FANOX

Specialized in
Self Powered Relays

GENERAL CATALOGUE

power T&D

Secondary and Primary Distribution Protection

- Dual & Self Powered Relays
- Overcurrent & Earth Fault Protection Relays
- Feeder / Generator Protection Relays

IEC 61850

protection & control

Protection & Control

- Electronic Protection & Control Relays for Motors, Generators and Pumps
- Control & Measurement
- Earth Leakage Protection Relays
- Transformers
- Surge Protection

The last decade has been a period of strong growth and international expansion for Fanox, making us one of the leading companies specializing in the design and manufacture of electronic relays for Low and Medium Voltage applications.

Since its founding back in 1992, we have developed a wide range of products for multiple applications in the low voltage sector, designing and launching new products to the market every year. These products have always been designed with one major focus; namely to reduce and save high installation and running costs for end user.

FANOX' international growth, has also led to expansion into the medium sector. Our MV Division is now one of the main focus areas of development, thanks to the decisive contribution of a highly qualified R&D department.

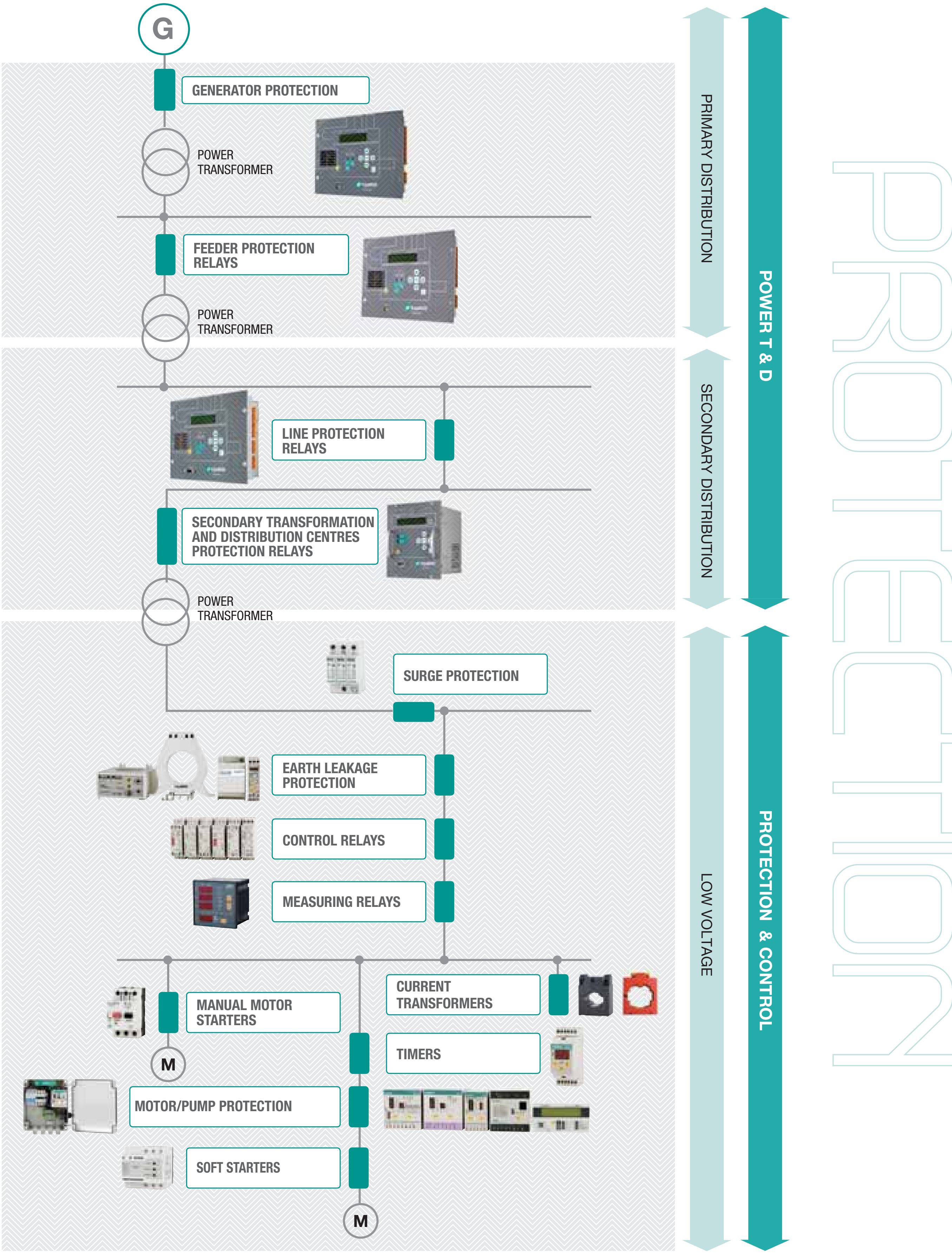
Resting on a strategy of sustainable growth, solid management capabilities and a very high technological potential, Fanox meets the future with a solid outlook, where we will be able to respond successfully to challenges thrown at us.

With the Quality Management System based on ISO 9001:2008 Fanox guarantees the highest quality services and products to its customers' satisfaction.

Fanox products meet the most relevant international standards. We carry the CE marking and have UL approvals (Underwriters Laboratories) for USA, c-UL for Canada and the PTB (Physikalisch-Technische Bundesanstalt) for EEx e motors working in explosive atmospheres (ATEX Certified).

Fanox' human resources have undergone a tremendous growth over the past decade, becoming a highly specialized team with high capacity for adaptation and development. It is a multicultural team which faces the challenges set by a strategic business plan which has its people and integrity as its main values.

FANOX PRODUCTS



POWER T&D

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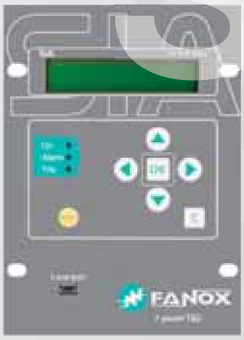
power T&D

5
Five year guarantee

FANOX
power T&D




FAMOT

Specialized in Ring Main Unit and Switchgear Protection

Why is Fanox the world's leading manufacturer of SELF POWERED Relays?

Our innovative spirit, the direct care of the market requirements and our extensive experience in the manufacture of protection relays, have made our **Self Powered Relays** a reference worldwide.

The relays include the latest technology: LCD, keyboard, event recording, SCADA communication, PC software ...

Utilities worldwide have relied on our technology for over 20 years.

Main advantages over other brands:

- The relays are **self powered by the operating current.** No batteries, chargers or any other external power sources are required. This means that the maintenance of transmission and distribution centers is **heavily reduced.**
- **High electromagnetic compatibility** makes FANOX relays the safest in the market. KEMA certification proves it.
- 5 years **warranty al least**.
- **Standard CTs** /1A or /5A can be used saving money.
- The **energy available to trip** the striker is the highest in the market: 24V - 135mJ.
- Possibility of **SCADA** communication for all relays.
- Very intuitive menu, extremely **easy to adjust.**
- Our **flexible design** offers solutions for all the applications worldwide: coils,strikers, dual-powered installations...
- No one in the market gives more quality and specifications with so **competitive prices.**

Besides, all models can be powered from an external battery, in order to make easier the commissioning and start-up of installations, to manage the incidents that may occur and also to manage the devices in adverse conditions.

Solutions for the Smart Grid and Predictive Maintenance Network

Our relays incorporate new industry trends in remote communication protocols for automatized substations.









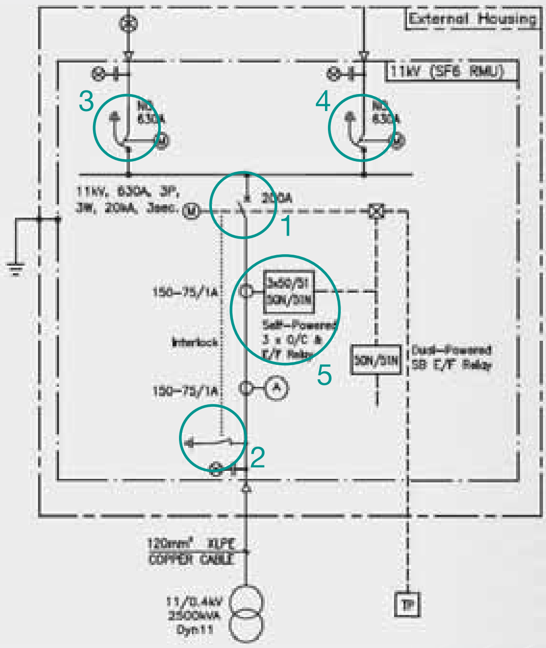

Evolution of RMU's Protection Systems

SIA-C Self and Dual Powered protection relay is the **most effective protection** relay for **SF6 RMUs** for secondary distribution (up to 13.8kV, 17.5kV, 24kV or 34.5kV). Its applications are quite varied.

But first of all...

What is a RMU?

We can define a Ring Main Unit as a standard piece of switchgear in distribution systems comprising of switches for switching power cable rings and of switches in series with fuses or circuit breakers for the protection of distribution transformers.



Breaking components:

1 Vacuum Circuit Breaker

2 Earth switch

3 Ring Switch with remote control

4 Ring Switch with remote control

5 Self Powered relay protection

Changes and developments

RMUs protection systems have experienced in recent years an outstanding development and modernization. Protection, control measurement, communication in addition to the need of simplify the maintenance of the installations are behind the current trend of change.

Switchgears and RMUs need to be **firmly and safely under control** and traditional RMUs based on switches with fuses don't meet the requirements of the market.

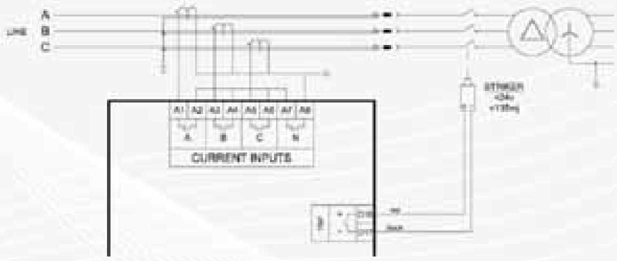
The need for electronic devices **without maintenance** has passed from a desire to a necessity.

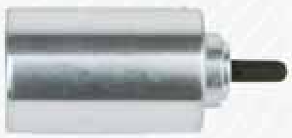
RMUs based on switches with 3 fuses are being substituted by SF6 **circuit breakers** and **self powered protection relays**. This way, batteries are removed, events and alarms of the RMU are stored in the relay and the Grid can be remotely motorized thanks to the communications that FANOX's protection relays have.

In most cases there is a lack of access to the installation. Not all facilities are roadside. Some are buried, or in areas of difficult access where replacing a fuse can entail a big problem.

Circuit breaker can be opened by the action of tripping coils or tripping strikers. When self powered relays are installed in the SF6 RMUs, the circuit breaker is opened by the action of a **tripping striker** that is activated by a 24V supply that the self powered relay provides.

The striker is an electromagnet that is loaded at the closing of the switchgear, and is required low-energy trigger to release them. Different models and tensions, and in general the selection of it is a compromise between mechanical security and tripping energy, but in general are a reliable and high quality element.





RMUs for primary distribution have a capacity of up to 50kA short circuits, rated currents up to 4000A. They usually use vacuum circuit breakers and air isolation.

RMUs for secondary distribution have a capacity of up to 21kA short circuit, rated currents up to 630A. They usually use vacuum circuit breakers and SF6 isolation.

All these improvements are focused in having the installation under the safest control and in saving cost in terms of material and personnel.

Fanox as a specialist in SELF POWERED relays, is the best ally to adapt your switchgear to what market demands.

Some success applications for our SIA-C Relay

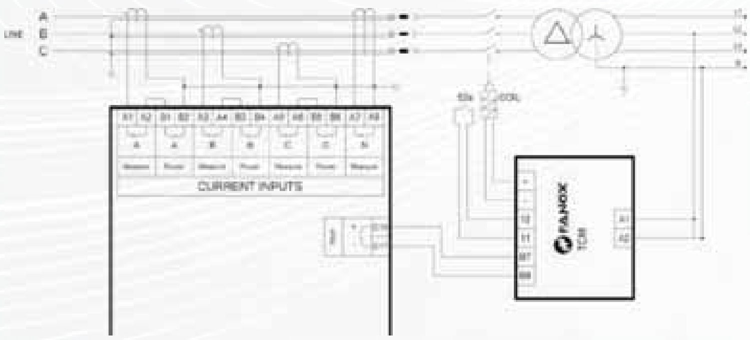
- **Withdrawable** Self powered model with a very compact size makes the installation and maintenance much easier.

- **Standby Earth Fault Relay** model designed as a backup protection to clear a remote earth fault on the downstream network. This relay performs 50P + 50/51P + 50N/G + 50/51N/G functions and shows 3 magnetic flags in its front indicating the tripping reason.

- Perfect solution for **RETROFIT applications.** Combined with TCM adapter this application is performed in these RMUs where the existing protection relay is replaced with a new generation digital relay like FANOX SIA-C.

The auxiliary power of the RMU energizes the TCM that activates the coil when the relay detects a fault condition.

RMU manufacturer do not require changing the existing circuit breaker and coil, SIA-C along with TCM adapter work as one supplying the energy needed to trip the coil. TCM provides the most common variety of auxiliary voltages that coils require: 48Vdc, 110Vdc or 220Vdc.



- **Ring Main Unit used for Metering (MRMU)** for MV applications (13.8kV, 36kV and 38kV) in a busbar rating up to 630A.

In this application a protection relay is included to protect the line by tripping the circuit breaker of the position, apart from voltage and current meter or energy analyzer.

Many MRMU manufacturers provide a 24 Vdc auxiliary power supply so the SIA-C Self and Dual Powered Relay at 24Vdc is the appropriate solution.

Self & Dual powered

Self & Dual powered

Protection relays for Secondary Distribution. SIA

The range of SIA relays is designed to protect the secondary transformer and distribution substations of electrical networks. Features include protection against instantaneous and inverse time overcurrent (for phase and neutral) as well as an external trip support (temperature, pressure, etc.) for certain models.

The protection functions can be enabled by using both control panel and the communications link to the SICom progamme. Combining the setting and IEC curves available, allows for precise coordination with other equipment.

Dual & Self powered protection relays

The outstanding feature of the SIA-C, SIA-B, SIA-E and SIA-A models is that they are dual/self-powered and function by employing the operating current of the installation. This means that maintenance of transformer and distribution substations is heavily reduced. All batteries, chargers and other external power elements are made redundant.

Furthermore a great advantage is that these relays ease commissioning and start-up of installations, and also make it easier to manage the equipment in adverse conditions. All models can be powered from an external battery portable kit (KITCOM), guaranteeing total operation of the relay, including trip functions occurring due to external faults

Protection relays for Primary and Secondary Distribution. SIL

The Energy sector is now in process of a deep transformation all over the world. Due to the high demand of energy, new distribution lines are needed as well as advanced systems of supervision. Assuming the need of intelligent infrastructures, FANOX has developed SIL family in order to perform this function.

Relays of SIL family, formed by SIL-A and SIL-B, are designed for protection of primary and secondary switching substations of electric distribution network. The protection features include protection against overcurrent (SIL-A and SIL-B), overvoltage (SIL-B) and undervoltage (SIL-B) but always with the option of reclosing in both models (SIL-A and SIL-B).

The protection functions can be enabled by using both the front panel and the communications link to the SICom programme.

The combination of the available IEC and ANSI curves and settings allows a precise combination with other equipments.

One advantage over other equipments available on the market is that SIL relays facilitate the start-up of installations and the carrying out specific operations in adverse conditions.

Communication protocols

Our relays incorpórate new industry trends as remote communication to facilitate the implementation of Smart Grid and predictive maintenance network:

- IEC 61850
- IEC 60870-5-103
- IEC 60870-5-104
- DNP3.0
- ModBus RTU

IEC 61850

IEC 61850

Protection functions & Standards

Function 50P
Instantaneous phase overcurrent

Function 50N and 50N/G
50N = Instantaneous neutral overcurrent internally calculated ($I_A+I_B+I_C$)
50N/G = Instantaneous neutral overcurrent measured

Function 50/51P
Inverse time phase overcurrent

Function 50/51N and 50/51 N/G
50/51N = Inverse time neutral overcurrent internally calculated ($I_A+I_B+I_C$)
50/51 N/G = Inverse time neutral overcurrent measured

Curves IEC 60255-151 and ANSI
Standard curves are used for the protection functions
- 50/51P, 50/51N, 46, 67P y 67N:
- Normally inverse
- Very inverse
- Extremely inverse
- Definite time

Function 49
Thermal overload protection.

Function 49T (External Trip)
There is a direct trip input, normally associated with a bimetallic contact that is fitted to the power transformer, which serves as a backup for the current functions. In order for it to be a real backup, this input is not related to the protection processors. This means that the processors do not read the input and trip the striker, but the input acts directly on the striker, remaining operational for as long as the equipment is powered. This input is especially protected against electromagnetic noise.

Function 81U
Underfrequency protection

Function 81O
Overfrequency protection

Function 25
Synchronism check

Function 46
Inverse time negative sequence overcurrent

Function 59P
Defined time phase overvoltage

Function 59N
Defined time neutral overvoltage

Function 27P
Defined time phase undervoltage

Function 37
Phase undercurrent

Function 32/40
Defined time directional overpower

Function 79, auto-recloser
This function is the responsible of reclosing the breaker when a fault occurs.

Function 67P
It uses the voltage between phases as the polarization magnitude and the phase current as the operating variable. If the directional function 67P is not enabled, it behaves as a 51/50P function.

The operative time starts when the following conditions are met simultaneously:
- Polarization voltage higher than setting
- Phase current higher than setting
- Gap between phase current and polarization voltage is such that the phase current is within the area of the intervention.

Function 67N, Neutral directional protection
It uses the residual voltage as the polarization magnitude and the residual current as the operating variable. If the directional function 67N is not enabled, it behaves as a 50/51 N/G Function. The operative time starts when the following conditions are met simultaneously:
- residual voltage higher than setting
- residual current higher than setting
- the gap between the residual current and residual voltage is such that the residual current is within the area of the intervention.

Trip Block for Switch disconnector protection
Many transformation centers have a disconnector as a break element. As line breakers have a limited opening current, with short-circuit events at high currents the responsibility for opening falls on the fuses, because otherwise, opening the line breaker would mean destroying it. In order to deal with these situations, tripping either in phase or neutral is blocked when the measured current exceeds a preset value.

Function 68, Logical Trip bus
Function 68 allows the creation of a coordinated net of equipments installed in different levels of the line which enables the blocking or the tripping and whose objective is clearing the fault in the least damaging place of the application.

Function 86
Function 86 allows to latch (lock out) the contact trip due to programmable logic (PLC).

Function 52
This function allows monitoring of circuit breaker state and makes a preventive maintenance.

Function 50BF
This function allows showing a possible error of the circuit breaker opening.

Function 74TCS, Trip Circuit Supervision
This function allows the supervision of breaker's trip circuit.

Function CLP, Cold Load Pick-up
This unit is used in order to avoid non-desirable operations of overcurrent functions when the line is not energized.

Function 74CT
Current transformer supervision

Function 46BC
Open phase detection

MEASUREMENTS
Phase and neutral are measured with an accuracy of ±2% over a band of ±20% of nominal and ±4% over the rest of the measurement range. The measurement range is from 0.02 until 30 times nominal current.

TIME SYNCHRONIZATION
- IRIG-B: GPS Time Synchronization Protocol
- Communications protocol synchronization.

SETTINGS GROUPS
The relay has up to 3 settings groups for the protections settings.

HMI
The HMI consists of:
- A 20x2 LCD screen with alphanumeric characters that allow the equipment parameters to be set (adjusted) and monitored (measurements, statuses, events).
- A membrane keyboard with six keys that allow you to navigate the menus and access information of interest. A seventh button "RESET", allows you to reset the bistable and led indicators and the events log. For security reasons, an access code is needed to modify the settings.
- LED indicators showing the type of power supply being used at all times. The relay can use more than one power source at one time.
- Bistable magnetic indicators that signal the cause of tripping. These indicators remain in position when the equipment loses power, reducing the time the maintenance service needs to identify the cause of tripping.

EVENTS RECORD
Events are recorded and ordered chronologically (up to 1024), allowing you to analyse what has happened with the installation over time (start-ups, tripping power supplies, etc.). They are recorded chronologically to the nearest millisecond in real time, thanks to the Real Time Clock (RTC). Events can be recorded on a non-volatile FRAM memory.

FAULT REPORT
A fault report is a record of specific events in the period of time when a fault occurs. Having a specific events record for the fault period is a significant help to resolve an incident.

OSCILLOGRAPHY RECORDS
The relay stores up to 5 oscillographic logs and 20 fault reports, with a resolution of 16 samples/cycle. The oscillography can be downloaded by communications through the Modbus protocol. The SICom communications program allows the oscillography to be downloaded and saved in COMTRADE format (IEEE C37.111-1991).

COM PORTS
The relay has up to 3 communication ports in different format: USB, RS232, RS485, FOP, FOC, RJ45 (Ethernet).

COM PROTOCOLS
The relay supports the different protocols: ModBus RTU, IEC60870-5-103, IEC60870-5-104, DNP3.0 (TCP/IP), IEC61850.

COMMUNICATIONS
The relays have a communication local port on the front of the equipment and rear ports on the back for remote communication. The SICom software with Windows® 2000/XP and Windows® 7 uses a graphic user interface to allow you to access all equipment information, modify the settings and save events.
The software can be used locally by using the front port or remotely by using the rear RS485 port when the protocol is ModBus RTU.

TEST MENU
This allows you to use the HMI to verify correct operation of the LEDs, the bistable magnetic indicators, the trip contact and the outputs.
Activating the trip contact from the test menu allows you to verify correct operation of the opening mechanism simply.

SELF-DIAGNOSIS
Diagnostic algorithms to generate the corresponding events are executed on starting up the equipment and all the time the relay is operating.

Protection functions & Standards

• EMC requirements - Emission

Test Name	Relay Test	LEVELS
Radiated emission	IEC 60255-26 EN 55022 EN 55011	Radiated emission limit for Class A (group 1 for EN 55011) on Enclosure port. Frequency range 30MHz - 230MHz (Quasi Peak 40dBμV/m). Frequency range 230MHz - 1000MHz (Quasi Peak 47dBμV/m)
Conducted emission	IEC 60255-26 EN 55022 EN 55011	Conducted emission limit for Class A (group 1 for EN 55011) on Auxiliary power supply port. Frequency range 0.15MHz – 0.5MHz (Quasi Peak 79μV, Avg 66μV). Frequency range 0.5MHz – 30MHz (Quasi Peak 73μV, Avg 60μV)

• EMC requirements - Immunity

Test Name	Relay Test	LEVELS
1MHz damped oscillatory waves	IEC 60255-26 IEC 61000-4-18	Class 3, Repetition frequency 400Hz, Duration of each application 3s. Common mode for all terminals ±2.5kV. Differential mode for all terminals excepts Communication port ±1kV
Electrostatic discharge	IEC 60255-26 IEC 61000-4-2	Level 4, Contact discharge ±8kV. Air discharge ±15kV
Radiated radiofrequency electromagnetic fields	IEC 60255-26 IEC 61000-4-3	Level 3, Test field strenght 10V/m, Frequency 80MHZ - 1000MHz and 1400MHz - 2000MHz, AM Modulation 80% for 1KHz carrier sinusoidal signal
Electrical fast transients	IEC 60255-26 IEC 61000-4-4	Level 4, Power supply to Earth terminals ±4kV, Signal and control terminals ±2kV. Repetition frequency 5KHz, Burst duration 75s.
Surge	IEC 60255-26 IEC 61000-4-5	Level 4, Line to earth for all terminals ±4kV. Line to Line for all terminals excepts Communication port ±2kV
Conducted disturbance induced by radio frequency fields	IEC 60255-26 IEC 61000-4-6	Level 3, Applied voltage 10V, Frequency 0.15MHz - 80 MHz, AM Modulation 80% for 1KHz carrier sinusoidal signal, Dwell time 1s., Test duration >10s.
Voltage dips, short interruptions and voltage variations	IEC 60255-26 IEC 61000-4-11 IEC 61000-4-29	DC Voltage Dips: 40%, 130ms and 70%, 100ms, 3 times every 10s. DC Voltage Interruption: 100ms, 3 times every 10s.
Ripple on DC input power port	IEC 60255-26 IEC 61000-4-17	Level 4, Ripple 15%, 50Hz and 100Hz
Power frequency magnetic field	IEC 60255-26 IEC 61000-4-8	Level 5, Continuous field strenght 100 A/m. Short field strenght for a duration of 3s. 1000 A/m. Frequency 50Hz.
100KHz damped oscillatory waves	IEC 61000-4-18	Class 3, Repetition frequency 40Hz, Duration of each application 3s. Common mode: ±2.5kV. Differential mode: ±1kV
Pulse magnetic fields	IEC 61000-4-9	Field strenght 1000 A/m, Cadence between pulses 40s.
Damped oscillatory magnetic fields	IEC 61000-4-10	Level 5, Field strenght 100 A/m, Frequency 100KHz and 1MHz, Repetition frequency 40 trans./s at 100KHz, 400 trans/s at 1MHz, Duration of each application 3s.
Ring wave immunity test	IEC 61000-4-12	Level 4, Line to earth for all terminals ±4kV. Line to Line for all terminals excepts Communication port ±2kV

• Product safety requirements (including thermal short time rating)

Test Name	Relay Test	LEVELS
Impulse voltage	IEC 60255-27 IEC 60255-5	Each group to earth and with rest of the groups in short-circuit ±5kV. Differential mode for each one of the groups ±1kV
AC or DC dielectric voltage	IEC 60255-27 IEC 60255-5	Each group to earth and with rest of the groups in short-circuit 2kVac, 50Hz, 1 minute
Insulation resistance	IEC 60255-27 IEC 60255-5	500V applied between each group to earth and with rest of the groups in short-circuit
Protective bonding resistance	IEC 60255-27	Test current 2xIn, Test voltage 12Vac during 60s. Resistance shall be less than 0.1 ohm

• Burden

Test Name	Relay Test	LEVELS
AC burden for CT	IEC 60255-1	Declared on manual
AC burden for VT		
AC, DC burden for power supply		
AC, DC burden for binary inputs		

• Contact performance

Test Name	Relay Test	LEVELS
Contact performance	IEC 60255-27	

• Communication requirements

Test Name	Relay Test	LEVELS
Communication requirements	ModBus RTU IEC 61850 IEC 60870-5-103 IEC 60870-5-104 DNP 3.0	

• Climatic environmental requirements

Test Name	Relay Test	LEVELS
Cold	IEC 60068-2-1	Cold Operation Ab, -25ºC, 72h Cold transport & Storage Ad, -40ºC, 72h
Dry heat	IEC 60068-2-2	Dry Heat Operation Bb, +70ºC, 72h Dry Heat transport & Storage Bd, +85ºC, 72h
Change of temperature	IEC 60068-2-14	Change of Temperature Nb, Upper temp +70ºC, Lower temp -25ºC, 5 cycles, Exposure time 3h, Transfer time 2 min.
Damp heat	IEC 60068-2-30	Damp Heat Cyclic Db, Upper temp +40ºC, Humidity 93%, 2 cycles. Relay energized
	IEC 60068-2-78	Damp Heat Steady State Test Cab, Upper temp +40ºC, Humidity 85%, 2 days. Relay not energized

• Mechanical requirements

Test Name	Relay Test	LEVELS
Vibration	IEC 60255-21-1 IEC 60068-2-6	Vibration response, Class 1, 10Hz to 59Hz, 0,035mm and 59Hz to 150Hz, 0.5g_n Vibration endurance, Class 1, 10Hz to 150Hz, 1g_n
Shock	IEC 60255-21-2 IEC 60068-21-2	Shock Response, Class 1, 5g_n, Shock Withstands, Class 1, 15g_n
Bump	IEC 60255-21-2 IEC 60068-21-2	Bump, Class 1, 10g_n
Seismic	IEC 60255-21-3 IEC 60068-21-3	Single Axis Sine Sweep, Class 1, X Axis: 1 to 9Hz, 3.5mm and 9 to 35Hz, 1g_n; Y Axis: 1 to 9Hz, 1.5mm and 9 to 35Hz, 0.5g_n

• Electrical environmental requirements

Test Name	Relay Test	LEVELS
CT Input continuous overload	IEC 60255-27	3xIn without damage for continuous operation
CT Input short time overload	IEC 60255-27	70xIn without damage for 1s short time overloading
VT Input continuous overload	IEC 60255-27	Declared on manual, without damage for continuous operation
VT Input short time overload	IEC 60255-27	Declared on manual, without damage for 10s short time overloa-ding

