

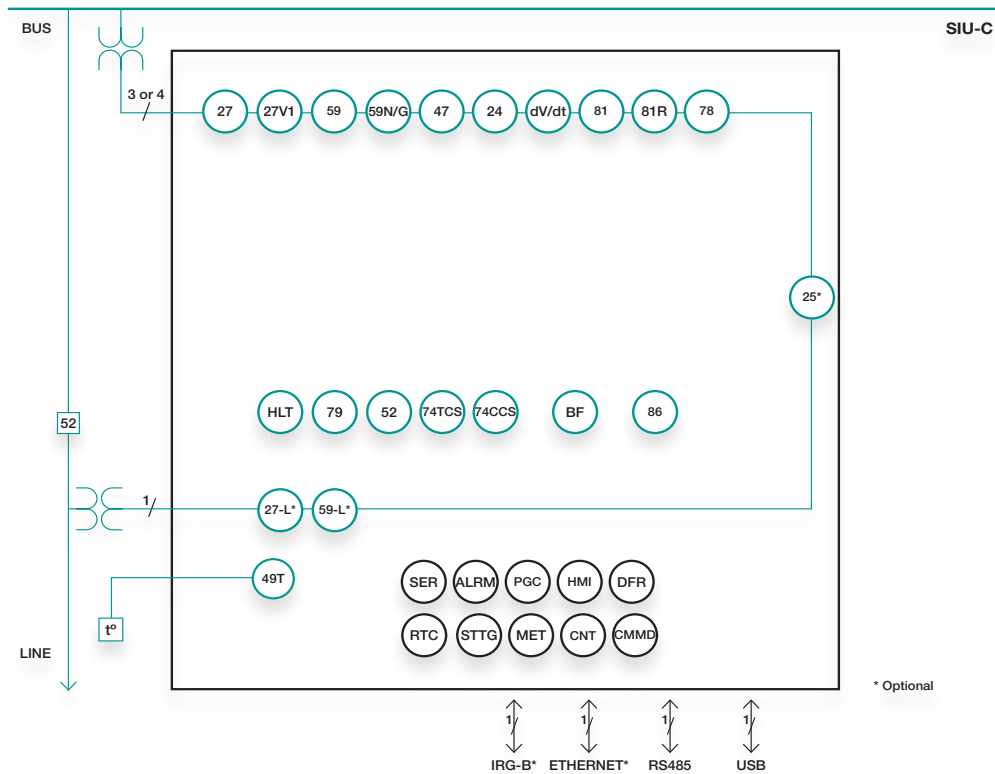
# SIU-C

## Voltage & Frequency Protection Relay



- The SIU-C is a voltage and frequency protection relay for transformers and electrical machines, in high, medium, and low voltage distribution systems with universal auxiliary supply of 24-230 Vdc/ac.
- 5 voltage channels for conventional VTs.
- 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 temperatures.
- 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. SIU-C protection relay detects this situation thanks to its voltage and frequency functions focused on the Rate of change of frequency (ROCOF) method.
- Signalling/control of the circuit breaker (52 function) and the recloser (79 function).
- To allow the communication, relays are provided with a local micro USB front port and with remote communication with different options (ports and protocols) on the rear side:
  - » Rear RS485 Port: IEC60870-5-103, Modbus RTU or DNP3.0 Serial (selectable by general settings).
  - » Rear RJ45 Port: Modbus TCP/IP, DNP3.0 TCP/IP or IEC60870-5-104 (selectable by general settings) + SNTP Protocol + Web Server.
- Synchronization through IRIG-B optional depending on the model.
- The SIU-C is provided with 11 configurable inputs and 5 configurable outputs.
- Alarms panel is available.
- SIU-C is provided with non-volatile RAM memory in order to store up to 3072 events and disturbance fault recording (DFR), maintaining date & time thanks to its internal RTC (real Time Clock).
  - » 5 records in data and COMTRADE format (300 cycles each record): 1 to 8 pre-fault cycles + 292 to 299 postfault cycles.
  - » 25 records in data and COMTRADE format (60 cycles each record): 1 to 8 pre-fault cycles + 52 to 59 postfault cycles.
  - » 50 records in data and COMTRADE format (30 cycles each record): 1 to 8 pre-fault cycles + 22 to 29 postfault cycles.
  - » 100 records in data and COMTRADE format (15 cycles each record): 1 to 8 pre-fault cycles + 7 to 14 postfault cycles.)
- 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 SIU-C



