accuracy: ±0.5% or ±30 ms

Circuit breaker monitoring	Breaker state: start, open, closed, error, opening time, opening error, closure time, closure error
	52a input and/or 52b input
	Opening and closure commands
	Maximum number of openings alarm: 1 a 10000
	Total amps alarm: 0 to 100000 M(A^2)
	Excess repeated openings: 1 a 10000
	Repeated openings excess time: 1 to 300 min
Function 50BF	Function permission : yes/no
	Opening failure time: 0.02 to 1.00 s (step 0. 01 s)
	Open breaker activation threshold: 8% In
	Open breaker reset time: 10% In
	Function start: Device trip, opening failure input activation, breaker opening command activation
Function 79	Function permission : yes/no
	Wait 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)
Function 25 (*)	Closure permission LLLB, LLDB, DLLB, DLDB: yes/no
	Live line/bar voltage level: 30 to 170 V (step 0.1 V)
	Dead line/bar voltage level: 4 to 170 V (step 0.1 V)
	Voltage supervisión temporisation: 0.02 to 300 s (step 0.01 s)
	Line-bar voltage difference: 4 to 170 V (step 0.1 V)
	Line-bar phase difference: 0 to 359º (step 1 º)
	Line-bar frequency difference : 0.02 to 0.50 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
74TCS	Function permission: yes/no
	Operating time: 0.02 to 300 s (step 0.01 s)
	Command voltage presence: -40%
	Trip continuity, in circuit a and b.
CLP	Function permission : yes/no
	50P_1 multiplier range: 1 to 5
	50P_2 multiplier range: 1 to 5
	67P_1 multiplier range: 1 to 5
	67P_2 multiplier range: 1 to 5
	50N/G_1 multiplier range: 1 to 5
	50N/G_2 multiplier range: 1 to 5
	67N_1 multiplier range: 1 to 5
	67N_2 multiplier range: 1 to 5
	Time to pass to CLP: 1 to 18000 s (step 1 s)
	CLP duration time: 1 to 18000 s (step 1 s)
	CLP activation threshold: 8% In
	CLP deactivation threshold: 10% In
Programmable logic control (PLC)	OR16, OR16_LATCH, NOR16, NOR16_LATCH
Function 86	Allows to latch (lock out) the contact trip due to programmable logic (PLC: OR_LATCH).
Settings tables	3 setting tables
	Selectable by input or general setting.
RTC	Condenser charge time: 10 minutes
	Functioning without auxiliary voltage: 72 hours

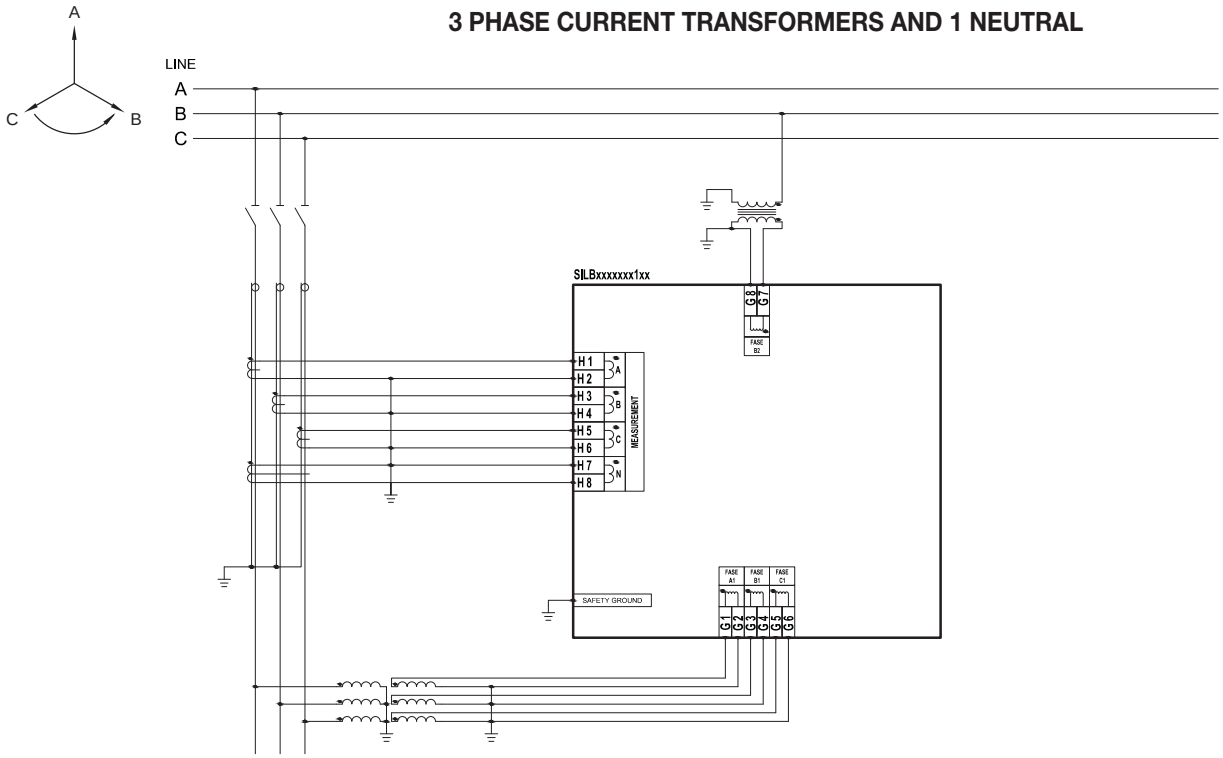
(*) Depending on the model.