• Enclosure protection

Test Name	Relay Test	LEVELS
Enclosure protection	IEC 60255-27 IEC 60529	IP-54

• Quality Management System

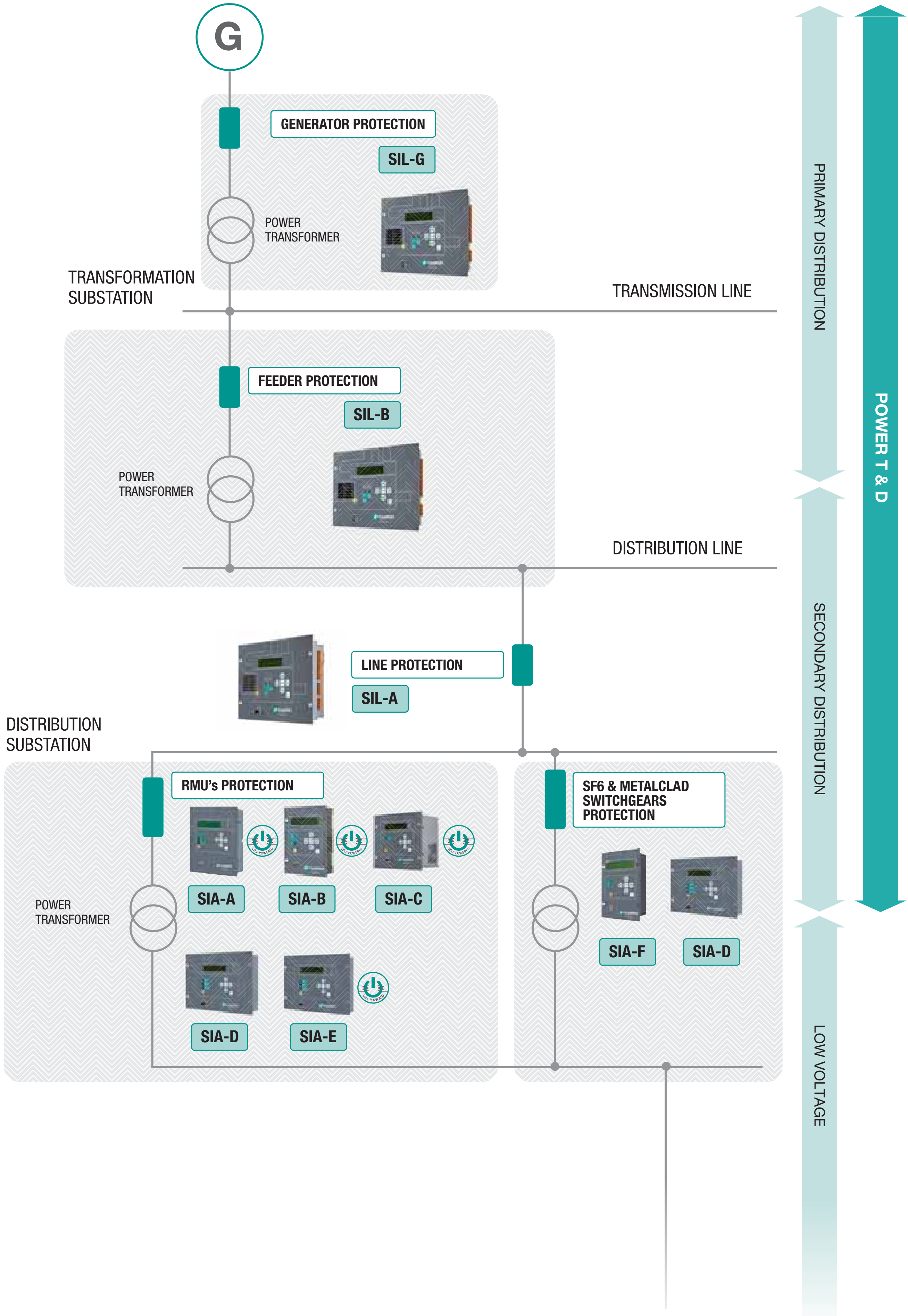
Test Name	Relay Test	LEVELS
Quality Management System	ISO 9001:2008	

Product selection guide

	SELF & DUAL POWERED			
	SIA-B	SIA-C	SIA-A	SIA-E
Auxiliary Supply	24Vdc 110Vac 230Vac	24Vdc 110Vac 230Vac 48 Vdc 85-265 Vac/Vdc	230Vac	230Vac
Self Power Supply	3.2A, 6.4A, 12.8A, 25.6A or 51.2A depending on the CT. (x3)	0,1 In (x3)	4A (x3)	2A (x3)
External battery	KITCOM	KITCOM	KITCOM	KITCOM
Consumption	0,5 W	0,5 W	0,5 W	0,5 W
CT	Specific CT	Standard 2,5VA	Dual Core	Dual Core
LPCT				
50P	1	2		1
50N/G		2		1
50N	1		1	
50/51P	1	1		1
51P			1	
50/51N/G		1		1
50/51N	1			
52				
50BF				
49				
49T	1	1	1	1
79				
46				
CLP				
74TCS				
Trip Block	1		1	1
68 (Trip Bus)		1		
86		✔		
74 CT				
46BC				
Programmable Logic		V3		
50/51/67N				
50/51/67P				
37				
59P				
59N				
27P				
32/40				
81U/O				
25				
81R				
78				
IRIG-B				
Counters				
Commands				
Sett. Group	2	3	1	1
Inputs	1	2	1	1
Outputs	1	2 + 1	1	1
Output for STRIKER	24 Vdc – 135 mJ	24 Vdc – 135 mJ	6 Vdc – 4 mJ	6 Vdc – 4 mJ
LEDs	2+1MAG.FLAGS	3+3 MAG.FLAGS	3+3 MAG. FLAGS	3+3 MAG. FLAGS
HMI	20X2 LCD + 7 keys	20X2 LCD + 7 keys	20X2 LCD + 7 keys	20X2 LCD + 7 keys
52 & 79 HMI				
Event	100	1024	100	100
Fault Report	4	20		
Oscillography				
Local Port (frontal)	USB	RS232	RS232	RS232
Remote Port (rear)		RS485		
Communications Protocols	ModBus RTU	ModBus RTU	ModBus RTU	ModBus RTU
Size of	4U x 1/4 rack	4U x 1/3 rack 4U x 3/5 rack	5U x 1/3 rack	4U x ½ rack

OC & EF				FEEDER PROTECTION	GENERATOR PROTECTION
SIA-F	SIA-D	SIL-A		SIL-B	SIL-G
		Adaptation A	Adaptation B		
24–48Vdc 90-300Vdc/110-230Vac	24–48Vdc 90-300Vdc/110-230Vac	24–48Vdc 90-300Vdc/110-230Vac	24-110Vdc/48-230Vac	24–48Vdc 90-300Vdc/110-230Vac	24–48Vdc 90-300Vdc/110-230Vac
KITCOM	KITCOM				
1,5 – 2,2 W	1,5 – 3 W	3,3 – 4,5 W		3,3 – 5,5 W	3,3 – 5,5 W
Standard 0,5VA	Standard 0,5VA	Standard 0,5VA		Standard 0,5VA	Standard 0,5VA
1	1	2		2	2
1	1	2		2	2
1	1	1			
1	1	1			
1	1	1		1	1
1		1		1	1
1		1		1	1
1	1	1		1	1
		1		1	1
		1		1	1
1		1		1	1
		1 (Specific input)	1 (Configurable input)	1	1
1	1	1	1		
	1		1		
✔		✔		✔	✔
			1		
			1		
V2	V0	V1	V3	V1	V1
	2			2	2
				2	2
			1	2	2
				2	2
				2	2
				2	2
				4	4
				4	4
				1	1
					4
					2
				✔	✔
✔	✔			✔	✔
✔	✔			✔	✔
3	1	3	4	3	3
2	4	4 + 4	2 + 4	4+4	4+4
2 + 1	2 + 1 + 1	2 + 3	2 + 2	2 + 5	2 + 5
3 configurable	3+3 MAG.FLAG	6 configurable	8 configurables	6 configurable	6 configurable
20X2 LCD + 7 keys	20X2 LCD + 7 keys	20X2 LCD + 7 keys		20X2 LCD + 7 keys	20X2 LCD + 7 keys
		2 led's + 3 keys		2 led's + 3 keys	2 led's + 3 keys
200	500	500	200	1000	1000
4	2	20		20	20
1 record x 22 cycles	2 record x 33 cycles	2 record x 50 cycles	5 records x 100 cycles	2 record x 138 cycles	2 record x 138 cycles
USB	RS232/USB	RS232	RS232	USB	USB
RS485	RS485	RS485 + RS485 or Ethernet (RJ45) + RS485	1 RS485 or 1 Ethernet (RJ45)	RS485 + RS485 Ethernet + RS485	RS485 + RS485 Ethernet + RS485
ModBus RTU	ModBus RTU	ModBus RTU IEC60870-5-103 IEC60870-5-104 DNP3.0 (TCP/IP) IEC61850		ModBus RTU IEC60870-5-103 IEC60870-5-104 DNP3.0 (TCP/IP) IEC61850	ModBus RTU IEC60870-5-103 IEC60870-5-104 DNP3.0 (TCP/IP) IEC61850
4U x 1/4 rack	4U x ½ rack	4U x ½ rack		4U x ½ rack	4U x ½ rack

PRODUCT APPLICATION GUIDE



PRODUCT

SIA-B

SIA-C

SIA-A

SIA-E

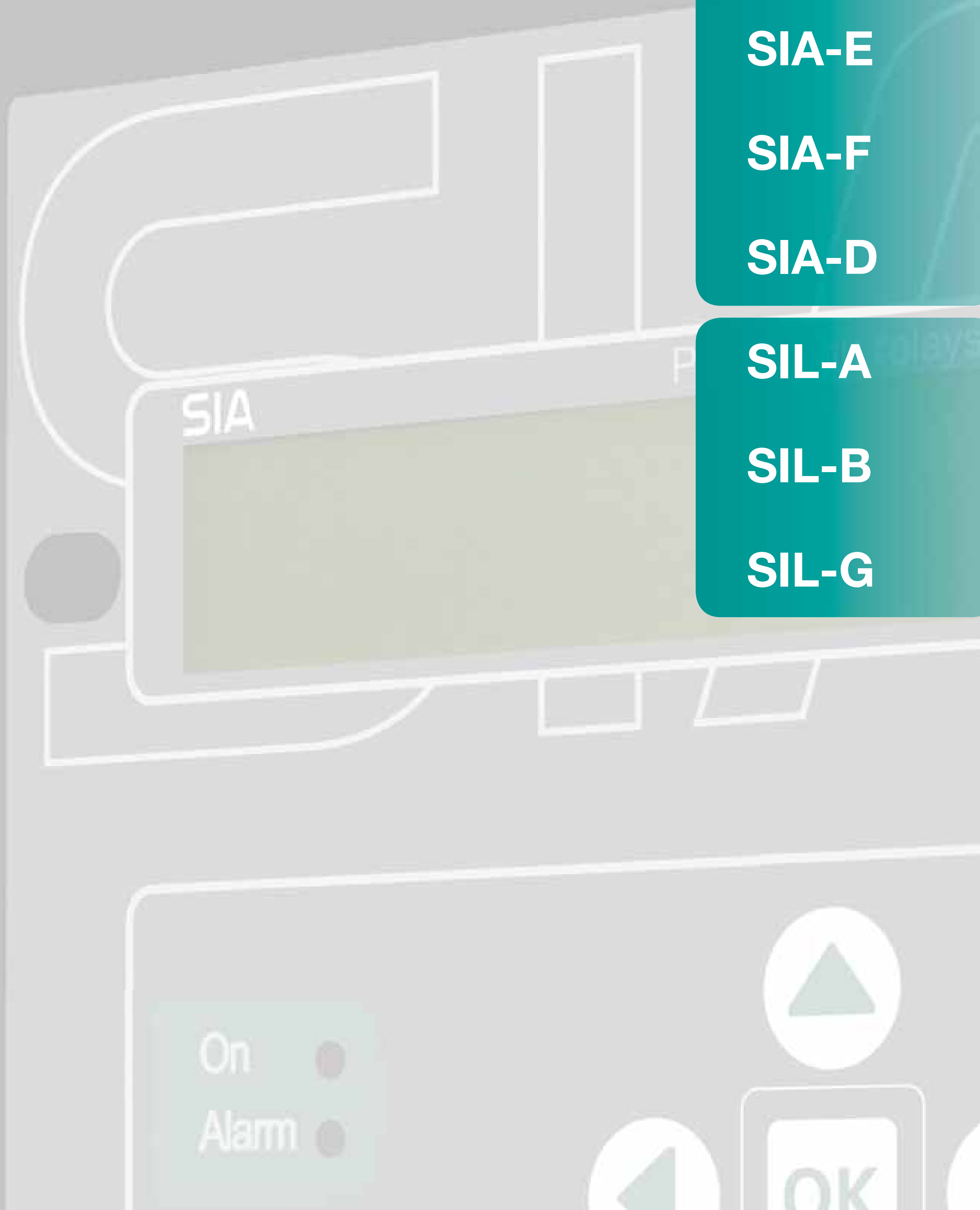
SIA-F

SIA-D

SIL-A

SIL-B

SIL-G



SIA-B

Overcurrent and Earth Fault Protection Relay for Secondary Distribution

Dual & Self Powered

Main characteristics

- The SIA-B is a Dual & Self powered overcurrent protection relay using the operating current through three specific current transformers fitted on the lines. These transformers are also used to obtain current measurements. Optionally, SIAB relay can be used with auxiliary power supply (24 Vdc, 110 Vac or 230 Vac). The equipment can be occasionally supplied by an external battery portable kit (KITCOM).
- 50P, 50/51P, 50N, 50/51N protection functions.
- Trip block for switch disconnector + 49T + 49 as optional.
- Its compact size makes SIA-B really easy to install and its light weight helps the customer to save costs in transport.
- Low power consumption (0.5 W, 24 Vdc).
- Non-volatile RAM memory in order to store up to 100 events.
- USB connection on the front (Modbus RTU communication protocol).
- There are bistable magnetic indicators which indicate the trip cause, maintaining their position even though the relay loses the supply (flags).
- In self powered modes, SIA-B starts-up from 0.4 Is of primary three phase current using specific CTs.

Low Power switchgear

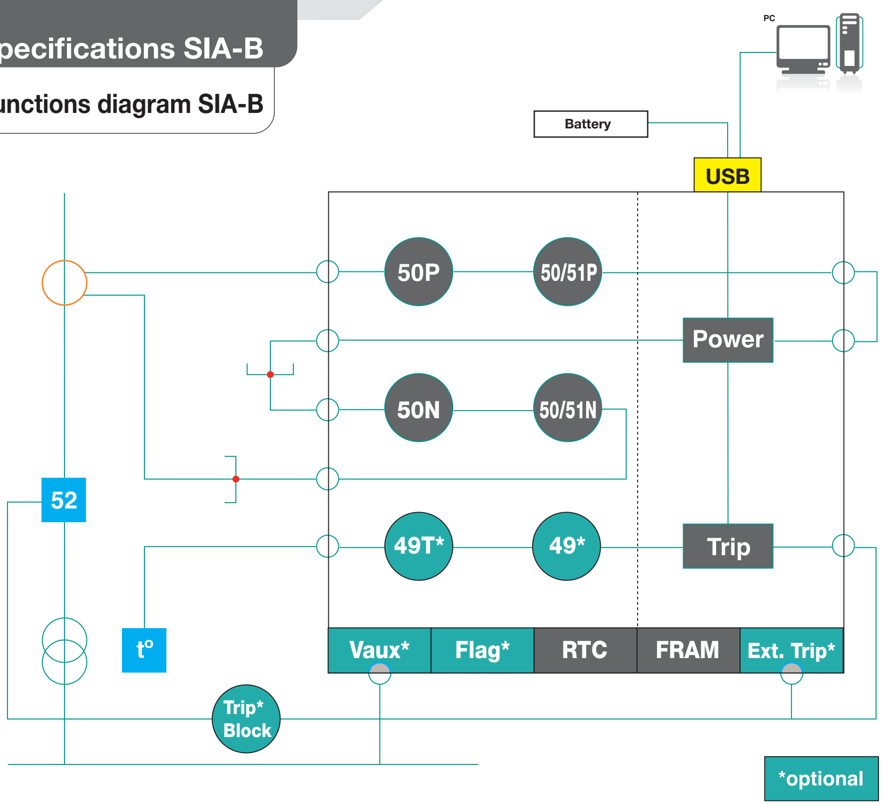
This CT is suitable for Fanox SIA-B Protection relay.

Special CTs		
Type	Range	Class
CT08-5	8-28 A	5P80
CT16-5	16-56 A	5P80
CT16-10	16-56 A	10P80
CT32-5	32-112 A	5P80
CT64-5	64-224 A	5P80
CT128-5	128-448 A	5P80

Technical specifications and dimensions of this CT in page 22-23.

Technical specifications SIA-B

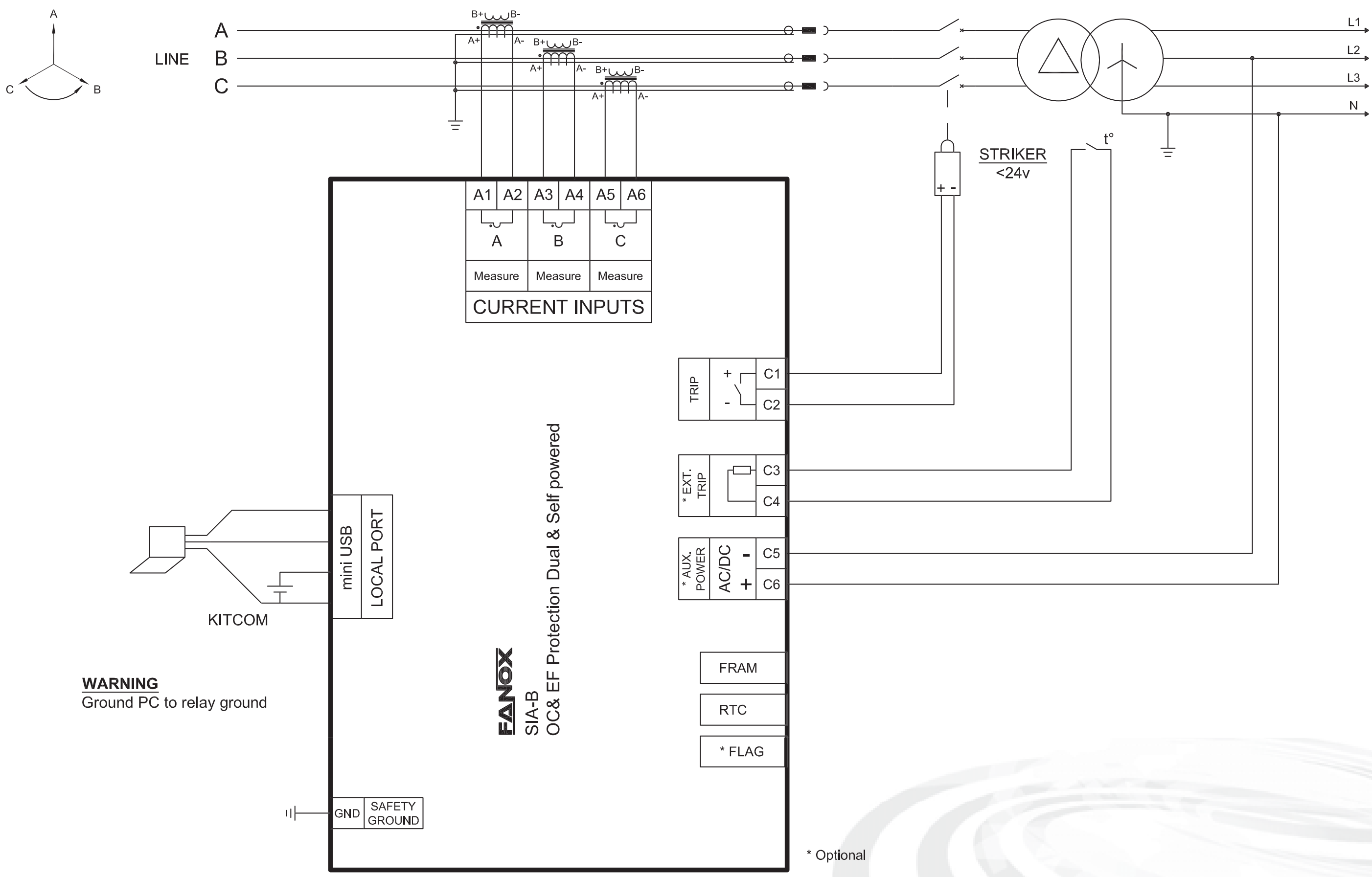
Functions diagram SIA-B



Technical specifications SIA-B

Connections diagram SIA-B

- 3 CT power supply-measurement
  Striker



Technical parameters SIA-B

Function 50P	Permission: yes/no
	Operating range: 0.20 to 20 x Is (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 0.5% or ± 30 ms (greater of both)
Function 50N	Permission: yes/no
	Operating range: 0.20 to 20 x Is (step 0.01)
	Operating time: 0.05 to 300 s (step 0.01s)
	Activation level 100%
	Deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 0.5% or ± 30 ms (greater of both)
Function 50/51P	Permission: yes/no
	Operating range: 0.20 to 7 x Is (step 0.01)
	Curves: IEC 60255-151
	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 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 5% or ± 30 ms (greater of both)
Function 50/51N	Permission: yes/no
	Operating range: 0.20 to 7 x Is (step 0.01)
	Curves: IEC 60255-151
	Operating time: inverse curve, very inverse curve, extremely inverse curve. Defined time: 0,05 to 300 s (step 0.01 s)
	Dial: 0.05 to 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 90%
	Instantaneous deactivation
	Timing accuracy: ± 5% or ± 30 ms (greater of both)
Function 49T (*)	Charging time 10 s (optional)

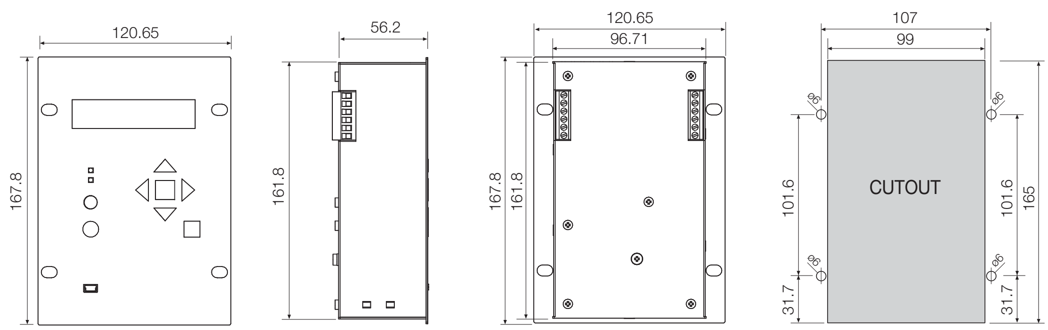
Function 49 (*)	Function permission : yes/no
	Tap: 0.10 a 2.40 Is (step 0.01)
	ζ heating: 3 a 600 minutes (step 1 min)
	ζ cooling: 1 a 6 x ζ heating (step 1)
	Alarm level: 20 a 99% (step 1 %)
	Trip level: 100%
	Trip reset: 95% of alarm level
	Timing accuracy:± 5% regarding theoretical value
Trip Block (*)	Blocking: Yes/no
	Blocking limit: 1.5 to 20 x In (step 0.01)
Trip output	24 Vdc; 135 mJ (activation of the striker or low powered coil)
Frequency	50/60Hz
Current measure	True RMS
	Sampling: 16 samples/cycle
Fault reports	Four fault reports
Communication	USB port: Modbus RTU
Auxiliary supply	230 Vac, ±20 %
	110 Vac, ±20 %
	24 Vdc, ±20 %
Battery supply	With USB KITCOM adapter
Self-power from current	Three phase self-power level: I > 0,4 x Is min
Environment	Operating temperature: -10 to 70ºC
	Storage temperature: -20 to 80 ºC
	Humidity: 95%
Transformers	Power supply and measurement specific CTs
Mechanical features	Metallic box
	Panel Mounting
	¼ Rack-4U
	IP-54 panel mounted

Technical parameters CT SIA-B

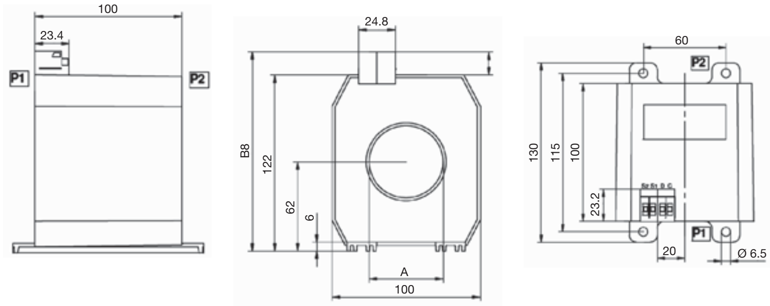
Application	Indoor Use
Class of insulation	Class E
Frequency	50-60 Hz
Primary Conductor	Cable max. Ø50 mm
Material	PU & PA6.6
Sec. wire diameter	6 mm² solid / 4 mm² strand
Test winding	0,288 A Nominal
Burden	0,1 VA

(*) Optional depending on the model

Dimensions and cutout SIA-B



Dimensions CT SIA-B



Selection & Ordering data SIA-B

SIA-B											
											PROTECTION FUNCTIONS 50P + 50/51P + 50N + 50/ 51N
	0										**PHASE MEASUREMENT** Defined by General Settings
		0									**NEUTRAL MEASUREMENT** Internal measurement
			0								**NET FREQUENCY** Defined by General Settings
				0 **1** **2** **3**							**POWER SUPPLY** Self powered Self powered + 230 Vac (Dual) Self powered + 110 Vac (Dual) Self powered + 24 Vdc (Dual)
					0 **1** **B**						**ADDITIONAL FUNCTIONS** - + 49 + Trip Block for switch disconnector
						0					**COMMUNICATIONS** USB frontal
							0 **1**				**INPUTS-OUTPUTS** 2 led's + trip output (striker) + External trip input (49T) + 1 FLAG
								0			**MECHANICAL ASSEMBLY** -
									A **B** **C** **D**		**LANGUAGE** English, Spanish and German English, Spanish and Turkish English , Spanish and French English , Spanish and Russian
										A	**ADAPTATION** -

Example of ordering code:

SIA B	**0**	**0**	**0**	**0**	**1**	**0**	**1**	**0**	**B**	**A**	*SIAB 0 0 0 0 1 0 1 0 B A*

Note: Accessories, page 60-61.

SIA-C

Overcurrent and Earth Fault Protection Relay for Secondary Distribution

Dual & Self Powered

SELF POWERED

KEMA

Main characteristics

- The SIA-C is a overcurrent protection relay with self powered and dual powered (self + auxiliary) models.
- The relay is self powered using the operating current through three /5 (5VA) or /1 (2.5VA) standard current transformers fitted on the lines. These transformers are also used to obtain current measurements. Optionally, SIAC relay can be used with auxiliary power supply (24 Vdc, 110 Vac, 230 Vac, 48 Vdc or 85-265 Vdc/ac). The equipment can be occasionally supplied by an external battery portable kit (KITCOM).
- 50P, 50/51P, 50N/G, 50/51 N/G, 86, PLC protection functions.
- 49T and 68 as optional protection functions.
- Specific test menu is provided.
- High electromagnetic compatibility.
- The installation and subsequent maintenance of batteries is eliminated. The operating costs of the centre are reduced.
- In self powered modes, the start-up of the relay from 0.1 times of the nominal current in three phases ensures capacity to trip at low energy levels.
- The line opening mechanism is activated either by means of a striker PRT, operated by the energy supplied by the relay itself, or by a coil using the TCM trip adapter in case it is necessary.
- There are bistable magnetic indicators which indicate the trip cause, maintaining their position even though the relay loses the supply (flags).
- Different sizes of SIA-C relay available by model list to fulfil all the needs of our customers and make the installation easier.
- SIA-C is fitted with the demand of current with the following characteristics:

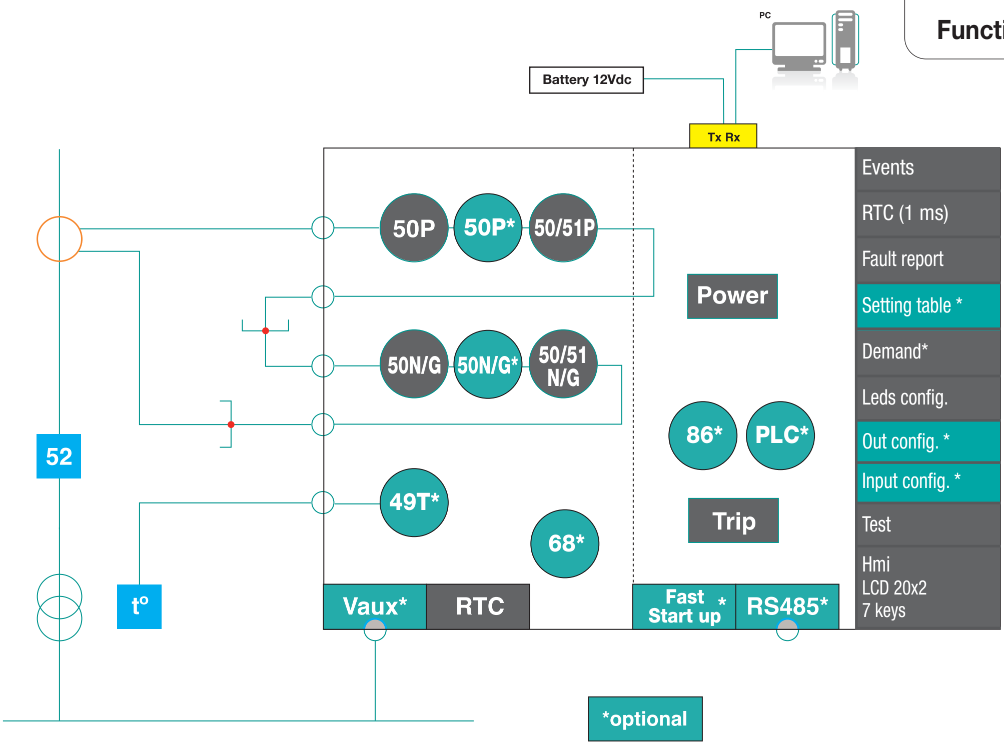
  Number of records: 168
  Recording mode circular
  Sampling rate (interval): configurable through communications: 1 – 60 min
- Non-volatile RAM memory in order to store up to 1.024 events and 20 fault report.