### ANSI CODE PROTECTIONS

<b>59</b>	Inverse Time Phase overvoltage (Bus Bar)
<b>59-L</b>	Inverse Time Phase overvoltage (Line)
<b>59N/G</b>	Inverse Time Calculated/Measured neutral overvoltage (Bus Bar)
<b>47</b>	Phase Balance voltage protection (Bus Bar)
<b>27</b>	Inverse Time Phase undervoltage (Bus Bar)
<b>27-L</b>	Inverse Time Phase undervoltage (Line)
<b>27V1</b>	Inverse Time Positive sequence undervoltage (Bus Bar)
<b>dV/dt</b>	Rate of change of voltage
<b>81O/U</b>	Under/Overfrequency
<b>81R</b>	Rate of Change of Frequency (ROCOF)
<b>78</b>	Out of Step (Vector Shift)
<b>24</b>	Overfluxing
<b>79</b>	AC Reclosing device
<b>HLT</b>	Hot Line Tag
<b>52</b>	Breaker Wear Monitoring
<b>25</b>	Synchro Check
<b>BF</b>	Circuit Breaker Failure
<b>74TCS</b>	Trip Circuit Supervision
<b>74CCS</b>	Close Circuit Supervision
<b>49T</b>	External Trip
<b>86</b>	Trip lockout
<b>PGC</b>	Programmable logic control

### ADDITIONAL FUNCTIONS

<b>CNT</b>	Counters
<b>RTC</b>	Real Time Clock
<b>ALRM</b>	Alarm panel
<b>PGC</b>	Programmable Logic Control
<b>HMI</b>	Human Machine Interface
<b>SER</b>	Sequential Event Recording
<b>DFR</b>	Disturbance Fault Recording
<b>MET</b>	Metering
<b>STTG</b>	Settings Groups
<b>CMMD</b>	Commands