Oscillography	16 samples/cycle
	Oscillo starting configuration
	2 records: 10 cycles pre-fault and 128 post-fault
	COMTRADE IEEE C37.111-1991
	8 analogue channels and 120 digital channels
Fault report	20 fault reports with 80 events in each
8 configurable inputs	The voltage of the inputs is the same as the auxiliary power supply
7 configurable outputs	250 V AC – 8 A 30 V DC – 5 A
	Output 1 and output 2:Commuted (NC + NO) Others: NO
Frequency	50/60Hz
Current measurement	Phase currents (IA,IB,IC), neutral (IN), positive sequence (I1) and negative sequence (I2)
	Real RMS
	Sampling: 16 samples/cycle
	±2% precision in a band covering ±20% of nominal current and ±4% in the rest of the range
Voltage measurement	Phase voltage (VA,VB,VC), phase-phase voltage (VAB,VBC,VCA), neutral voltage (VN), bus voltage (VBB)
	The neutral voltage is calculated internally from the phase voltages.
	Real RMS
	Sampling: 16 samples/cycle
	±2% precision in a band covering ±20% of nominal current and 4% in the rest of the range
	Measure: 4 to 185V
Angle accuracy	±2º
Power measurement	Total and per phase active power
	Total and per phase reactive power
	Total and per phase apparent power
	Total and per phase power factor
	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 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.
	Minimum voltage: 30V
	Accuracy: ±0.01 Hz
Communications	Local port (USB): Modbus RTU
	Remote port RS485: Modbus RTU
	Remote port RS485: IEC 60870-5-103 (*)
	Remote port RJ45: IEC 61850 , DNP3.0 and IEC60870-5-104 (*)
Auxiliary power supply (*)	90 V DC – 300V DC / 110 V AC – 230 V AC ±20%
	24V DC - 48 V DC ±10%
Environmental conditions	Operating temperature: -10 to +70ºC
	Storage temperature: -20 to +80 ºC
	Relative humidity: 95%
Mechanical characteristics	Metal case
	Panel mounting
	1/2 Rack – 4 U
	IP-54

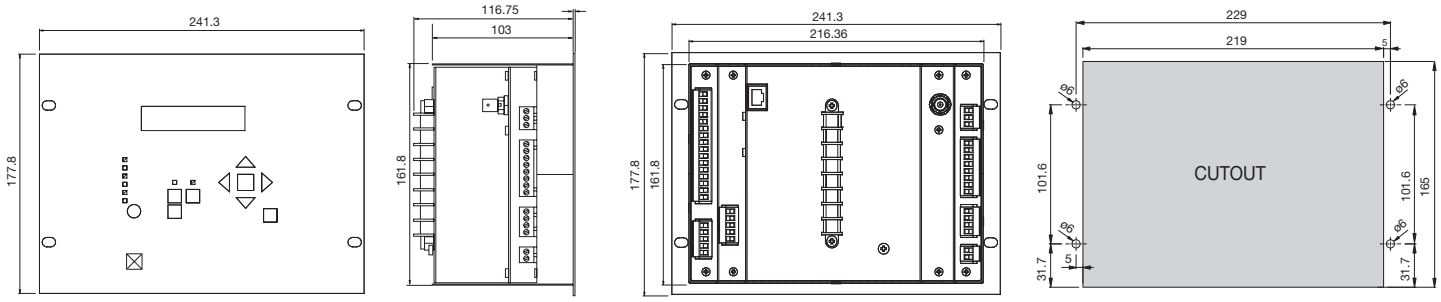
3 PHASE CURRENT TRANSFORMERS



3 PHASE CURRENT TRANSFORMERS AND 1 NEUTRAL



Dimensions and cutout pattern SIL-B



Selection & Ordering data SIL-B

SIL-B											
											PROTECTION FUNCTIONS 50P(2) + 50N/G(2)+ 67P(2) + 67N(2) + 59P(2) + 59N(2) + 27P(2) + 32(4) + 52 + 50BF + 46 + 79 + 74TCS + Cold Load Pick-up + 49 + 86 + 49T
	1 **5**										**PHASE MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A)
		1 **5**									**NEUTRAL MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A)
			5 **6**								**NET FREQUENCY** 50 Hz 60 Hz
				A **B**							**POWER SUPPLY** 24-48 Vdc 90-300 Vdc / 110-230 Vac
					0 **1** **2**						**ADDITIONAL FUNCTIONS** - + 81U/O(4) + 25 + 37(2) + 81U/O(4) + 25 + 37(2) + IRIG-B
						0 **1** **2** **3** **4** **5**					**COMMUNICATIONS** RS485: ModBus + IEC 60870-5-103 FOP: ModBus + IEC 60870-5-103 FOC-ST: ModBus + IEC 60870-5-103 IEC61850 + ModBus (RS485) DNP3.0 (TCP/IP) + ModBus (RS485) IEC 60870-5-104 + ModBus (RS485)
							0				**INPUTS-OUTPUTS** 8 Inputs and 7 Outputs
								1			**MECHANICS** Compact: 4U x ½ Rack
									A **B** **D**		**LANGUAGE** English, Spanish, French and German English, Spanish , French and Turkish English , Spanish , French and Russian
										A	**ADAPTATION** -

Example of ordering code:

SIL B	**1**	**5**	**6**	**B**	**0**	**1**	**0**	**1**	**D**	**A**	*SILB156B0101DA*

Note: Accessories, page 60-61.