Withdrawable Vertical Assembly

Horizontal Assembly

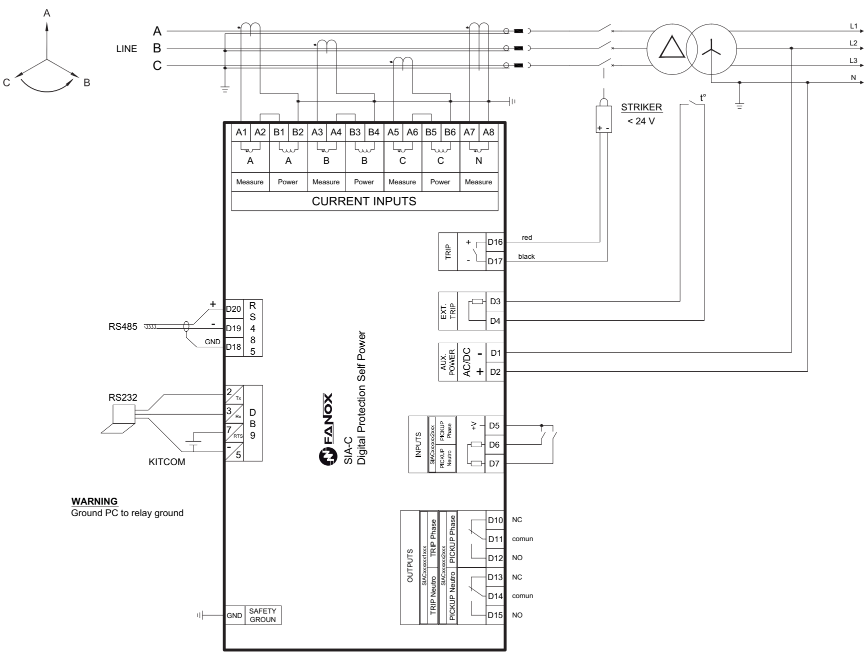
Vertical Assembly

Functions diagram SIA-C

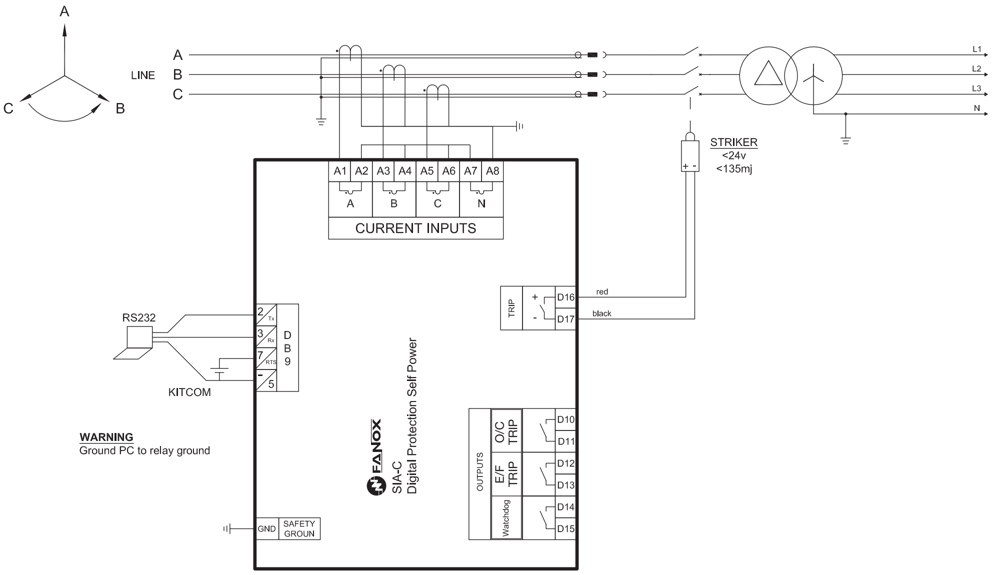


Connections diagram SIA-C

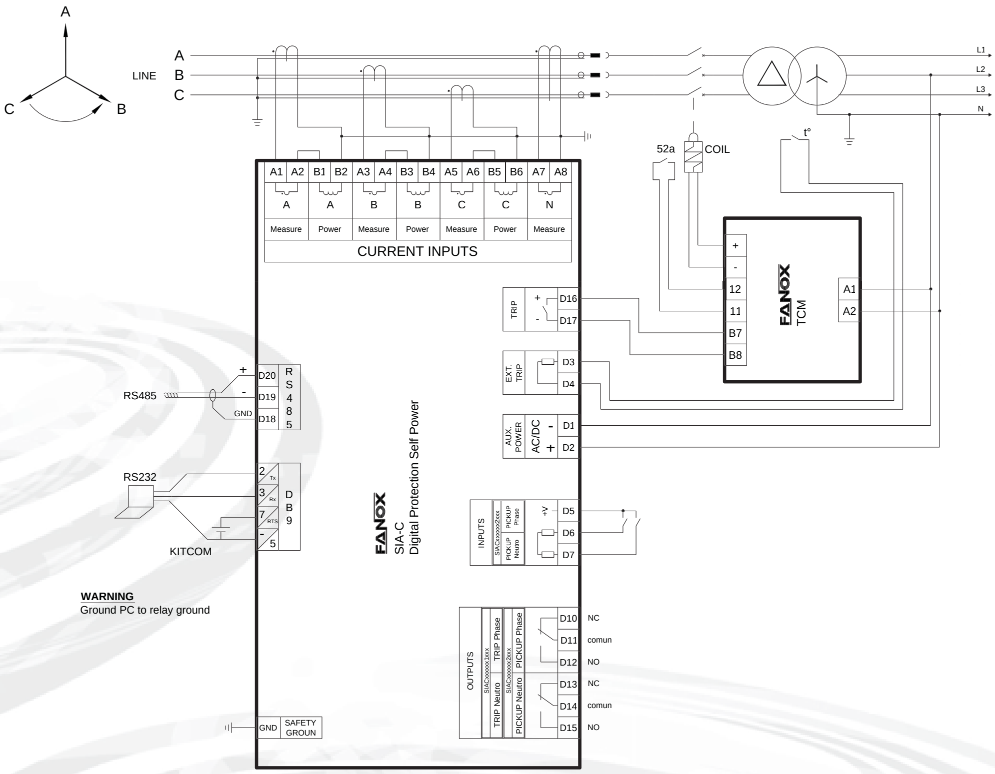
- 3 CT power supply-measurement
  1 CT sensitive neutral
  Striker



- 3 CT power supply
  Striker
  Withdrawable model



- 3 CT power supply-measurement
  1 CT sensitive neutral
  Potential free + TCM



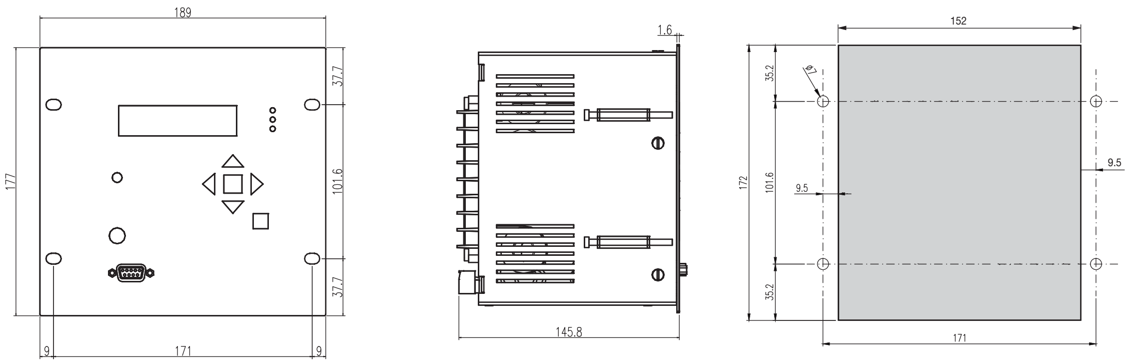
Function 50P_1 **Function 50P_2 (*)**	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01 x In)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 30 ms or ± 0.5% (greater of both)
Function 50N/G_1 **Function 50N/G_2 (*)**	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01 x In)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 30 ms or :± 0.5% (greater of both)
Function 50/51P	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01 x In)
	Curves: IEC 60255-151
	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 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 5% or ±30 ms (greater of both)
Function 50/51N/G	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01 x In)
	Curves: IEC 60255-151
	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 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy: ±5% or± 30 ms (greater of both)

Function 68 (*)	Available through configurable inputs and outputs thanks to programmable logic
Function 49T (*)	Charging time 10 s
Programmable logic control (PLC)	OR4, NOR4, OR4_LACTH, NOR4_LACTH, OR4_PULSES, AND4, NAND4, AND4_PULSES, OR_TIMER_UP, NOR_TIMER_UP, AND_TIMER_UP, NAND_TIMER_UP, OR_PULSE, NOR_PULSE, AND_PULSE, NAND_PULSE
Function 86	Allows to latch (lock out) the contact configured like trip due to programmable logic (PLC).
Fault reports	20 fault reports, 16 events in each
Trip output	For Striker: 24 Vdc-135 mJ For coil (optionally with TCM adapter): 250 Vac – 8A 30 Vdc – 8A Resistive charge (cos ϕ = 1)
Signalling outputs (*)	Up to 3 configurable outputs
Signalling inputs (*)	2 configurable inputs
Frequency	50/60Hz
Current measure	RMS
	Sampling: 16 samples/cycle
	Accuracy of 2% on a band of ±20% over the nominal current and 4% over the rest of the range.
Communication	RS232 port: Modbus RTU
	RS485 port: Modbus RTU (*)
Auxiliary supply (*)	230 Vac, ±20 % / 110 Vac, ±20 % / 24 Vdc ±10 % / 48Vdc±10 % / 85-265 Vdc-ac±20 %
Battery supply	With adapter (Kitcom) port DB9
Self-power from current	One phase self-power level: I > 0,2 x In
Environment	Operating temperature: -10 to 70ºC
	Storage temperature: -20 to 80 ºC
	Humidity: 95%
Transformers	Power supply and measurement CT /5 or /1
Mechanical features	Metallic box
	Panel Mounting
	1/3 Rack – 4 U (mechanics type A, D, E, F and G) 0.6 Rack – 4 U (mechanics type B and C)
	IP-54
Demand of current	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 (actual) IA IB IC IN

(*) Optional depending on the model

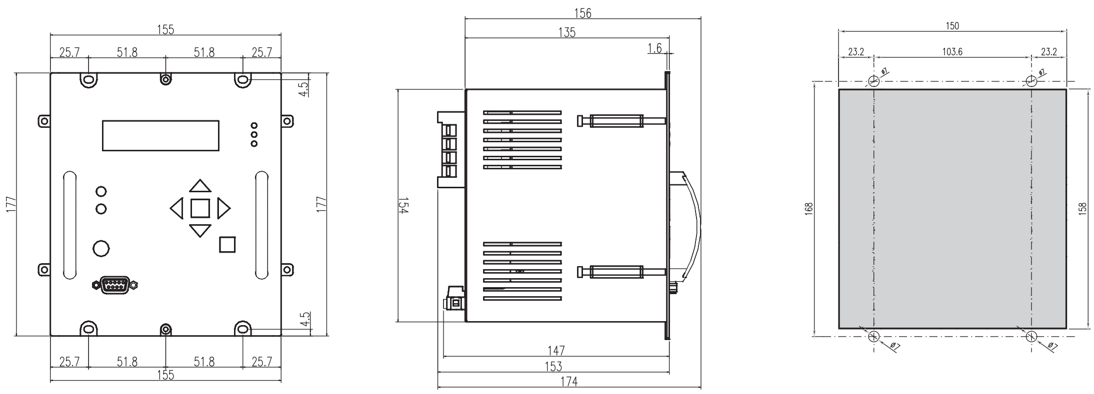
Vertical
assembly

Mechanical
assembly:
A, D



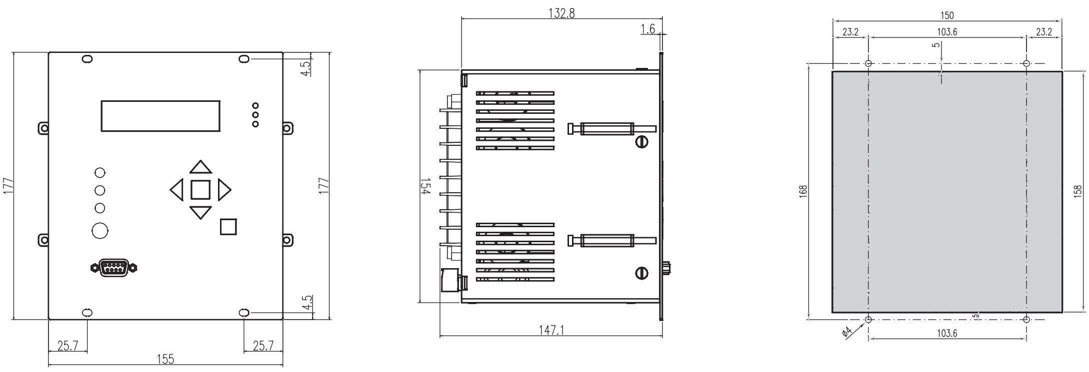
Withwadrable
Vertical assembly
Compact size

Mechanical
assembly:
F



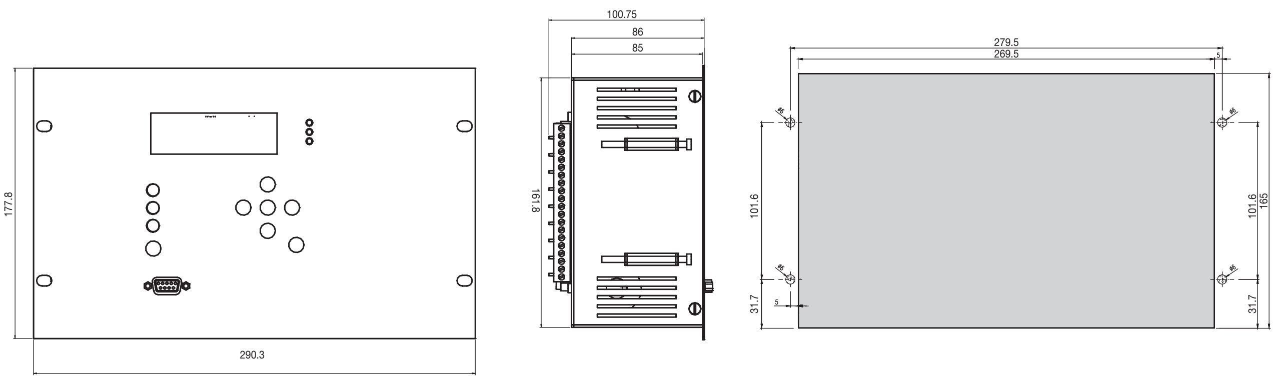
Vertical
assembly
Compact size

Mechanical
assembly:
E, G



Horizontal
assembly

Mechanical
assembly:
B, C



SIA-C												
												PROTECTION FUNCTIONS 50P + 50/51P + 50N/G + 50/51N/G + 86 + PLC
	1 5											**PHASE MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A)
		1 5 A B										**NEUTRAL MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A) In = 0,1 A; (0,01 – 3,00 A) In = 0,2 A; (0,02 – 6,00 A)
			5 6									**NET FREQUENCY** 50 Hz 60 Hz
				0 1 2 3 4 5								**POWER SUPPLY** Self powered Self powered + 230 Vac (Dual) Self powered + 110 Vac (Dual) Self powered + 24 Vdc (Dual) Self powered + 48 Vdc (Dual) Self powered + 85-265 Vac-dc (Dual)
					0 1 2 3 4							**ADDITIONAL FUNCTIONS** Striker Striker and with external trip (49T) Coil Coil and with external trip (49T) Striker and 230 Vac adapted external trip
						0 1						**COMMUNICATIONS** Local ModBus port (RS 232) + Remote ModBus port (RS485)
							0 1 2 3					**INPUTS-OUTPUTS** - 2 Outputs to signalling 2 Outputs + 2 inputs 3 Outputs to signalling
								1 2				**FAST START-UP** Non-volatile RAM memory Non-volatile RAM memory + Fast start-up
									A B C D			**LANGUAGE** English, Spanish and German English, Spanish and Turkish English, Spanish and French English , Spanish and Russian
										A B C D E F G		**MECHANICS** Vertical, withdrawable with 3 magnetic Flags Horizontal assembly with 1 magnetic Flag Horizontal assembly with 3 magnetic Flag Vertical assembly with 1 magnetic Flag Vertical, Compact Size with 3 magnetic Flag Vertical, Compact Size, 2 Flags, Backlight LCD, withdrawable Vertical, Compact Size, 1 Flag, Backlight LCD
											- A	**ADAPTATION** 50P + 50/51P + 50N/G + 50/51N/G + 86 + PLC + 50P_2 + 50N/G_2 + 3 Setting groups

Example of ordering code:

SIA C	1	5	6	0	0	1	2	2	D	A	A	*SIAC 1 5 6 0 0 1 2 2 D A A*

Note: Accessories, page 60-61.

SIA-A

Overcurrent and Earth Fault Protection Relay for Secondary Distribution

Dual Powered

Main specifications

- The SIA-A is a Dual powered overcurrent protection relay using the operating current through specific dual-core current transformers, one used for measuring and the other for powering.
- Protection functions: 50N, 51P, 49T, TRIP BLOCK.
- The events are recorded.
- High electromagnetic compatibility.
- Self power allows for the minimisation of costs for installation and maintenance of the centre as there is no need for batteries or other external power supply items.
- SIA-A starts up from 4 A of primary three phase and 10 A of primary single phase with the relay fully operative at this low energy level.
- Its reduced depth of 60 mm makes it easy to install.
- It includes the switch disconnector protection function by means of trip blocking.
- The line opening mechanism is activated by means of a striker PRT operated by the energy supplied by the relay itself.
- There are bistable magnetic indicators which indicate the cause of the trip, maintaining their position even though the relay loses the supply (flags).

CT-60-100

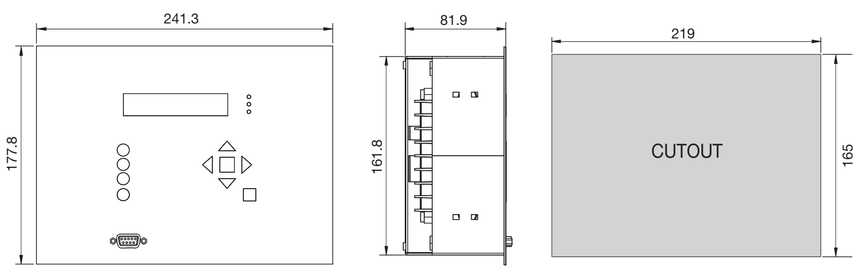
Highest voltage/Insulation rating:
0.72 kV/3 kV
Insulation class: Class B, 130 °C
Short-circuit thermal intensity/Dynamic:
20 kA - 1 s / 50 kA
Dual Core

SIA-E

With additional features regarding to SIA-A model

Additional specifications

- It can be powered up from 2 A of primary three phase current.
- It includes 50P and 50/51N/G protection functions.
- It has Neutral input, getting higher sensibility.
- It is provided with Multilanguage menu (English/Spanish/French) and optional Real Time Clock (RTC).
- It is available with remote communication through RS-485 port and Modbus RTU protocol.
- It has different dimensions.



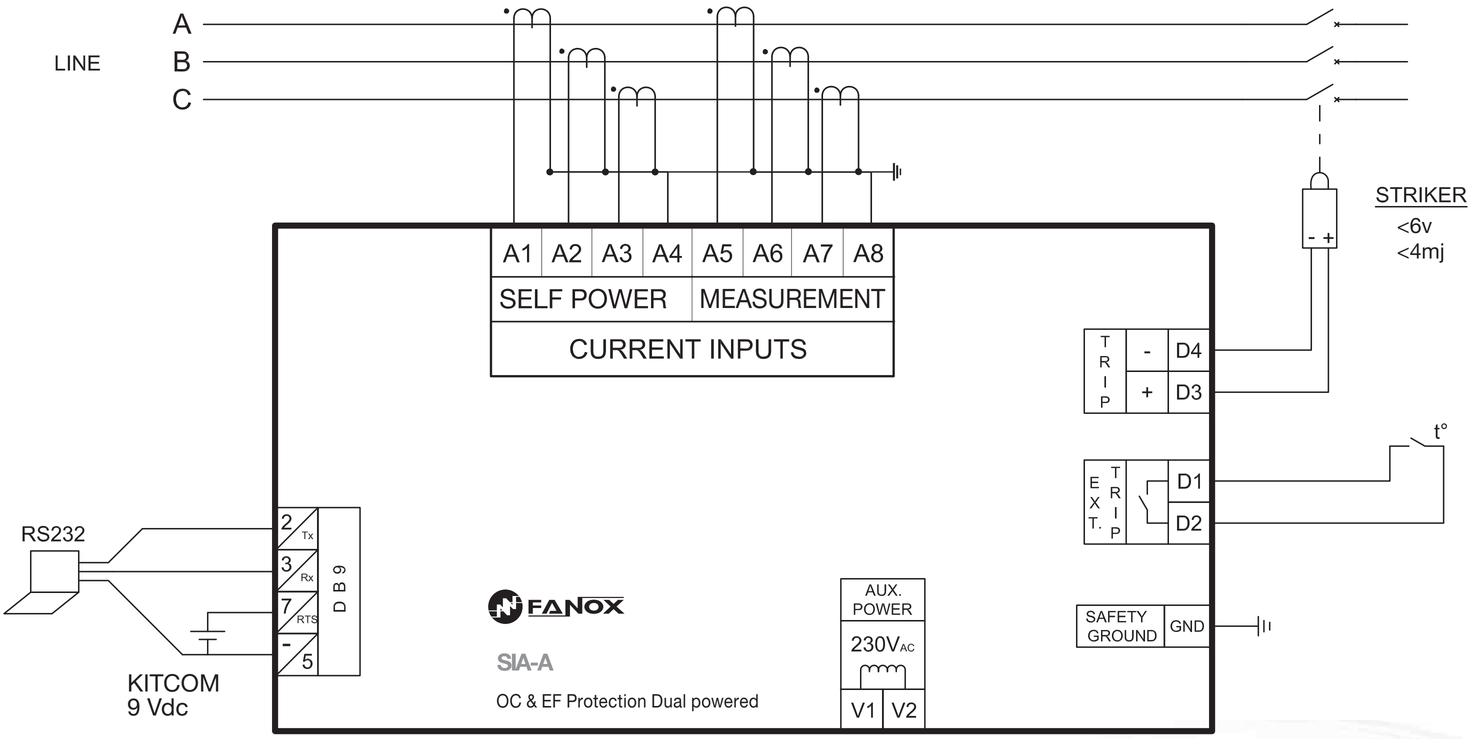
CT-35-60
CT-60-100

Highest voltage/Insulation rating:
0.72 kV/3 kV
Insulation class: Class B, 130 °C
Short-circuit thermal intensity/Dynamic:
20 kA - 1 s / 50 kA
Dual Core

Technical specifications SIA-A

Connections diagram SIA-A

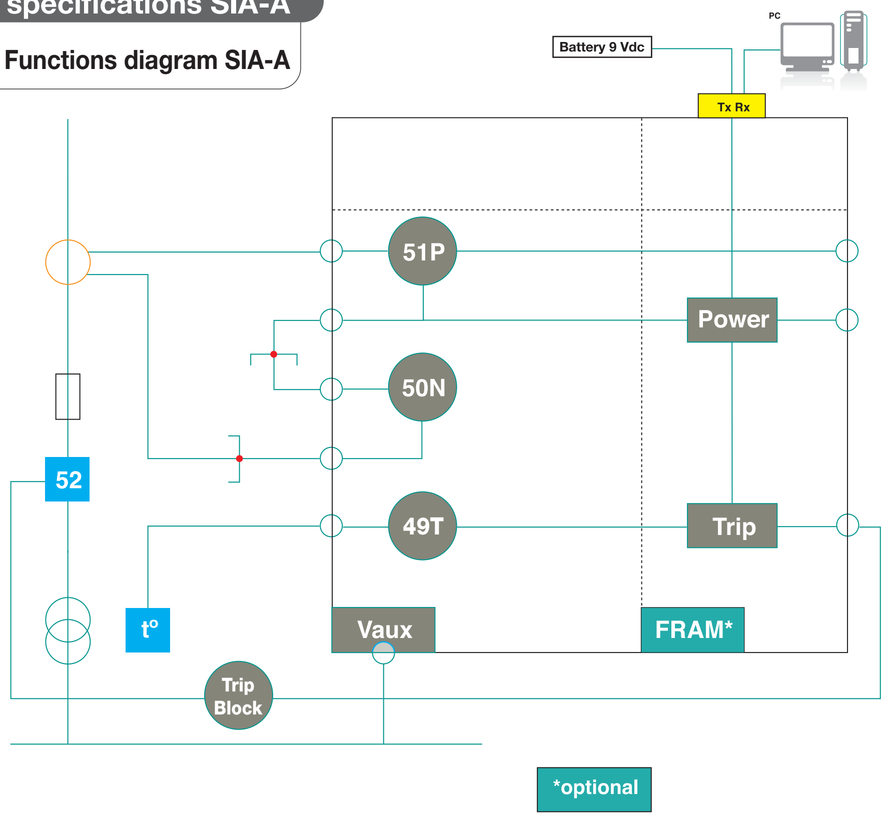
- 3 CT measurement
  3 CT power supply
  Dual Core CT



WARNING
Ground PC to relay ground

Technical specifications SIA-A

Functions diagram SIA-A

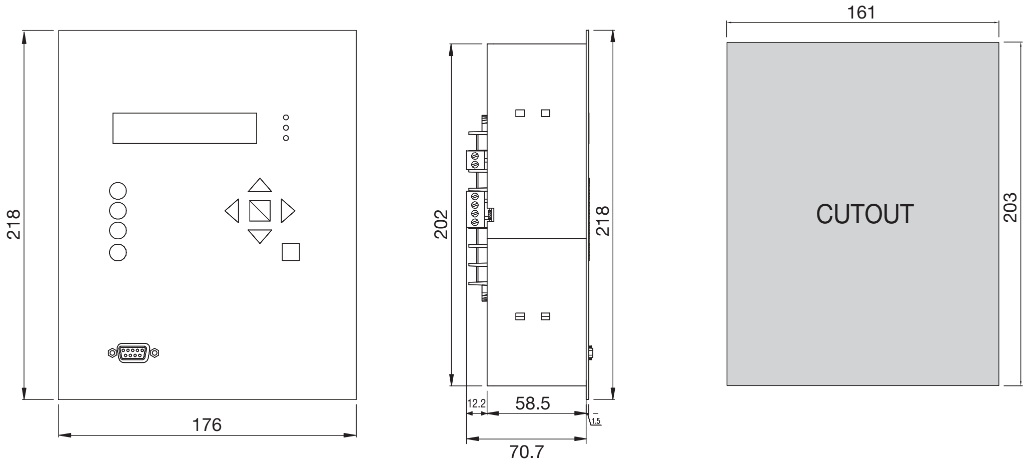


Technical parameters SIA-A

Function 51P	Permission: yes/no
	Operating range: 3 to 100A primary (step 0.01)
	Curves: IEC 60255-151
	Operating time: Inverse curve, very inverse curve, extremely inverse curve.
	Dial: 0.05 to 1.25
	Curve, activation level 120%
	Curve, deactivation level 100%
	Instantaneous deactivation
	Timing accuracy: ± 5% or ± 30 ms (greater of both)
Trip blocking	Blocking level: 300 A or 20 x 51P tap (lower of both)
Function 49T	Charging time 10 s
Trip output	6 V - 4 mJ (activation of the strike)
Frequency	50/60 Hz
Current measure	True RMS
	Sampling: 16 samples/cycle
	Accuracy ±2% over band of ±20% of rated current and ±4% over the rest of the range.
Communications	RS232 port: Modbus RTU

Function 50N	Permission: yes/no
	Operating range: 0.5 to 20 A primary (step 0.1)
	Operating time: 0.02 to 300 s (step 0.01)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
Function 50N	Permission: yes/no
	Operating range: 0.5 to 20 A primary (step 0.1)
	Operating time: 0.02 to 300 s (step 0.01)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
External battery	With DB9 KITCOM adapter (9 Vdc)
Self power from current	3 phase self-power level I > 4 A (primary)
Maximum permanent current	200 A primary
Environment	Operating temperature: -10 to +70 °C
	Storage temperature: -20 to +80 °C
	Humidity: 95%
Transformers	Power supply and measurement. Transformers with double core CT-DB
Mechanical features	Metallic box
	Panel mounting
	160 x 202 x 60 mm
	IP-54 panel mounted
Auxiliary Supply	230 Vac ±20 %

Dimensions and cutout pattern SIA-A



Selection & Ordering data SIA-A

SIA-A							
							PROTECTION FUNCTIONS 50N + 51P + 49T
	R						**APPLICATION** Trip block for switch disconnector
		5 **6**					**NET FREQUENCY** 50 Hz 60 Hz
			0 **1**				**EVENTS** With standard RAM memory (events) With non volatile RAM memory (events)
				S **E**			**LANGUAGE** Spanish English
					4		**POWER SUPPLY** Self powered + 230 Vac + 9 Vdc (Dual)
						A	**ADAPTATION** -

Example of ordering code:

SIA A	**R**	**5**	**1**	**S**	**4**	**A**	*SIAA R 5 1 S 4 A*

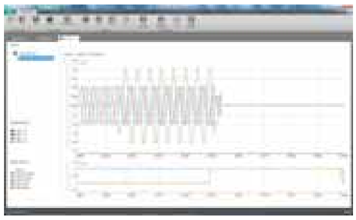
Note: Accessories, page 60-61.