## Technical parameters SIU-C

<b>Function 27-1</b>	Function enable: No/Alarm/Trip	<b>Function 59-1</b>	Function enable: No/Alarm/Trip
	Curve type: IDMT or DT		Curve type: IDMT or DT
	Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.060 to 300.000 s (step 0.001 s)		Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.045 to 300.000 s (step 0.001 s)
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)		Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)		Reset time: 0.020 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Curve, voltage activation level: 110%
	Curve, voltage activation level: 90%		<b>Function 59-2</b>
	Curve, voltage deactivation level: 100%		Curve, voltage deactivation level: 100%
	<b>Function 27-2</b>		Defined time, voltage activation level: 101%
	Defined time, voltage activation level: 99%		<b>Function 59-3</b>
	<b>Function 27-3</b>		Defined time, voltage deactivation level: 99%
<b>Function 27-4</b>	Defined time, voltage deactivation level: 101%		
Temporized deactivation	<b>Function 59-4</b>		
Timing accuracy for IDMT curve selection: $\pm 30$ ms or $\pm 5\%$ (greater of both)	Temporized deactivation		
Timing accuracy for defined time curve selection: $\pm 30$ ms or $\pm 0.5\%$ (greater of both)	Timing accuracy for IDMT curve selection: $\pm 30$ ms or $\pm 5\%$ (greater of both)		
<b>Function 27V1-1</b>	Function enable: No/Alarm/Trip	<b>Function 59N/G-1</b>	Function enable: No/Alarm/Trip
	Curve type: IDMT or DT		Curve type: IDMT or DT
	Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.060 to 300.000 s (step 0.001 s)		Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.045 to 300.000 s (step 0.001 s)
	Voltage tap: 0.15 to 2.00 xUn (step 0.01xUn)		Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)		Reset time: 0.020 to 300.000 s (step 0.001 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Curve, voltage activation level: 110%
	Curve, voltage activation level: 90%		<b>Function 59N/G-2</b>
	Curve, voltage deactivation level: 100%		Curve, voltage deactivation level: 100%
	<b>Function 27V1-2</b>		Defined time, voltage activation level: 101%
	Defined time, voltage activation level: 99%		<b>Function 59N/G-3</b>
	Defined time, voltage deactivation level: 101%		Defined time, voltage deactivation level: 99%
Temporized deactivation	Temporized deactivation		
Timing accuracy for IDMT curve selection: $\pm 30$ ms or $\pm 5\%$ (greater of both)	Timing accuracy for IDMT curve selection: $\pm 30$ ms or $\pm 5\%$ (greater of both)		
Timing accuracy for defined time curve selection: $\pm 30$ ms or $\pm 0.5\%$ (greater of both)	Timing accuracy for defined time curve selection: $\pm 30$ ms or $\pm 0.5\%$ (greater of both)		
<b>Function 27-L (*)</b>	Function enable: No/Alarm/Trip	<b>Function 47-1</b>	Function enable: No/Alarm/Trip
	Curve type: IDMT or DT		Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.060 to 300.000 s (step 0.001 s)		Time delay: 0.045 to 300.000 s (step 0.001 s)
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)		Reset time: 0.020 to 300.000 s (step 0.001 s)
	Minimum level: 0.00 to 1.00 xUn (step 0.01xUn)		Activation level: 101%
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Deactivation level: 99%
	Curve, voltage activation level: 90%		Temporized deactivation
	Curve, voltage deactivation level: 100%		Timing accuracy: $\pm 0.5\%$ or $\pm 30$ ms (greater of both)
	<b>Function 27-L (*)</b>		Defined time, voltage activation level: 99%
	Defined time, voltage deactivation level: 101%		
	Temporized deactivation		
Timing accuracy for IDMT curve selection: $\pm 30$ ms or $\pm 5\%$ (greater of both)			
Timing accuracy for defined time curve selection: $\pm 30$ ms or $\pm 0.5\%$ (greater of both)			