SIA-F

Overcurrent and Earth Fault Protection Relay for Secondary Distribution

Main specifications

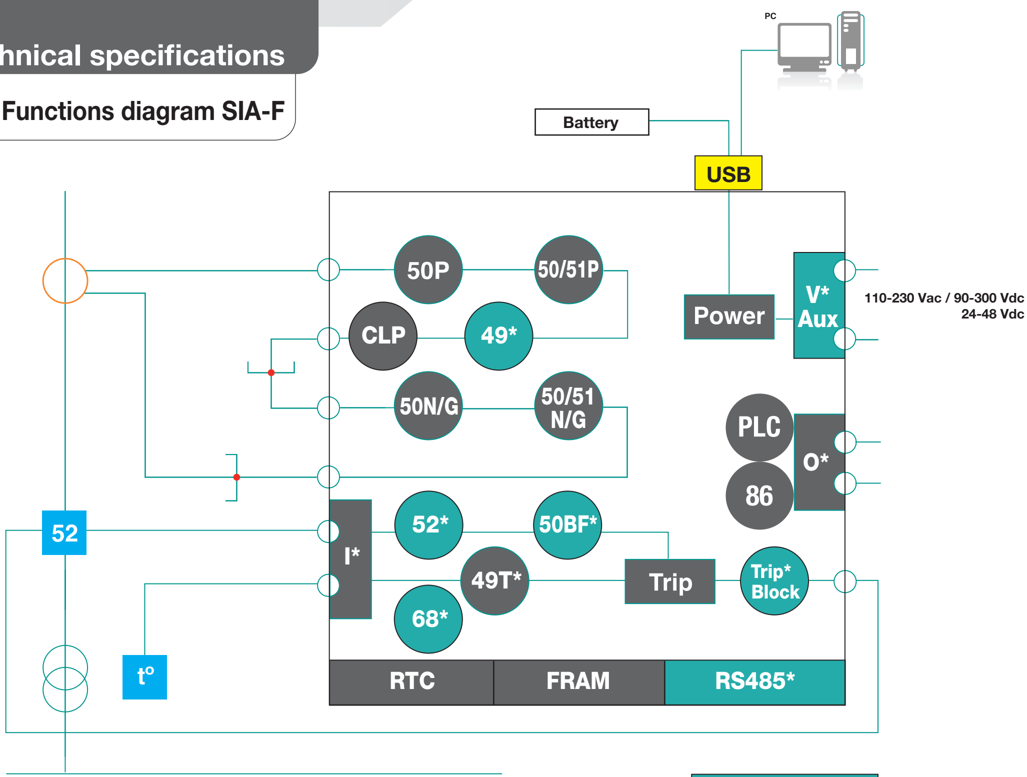
- The SIA-F is an overcurrent protection relay with a switched auxiliary power supply (110-230 Vac / 90-300 Vdc or 24-48 Vdc). The current is measured by using /5 or /1 current transformers. The equipment can be occasionally supplied by an external battery portable kit (KITCOM).
- 50P, 50/51P, 50N/G, 50/51 N/G, CLP, 86 protection functions.
- Trip block for switch disconnector, 49, 49T, 52, 50BF, as optionals.
- High electromagnetic compatibility.
- With circuit breaker control and monitoring (circuit breaker status, number of openings, accumulated amperes, etc.).
- Compact size with reduced depth makes it easier to install and saves costs.
- Low power consumption (0.5 W, 24 Vdc).
- USB connection on the front (Modbus RTU communication protocol).
- The events are recorded and a specific test menu is provided.
- Possibility of external battery power supply (KITCOM).
- There are three configurable LED indicators on the front of the SIA-F equipment. By default, they indicate indicate if the equipment is On (LED ON), if an alarm has happened (LED ALARM) or if a trip has happened (LED TRIP).
- Programmable logic (PLC)
- 2 Oscillographic records, 4 faults reports and non-volatile RAM memory: Stores 200 events with date/time event without power supply thanks to its interna RTC (real time clock)



Additional information to fault reports

Technical specifications

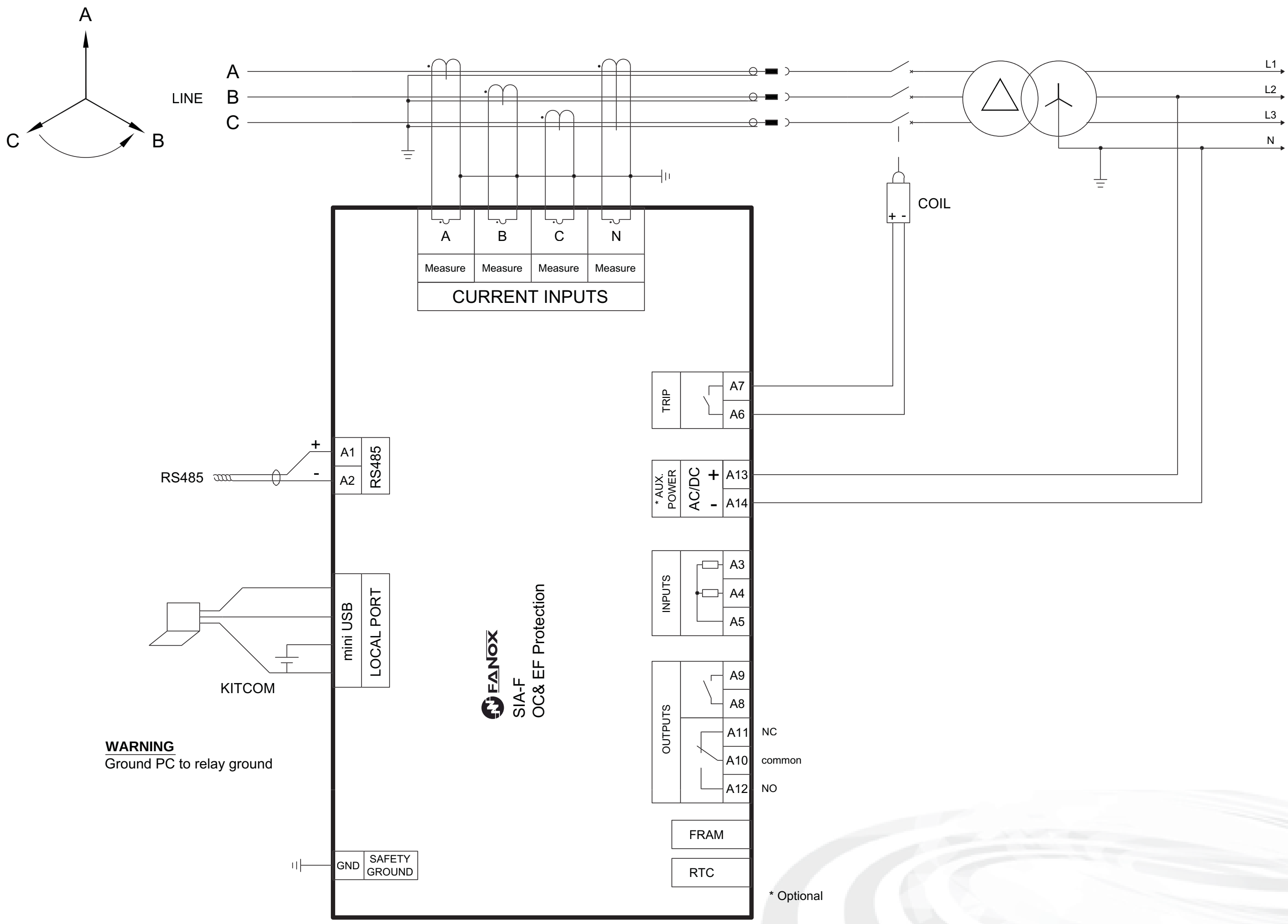
Functions diagram SIA-F



* By model list

- 3 CT measurement
  1 CT sensitive neutral

Connections diagram SIA-F

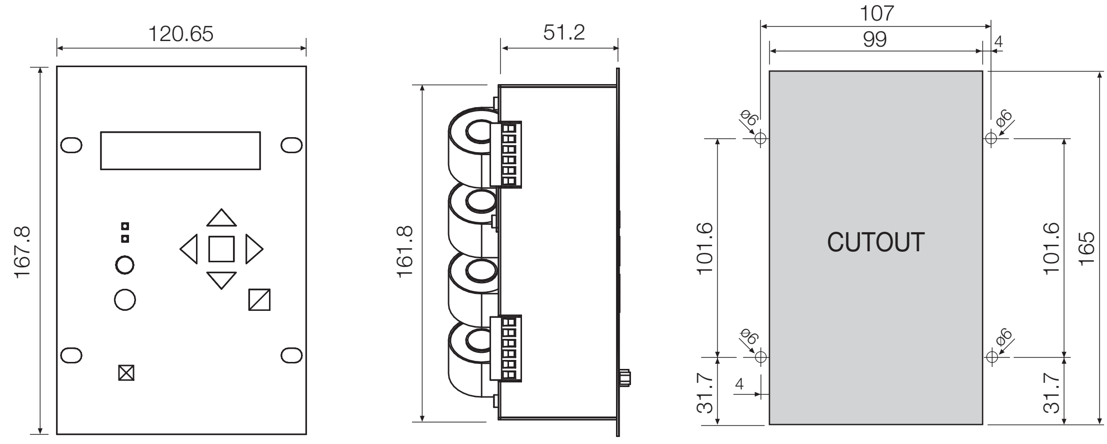


Function 50P	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 5% or± 30 ms (greater of both)
Function 50N/G	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 5% or± 30 ms (greater of both)
Function 50/51P	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01)
	Curves: IEC 60255-151 and ANSI
	Operating time: inverse curve, very inverse curve, extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.02 to 1.25 (step 0,01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 5% or± 30 ms (greater of both)
Function 50/51 N/G	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01)
	Curves: IEC 60255-151 and ANSI
	Operating time: inverse curve, very inverse curve, extremely inverse curve. Defined time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.02 to 1.25 (step 0,01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Defined time, activation level 100%
	Defined time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy:± 5% or± 30 ms (greater of both)
Function 49T(*)	Available through configurable inputs (optional)
Trip block(*)	Blocking: Yes/no
	Blocking limit: 1.5 to 20 x In (step 0.01)
Function 68(*)	Available through configurable inputs (optional)
Circuit breaker monitoring(*)	Circuit Breaker state: start, open, closed, error, opening time, opening error, closing time, closing error
	Input 52a and/or input 52b
	Opening and closing command
	Alarm, maximum number of openings: 1 a 10000
	Alarm, accumulated amps: 0 a 100000 M(A²)
	Excessive repeated openings: 1 a 10000
	Time of excessive repeated openings: 1 a 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 threshold: 10% In
	Function start: Device trip, opening failure input activation, breaker opening command activation

CLP	Function permission; yes/no
	Setting groups: 1 to 3 (step 0.01)
	No load time: 0,02 to 300 s (step 0.01s)
	Cold load: 0,02 to 300 s (step 0.01s)
Setting tables	3 setting table
	Activated, by inputs, by communications, by settings
Function 49(*)	Function permission : yes/no
	Tap: 0.10 a 2.40 Inominal (step 0.01)
	ζ heating: 3 a 600 minutes (step 1)
	ζ cooling: 1 a 6 xζ heating (step 1)
	Alarm level: 20 a 99% (step 1)
	Trip level: 100%
	Trip reset: 95% of alarm level
	Timing accuracy: ± 5% or ± 2s (greater of both) regarding theoretical value
Programmable Logic Control (PLC)	OR4, NOR4, OR4_LACTH, NOR4_LACTH, OR4_PULSES, AND4, NAND4, AND4_PULSES, OR_TIMER_UP, NOR_TIMER_UP, AND_TIMER_UP, NAND_TIMER_UP, OR_PULSE, NOR_PULSE, AND_PULSE, NAND_PULSE
Function 86	Allows to latch (lock out) the contact trip due to programmable logic (PLC).
2 inputs configurable	The same voltage as auxiliary power supply
Configurable outputs	2 configurable outputs
Frequency	50/60Hz
Current measure	True RMS
	Sampling: 16 samples/cycle
	Accuracy of ±2% in a band of 20% over the rated current and ±4% for the rest of measurement range
	Saturation limit: 30 times rated current
Oscillography	16 samples/cycle
	Oscillo starting configuration
	2 records: 3 cycles pre-fault and 19 post-fault
	COMTRADE IEEE C37.111-199
	4 analogue channels and 32 digital channels
Communications	USB port: Modbus RTU
	RS485 port: Modbus RTU(*)
Auxiliary power supply(*)	110-230 Vac / 90-300 Vdc ±20%
	24-48 Vdc ±20%
External battery	With USB KITCOM adapter
Environment	Operating temperature: -10 to 70ºC
	Storage temperature: -20 to 80 ºC
	Humidity: 95%
Transformers	3 or 4 standard CT: /5, /1
Mechanical features	Metallic box
	Panel Mounting
	1/4 Rack – 4 U
	Fondo: 74,6 mm
	IP-54 on panel
Fault report	4 fault reports with 16 events each

(*) Optional depending on the model

Dimensions and cutout SIA-F



Selection & Ordering data SIA-F

SIA-F											
											PROTECTION FUNCTIONS 50P + 50/51P + 50N/G + 50/51N/G + 86 + PLC + Cold Load Pick-up
	1 5										**PHASE MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A)
		1 5 B									**NEUTRAL MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A) In = 0,2 A; (0,02 – 6,00 A)
			0								**NET FREQUENCY** Defined by General Setting
				A B							POWER SUPPLY 24–48 Vdc 90-300 Vdc / 110-230 Vac
					0 1 B C						**ADDITIONAL FUNCTIONS** - + 49 + 52 + 50BF + Trip block for switch disconnector + Trip block for switch disconnector + 49 + 52 + 50BF
						0 1					**COMMUNICATIONS** USB frontal + Rear RS485
							0 1				**INPUTS - OUTPUTS** 3 Led's + trip output + 2 Input + 2 output (configurable)
								0			**MECHANICS** -
									A B C D		**LANGUAGE** English, Spanish and German English, Spanish and Turkish English, Spanish and French English, Spanish and Russian
										A	**ADAPTATION** -

Example of ordering code:

SIA F	1	1	0	B	0	1	1	0	C	A	*SIAF 1 1 0 B 0 1 1 0 C A*

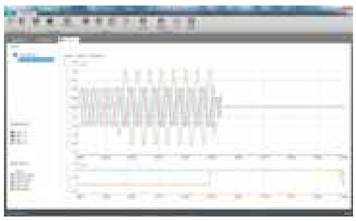
Note: Accessories, page 60-61.

SIA-D

Overcurrent and Earth Fault Protection Relay for Secondary Distribution

Main specifications

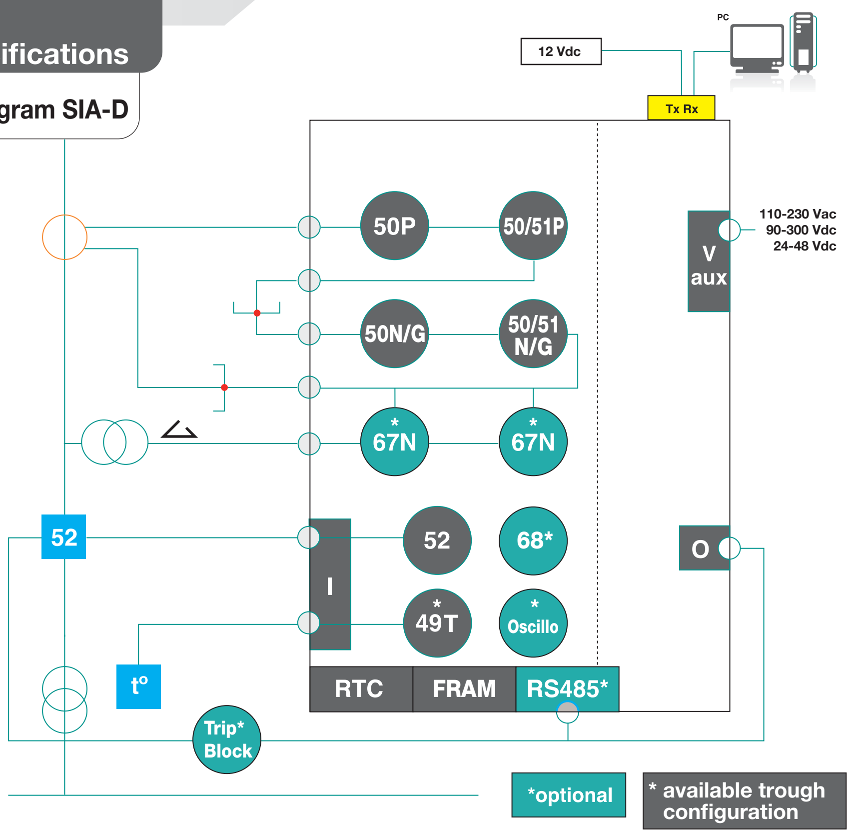
- The SIA-D is an overcurrent protection relay with a switched auxiliary power supply (110-230 Vac / 90-300 Vdc or 24-48 Vdc). The current is measured by using /5 or /1 current transformers.
- Protection functions: 50P, 50/51 P, 50N/G, 50/51 N/G, 52, 49T.
- It includes switch disconnector protection functions by means of trip blocking + 67N + 68 optionals.
- Up to 500 events can be recorded and a specific test menu is provided.
- High electromagnetic compatibility.
- Its reduced depth of 75 mm makes it easy to install.
- It is ideal for transformation and distribution centres with auxiliary power supplies and/or rechargeable batteries.
- It is fitted with two 67N neutral directional units.
- With circuit breaker control and monitoring (circuit breaker status, number of openings, accumulated amperes, etc.)
- It has 4 configurable inputs and 4 free-potential outputs.
- There are bistable magnetic indicator which indicate the cause of the trip, maintaining their position even though the relay loses the supply (flags).
- Oscillography records are available.



Additional information to fault reports

Technical specifications

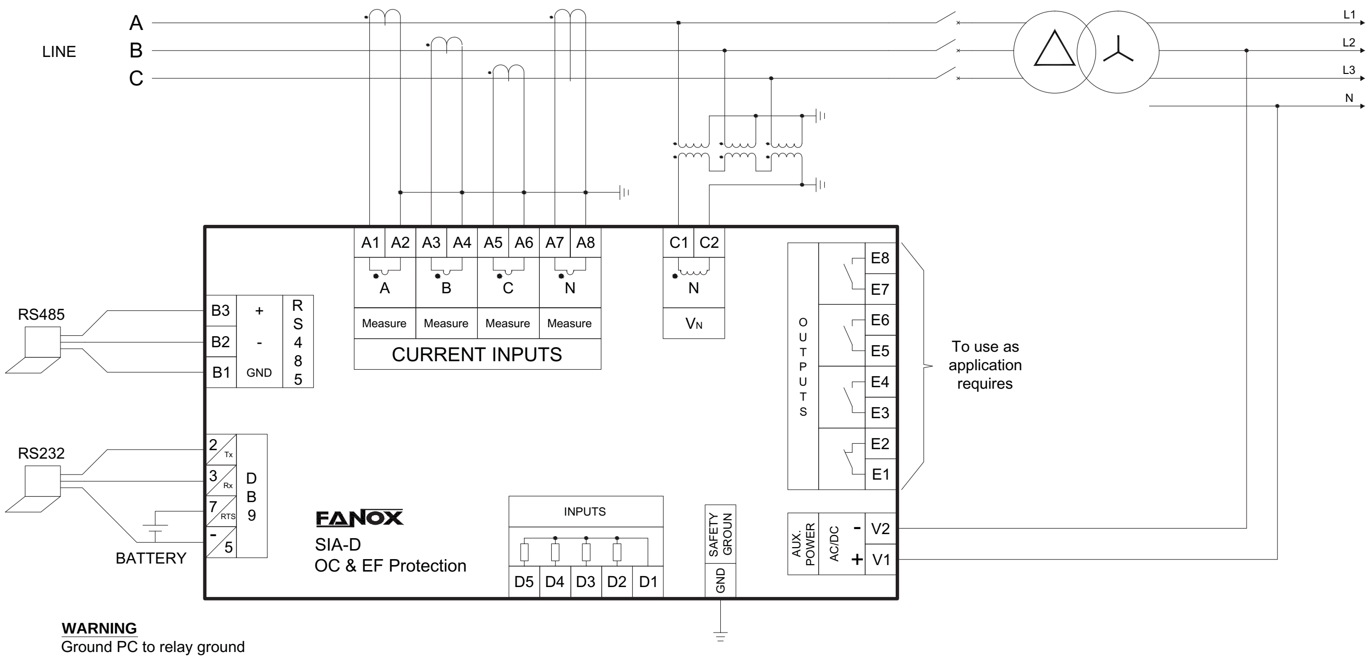
Functions diagram SIA-D



Technical specifications

Connections diagram SIA-D

- 3 CT measurement
  1 CT sensitive neutral
  1 neutral voltage



Technical parameters

Function 50P	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy: ±0.5% or ±30 ms (greater of both)

Function 50/51P	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01)
	Curves: IEC 60255-151
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Definite time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Definite time, activation level 100%
	Definite time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy: ±5% or ±30 ms (greater of both)

Function 67N (2 units) (*)	Permission: yes/no
	Operating range Io: 0.1 to 30 x In (step 0.01)
	Operating range Vo: 4 to 110 V (step 1 V)
	Operating time: 0.02 to 300 s (step 0.01 s)
	Directionality: yes/no
	Operating angle: 0 to 359° (step 1°)
	Semicone angle: 0 to 170° (step 1°)
	Current, activation level 100%
	Current, deactivation level 95%
	Voltage, activation level 100%
	Voltage, deactivation level 95%

Function 49T	Available through configurable inputs
Communications	RS232 port: Modbus RTU
	RS485 port: Modbus RTU(*)
Auxiliary power supply (*)	110-230 Vac / 90-300 Vdc ±20%
	24-48 Vdc ±10%
External battery	With DB9 KITCOM adapter
Environment	Operating temperature: -10 to +70 °C
	Storage temperature: -20 to +80 °C
	Humidity: 95%
Transformers	Measurement CT /5 or /1
Mechanical features	Metallic box
	Panel mounting
	1/2 Rack - 4 U
	IP-54 panel mounted

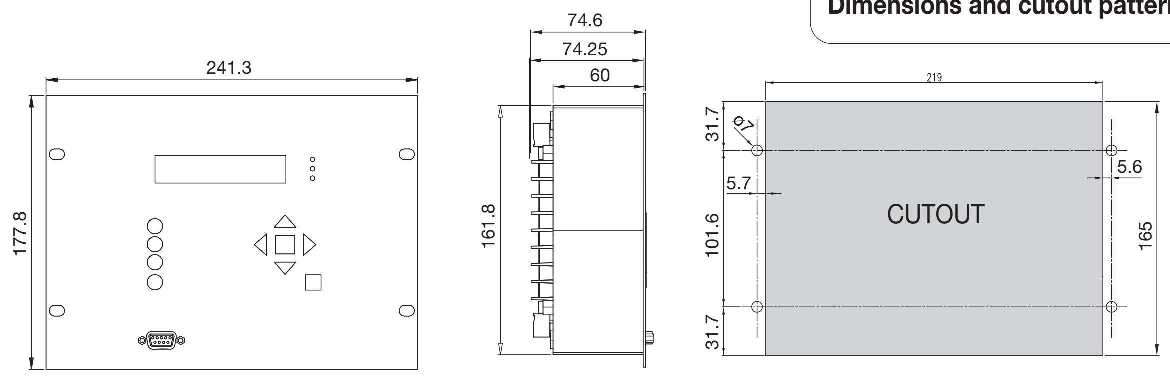
(*) Optional depending on the model

Function 50 N/G	Permission: yes/no
	Operating range: 0.10 to 30 x In (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01)
	Activation level 100%
	Deactivation level 95%
	Instantaneous deactivation
	Timing accuracy: ±0.5% or ±30 ms (greater of both)

Function 50/51 N/G	Permission: yes/no
	Operating range: 0.10 to 7 x In (step 0.01)
	Curves: IEC 60255-151
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Definite time: 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 1.25 (step 0.01)
	Curve, activation level 110%
	Curve, deactivation level 100%
	Definite time, activation level 100%
	Definite time, deactivation level 95%
	Instantaneous deactivation
	Timing accuracy: ±5% or ±30 ms (greater of both)

4 inputs configurables	110 Vdc ±40 %
4 outputs configurables	250Vac - 8A 30Vdc - 5A
Trip block (*)	Blocking: Yes/no
	Blocking level: 1.5 to 20 x In (step 0.01)
Circuit breaker monitoring	Circuit breaker status: Pickup, open, closed, error, opening time, opening fault, closing time and closing fault.
	Input 52a and/or input 52b
	Open and close command
	Alarm for maximum opening number: 1 to 10000
	Alarm for accumulated amps: 0 to 100000 $M(A^2)$
	Maximum repeated openings: 1 to 10000
	Time of maximum repeated openings: 1 to 300 min
Frequency	50/60Hz
Current measure	True RMS
	Sampling: 16 samples/cycle
	Accuracy ±2% over band of ±20% of rated current and ±4% over the rest of the range.
Oscillography (*)	16 records per cycle
	The beginning of the oscillography is configurable
	2 registers: 3 cycle previous to the fault and 30 after fault
Function 68 (*) (Trip Bus)	Blocking permission for 50 P, 50/51P, 50N/G, 50/51 N/G, 67N1, 67 N2
Fault report	2

Dimensions and cutout pattern SIA-D



Selection & Ordering data SIA-D

SIA-D											**PROTECTION FUNCTIONS** 50P + 50/51P + 50N/G + 50/51N/G + 52 + 49T
	1 5										**PHASE MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A)
		1 5 B									**NEUTRAL MEASUREMENT** In = 1 A; (0,10 – 30,00 A) In = 5 A; (0,50 – 150,00 A) In = 0,2 A; (0,02 – 6,00 A)
			5 6 7 8								**NET FREQUENCY** 50 Hz + Trip Block for switch disconnector 50 Hz 60 Hz + Trip Block for switch disconnector 60 Hz
				2 3							**POWER SUPPLY** 90-300 Vdc / 110-230 Vac 24-48 Vdc
					0 1						**ADDITIONAL FUNCTIONS** - + 67N1 + 67N2
						0 1					**COMMUNICATIONS** Local ModBus port + Remote ModBus port (RS485)
							2				**INPUTS - OUTPUTS** 4 Inputs + 4 outputs
								1 2			**MEMORY** Non-volatile RAM memory Non-volatile RAM memory + Oscillography
									A B D		**LANGUAGE** English, Spanish and German English, Spanish and Turkish English, Spanish and Russian
										A B	**ADAPTATION** - + Trip Bus function (68) + USB local port

Example of ordering code:

SIA D	1	5	6	2	0	1	2	1	D	A	*SIAD 1 5 6 2 0 1 2 1 D A*

Note: Accessories, page 60-61.

SIL-A

Overcurrent and Earth Fault Relay for Primary and Secondary Distribution

Main characteristics

- The SIL-A is an overcurrent and earth fault protection relay for primary and secondary distribution with auxiliary power supply (110-230 Vac/ 90-300 Vdc, 24-48 Vdc or 24-110 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: 50P(2), 50N/G (2)(1), 50/51P, 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.
- Different mechanics (Adaptation A and Adaptation B) make the SIL-A 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).
- SIL-A with Adaptation B with 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:

  - IEC60870-103 or Modbus RTU selectable by settings
  - IEC 61850, DNP 3.0 or IEC 60870-5-104 (depending on model).

  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 (depending on model).