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<b>Function 59-L (*)</b>	Function enable: No/Alarm/Trip	<b>Function 78-1</b>	Function enable: No/Alarm/Trip
	Curve type: IDMT or DT		Activation level: 1 to 25° (step 1°)
	Time dial (TMS): 0.05 to 25.00 (step 0.01) Time delay: 0.045 to 300.000 s (step 0.001 s)		Reset time: 0.020 to 300.000 s (step 0.001 s)
	Voltage tap: 0.08 to 2.00 xUn (step 0.01xUn)		Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Temporized deactivation
	Curve, voltage activation level: 110%		Measurement accuracy: ±1° or ±10% (greater of both)
	Curve, voltage deactivation level: 100%		
	Defined time, voltage activation level: 101%		
	Defined time, voltage deactivation level: 99%		
	Temporized deactivation		
	Timing accuracy for IDMT curve selection:  ± 30 ms or ± 5% (greater of both)		
Timing accuracy for defined time curve selection:  ± 30 ms or ± 0.5% (greater of both)			
<b>Function dV/dt-1</b> <b>Function dV/dt-2</b>	Function enable: No/Alarm/Trip	<b>Function 24-1</b> <b>Function 24-2</b>	Function enable: No/Alarm/Trip
	Type: Increase or Decrease		Curve Type: Inverse A, Inverse B, Inverse C and Defined Time. Time delay: 0.020 to 300.000 s (step 0.001 s)
	Activation level: 1.0 to 20.000 V/s (step 0.1 V/s)		Time dial (TMS): 0.10 to 25.00 (step 0.01)
	Time Delay: 0.500 to 30.00 s (step 0.001 s)		Activation level: 0.50 to 2.00 xUn/Fn (step 0.01 xUn/Fn)
	Reset time: 0.02 to 300 s (step 0.001 s)		Reset Time: 0.00 to 300.000 s (step 0.01 s)
	Timing accuracy: ±60 ms or ± 5% (greater of both).		Curve, activation level: 110%
<b>Function 81-1</b> <b>Function 81-2</b> <b>Function 81-3</b> <b>Function 81-4</b> <b>Function 81-5</b> <b>Function 81-6</b> <b>Function 81-7</b> <b>Function 81-8</b>	Function enable: No/Alarm/Trip	<b>Function 79</b>	Number of recloses: 0 to 4 (step 1)
	Type: Underfrequency or overfrequency		Reclose time 1, 2, 3, 4: 0.020 to 2000.000 s (step 0.01 s)
	Activation level: 45.000 to 65.000 Hz (step 0.001 Hz)		Hold Enable: No/Yes/No Time
	Time delay: 0.020 to 300.000 s (step 0.001 s)		Hold time: 0.000 to 2000.000 s (step 0.01 s)
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Reset time: 0.020 to 2000.000 s (step 0.01 s)
	Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)		Safe time: 0.020 to 2000.000 s (step 0.01 s)
	Activation level: 100%		Locking possibilities: pulse inputs, level inputs, commands.
	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.		
<b>Function 81R-1</b> <b>Function 81R-2</b> <b>Function 81R-3</b> <b>Function 81R-4</b> <b>Function 81R-5</b> <b>Function 81R-6</b>	Function enable: No/Alarm/Trip	<b>Function 25 (*)</b>	Dead tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Type: Increase/Decrease		Live tap: 0.08 to 2.00 xUn (step 0.01xUn)
	Activation level: 0.10 to 5.00 Hz/s (step 0.01 Hz/s)		Voltage supervision time: 0.060 to 300.000 s (step 0.001 s)
	Time delay: 0.060 to 40.000 s (step 0.001 s)		Voltage difference: 0.05 to 2.00 xUn (step 0.01xUn)
	Reset time: 0.020 to 300.000 s (step 0.001 s)		Phase difference: 2 to 90 ° (step 1°)
	Function blocked if phase B voltage is lower than 20 volts P-N (35 volts P-P)		Frequency difference: 0.060 to 10.000 Hz (step 0.001 Hz)
	Activation level: 100%		Synchro check time: 0.020 to 300.000 s (step 0.001 s)
	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.		
<b>Function 74TCS</b>		<b>Function 52</b>	Maximum number of openings: 1 to 100,000 (step 1)
			Repetitive number of openings: 1 to 100,000 (step 1)
			Time for repetitive number of openings: 1 to 300 min (step 1 min)
		<b>Function 74TCS</b>	Maximum opening time: 0.020 to 300.000 s (step 0.01 s)
			Maximum closing time: 0.020 to 300.000 s (step 0.01 s)
			Function enable: No/Yes
			Time delay: 0.020 to 300.000 s (step 0.001 s)
			Continuity in circuits A and B

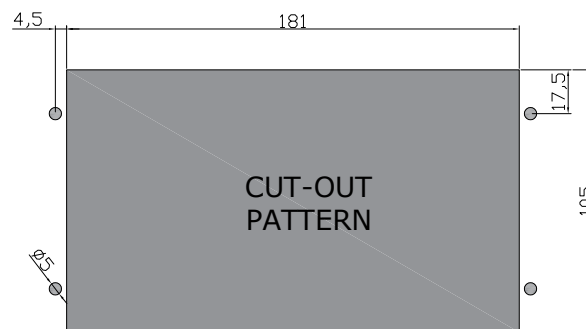
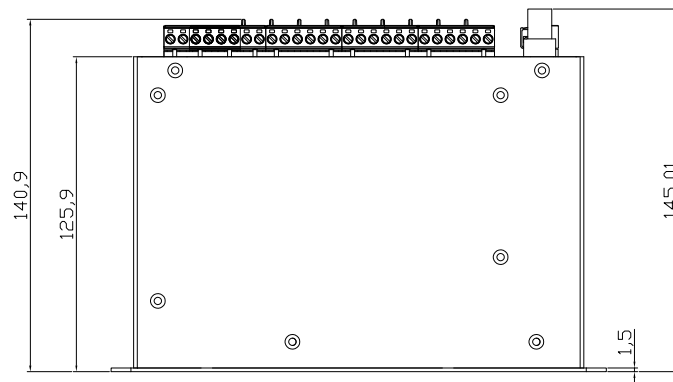
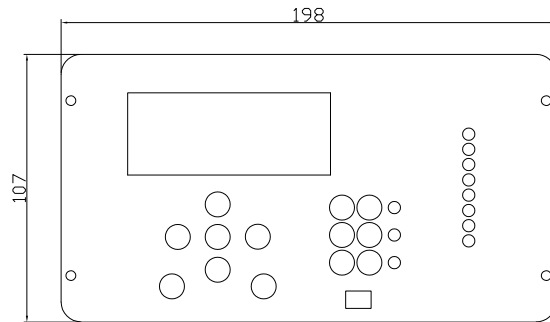
## Technical parameters SIU-C

<b>Function 74CCS</b>	Function enable: No/Yes
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Continuity in circuits A and B
<b>Function BF</b>	Function enable: No/Yes
	Time delay: 0.020 to 1.000 s (step 0.001 s)
<b>Function 49T</b>	Available through configurable inputs thanks to the programmable logic
<b>Function 86</b>	It allows to latch (lock out) the contact trip due to programmable logic (PGC: RSFF or SRFF).
<b>Programmable logic control (PGC)</b>	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, SRFF_NON VOLATIL
<b>Settings Groups</b>	4 settings groups
	Selectable by input, communications, user commands or general setting.
<b>Sequential Events Recording (SER)</b>	3072 events
<b>Disturbance fault recording (DFR)</b>	32 samples/cycle
	Fault start configurable
	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 postfault cycles.
	25 records in data and COMTRADE format (60 cycles each record): 1 to 8 pre-fault cycles + 52 to 59 postfault cycles.
	50 records in data and COMTRADE format (30 cycles each record): 1 to 8 pre-fault cycles + 22 to 29 postfault cycles.
<b>Inputs</b>	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
<b>Outputs</b>	5 configurable outputs Output 1: NO-NC; the rest of the outputs: NO. 250 V AC – 8 A; 30 V DC – 8 A Contact current short duration: 30A – 200ms