- The SIL-A has configurable inputs and configurable outputs:

Adaptation A	Adaptation B
8 inputs + specific inputs for 74TCS	6 inputs (74TCS through configurable inputs)
5 outputs	4 outputs

- SIL-A with adaptation B is fitted with the demand of current with the following characteristics:

  Number of records: 168

  Recording mode circular

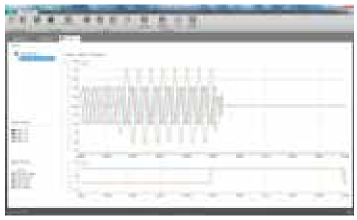
  Sampling rate (interval): configurable through communications: 1 – 60 min

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

(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

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

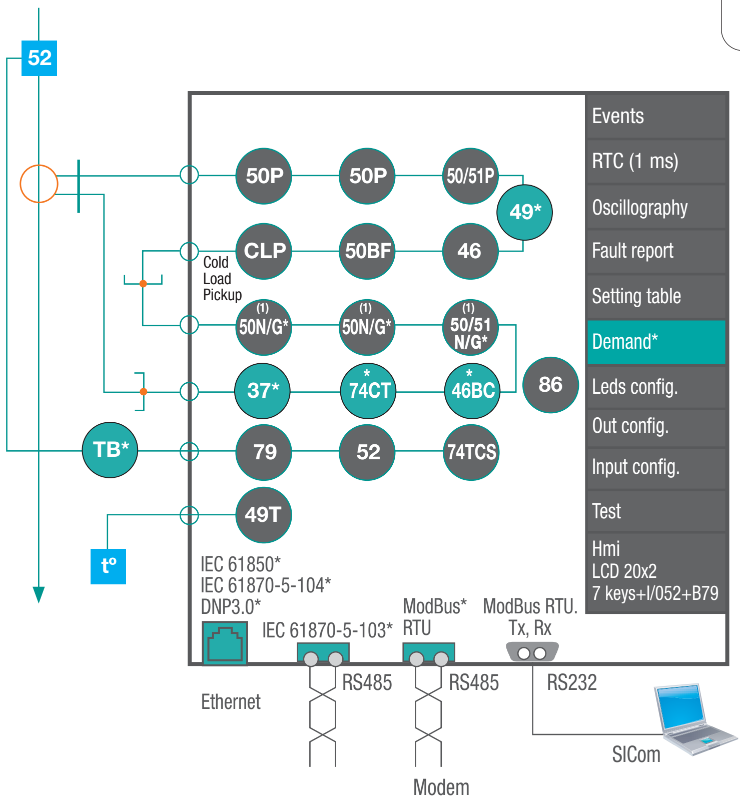
Adaptation A	Adaptation B
500 events	200 events
20 fault reports /80 events in each	20 fault reports /24 events in each
2x50 cycles oscillographic records	5x 100 cycles oscillographic records



Additional information to fault reports

Technical specifications SIL-A

Functions diagram SIL-A



(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

*** optional**

	Adaptation A	Adaptation B
50P(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 95%	
	Instantaneous deactivation	
	Timing accuracy: ±30 ms or ±0.5% (greater of both)	
50N/G(2) (1)	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 95%	
	Instantaneous deactivation	
	Timing accuracy: ±30 ms or ±0.5% (greater of both)	
50/51P	Function permission: yes/no	
	Operating range: 0.10 to 7 xIn (step 0.01)	
	Curves IEC 60255-151 and ANSI	
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Defined time : 0.02 to 300 s (step 0.01 s)	Operating time:IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve, IEC Long time inverse, ANSI Inverse curve, ANSI very inverse curve, ANSI extremely inverse curve. Defined time : 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 2.20 (step 0.01)	Dial: 0.02 to 2.20 (step 0.01)
	Curve, activation level 110%	
	Curve, deactivation level 100%	
	Defined time, activation level 100%	
	Defined time, deactivation level 95%	
	Instantaneous deactivation	
	Timer accuracy: ±5% or ±30 ms (whichever is greater)	
50/51N/G (1)	Function permission: yes/no	
	Operating range: 0.10 to 7 xIn (step 0.01)	
	Curves IEC 60255-151 and ANSI	
	Operating time: Inverse curve, very inverse curve, extremely inverse curve. Defined time : 0.02 to 300 s (step 0.01 s)	Operating time:IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve, IEC Long time inverse, ANSI Inverse curve, ANSI very inverse curve, ANSI extremely inverse curve. Defined time : 0.02 to 300 s (step 0.01 s)
	Dial: 0.05 to 2.20 (step 0.01)	Dial: 0.02 to 2.20 (step 0.01)
	Curve, activation level 110%	
	Curve, deactivation level 100%	
	Defined time, activation level 100%	
	Defined time, deactivation level 95%	
	Instantaneous deactivation	
	Timer accuracy: ±5% or ±30 ms (whichever is greater)	
46	Function permission: yes/no	Function permission: yes/no
	Operating range: 0.10 to 1.00 xIn (step 0.01)	Operating range: 0.10 to 7.00 xIn (step 0.01)
	Operating time: 0.02 to 300 s (step 0.01 s)	Curves IEC 60255-151 and ANSI
	Activation level: 100%	Operating time:IEC Inverse curve, IEC very inverse curve, IEC extremely inverse curve, IEC Long time inverse, ANSI Inverse curve, ANSI very inverse curve, ANSI extremely inverse curve. Defined time : 0.02 to 300 s (step 0.01 s)
	Deactivation level 95%	Dial: 0.02 to 2.20 (step 0.01)
	Instantaneous deactivation	Curve, activation level 110%
	Timing accuracy: ±30 ms or ±0.5% (greater of both)	Curve, deactivation level 100%
		Defined time, activation level 100%
		Defined time, deactivation level 95%
		Instantaneous deactivation
		Timer accuracy: ±5% or ±30 ms (whichever is greater)

	Adaptation A	Adaptation B
Circuit breaker monitoring	Circuit breaker status: Pickup, open, closed, error, opening time, opening fault, closing time and closing fault.	
	Input 52a and/or input 52b	
	Open and close command	
	Alarm for maximum opening number: 1 to 10000	
	Alarm for accumulated amps: 0 to 100000 (M(A²))	
	Maximum repeated openings: 1 to 10000	
	Time of maximum repeated openings: 1 to 300 min	
79	Function Permission: yes/no	
	Hold permission: yes/no	
	Number of reclosings: 1 to 5	
	Reclosing time 1, 2, 3, 4, 5 : 0.02 to 300 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 s (step 0.01 s)	
	Definitive opening time: 0.02 to 300 s (step 0.01 s)	
74TCS	Function permission: yes/no	
	Operating time: 0.02 to 300 s (step 0.01 s)	
	Trip continuity, in circuits A and B	
	Control voltage presence: -40%	Configurable inputs
	Specific inputs	
CLP	Function permission: Yes/no	Function permission: Yes/no
	50P_1 Multiplier range: 1 to 5	Setting table: 1 to 4 (step 1)
	50P_2 Multiplier range: 1 to 5	No load time:0.02 to 300 s (step 0.01 s)
	50N/G_1 Multiplier range: 1 to 5	Cold load time: 0.02 to 300 s (step 0.01 s)
	50N/G_2 Multiplier range: 1 to 5	CLP activation threshold: 8% In
	50/51N/G Multiplier range: 1 to 5	CLP reset threshold: 10% In
	50/51P Multiplier range: 1 to 5	
	CLP pass time: 1 to 18000 s (step 1 s)	
	CLP duration: 1 to 18000 s (step 1 s)	
	CLP activation threshold: 8% In	
	CLP reset threshold: 10% In	
PLC	OR16, OR16_LATCH, NOR16, NOR16_LATCH	OR4, NOR4, OR4_LATCH, NOR4_LATCH, OR4_PULSES, AND4_LATCH, NAND4_LATCH, AND4_PULSES, OR4_TIMER, NOR4_TIMER_UP, AND4_TIMER_UP, NAND4_TIMER_UP
86	Allows to latch (lock out) the contact trip due to programmable logic (PLC: LATCH).	
49T	Available through configurable inputs thanks to the programmable logic	
49 (*)	Function permission: yes/no	
	Operating range: 0.1 to 2.4 xIn (step 0.01)	
	ζ heating: 3 to 600 min (step 1 min)	
	ζ cooling: 1 to 6 ζ heating (step 1)	
	Alarm: 20 to 99 % (step 1%)	
	Trip level: 100%	
	Deactivation level: 95% of alarm level	
	Trip time accuracy: ± 5% over the theoretical 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.	

	Adaptation A	Adaptation B
74CT (*)	Not available	Function permission: yes/no
		Operating time: 0.02 to 300 s (step 0.01 s)
		Timing accuracy: ±30 ms or ±0.5% (greater of both)
37 (*)	Not available	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: ±30 ms or ±0.5% (greater of both)
46BC (*)	Not available	Function permission : yes/no
		Current tap: 15 to 100 %(step 1%)
		Operating time: 0.02 to 300 s (step 0.01 s)
		Timing accuracy: ±30 ms or ±0.5% (greater of both)
Trip Block (*)	Not available	Blocking: Yes/no
		Blocking limit: 1.5 to 20 x In (step 0.01)
68 (*)	Not available	Available through configurable inputs and outputs thanks to programmable logic
Settings tables	3 settings tables	4 settings tables
	Activated by inputs or by general settings.	Activated by inputs or by general settings.
RTC	Capacitor charge time: 10 minutes	
	Operation with no auxiliary voltage: 72 hours	
Oscillography	16 samples/cycle	16 samples/cycle
	Fault init configurable	Fault init configurable
	2 records of 50 cycles: 3 prefault and 47 postfault cycles	5 records of 100 cycles: 3 prefault and 97 postfault cycles
	COMTRADE IEEE C37.111-1991	COMTRADE IEEE C37.111-1991
	4 analog channels y 80 digital channels	4 analog channels y 48 digital channels
Fault reports	20 fault reports with 80 events each one	20 fault reports with 24 events each one
Demand of current	Not available	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 (actual) IA IB IC IN
Configurable inputs	Same voltage as the auxiliary power supply 8 configurable inputs	Same voltage as the auxiliary power supply 6 configurable inputs

	Adaptation A	Adaptation B
Configurable outputs	250 Vac – 8 A 30 Vdc – 5 A	
	5 configurable outputs: • Output 1 and output 2: NC + NO • Output 3, output 4 and output 5: NO	4 configurable outputs: • Output 1 and output 2: NC + NO • Output 3 and output 4: NO
Frequency	50/60Hz (*)	50/60 Hz selectable by general settings
Current measurement	Phase current (IA, IB, IC), neutral (IN), positive sequence (I1), negative sequence(I2) and maximum current (Imax)	
	Real RMS	
	Sampling: 16 samples/cycle	
	±2% Accuracy over a band of ±20% over the nominal current and 4% over the rest of the range	
	Saturation limit: 30 times rated current	
Communications	LOCAL COMMUNICATION 1 Local port RS232: ModBus RTU	
	REMOTE COMMUNICATION (*) 2 remote ports with the following options : • 2 Remote ports RS485: ModBus RTU and IEC 60870-5-103 • 1 Remote port RS485 ModBus RTU and 1RJ45 port: IEC 61850, DNP3.0 or IEC 60870-104	REMOTE COMMUNICATION (*) 1 remote port 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 60870-104
Auxiliary power (*)	90 Vdc – 300Vdc / 110 Vac – 230 Vac ±20%	24-110 Vdc / 48-230 Vac ±20%
	24-48 Vdc ±10%	
Environmental conditions	Operating temperature : -10 to 70ºC	
	Storage temperature: -20 to 80ºC	
	Relative humidity: 95%	
Transformers	Measurement 3 or 4 CT /5 or /1	
	Measurement 3 LPCT (current transformers with voltage output)	
Mechanical Characteristics	Metallic box	
	Panel mounted.	
	1/2Rack – 4 U	1/4Rack – 4 U
	IP-54 on pannel	

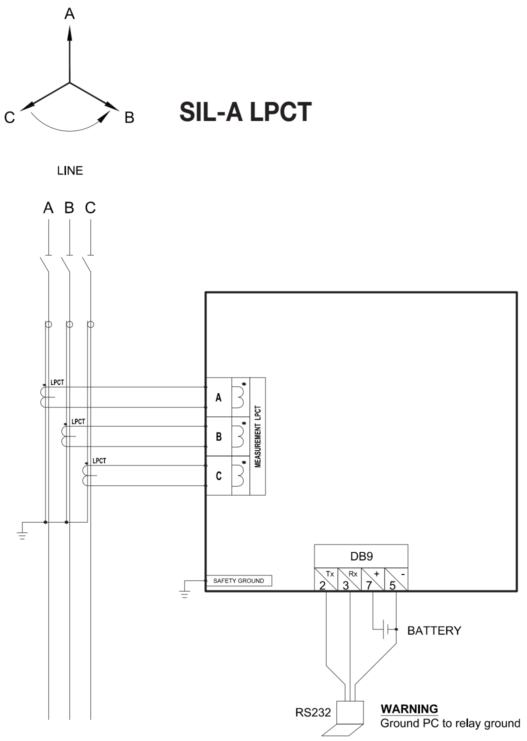
(1) Note:

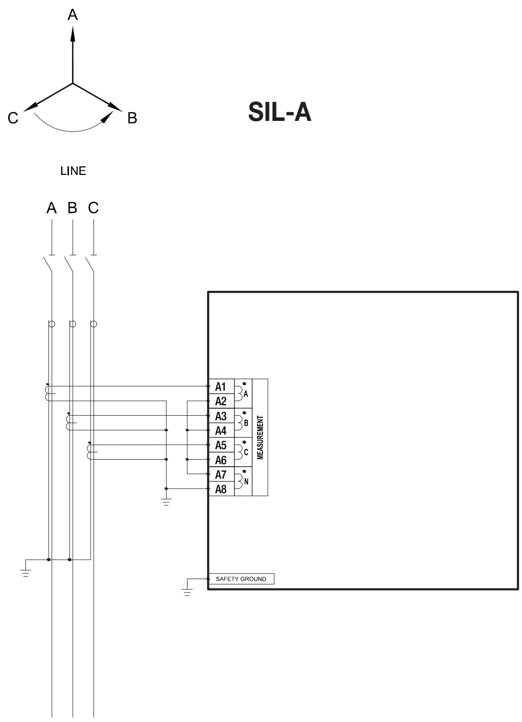
- LPCT model: neutral current is calculated so overcurrent protection functions are 50N(2) and 50/51N
- Compact model: neutral current is measured so overcurrent protection functions are 50N/G(2) and 50/51 N/G

(*) Optional depending on model

Technical specifications

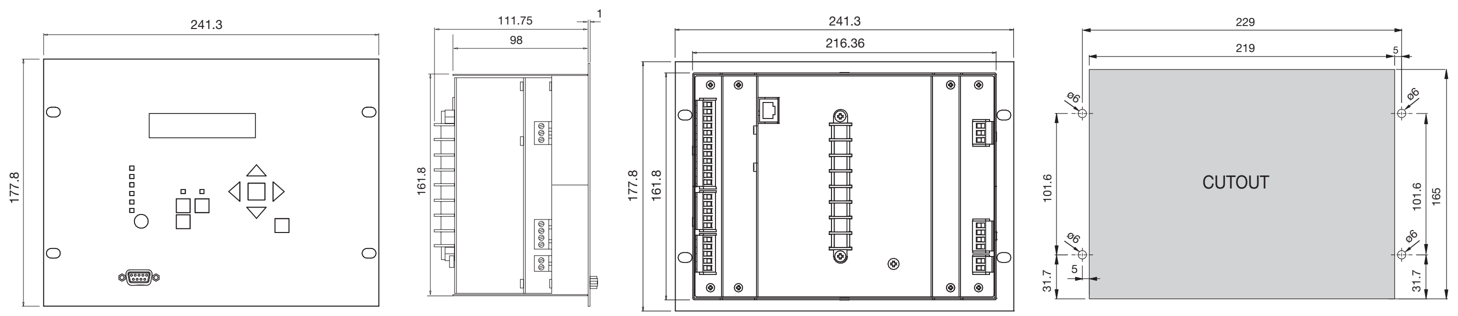
Connections diagram SIL-A



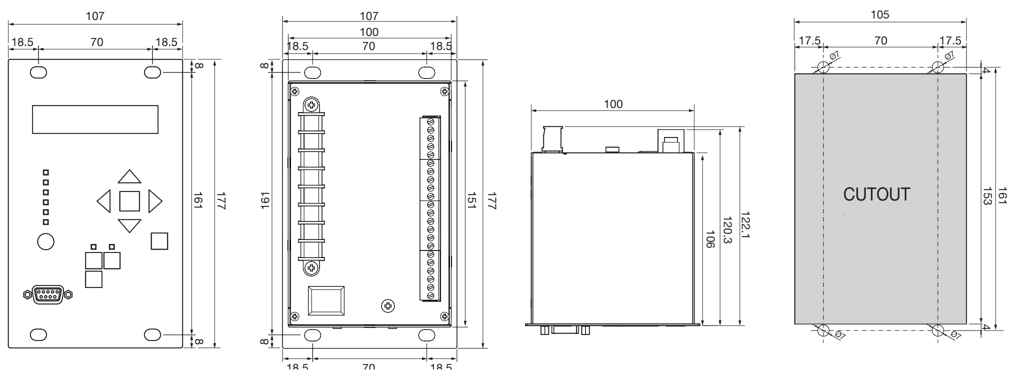


Dimensions and cutout pattern SIL-A

Adaptation A



Adaptation B



SIL-A	(Adaptation A)										(Adaptation B)										PROTECTION FUNCTIONS (2) 50P + 50/51P + (2) 50N/G(1) + 50/51 N/G(1) + 52 + 50BF + 46 + 79 + 74TCS + CLP + 86 + 49T
	X 1 5										0 S X										**PHASE MEASUREMENT** Standard In = 1A or 5A; (0.1 – 30A) / (0.5 – 150A). Sensible In = ½ A or 5/2 A; (0.05 – 15A) / (0.25 – 75A). LPCT In (Primary) = 50 – 800A. Defined by Setting In = 1 A; (0.1 – 30A) In = 5 A; (0.5 – 150A)
		X 1 5										0 S X									**NEUTRAL MEASUREMENT** Standard In = 1A / 5A; (0.1 – 30A) / (0.5 – 150A). Sensible In =1/10 A or 5/10 A; (0.01 – 3A) / (0.05 – 15A). LPCT: Internally Calculated. In = 1 A; (0.10 – 30A) In = 5 A; (0.50 – 150A)
			5 6										0								**NET FREQUENCY** (50Hz / 60Hz). Defined by Setting 50 Hz 60 Hz
				A B										C							**POWER SUPPLY** 24-48 Vdc 90-300 Vdc / 110-230 Vac 24-110 Vdc / 48-230 Vac
					0 1										0 2						**ADDITIONAL FUNCTIONS** - + 49 + 49 + 74CT + 37 + 46BC + Trip Block
						0 1 2 3 4 5										A B C D E F G H I					**REAR 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)* RS485. by Setting : ModBus or IEC 60870-5-103 RJ45. IEC61850 RJ45. DNP3.0 RJ45. IEC60870-5-104 FOC. Defined by Setting : ModBus or IEC 60870-5-103 FOC. IEC61850 FOC. DNP3.0 FOC. IEC60870-5-104 FOP. Defined by Setting : ModBus or IEC 60870-5-103
							0										1				**INPUTS-OUTPUTS** 8 Inputs y 5 Outputs. Configurable 6 Inputs + 4 Outputs. Configurable
								0 1										2			**MECHANICS** LPCT model Adaptation A: 4U x ½ Rack Standard model Adaptation A: 4U x ½ Rack Adaptation B: 4U x ¼rack
									A B C D										A B C D		**LANGUAGE** English, Spanish and German English, Spanish and Turkish English, Spanish and French English, Spanish and Russian
										A										B	**ADAPTATION** . .

*not available in LPCT model

Example of ordering code:

SIL A	5	5	5	A	1	3	0	1	A	A	0	0	0	C	2	A	1	2	B	B	*SILA 5 5 5 A 1 3 0 1 A A Adaptation A* *SILA 0 0 0 C 2 A 1 2 B B Adaptation B*

(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

SIL-B

Feeder Protection Relay for Primary Distribution

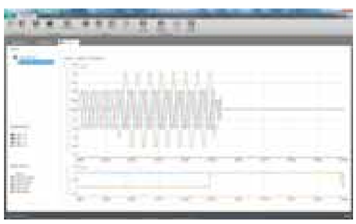
Main characteristics

- 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.

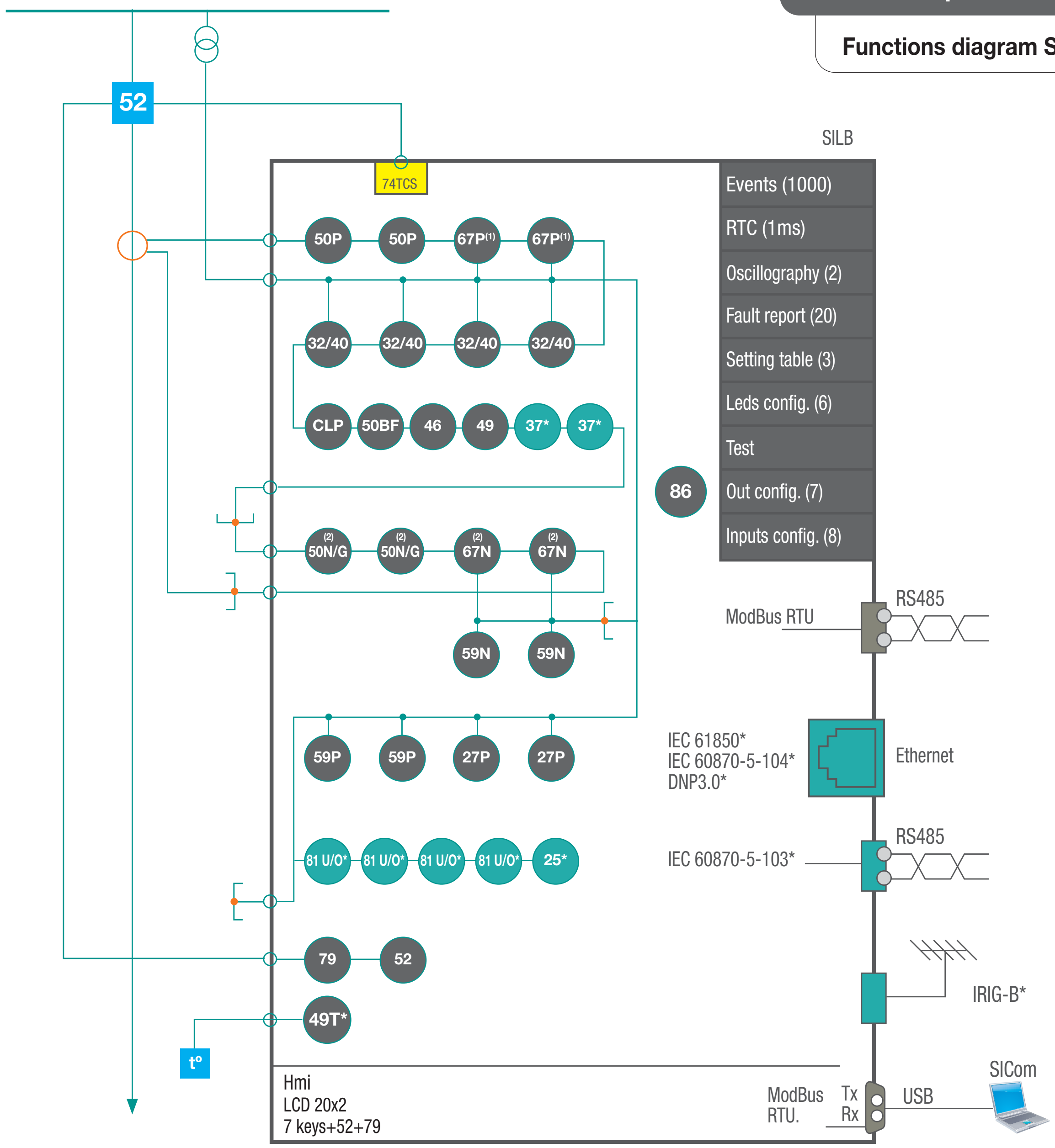
  Optionally: 81 U/O, 25, 37 and IRIG-B.
- 79 protection function (Recloser) allows up to 5 attempts of reclosing which can be programmed by the user.
- SIL-B has metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Its reduced size makes the SIL-B 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)

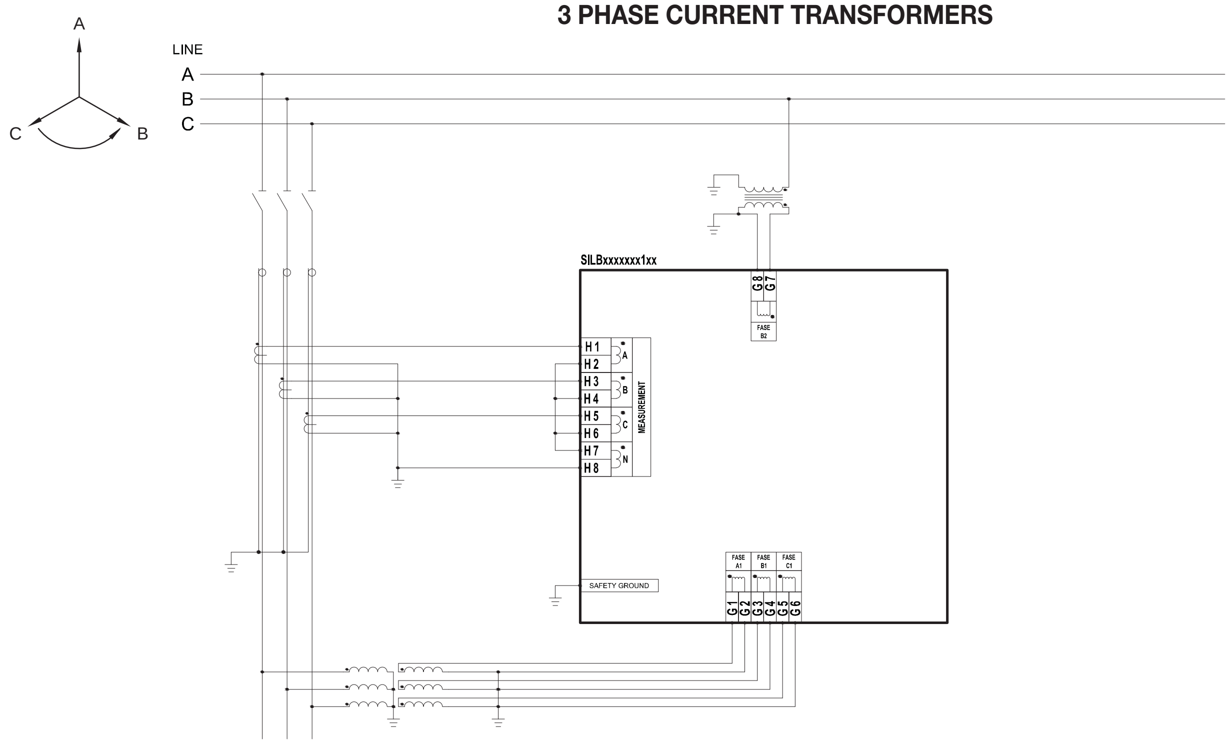
Function 49	Function permission : yes/no
	Tap: 0.10 a 2.40 Inominal (step 0.01)
	heating: 3 a 600 minutos (step 1 min)
	cooling: 1 a 6 veces heating (step 1)
	Alarm level: 20 a 99% (step 1%)
	Trip level: 100%
	Deactivation level: 95% of alarm level
	Timing accuracy: ± 5% respect of theorical value.
	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(A²)
	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

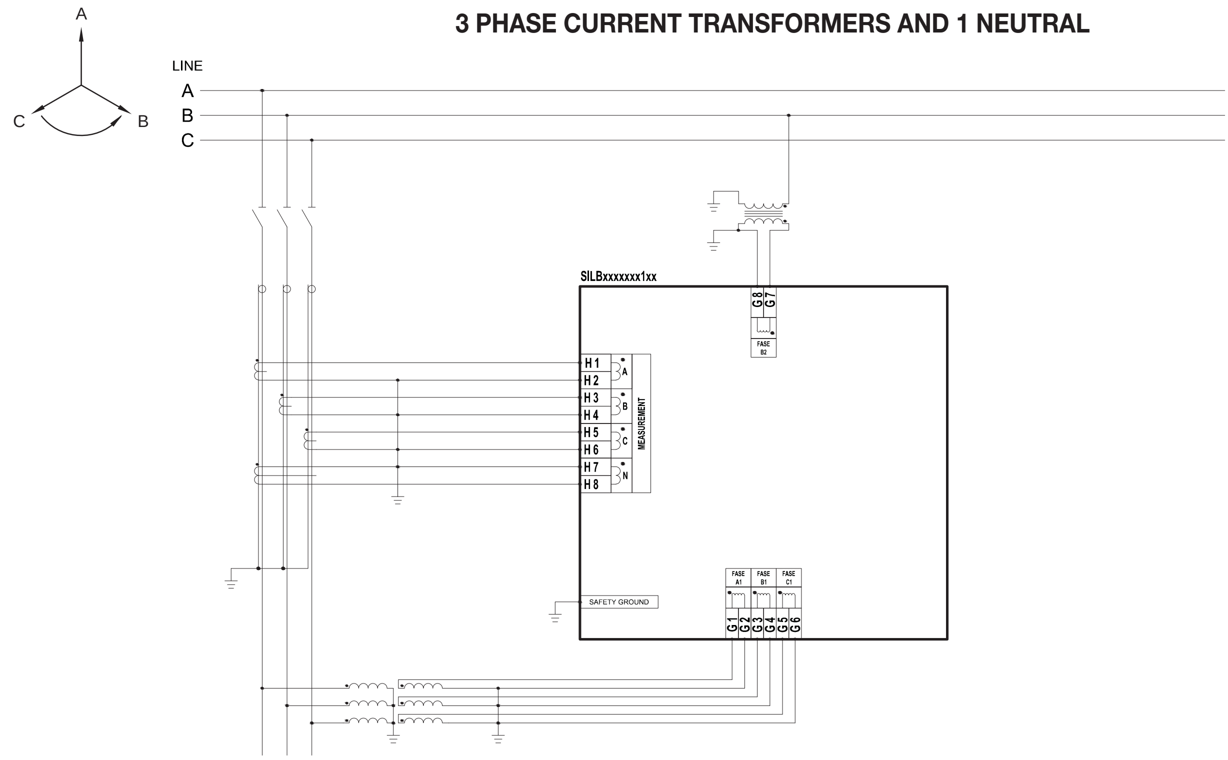
(*) Depending on the model.