<b>Frequency</b>	50/60Hz
<b>Energizing Quantities</b>	Burden of voltage inputs:  < 70 mVA
	Burden of power supply unit:  24-230 Vdc/Vac: < 20 VA
	Burden for binary inputs: 24 Vdc: <20 mW 230 Vdc: <200 mW 24 Vac: <50 mW 230 Vac: < 500 mW
	Phase voltage (VA, VB, VC), Line Voltage (VL)*, phase-phase voltage (UAB, UBC, UCA), neutral voltage (VR, 3V0), positive sequence (V1) and negative sequence (V2), Maximum voltage (VMAX) and V/f.
<b>Voltage measurements</b>	Fundamental values (DFT)
	Sampling: 32 samples/cycle
	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)
<b>Angle Measurement</b>	- With VTs: 3-250 V - Direct connection: Up to 1000 V
	Voltage Angles: VA, VB, VC, VR, VL*, 3V0, UAB, UBC and UCA.
<b>Frequency measurements</b>	Busbar Frequency, Line Frequency, Rate of change of frequency (df/dt)
	Minimum voltage: 20V P-N (35 P-P)
	Accuracy: ±0.005 Hz
<b>Communications</b>	Local port (micro-USB): Modbus RTU
	Remote port RS485: Modbus RTU, DNP3.0 or IEC60870-5-103
	Remote port RJ45 (10/100Base-TX): DNP3.0 TCP/IP, IEC60870-5-104 or Modbus TCP/IP + Web Server + SNTP Protocol + IIRIG-B (*)
<b>Power supply</b>	24-230 Vac/dc (24-220 Vdc (±20%) / 100-230 Vac (±15%))
	Burden: 24-230 Vdc/Vac: < 20 VA
<b>Environmental conditions</b>	Operating temperature: -40 to 70°C
	Storage temperature: -40 to 80°C
	Relative humidity: 95%
<b>Mechanical characteristics</b>	Metallic box
	Panel mounted
	Vertical assembly: HxWxD: 198x107x145.01 (mm) Horizontal assembly: HxWxD: 107x198x145.01 (mm)
	IP-54 (front)
(*) Optional depending on model	