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

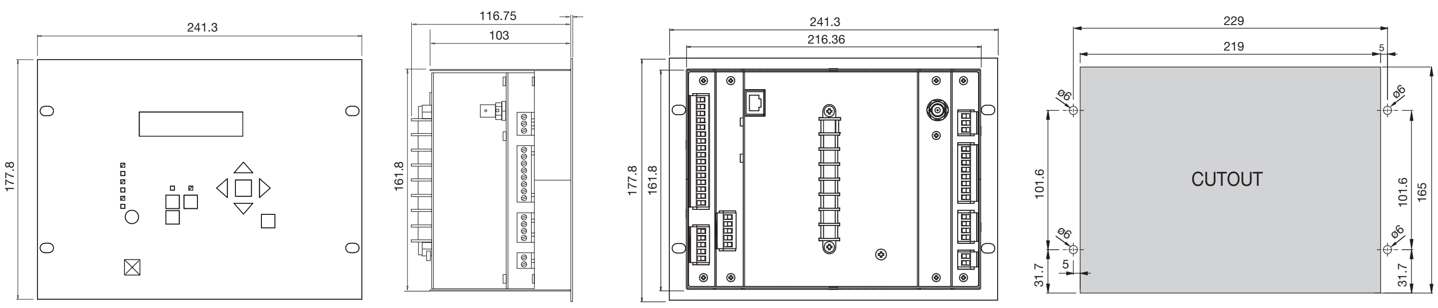
3 PHASE CURRENT TRANSFORMERS



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.

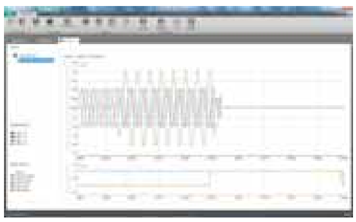
SIL-G

Generator Protection Relay

Main characteristics

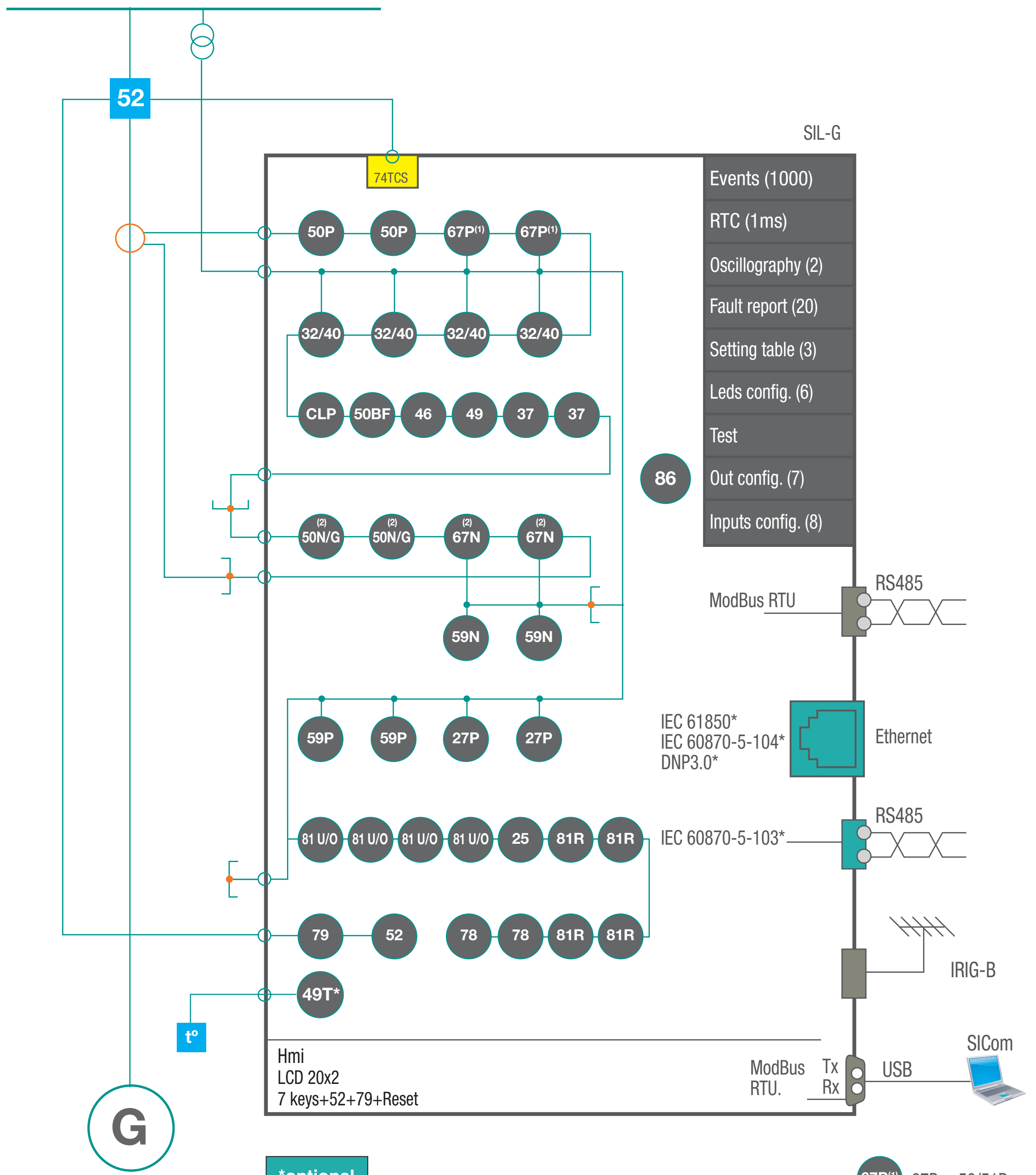
- The SIL-G is a relay for the protection of generators which is able to protect a generator by means of current, voltage and frequency functions. It is normally used with a circuit breaker as cutting element.
- It is normally used in Cogeneration in power stations from gas, steam, hydraulic turbine, or diesel driven generators.
- SIL-G is used with auxiliary power supply (110-230 Vac/ 90-300 Vdc or 24-48 Vdc).
- Protection functions available in SIL-G are the following:

  81R (4), 78 (2), 81 U/O (4), 27P, 32/4 (4), 59P (2), 59N (2), 25, 79, 50P (2), 50N/G (2), 67P (2), 67N (2), 46, 50BF, 52, 49, 86, Cold Load Pick-up, 49T, 74TCS, 37 and IRIG-B.
- 79 protection function (Recloser) allows up to 5 attempts of reclosing which can be programmed by the user.
- SIL-G has metallic box with high electromagnetic compatibility level (EMC) and wide range of operating temperature.
- Its reduced size makes the SIL-G 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-G can show different measurements:
  - 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-G has 8 configurable inputs and 7 configurable outputs apart from the specific inputs for the supervisión of trip coils (function 74TCS)
- 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

Functions diagram SIL-G



*optional

* available trough configuration

67P(1) 67P → 50/51P

(2) 67N 67N → 50/51 N/G

Technical parameters SIL-G

Function 81R(4)	Function permission : yes/no
	Type: Increment/Decrement
	Level: 0.1 to 5 Hz/s (step 0.1 Hz/s)
	Operating time: 0.3 to 40 s (step 0.1 s)
	Block function if phase b voltage is lower than 30 volts
	Activation level: 100%
	Reset time: 0.2 to 120 s (step 0.1s)
	Deactivation level: 95%
	Temporized deactivation
Function 78(2)	Function permission : yes/no
	Level: 1 to 25º (step 1º)
	Reset time: 0.2 to 120 s (step 0.1 s)
	Block function if phase b voltage is lower than 30 volts
	Activation level: 100%
	Deactivation level: 95%
	Temporized 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
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: ±30 ms or ±0,5% (greater of both)
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: ±30 ms or ±0,5% (greater of both)
Function 27(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%
	Timing accuracy: ±30 ms or ±0,5% (greater of both)
Function 32(4)	Function permission : yes/no
	Operating range: 0 to 10000 VA (steps 1 VA) – secondary values
	Operating angles: 0 to 359º (step 1º)
	Operating time: 0.02 to 300.00 s (step 0.01 s)
	Activation level: 100%
	Deactivation level: 95%
	Instantaneous deactivation
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 supervision temporization: 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

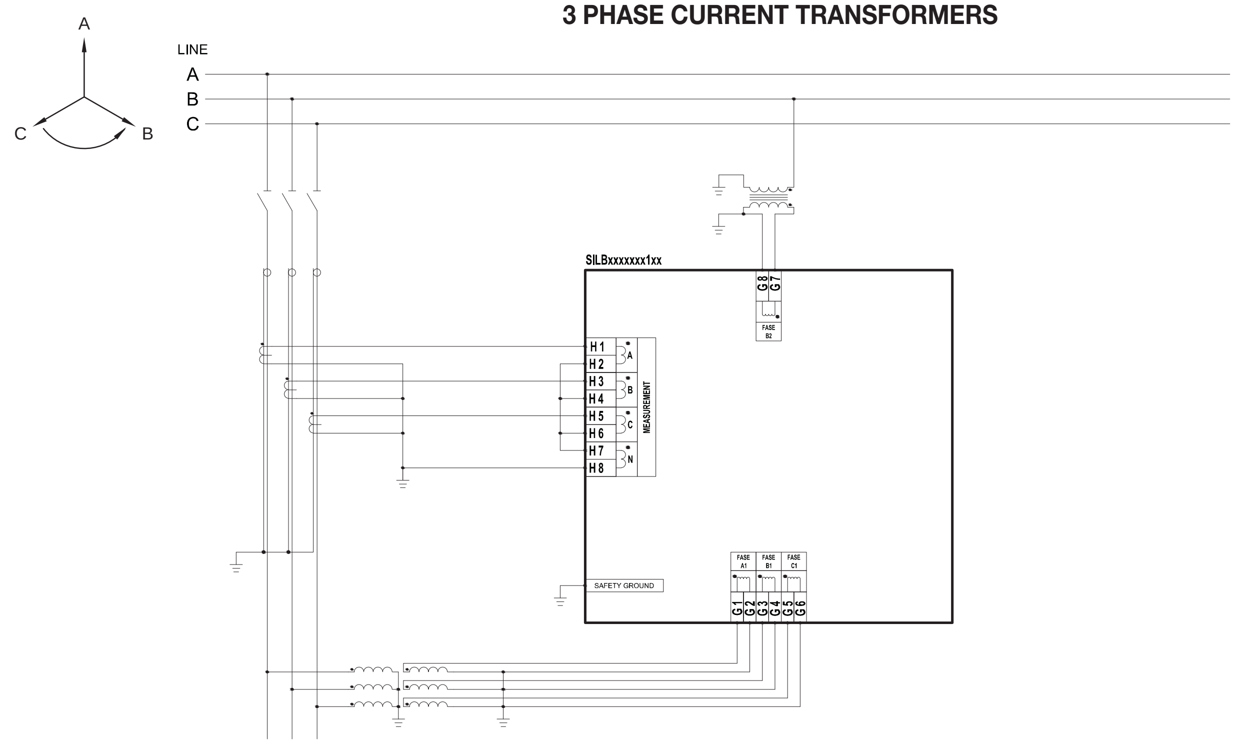
Function 79	Function permission : yes/no
	Wait permission: yes/no
	Number of reclosings: 1 to 5
	Reclosure times 1, 2, 3, 4, 5 : 0.02 to 300.00 s (step 0.01 s)
	Hold time: 0.02 to 300 s (step 0.01 s)
	Locking possibilities: pulse inputs, level inputs, commands.
	Replacement time: 0.02 to 300.00 s (step 0.01 s)
	Definitive opening time: 0.02 to 300 s (step 0.01 s)
Function 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: ±30 ms or ±0,5% (greater of both)
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: ±30 ms or ±0,5% (greater of both)
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: ±30 ms or ±0,5% (greater of both)
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: ±30 ms or ± 5% (greater of both)

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: ±30 ms or ± 5% (greater of both)
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: ±30 ms or ±0,5% (greater of both)
Function 49	Function permission : yes/no
	Tap: 0.10 to 2.40 Inominal (step 0.01)
	ζ heating: 3 to 600 minutes (step 1 min)
	ζ cooling: 1 to 6 times ζ 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.
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(A²))
	Excess repeated openings: 1 to 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 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.
Function 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

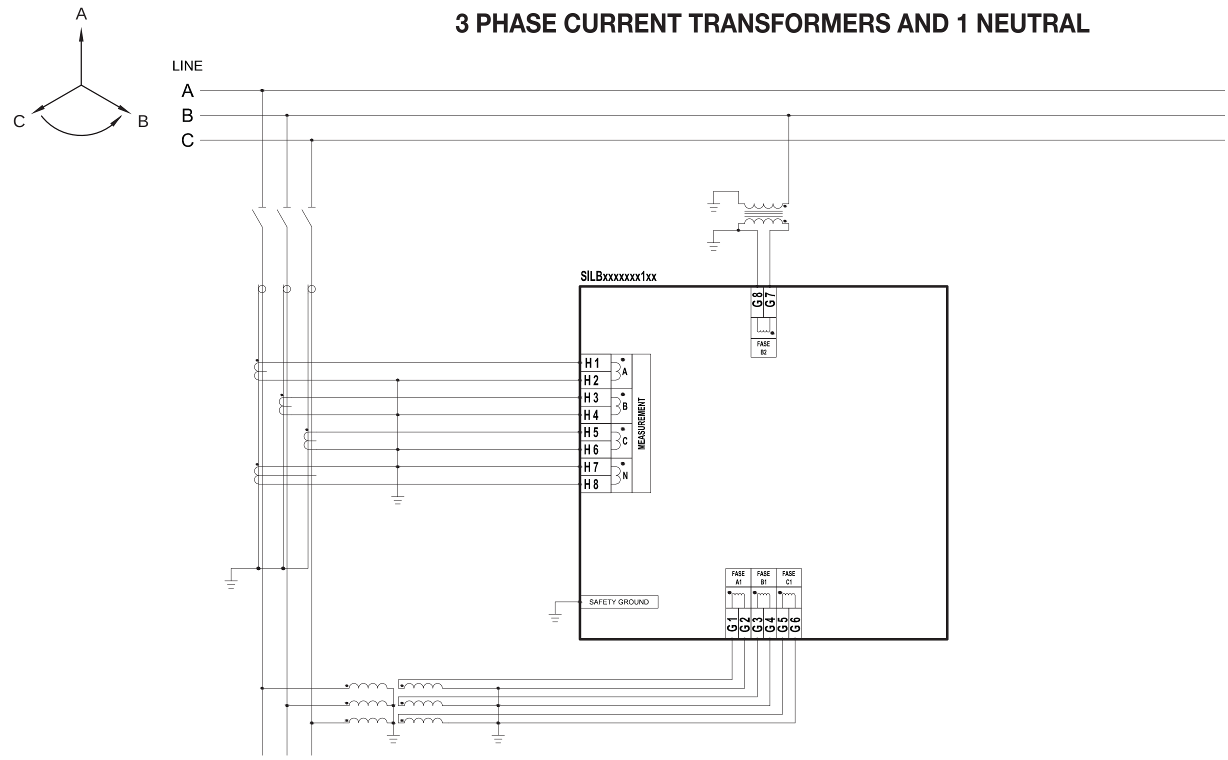
Function 49T	Available through configurable inputs
Programmable logic control (PLC)	OR16, OR16_LATCH, NOR16, NOR16_LATCH.
Function 86	Allows to latch (lock out) the contact trip due to programmable logic (PLC: OR_LATCH).
Settings tables	3 setting tables
	Selectable by input or general setting.
RTC	Condenser charge time: 10 minutes
	Functioning without auxiliary voltage: 72 hours
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
	Saturation limit: 30 times the rated current
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 185 V
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

(*) Optional depending on the model

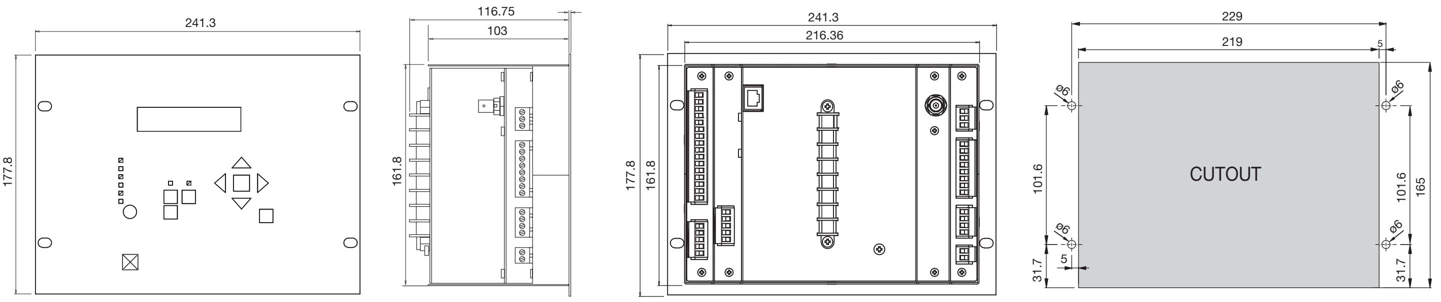
3 PHASE CURRENT TRANSFORMERS



3 PHASE CURRENT TRANSFORMERS AND 1 NEUTRAL



Dimensions and cutout pattern SIL-G



Selection & Ordering data SIL-G

SIL-G											**PROTECTION FUNCTIONS** 81R(4) + 78(2) + 81U/O(4) + 59P(2) + 59N(2) + 27P(2) + 32/40(4) + 25 + 79 + 37(2) + 50P(2) + 67P(2) + 50N/G(2) + 67N(2) + 46 + 52 + 50BF + 74TCS + CLP + 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 - 48Vdc 90 – 300Vdc / 110 – 230Vac
					4						**ADDITIONAL FUNCTIONS** + IRIG-B
						0 **1** **2** **3** **4** **5**					**REAR COMMUNICATIONS** IEC 60870-5-103 + ModBus (RS485) IEC 60870-5-103 + ModBus (FOP) IEC 60870-5-103 + ModBus (FOC-ST) IEC61850 + ModBus (RS485) DNP3.0 (TCP/IP) + ModBus (RS485) IEC 60870-5-104 + ModBus (RS485)
							0				**INPUTS-OUTPUTS** 7 outputs + 8 inputs
								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 G	**1**	**5**	**6**	**B**	**4**	**1**	**0**	**1**	**D**	**A**	*S I L G 1 5 6 B 4 1 0 1 D A*

Note: Accessories, page 60-61.

Accesories

Battery supply Kitcom

The KitCom is an adapter that allows you to feed SIA relays from the front communications port, allowing also to communicate with the computer locally.

SIA-C and SIA-D

The power comes from two AA batteries (IEC LR06) of 1.5 Volts placed at the bottom of the device. The equipment has a small Dc/Dc power supply that raises the voltage till the required 12 volts to operate the equipment. This operation includes the energy necessary to trip. With DB9 connection.

SIA-F and SIA-B

The power comes from two AA batteries (IEC LR06) of 1.5 Volts placed at the bottom of the device. The equipment has a small Dc/Dc power supply that raises the voltage till the required 5 volts to operate the equipment. This operation includes the energy necessary to trip. With USB connection.

SIA-A and SIA-E

The power comes from one PP3 battery (IEC GLR061) of 9 Volts placed at the bottom of the device.

The battery supplies the voltage of 9V required to operate the equipment, including the energy necessary to trip.

With DB9 connection.

The KitCom is an adapter to supply SIA relays through the front communication port, allowing the communication with the computer simultaneously.

This adapter is very useful in the commissioning processes of the transformation centres, allowing full verification of the centre, without any auxiliary power supply.

The equipment has a microswitch that feeds the power supply with a LED (ON) when the voltage is adequate.

In addition to all the necessary to give the power supply, this device has two LED associated with the Rx and Tx lines of communication, and they are used to verify that there is data traffic between the PC and the SIA relay.

Selection & Ordering data

KITCOM						
						VOLTAGE
	1					12 Vdc
	5					5 Vdc
	9					9 Vdc
						TO EQUIPMENT
		D				DB9 MALE
		U				USB TYPE-A FEMALE
						TO PC
			0			-
			D			DB9 FEMALE
			U			USB TYPE-A MALE
						BATTERY
				0		-
				1		1 X PP3 without cover
				3		2 X AA without cover
				4		2 X AA with cover
						ADAPTATION
					A	-

Striker PRT

This is a single effect solenoid. The striker is spring operated.

The striker is activated by low-power polarised electrical signal supplied by the relay in case of a fault.

The striker is reset to its starting position manually.

Travel: 8 mm

Spring strength:

- Start of travel: 37 N
- End of travel: 18 N

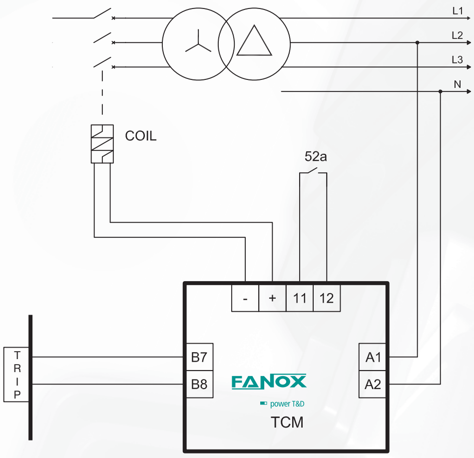
Response time: 4 ms

Protection rating: IP-40

Trip coil module TCM

This item is connected to the potential-free trip contact of the relay and supplies the energy needed to trip the coil (30J).

It is loaded using the auxiliary voltage supply of the transformation centre and retains power for up to 3 days without external power supply.



Selection & Ordering data

TCM				
	1 2			POWER SUPPLY 230 Vac 110 Vac
		A B C		OUTPUT VOLTAGE FOR TRIP 48 Vdc 110 Vdc 220 Vdc
			A	ADAPTATION Available for potential free contact

Example of ordering code:

TCM	1	A	A	*TCM1AA*

*TCM2CA is not available

Communications

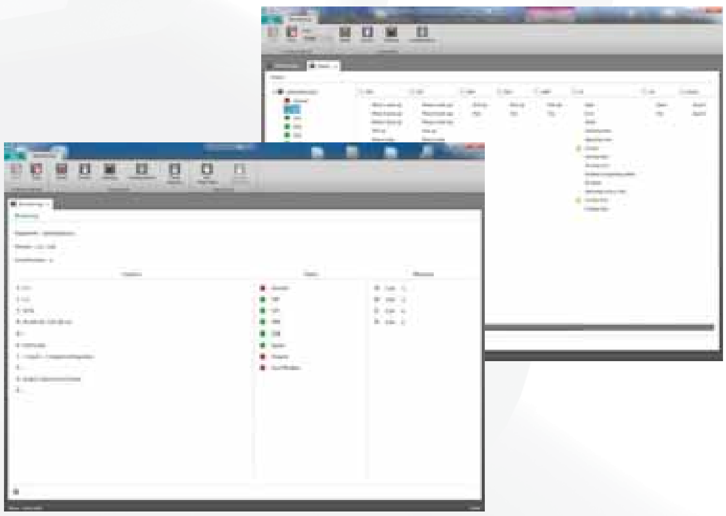
SICOM Programme

The relays have a communication local port on the front of the equipment and two rear ports on the back for remote communication.

The SICom programme with Windows® 7/8 uses a graphic user interface to allow you to access all equipment information, modify the settings and save events.

The programme can be used locally by using the front port or remotely by using the rear port.

There are 4 levels of access with user-definable codes.




R36
100K
Q1
A733
R54
100K
R15
2K15
C15
D POWER SUPPLY

protection & control

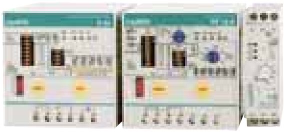
protection & control

PROTECTION & CONTROL

Index

protection & control

ELECTRONIC PROTECTION & CONTROL OF MOTORS, GENERATORS AND PUMPS



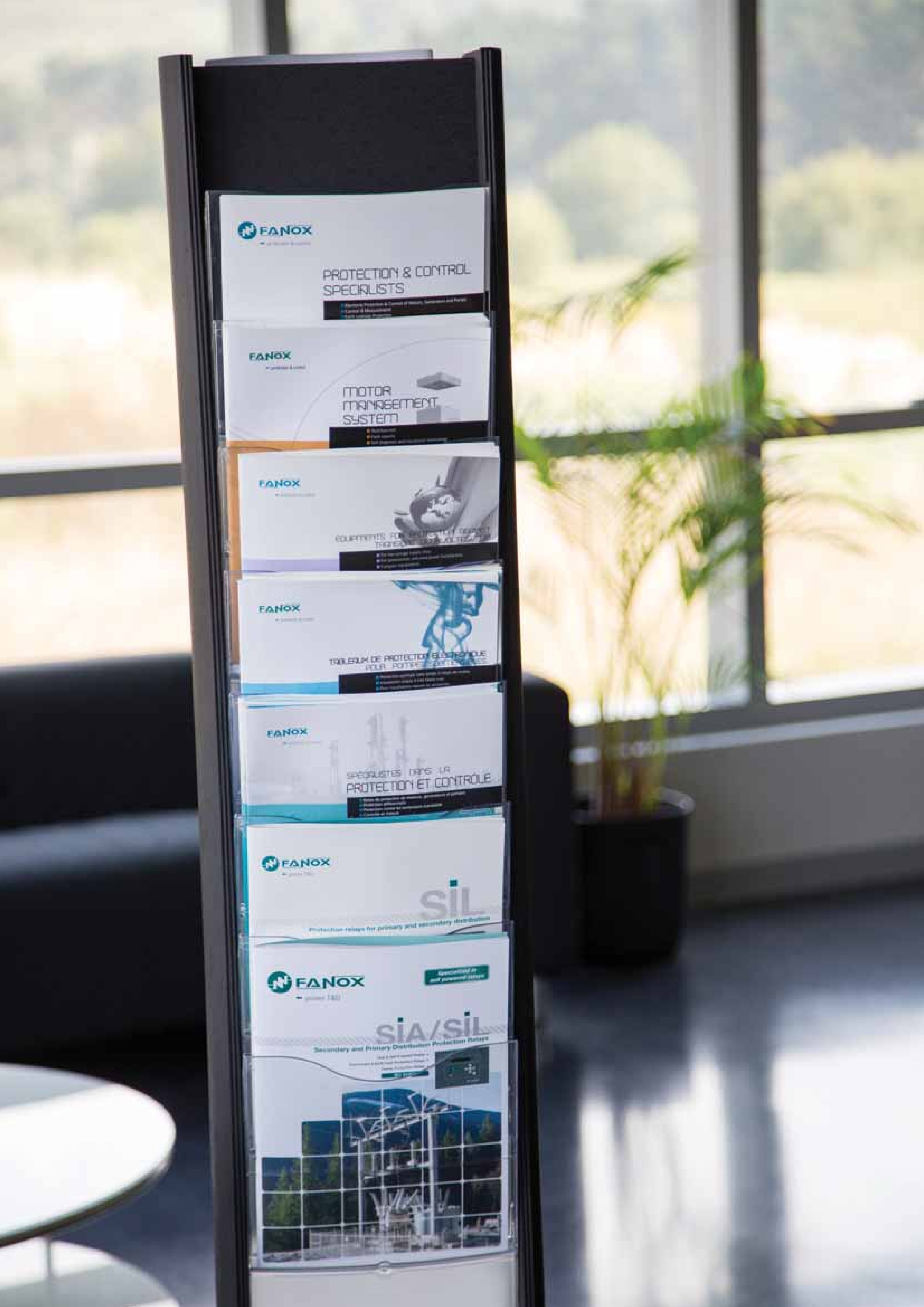
CONTROL & MEASUREMENT

EARTH LEAKAGE PROTECTION

TRANSFORMERS

SURGE PROTECTION

CUSTOMIZED PRODUCTS AND BRANDLABELING


FANOX
PROTECTION & CONTROL
SPECIALISTS
FANOX
MOTOR
MANAGEMENT
SYSTEM
FANOX
FANOX
FANOX
SPECIALISTES DANS LA
PROTECTION ET CONTROLE
FANOX
SIL
Protection relays for primary and secondary distribution
FANOX
SIA/SIL
Secondary and Primary Distribution Protection Relays

ELECTRONIC PROTECTION & CONTROL OF MOTORS, GENERATORS AND PUMPS

Introduction

Fanox designs and manufactures the most reliable protection & control relays in the market. Products that efficiently prevent engine burnouts, saving costly repairs and preventing dreaded and unnecessary downtime in any important process.

The electric motor is one of the most important drives in industry, and plays a decisive role in the success of a production process. Valuable production processes and high value machinery can be completely paralyzed by one single motor failure. This poses the risk of great expenses, with the resulting costs significantly exceeding the cost of repairing the motor itself.

Experience shows that motor protection is still a novelty, and still not a priority amongst users. The high numbers of faults that occur every day are mainly due to overloads, locked rotor, phase failure or imbalance, heavy bursts of long duration or high duty cycle of operations, or overheating.

Over 60% of failures are due to causes not detected by conventional protection systems, causing excessive heat in the windings, leading to a drastic reduction of the electrical life of the motor.

The most significant technical advantages of Fanox designed equipment is:

- Continuous Thermal image memory of heating and cooling cycles of the engine's starting cycles, work overload and stoppages.
- The prompt detection of phase loss, even with the engine running at low loads, stopping quickly to avoid costly breakdowns.
- Identification of trip cause. The relays indicate the reason for tripping instantly allowing you to identify and act quickly on faults.

PBM

PBM Protection, Control and Monitoring System

MOTOR MANAGEMENT SYSTEM

INTEGRAL SOLUTION FOR MCCs ADAPTABLE TO EVERY CUSTOMER NEEDS

MULTIFUNCTION

FAULT REPORTS

4 fault reports with the following information: dates, measurements, status bits, inputs and outputs.

SELF-DIAGNOSIS, INSTALLATION MONITORING AND STATISTICS

- Earth toroidal disconnection monitoring.
- PTC sensor open circuit and short circuit detection.
- Magnetic module hardware monitoring.
- Non-volatile memory stored information coherence.
- Number of motor start ups.
- Medium and maximum current of last start up.
- Number of faults for the following functions: Overload, PTC, JAM, locked rotor and neutral faults.
- Operating hours counter.

TEST MENU

Operation check on LEDs and outputs.

DESIGNED FOR SCADA APPLICATIONS

RTU Modbus protocol and RS485 communication

MODULAR AND SCALABLE

The basic functions of the system can be extended with different modules (PBM H, PBM D...)

COMMUNICATION SOFTWARE PBCom

PBM B

PBM H

PBM Motor Management System Video demo:

PROTECTION FUNCTIONS

- $\theta>$ Overload with thermal image
- Overheating protection (PTC sensor)
- Phase imbalance or phase failure
- Phase sequence
- **JAM** JAM detection
- Locked rotor detection
- $I_g>>$ Instantaneous earth leakage overcurrent
- $I_g>$ Earth leakage inverse time overcurrent
- $I_0>>$ Instantaneous neutral overcurrent
- $I_0>$ Neutral inverse time overcurrent
- $I<$ Undercurrent

PBM B

BASE MODULE

Current measurement is obtained from the motor line through the magnetic module without need of external current transformers.

From 0,8 up to 25 A with internal current transformers.
Over 25 A with external current transformers.

MODELS		PBM-B1		PBM-B5	
		PBM-B11	PBM-B12	PBM-B51	PBM-B52
Adjustment range	Ib (A)	0,8-6A	0,8-6A	4-25A	4-25A
Auxiliary supply		110/230Vac-dc	24/48Vdc	110/230Vac-dc	24/48Vdc
Frequency		50/60/ variable (45-65) Hz			
Maximum motor nominal voltage		1.000 Vac			
CODE		17000	17002	17001	17003
For I_N of the motor below the minimum setting I_B		Pass the cables several times (n) through the holes in the relay I_B = n x I_N			
For I_N of the motor above the maximum setting I_B		Use 3 CT .../5 and the relay PBM B and pass the secondary through the holes			
OTHERS CHARACTERISTICS					
Optional		PBM-H display module HMI			
Inputs		1 x PTC temperature sensor, 1 x Toroidal transformer (external earth fault), 1 x Digital input 24 Vdc			
Outputs		2 x NO-NC contact			
Short circuit withstand rating		5000 A to 0,5s (SCR 5000@0,5s)			
Communication		RS485 ModBus RTU			
Signalling		5 signalling LEDs			
Reset mode		Manual, automatic and automatic time delayed			
Test		Specific test menu			
Operating temperature		- 10ºC + 60ºC			

PBM H

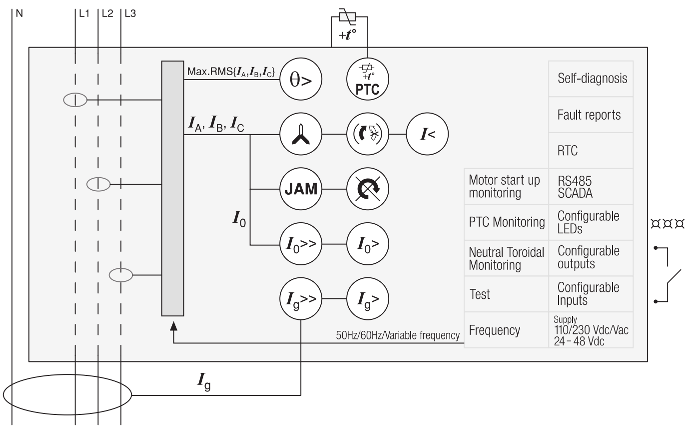
DISPLAY MODULE HMI

This is an optional display module with an LCD screen for signalling, control and setting.
The LEDs can be configured and are identified by labels.
Access to menus is intuitive and direct, making protection system commissioning easier.

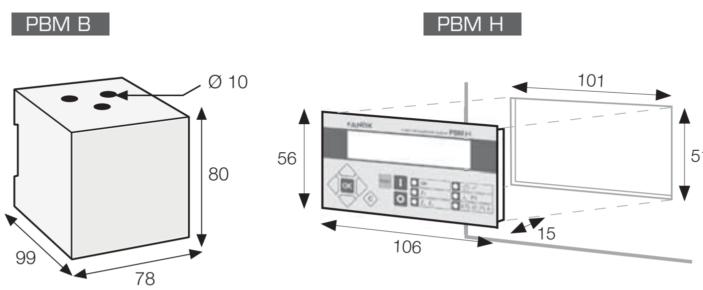
CODE	ACCESORIES	LANGUAGE
17004	PBM-HS display	Spanish
17005	PBM-HS display	French
17006	PBM-HS display	English
17007	PBM-HS display	Polish
17010	PBM-HS display	German
79229	CD PBM	
17008	CDCNB CABLE 0,5 M	
17009	CDCN1 CABLE 1 M	

CHARACTERISTICS PBM H	
LCD Display	20 x 2 alphanumeric characters
Keyboard	9 keys
Communication	RJ45 connector to relay
Signalling	6 configurable signalling LEDs
Reset mode	Manual, automatic and automatic time delayed
Test	Specific test menu

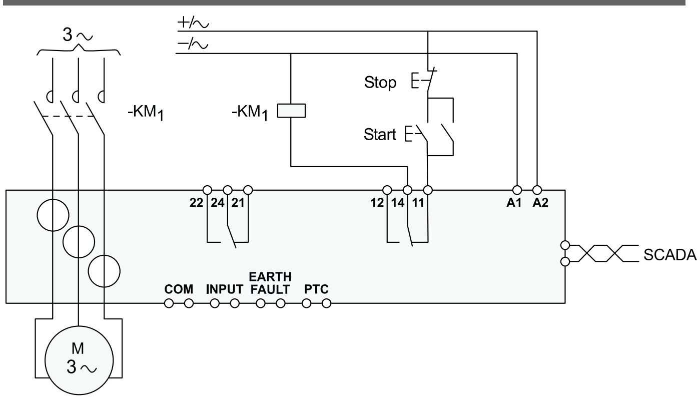
FUNCTION DIAGRAM PBM B



DIMENSIONS (mm)



CONNECTION DIAGRAM PBM B



GL

Motor Protection Relays

INTEGRAL MOTOR PROTECTION

- ***For 3-phase motors from 1 to 630 A and over. Cable feed through relay.***
- ***Precise motor heating and cooling memory, reproduces its thermal image.***
- ***Immediate detection of phase loss (3 s), even at reduced load.***
- ***Visual indication of tripping cause.***

For motors (1 to 630 A and over), in applications such as surface mounted pumps, compressors, mixers, ventilators, elevators, cranes, industrial refrigeration and in general for those motors requiring complete protection where over temperature (by means of PTC sensor) and incorrect phase sequence protection is required.

Its 7 trip classes cover all types of starting or working cycles.

GL

PROTECTION FUNCTIONS

- $I>$ Overload
- Phase imbalance or phase loss
- Overtemperature
- Phase sequence

EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory, the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of a Ø22 mm push button.

Suitable for motor control centres (MCC) and panel boards.

ODGL

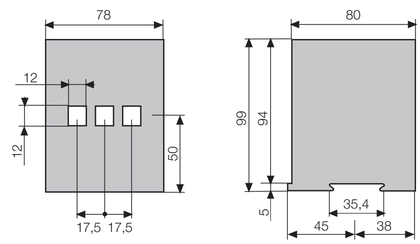
Models	Code	Relay type
ODGL	**12535**	GL

MODELS				GL 16	GL 40	GL 90
Adjustment range Motor 400 V 50/60 Hz		I_B (A)		4 - 16,7	15 - 40,5	40 - 91
		CV		3 - 10	10 - 25	30 - 60
		kW		2,2 - 7,5	7,5 - 18,5	22 - 45
Code	according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	230 Vac	single phase	**11303**	**11323**	**11343**
		115 Vac	single phase	**11302**	**11322**	**11342**
		24 Vac, dc	single phase	**11300**	**11320**	**11340**
For I_N of the motor below the minimum setting I_B				Pass the cables several times (n) through the holes in the relay I_B = n x I_N		
For I_N of the motor above the maximum setting I_B				Use 3 CT .../5 and the relay GL16 and pass the secondary through the holes		
External display module (optional)				ODGL		

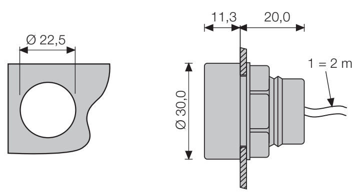
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	1000 Vac
Trip classes (IEC 947-4-1)	5 - 10 - 15 - 20 - 25 - 30 - 35
Phase sequence protection	ON ▬ OFF Actuates during the motor start
Phase imbalance protection	Over 40%. Tripping time < 3s
PTC Min/max cold resist.-Average trip / reset resist.	25Ω / 1500Ω - 3600Ω / 1800Ω
Reset mode	Manual and remote
Signalling LED's	4 LED's: ON + $I>$ + + +
Output contacts	1 relay with 1 NA + 1 NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	2,5 VA (115-230 Vac) - 1,5 W (24 Vdc)
Protection degree / weight / mounting	IP20 / 0,5 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m ; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE c UL us LISTED

Settings and curves, see pages 87 to 93.

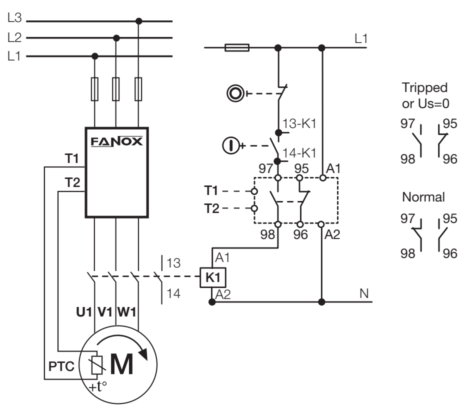
DIMENSIONS GL RELAY (mm)



DIMENSIONS ODGL MODULE (mm)



WIRING DIAGRAMS



INTEGRAL MOTOR PROTECTION

- ***For 3-phase motors from 60 to 200 A and over. Cable feed through relay.***
- ***Precise motor heating and cooling memory, reproduces its thermal image.***
- ***Immediate detection of phase loss (3 s), even at reduced load.***
- ***Visual indication of tripping cause.***

For 3 phase motors up to 200A, in applications such as surface mounted pumps, compressors, mixers, ventilators, elevators, cranes, industrial refrigeration and in general for those motors requiring complete protection where over temperature (by means of PTC sensor) and incorrect phase sequence protection is required.

Its 7 trip classes cover all types of starting or working cycles.

GL 200

PROTECTION FUNCTIONS

- $I>$ Overload
- Phase imbalance or phase loss
- Overtemperature
- Phase sequence

EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory, the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of a Ø22 mm push button.

Suitable for motor control centres (MCC) and panel boards.

ODGL

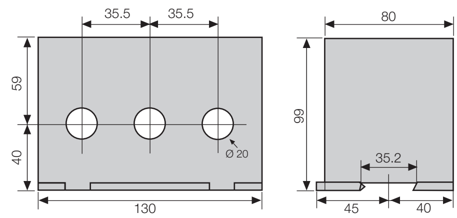
Models	Code	Relay type
ODGL	**12535**	GL

MODELS				GL 200
Adjustment range Motor 400 V 50/60 Hz	I_B (A)			60 - 200
	CV			50 - 150
	kW			37 - 110
Code: according to the relay voltage supply ac: 50/60 Hz	15%	230 Vac	single phase	**11363**
	15%	115 Vac	single phase	**11362**
	20%	24 Vac, dc	single phase	**11360**
External display module (optional)				ODGL

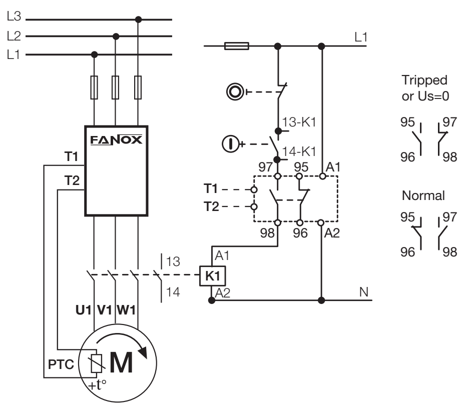
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	1000 Vac
Trip classes (IEC 947-4-1)	5 - 10 - 15 - 20 - 25 - 30 - 35
Phase sequence protection	ON / OFF Actuates during the motor start
Phase imbalance protection	Over 40%. Tripping time < 3s
PTC Min/max cold resist.-Average trip / reset resist.	25Ω / 1500Ω - 3600Ω / 1800Ω
Reset mode	Manual and remote
Signalling LED's	4 LED's: ON + $I>$ + ⅄ + (↻) + +t°
Output contacts	1 relay with 1 NA + 1 NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	4.0 mm², No. 30 - 12AWG / 50Ncm, 4.4 LB - IN
Power consumption	2,5 VA (115-230 Vac) - 1,5 W (24 Vdc)
Protection degree / weight / mounting	IP20 / 1 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m ; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE c UL US LISTED

Settings and curves, see pages 87 to 93.

DIMENSIONS GL RELAY (mm)



WIRING DIAGRAMS



Motor Protection Relays

BASIC MOTOR PROTECTION

- ***For 3-phase motors from 1 to 630 A and over. Cable feed through relay.***
- ***Precise motor heating and cooling memory, reproduces its thermal image.***
- ***Immediate detection of phase loss (3 s), even at reduced load.***
- ***Visual indication of tripping cause.***

For motors of low and medium power in several applications such as compressors, ventilators, surface mounted pumps, conveyor belts, machine tools, and in general to protect motors which need dependable and accurate protection relays for every type of start.

Its 3 trip classes cover many types of starting or working cycles.

C

PROTECTION FUNCTIONS

- *I*> Overload
- Phase imbalance or phase loss

EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory, the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of a Ø22 mm push button.

Suitable for motor control centres (MCC) and panel boards.

ODC

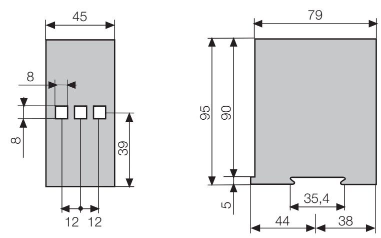
Models	Code	Relay type
ODC	**12530**	C

MODELS			C 9	C 21	C 45
Adjustment range Motor 400 V 50/60 Hz		I_B (A)	3 - 9,3	9 - 21,6	20 - 45,2
		CV	2 - 5,5	7,5 - 12	15 - 30
		kW	1,5 - 4	5,5 - 9	11 - 22
Code	according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	230 Vac single phase	**11203**	**11223**	**11243**
		115 Vac single phase	**11202**	**11222**	**11242**
		24 Vac, dc single phase	**11200**	**11220**	**11240**
For I_N of the motor below the minimum setting I_B			Pass the cables several times (n) through the holes in the relay I_B = n x I_N		
For I_N of the motor above the maximum setting I_B			Use 3 CT .../5 and the relay C9 and pass the secondary twice through the holes		
External display module (optional)			ODC		

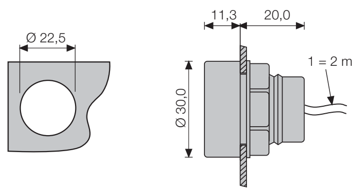
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	1000 Vac
Trip classes (IEC 947-4-1)	10 - 20 - 30
Phase imbalance protection	Over 40%. Tripping time < 3s
Reset mode	Manual and remote
Signalling LED's	3 LED's: ON + *I*> + ⅄
Output contacts	1 relay with 1 NO + 1 NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	**C9:** 6,5VA (230Vac) - 3VA (115Vac) / **C21-C45:** 2,5VA
Protection degree / weight / mounting	IP20 / 0,3 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m ; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE cULus LISTED

Settings and curves, see pages 87 to 93.

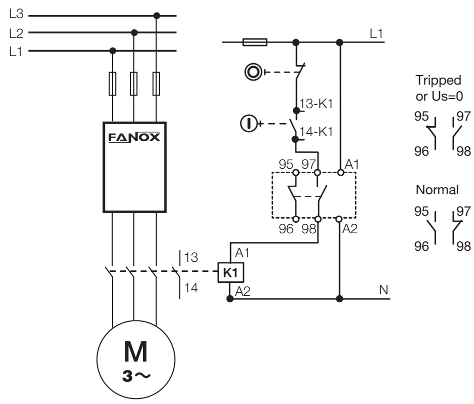
DIMENSIONS C RELAY (mm)



DIMENSIONS ODC MODULE (mm)



WIRING DIAGRAMS



EEx e Motor Protection Relays

MOTOR PROTECTION IN EXPLOSIVE OR HAZARDOUS AREAS

- ***Certificates for use as category 3 - Directive ATEX 94/9/EC.***
- ***For 3-phase motors up to 1000 Vac.***
- ***Currents from 1,5 to 630 A and over.***
- ***With thermal memory.***
- ***Visual indication of tripping cause.***

These relays are applicable for EEx e motors with ratings up to 630A and above, operating in potentially explosive or hazardous areas such as petrochemical industries, plastic factories, etc. The relay is installed outside the explosive area.

G

PROTECTION FUNCTIONS

- I> Overload
- Phase imbalance or phase loss
- Overtemperature

ATEX

The models G and BG are ATEX marked with certification for Category 3 use.

PTB approval:

G and BG relays have been approved by the **Physikalisch-Technische Bundesanstalt-PTB** for the protection of EEx e explosion proof motors (DIN EN 50019 / DIN VDE 0170 /DIN VDE 0171 part 6) according to the stipulations and requirements of PTB. PTB report no. PTB Ex 3.43-30004/00.

CE Ex II (3) G EEx e

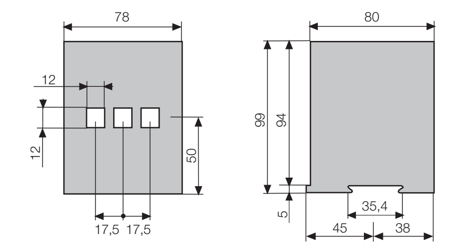
PTB Ex 3.43 - 30004/00

MODELS			G 17
Adjustment range Motor 400 V 50/60 Hz		I_B (A)	5 - 17,7
		CV	3 - 10
		kW	2,2 - 7,5
Code	according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	230 Vac single phase	**10723**
		115 Vac single phase	**10722**
		24 Vdc, ac	**10720**
For I_N of the motor below the minimum setting I_B			Pass the cables several times (n) through the holes in the relay I_B = n x I_N
For I_N of the motor above the maximum setting I_B			Use 3 CT's .../5 and pass their secondary twice (n=2) through the relay holes
External display module / Code no.			No

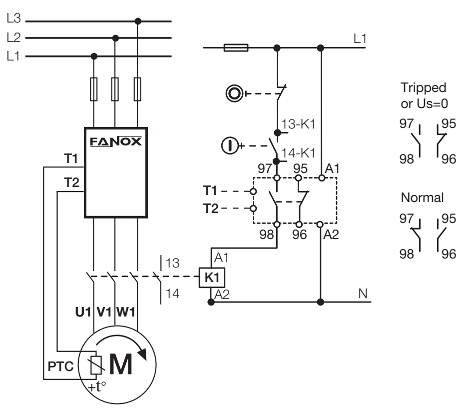
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	1000 V
15 adjustable tripping curves	Cold tripping times at 6 x I_B from 2 to 30s
Phase imbalance protection	Over 40%. Tripping time < 3s
PTC min/max cold resist. / Average trip resistance	100 Ω / 1500 Ω - 2750 Ω
Reset mode	Manual and remote
Signalling LED's	4 LED's: ON + one for each protection
Alimentación auxiliar monofásica • Voltage Us • Frequency • Consumption • Protection fuse	 115 - 230 Vac (+15% -6%) / 24 Vdc (±10%) 50/60 Hz (from 49 to 61,2 Hz) 2,5 VA (115 - 230 Vac) / 1,5 W (24 Vdc) GL 6 A
Output contacts • Switching capacity in abnormal conditions • Short-circuit resistance	1 relay with 1 NO + 1 NC I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A 1000 A
Short circuit withstand rating	5000 A at 0,5 s (SCR 5000@0,5 s)
Terminals max. section / Screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Protection degree / weight / mounting	IP20 / 0,5 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature	-15°C +60°C
Standards CE c UL us LISTED	EN 50081-2, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 60529, EN 60947-5-1, UL 508 EN 60947-1, EN 60947-4-1, EN 60255-8, EN 954-1, EN 60079-14, EN 60034-1, EN 50019

Settings and curves, see pages 87 to 93.

DIMENSIONS G RELAY (mm)



WIRING DIAGRAM



PS

SINGLE PHASE Pump Protection Relay without Level Sensors

SINGLE PHASE PUMP PROTECTION

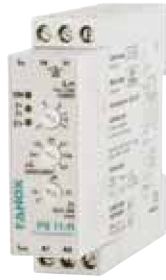
Underload protection by undercurrent

- *Eliminates need for level sensors to detect dry running.*
- *For 1-phase motors from 3 to 16 A.*
- *Precise motor heating and cooling memory, reproduces its thermal image.*
- *Visual indication of trip cause.*
- *Adjustable reset time for I<.*

Suitable for 1-phase submersible pumps. By monitoring undercurrent it avoids problems caused by dry running, cavitation, etc.

The great advantage of the PS relay is that, without requiring any external detectors like level electrodes, it monitors the load of the motor and stops it before an expensive breakdown occurs.

PS 11-R



PROTECTION FUNCTIONS

- I> Overload
- I< Undercurrent
- U> Overvoltage

WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

PS 16-R

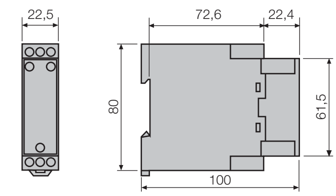
MODELS			PS 11-R	PS 16-R
Adjustment range Motor 400 V 50/60 Hz		I_B (A)	3 - 11	3 - 16
		CV	0,5 - 2	0,5 - 3
		kW	0,37 - 1,5	0,37 - 2,2
Code	according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	230 Vac single phase	**12164**	**12163**
		115 Vac single phase	**12171**	**12172**

CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	230 Vac
Trip classes (IEC 947-4-1)	10
Undercurrent protection adjustable / Trip delay	From 0,4 to 0,9 x I_B / 5 s
Overvoltage protection	From nominal V + 15%
Reset mode for protection against dry running	I< automatic (adjustable) and remote. More info in page 92
Reset mode for other protection functions	I> automatic and remote, U> automatic. More info in page 92
Signalling LED's	3 LED's: ON + I> I< + U>
Output contacts	1 relay with 1 NO
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	**PS11-R:** 7 VA (230 Vac) - 4 VA (115 Vac) **PS16-R:** 3 VA (115-230 Vac)
Protection degree / weight / mounting	IP20 / 0,15 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE

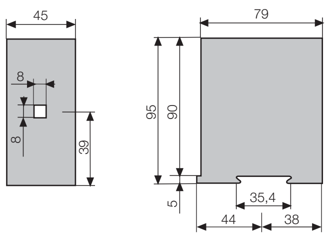
Settings and curves, see pages 87 to 93.

DIMENSIONS PS RELAY (mm)

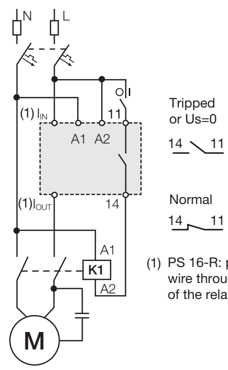
PS 11-R



PS 16-R



WIRING DIAGRAM



(1) PS 16-R: pass the wire through the hole of the relay.

FANOX protection & control

THREE PHASE Pump Protection Relay without Level Sensors

THREE PHASE PUMP PROTECTION

Underload protection by undercurrent

- *Eliminates need for level sensors to detect dry running.*
- *For 3-phase motors from 1 to 630 A and over. Cable feed through.*
- *Precise motor heating and cooling memory, reproduces its thermal image.*
- *Visual indication of tripping cause.*
- *Manual, remote and automatic reset.*

Suitable where the undercurrent (running without load) is critical, such us submersible pumps, surface pumps, etc. In these cases, when the equipment runs without load (dry well) the relay trips by undercurrent.

The great advantage of the P relay is that, without requiring any external detectors such as level electrodes, it monitors the load of the motor and stops it before an expensive breakdown occurs.

P

PROTECTION FUNCTIONS

- *I*> Overload
- *I*< Undercurrent
- Phase imbalance or phase loss
- Phase sequence

WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory, the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of a Ø22 mm push button.

Suitable for motor control centres (MCC) and panel boards.

ODP

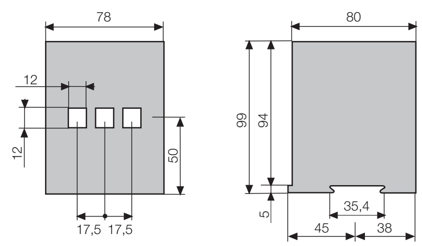
Models	Code	Relay type
ODP	**12540**	P

MODELS			P 19	P 44	P 90
Adjustment range Motor 400 V 50/60 Hz		I_B (A)	7 - 19,6	19 - 44,2	40 - 90,4
		CV	4 - 10	12,5 -27,5	27,5 - 55
		kW	3 - 7,5	9,2 - 20	20 - 40
Code	according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	230 Vac single phase	**11403**	**11423**	**11443**
		115 Vac single phase	**11402**	**11422**	**11442**
		24 Vac, dc single phase	**11400**	**11420**	**11440**
For I_N of the motor below the minimum setting I_B			Pass the cables several times (n) through the holes in the relay I_B = n x I_N		
For I_N of the motor above the maximum setting I_B			Use 3 CT .../5 and the relay P 19		
External display module (optional)			ODP		

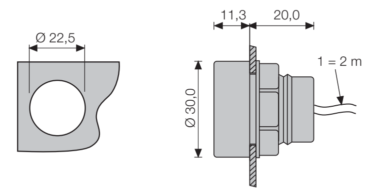
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	1000 Vac
Trip classes (IEC 947-4-1)	5 - 10 - 15
Phase sequence protection	Yes
Phase imbalance protection	Over 40%. Tripping time < 3s
Undercurrent protection adjustable / Trip delay	From 0,5 to 0,9 x I_B . Operative from 0,3 x I_B / 3s
Reset mode for protection against dry running	*I*< manual, remote and automatic. More info in page 92
Reset mode for other protection functions	Manual, remote and automatic (every 15 minutes)
Short circuit withstand rating	5000 A at 0,5 s (SCR 5000@0,5 s)
Signalling LED's	4 LED's: ON + *I*> + *I*< +
Output contacts	1 relay with 1 NO + 1 NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	2,5 VA
Protection degree / weight / mounting	IP20 / 0,5 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE c UL US LISTED

Settings and curves, see pages 87 to 93.