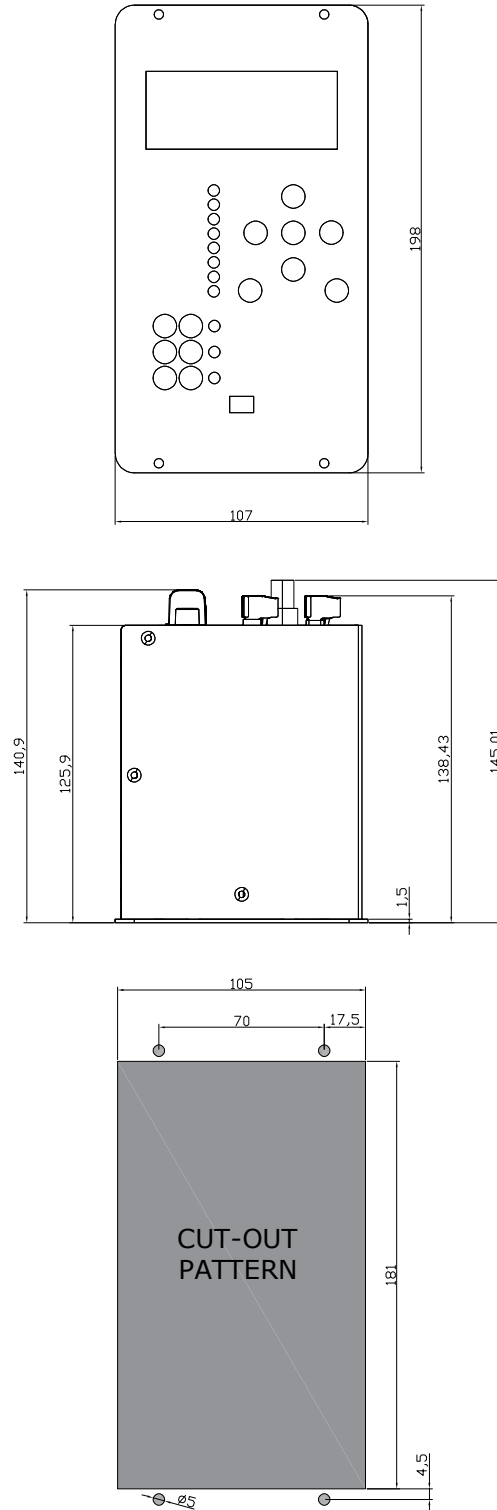
## Dimensions and cutout SIU-C

Horizontal assembly



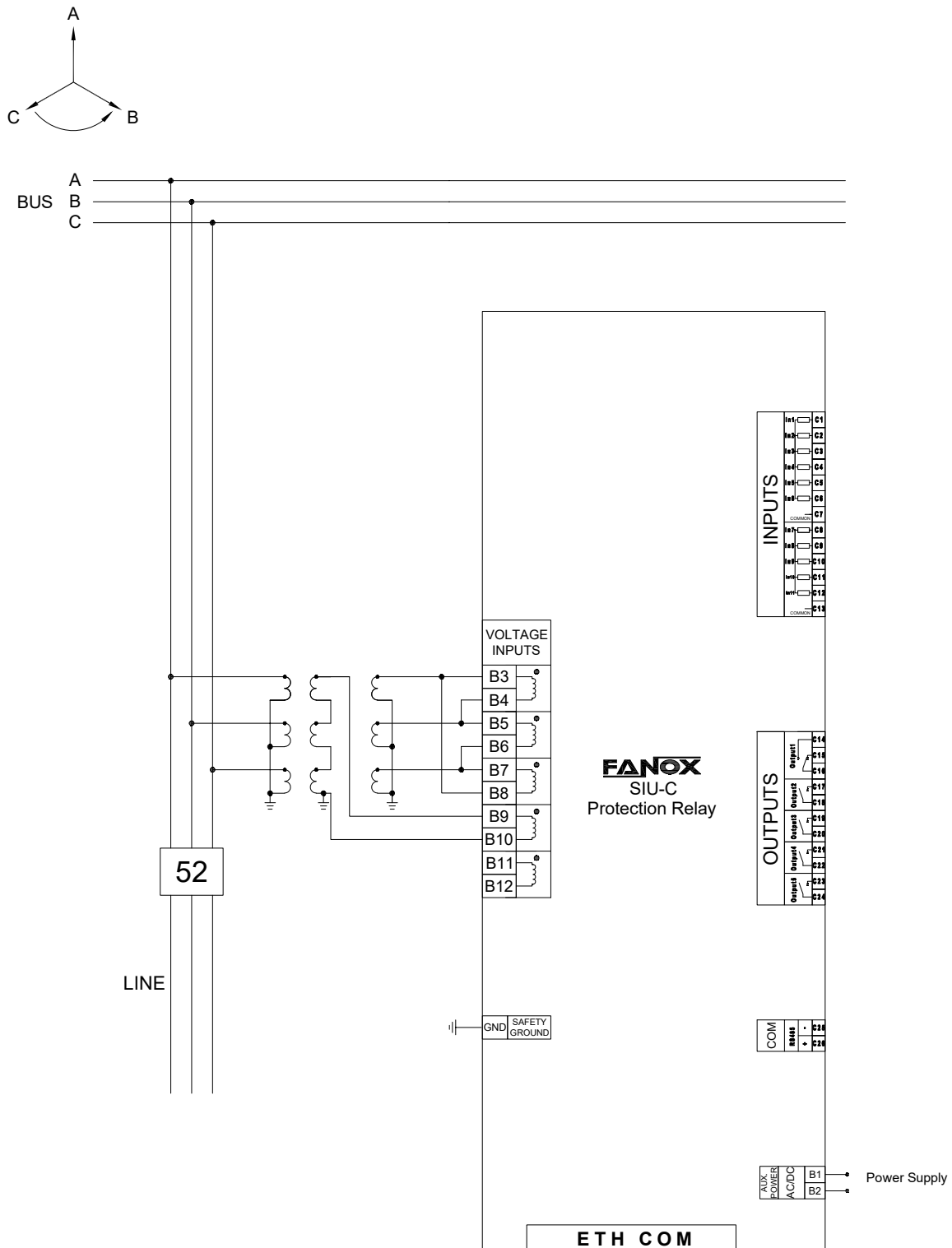
## Dimensions and cutout SIU-C

Vertical assembly



## Connections diagram SIU-C

3 VTs CONFIGURATION (PHASE-PHASE) + RESIDUAL VOLTAGE

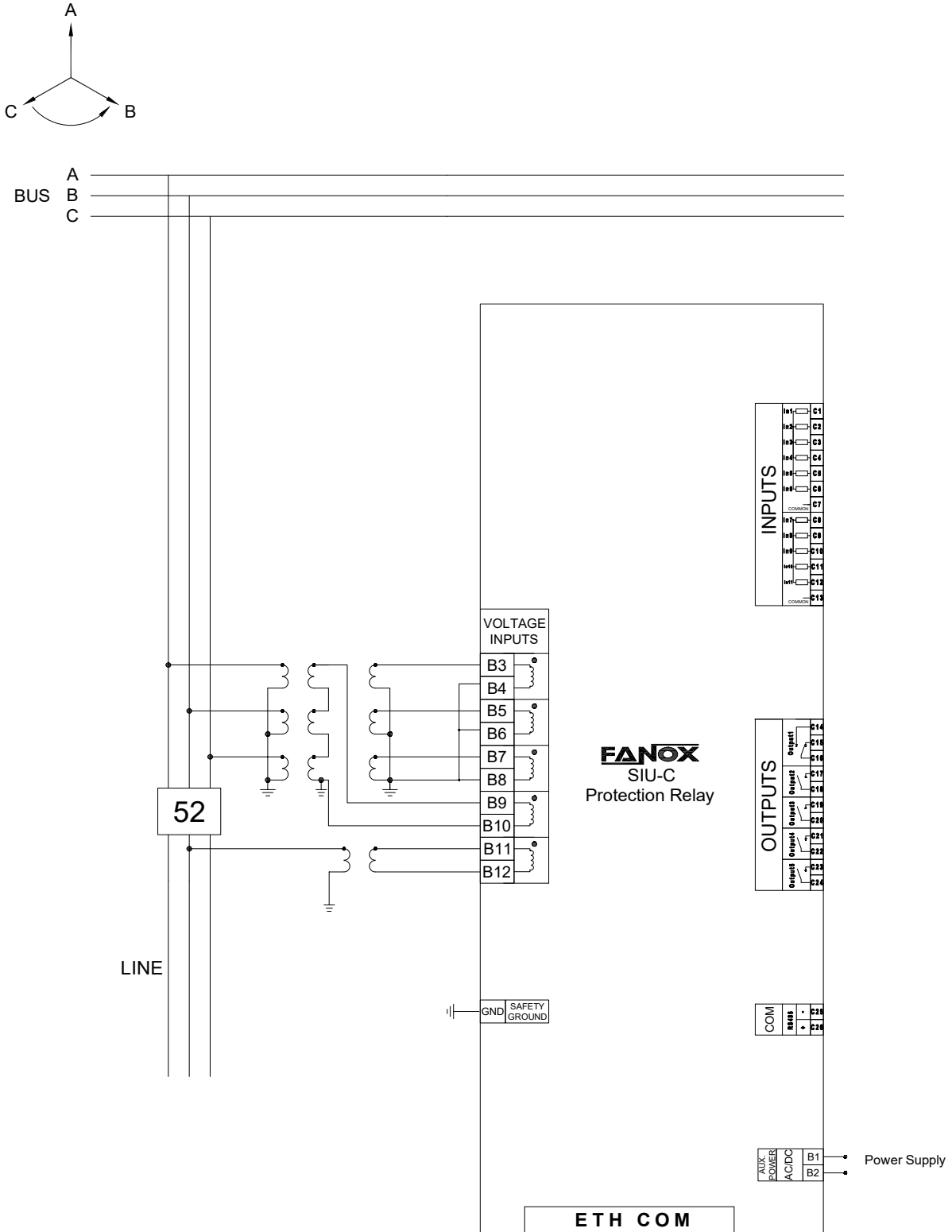


(\*) Example of connections diagram



# Connections diagram SIU-C

3 VTs CONFIGURATION (PHASE-NEUTRAL) + RESIDUAL VOLTAGE + 1 VT FOR SYNCHRONISM



(\*) Example of connections diagram