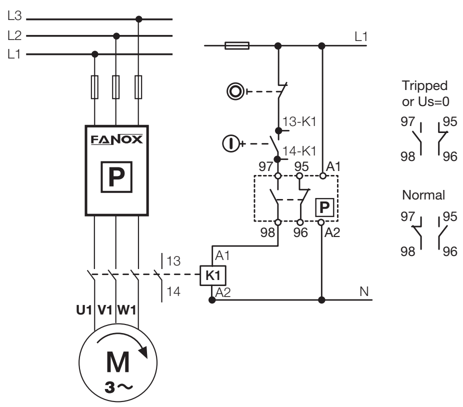
DIMENSIONS P RELAY (mm)



DIMENSIONS ODP MODULE (mm)



WIRING DIAGRAM



PF

THREE PHASE Pump Protection Relay without Level Sensors

THREE PHASE PUMP PROTECTION

Underload protection by cos φ

- ***Eliminates need for level sensors to detect dry running.***
- ***For 3-phase motors from 1 to 630 A and over. Cable feed through relay itself.***
- ***Precise motor heating and cooling memory, reproduces its thermal image.***
- ***Visual indication of tripping cause.***
- ***Adjustable reset time for cos φ.***

Suitable for 3-phase submersible pumps, petrol station pumps, and other type of pumps and systems where running without load is critical (dry well, broken transmission belt, etc.).

The great advantage of these relays is that, by using the motor itself as a sensor and without requiring any external detectors, they monitor the cos φ of the motor and stop it before a breakdown caused by dry running, cavitation or closed valve occurs.

PF

PROTECTION FUNCTIONS

- *I*> Overload
- **cos** φ Underload
- Phase imbalance or phase loss
- Phase sequence

WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

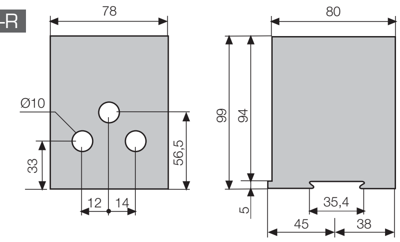
MODELS			PF 16-R	PF 47-R
Adjustment range Motor 400 V 50/60 Hz	I_B (A)		4 - 16,6	16 - 47,5
	CV		3 - 10	10 - 30
	kW		2,2 - 7,5	7,5 - 22
Adjustment range Motor 230 V 50/60 Hz	I_B (A)		4 - 16,6	16 - 47,5
	CV		1,5 - 5,5	5,5 - 15
	kW		1,1 - 4	4 - 11
Code — according to the relay voltage supply (+15% -10%) ac: 50/60 Hz	400/440 Vac	3-phase (motor)	**12165**	**12167**
	230 Vac	3-phase (motor)	**12173**	**12168**
For I_N of the motor below the minimum setting I_B			Pass the cables several times (n) through the holes in the relay I_B = n x I_N	
For I_N of the motor above the maximum setting I_B			Use 3 CT .../5 and the relay PF16-R	
External display module (optional)			ODPF	

CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum motor nominal voltage	440 Vac
Trip classes (IEC 947-4-1)	10 - 20 - 30
Phase sequence protection	Yes
Phase imbalance protection	Over 40%. Tripping time < 3s
Underload protection by cos φ / Trip delay	cos φ adjustable from 0,15 to 1,0 / adjustable from 5 to 45s
Reset mode for protection against dry running	cos φ automatic (adjustable) and remote. More info in page 92
Reset mode for other protection functions	*I*> Manual, remote and automatic. More info in page 92
Signalling LED's	4 LED's: ON + *I*> + **cos** φ +
Output contacts	1 relay with 1 NO + 1 NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	1,5W - 12 VA (230 Vac) - 20 VA (400 Vac)
Protection degree / weight / mounting	IP20 / 0,5 kg / DIN rail
Storage temperature	-30°C +70°C
Operating temperature / max. altitude	-15°C +60°C / 1000m; -15°C +50°C / 3000m
Standards	IEC 255, IEC 947, IEC 801, EN 50081-2
	CE

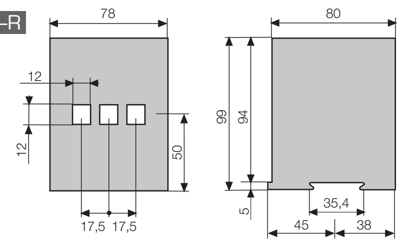
Settings and curves, see pages 87 to 93.

DIMENSIONS PS RELAY (mm)

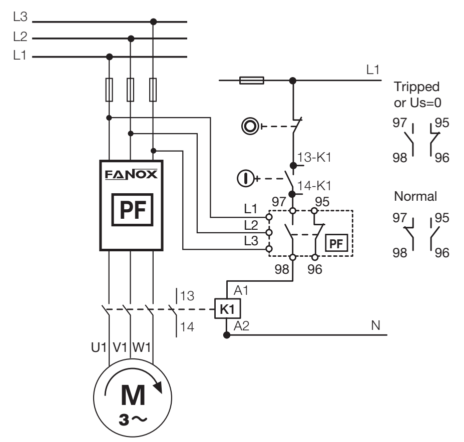
PF 16-R



PF 47-R



WIRING DIAGRAM



EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory, the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of a Ø22 mm push button.

Suitable for motor control centres (MCC) and panel boards.

This optional display module is mounted externally, e.g. on the panel door or a draw-out unit in a motor control centre (MCC) and connected to the relay by a flat cable (length 2 meters).

The module has the appropriate LED's to signal the trip cause and a reset push-button.

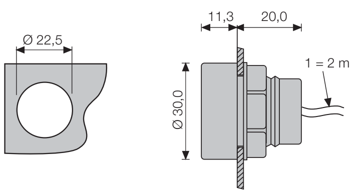
Weight: 0,05 kg.

Protection degree: IP50

ODPF

Model	Code	Relay type
ODPF	**12555**	PF

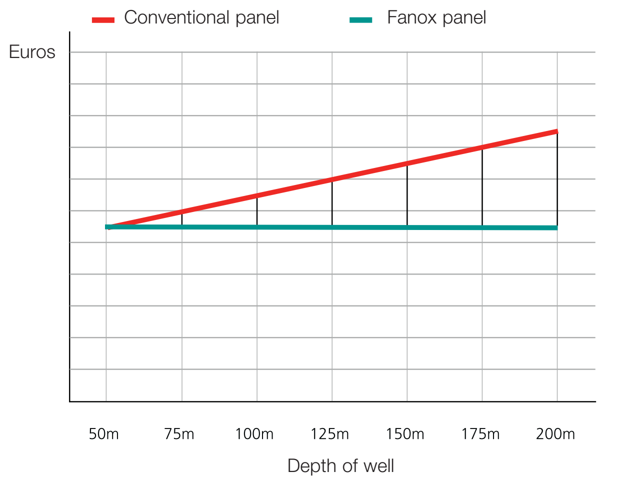
DIMENSIONS ODPF MODULE (mm)



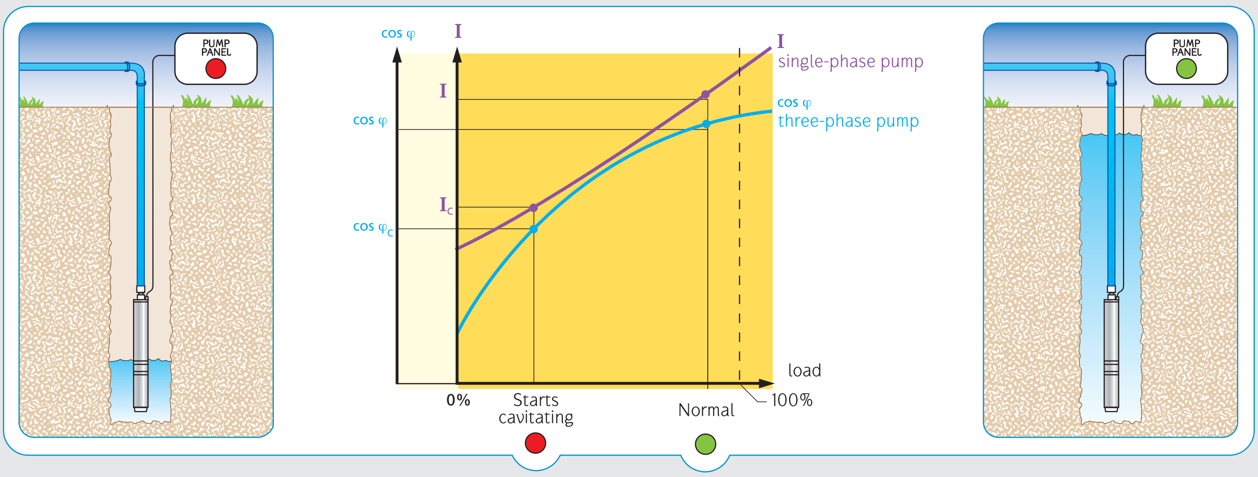
"The PS and PF electronic relays have been specially designed to provide complete protection for both single and three phase pumps and any other system where dry running is a critical factor."

Fanox panel	Conventional panel
Electronic relay	Thermal relay Level electrode relay as well as Level electrodes Level electrode wiring

COST COMPARISON



The graph shows that with FANOX SOLUTION you can save up to 35% of the cost of a pump protection system.



CBM

Panels for SUBMERSIBLE Pumps

SINGLE PHASE PUMPS

- *Thermal memory of motors heating and cooling cycles.*
- *Automatic reset, adjustable from 2 to 240 minutes for well filling,*
- *Indication of trip cause.*
- *Control point for pressure switch, buoy, programmer...*
- *Includes: circuit breaker 1P+N, PS-R electronic relay, contactor, LEDs and on/off switch.*

One of the most critical situations in pump operation is dry running. The solution offered by FANOX single-phase protection panels is based on measuring the undercurrent. In dry running situations a current decrease is detected. This reduction of consumed current is measured by the PS-R electronic relay fitted to the protection panel: when the preset undercurrent value is reached, it switches the pump off.

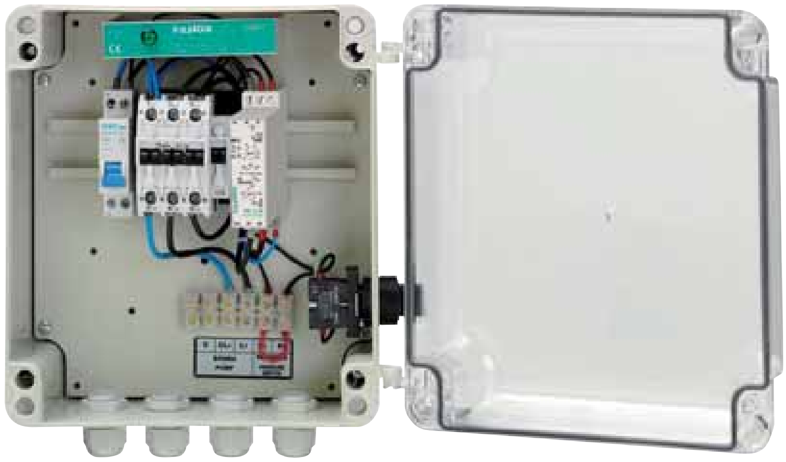
WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

PROTECTION FUNCTIONS

- *I*> Overload
- *I*< Undercurrent
- *U*> Overvoltage
- *I*>> Short-circuit

CBM



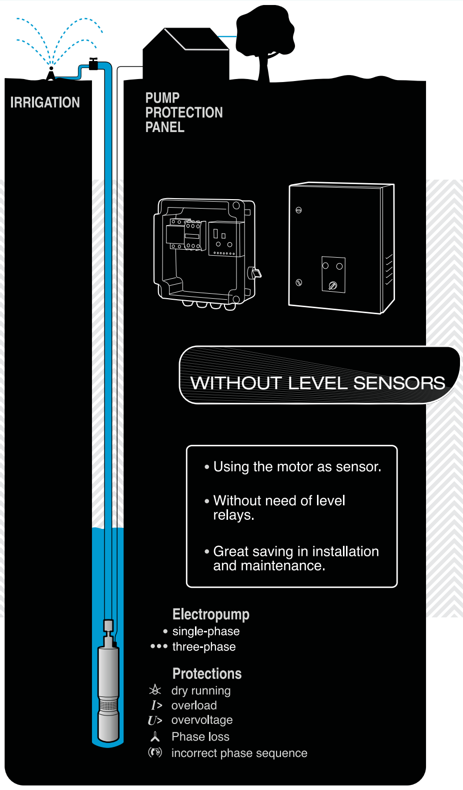
Pump protection without level sensor video demo:

Models	Code	Approx. motor current (Amps)	Power of single-phase 230 V motor		Adjustable well filling time (minutes)	Dimensions (mm)
			HP	kW		
CBM-2	**12312**	3 - 11	0.5 - 2	0.37 - 1.5	2 - 70	230 x 250 x 150
CBM-3	**12314**	11 - 16	2 - 3	1.5 - 2.2	2 - 240	230 x 250 x 150

- *Equipment with halogen-free wiring*

Fanox Control Panels protect pumps against dry running without using level sensors.

- ***Maximum protection without level electrodes or level relays.***
- ***Electronic relay incorporated.***
- ***Quick and easy installation, maintenance-free.***
- ***Installation costs are significantly reduced.***
- ***Can be adapted to installations already in service, without removing the pump.***



CBT

FANOX
protection & control

Panels for SUBMERSIBLE Pumps

THREE PHASE PUMPS

- *Thermal memory of motors heating and cooling cycles.*
- *Automatic reset for well filling. Adjustable from 2 to 75 minutes.*
- *Trip cause indication.*
- *Control point for pressure switch, buoy, programmer...*
- *Includes: circuit breaker 3P or 3P+N, PF-R electronic relay, contactor, LEDs and on/off switch.*
- *Models with metal enclosure also include voltmeter, ammeter and φ meter.*

The cosine of phi (Cos φ) is the value of the cosine of the phase angle between the voltage and the intensity of the electrical current. This oscillates from a value slightly below 1 for a full load operating motor to almost 0 when it is dry running.

Therefore, in dry running situations, cos φ falls significantly. This reduction is monitored by the PF-R relay installed in FANOX three-phase protection panels, meaning that when it falls beneath the adjusted value, the panel shuts down the pump and protects it from damage.

WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

CBT

CBT-M

PROTECTION FUNCTIONS

- cos φ Underload
- I> Overload
- Phase imbalance or phase loss
- Phase sequence
- I>> Short-circuit

	Models	Code	Approx. motor current (Amps)	Power of single-phase 230 V motor		Adjustable well filling time (minutes)	Dimensions (mm)
				HP	kW		
PLASTIC	**CBT-1**	**12301**	1.1 - 2.0	0.5 - 1	0.37 - 0.75	2 - 75	230x250x150
PLASTIC	**CBT-2**	**12302**	2.8 - 3.8	1.5 - 2	1.1 - 1.5	2 - 75	230x250x150
PLASTIC	**CBT-5**	**12305**	5.5 - 9.5	3 - 5.5	2.2 - 4	2 - 75	230x250x150
PLASTIC	**CBT-7**	**12307**	13	7.5	5.5	2 - 75	230x250x150
PLASTIC	**CBT-10**	**12310**	16.5	10	7.5	2 - 75	230x250x150
PLASTIC	**CBT-15**	**12315**	24	15	11	2 - 75	230x250x150
METAL	**CBT-20M**	**12316**	32	20	15	2 - 75	230x250x150
METAL	**CBT-25M**	**12317**	40	25	18.5	2 - 75	230x250x150
METAL	**CBT-30M**	**12318**	47	30	22	2 - 75	230x250x150
METAL	**CBT-40M**	**12319**	64	40	30	2 - 75	600x500x200
METAL	**CBT-50M**	**12320**	79	50	37	2 - 75	600x500x200
METAL	**CBT-60M**	**12332**	92	60	45	2 - 75	600x500x200

- ***Equipment with halogen-free wiring***

CBS

Panels for SUBMERSIBLE Pumps

THREE PHASE PUMPS WITH SOFT STARTER

- *Thermal memory of motors heating and cooling cycles.*
- *Automatic reset for well filling. Adjustable from 2 to 75 minutes.*
- *Trip cause indication.*
- *Control point for pressure switch, buoy, programmer...*
- *Metal case.*
- *Includes: circuit breaker 3P+N, PF-R electronic relay, ES soft starter, contactor, LEDs and on/off switch.*

FANOX protection panels with progressive startup and shut -down are fitted with ES soft starters to prevent problems caused by water hammering or sudden start-ups and shut-downs.

Protection against dry running is provided by the PF-R relay that monitors the value of cos φ and shuts down the pump when it falls below the selected value.

CBS

PROTECTION FUNCTIONS

- cos φ Underload
- I> Overload
- Phase imbalance or phase loss
- Phase sequence
- I>> Short-circuit
- Soft start
- Soft stop

WITHOUT LEVEL SENSORS

WITHOUT LEVEL SENSORS

	Models	Code	Approx. motor current (Amps)	Power of single-phase 230 V motor		Adjustable well filling time (minutes)	Dimensions (mm)
				HP	kW		
METAL	**CBS-2***	**12321**	3.8	0.5 - 2	0.37 - 1.5	2 - 75	400x300x200
	CBS-3*	**12322**	5.5	3	2,2	2 - 75	400x300x200
	CBS-5*	**12323**	7.0 - 9.5	4 - 5.5	3 - 4	2 - 75	400x300x200
	CBS-7*	**12324**	13	7.5	5.5	2 - 75	500x400x200
	CBS-10	**12326**	16.5	10	7.5	2 - 75	500x400x200
	CBS-12	**12327**	21	12.5	9.2	2 - 75	500x400x200
	CBS-15	**12328**	24	15	11	2 - 75	500x400x200
	CBS-20	**12329**	32	20	15	2 - 75	600x400x200
	CBS-25	**12330**	40	25	18.5	2 - 75	600x400x200
	CBS-30	**12331**	47	30	22	2 - 75	600x500x200

- ***Equipment with halogen-free wiring***

* Models available in plastic box.

GEN

Generator Protection Relay

GENERATOR PROTECTION

- ***For generators up to 1000 Vac.***
- ***With thermal memory.***
- ***Visual indication of trip cause.***
- ***Fast trip curves.***

This relay is specially applicable for protecting low voltage generators up to 1000 Vac, and currents up to 2000 A or higher.

Precise motor heating and cooling memory, reproduces its thermal image.

It offers a suitable protection offering the choice between 15 trip curves thus avoiding the generator working over its damage curve.

GEN

PROTECTION FUNCTIONS

- *I>* Overload
- Phase imbalance or phase loss

EXTERNAL DISPLAY MODULE

By means of this plug-in optional accessory the relay status can be seen and reset from the exterior of the electrical panel board.

Easy to install. Size of Ø22 mm push button.

ODGEN

Models	Code	Relay type
ODGEN	**12545**	GEN

OTHER RELAYS FOR GENERATORS:

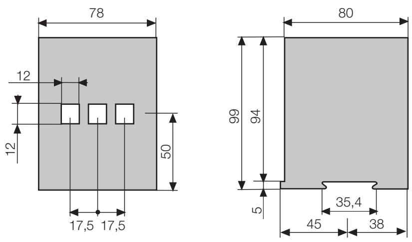
- **H:** Frequency relay (See page 102).
- **U3N:** Three-phase voltage relay (See page 101).

MODELS	GEN 10
Adjustment range I_B (A)	4 - 10,3
Auxiliary voltage supply (+15% -10%)	24 Vdc
Code	**11350**
For I_N of the generator above 10,3 A	Use 3 current transformers.../5
External display module (optional)	ODGEN

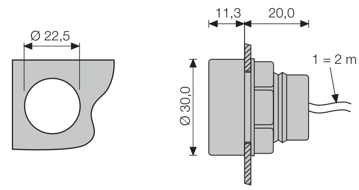
CHARACTERISTICS	
Thermal memory / Overload trip	Yes / From 1,1 x I_B
Maximum generator nominal voltage	1000 Vac
Trip time t6 x I_B	15 adjustable curves from 0,2 to 3 s.
Phase imbalance protection	Over 20%. Tripping time < 3s
Reset mode	Manual and remote
Signalling LED's	3 LED's: ON + one for each protection
Output contacts	1 relay with 1 NO + 1 NC
Switching power	I_{th}:5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Short circuit withstand rating	5000 A at 0,5 s (SCR 5000@0,5 s)
Terminals: Max.section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	1,5 W
Protection degree / weight / mounting	IP20 / 0,5 kg / DIN rail
Storage temperature	-30°C +70 °C
Operating temperature / max. altitude	-15°C +60°C / 1000m; -15°C +50°C / 3000m
Standards	IEC 255, IEC 801, EN 50081-2
	CE c UL US LISTED

Settings and curves, see pages 87 to 93.

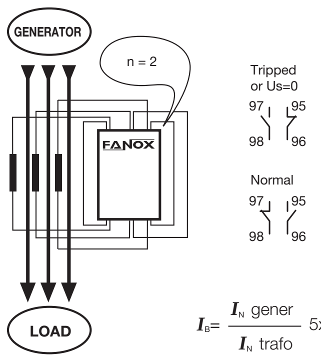
DIMENSIONS GEN RELAY (mm)



DIMENSIONS ODGEN MODULE (mm)



WIRING DIAGRAM



$$I_B = \frac{I_N \text{ gener}}{I_N \text{ trafo}} \text{ 5xn}$$

ES

Soft Starters and Motor Controller

- ***For three-phase induction motors of up to 22 kW / 400 V.***
- ***Built in heat dissipater and electro-mechanical bypass relay.***
- ***Substitutes the conventional contactors. One in direct start-up and three in star-delta start-up cycle. Offers greater life cycle.***

- Lower maintenance cost.
- No pressure surge when using pumps and compressors. Reduces hammering.
- Less current and voltage drop during start up. Allows for reduced power consumption.
- Mechanical dimensioning can be optimised.
- Simplified automation.
- Assembly, setting, installation, commissioning and maintenance are made easy by the compact design.
- Reduces start and stop torque, eliminating mechanical problems.
- Additional cooling is not necessary thanks to the bypass built-in relay.
- Substitutes the conventional contactors: one for direct start-up and three for star-delta start-up ⅄-Δ .

ES 400-3

ES 400-12

ES 400-25

ES 400-45

PROTECTION FUNCTIONS

- Soft start
- Soft stop

ES 230-45 and ES 400-45 model include:

- Phase imbalance or phase loss
- Overtemperature
- Phase sequence

MODELS*		ES 400-3	ES 230-12	ES 400-12	ES 230-25	ES 400-25	ES 230-45	ES 400-45
Nominal voltage 50/60 Hz V±15%		400	230	400	230	400	230	400
Maximum current A		3	12	12	25	25	45	45
Motor power	kW	1,1	3	5,5	5,5	11	11	22
	CV	1,5	4	7,5	7,5	15	15	30
Code		**41803**	**41801**	**41812**	**41802**	**41825**	**41846**	**41845**

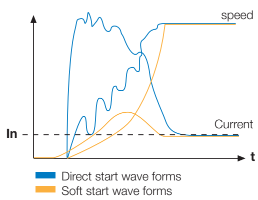
* Other voltages available upon request. (380V,480V and 600V)

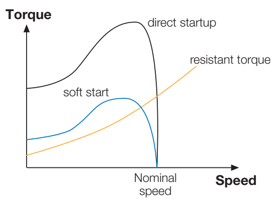
CHARACTERISTICS		
Control voltage (±15%)	A1-A2=24-100 Vac,dc / A1-A3=110-480 Vac	A1-A2=24-550 Vac,dc
Degree of protection	IP20	
Operating temperature	-20°C +50°C	
Standards and approvals	IEC947-4-2 UL, CSA and CE mark	

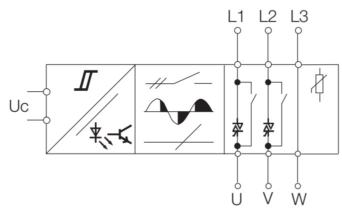
INDICATIONS						
Supply	green		POWER ON	green	POWER ON	green
Ramps	yellow		RAMPING	yellow	RAMPING	yellow
Bypass relay	yellow		BYPASS	yellow	BYPASS	yellow
Semiconductors overtemperature			OVERHEAT	flashing red	OVERHEAT	flashing red
Motor overtemperature (PTC)					OVERHEAT	continuous red
Phase loss					φ LOSS	red
Phase sequence					φ WRONG	red

ADJUSTMENTS		
Start torque (% of nominal torque)	0 - 85%	0 - 70%
Start-up time	0,5 - 5 s	1 - 10 s
Stop time	0,5 - 5 s	1 - 30 s

CE c UL US LISTED







OPERATION

These units represent the best protection against premature ageing of motors and mechanical items.

Sudden starts and stops, that can produce damages in the bearings and gears of the motors, are eliminated.

They prevent frequent faults and objects falling onto conveyer belts.

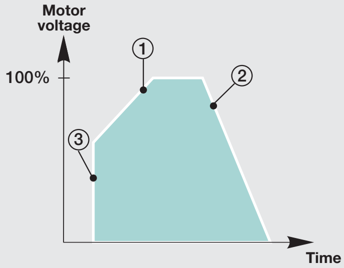
They reduce mechanical impact in motors, axles, gears and belts, significantly prolonging the operating life of the controlled units.

An electronic circuit with semiconductors starts the motor without using the contacts. Hence these do not withstand sparks or erosion.

When the minimal voltage of the motor is reached the semiconductors are bypassed by the relay contacts. Thanks to this technology, the ES starters have a longer operating life than conventional contactors.

They are easy to install and control. They can operate by means of an external control signal, such as a programmable automation.

POTENTIOMETER SETTING



① Ramp up time: RAMP UP.

② Ramp-down time: RAMP DOWN.

③ Par: INITIAL TORQUE.
Voltage when ramp-up begins.

Potentiometers ① ② and ③

- Initially set potentiometers ① and ② to maximum.
- Connect the supply and set potentiometer ③ so that the motor begins to rotate as soon as the supply is applied.
- Set the ramp-up and ramp-down times to the desired value.

MODE OF OPERATION

a) Change from on line direct start to soft start:

1) Cut off the cable from the motor and insert the ES starter.

2) Connect the control input to two of the input lines. Set the potentiometers according to the settings mode.

3) Reconnect the power supply.

On connecting C1, the starter performs a soft motor start. On disconnecting C1, the motor stops, the starter resets to zero and after 0.5 seconds a new soft start up may be performed. (fig. 1 and fig. 4).

b) Soft Start / Soft Stop (fig. 2 and fig. 3)

When S1 is closed (connection diagram), the soft motor start is realised according to the potentiometers setting of initial t and % torque.

When S1 is open the soft stop is done in accordance with the ramp down potentiometer setting.

APPLICATIONS

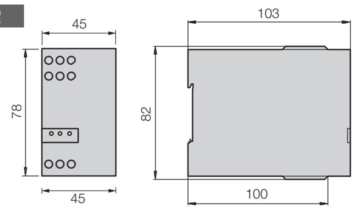
For three-phase motors in applications such as:

- Pumps.
- Cold compressors.
- Conveyor belts, lifting devices, etc.
- Mixers.
- Fans, extractor fans and blowers.
- Garage doors and elevators.
- Concrete mixers.
- Palletizer devices, etc.

DIMENSIONS (mm)

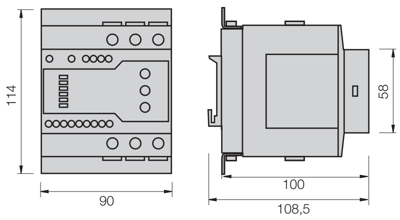
ES 230-12

ES 400-3 and ES 400-12



ES 230-25 and ES 230-45

ES 400-25 and ES 400-45



WIRING DIAGRAMS

ES 230-12 and 45

Soft start

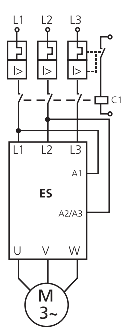


fig. 1

ES 400-3, 12 and 25

Soft start / soft stop

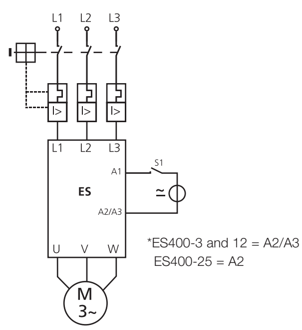


fig. 2

ES 230-45

Soft start / soft stop

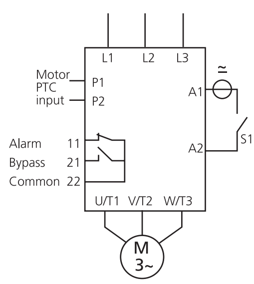


fig. 3

ES 400-45

Soft start

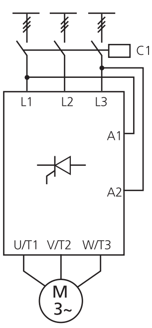


fig. 4

Manual Motor Starters

MANUAL MOTOR STARTERS

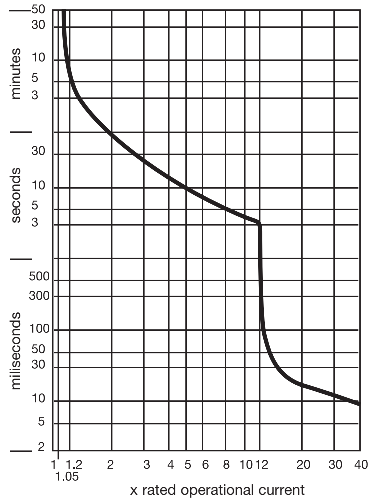
- ***Overload and short-circuit protection.***
- ***Overload range adjustable from 0,1 to 32A.***
- ***Wide range of accessories.***
- Suitable for small size motors in machine-tools, conveyor systems, etc.
- Modular size 45 mm. DIN rail mounting (EN 50022-35).
- Isolating and main switch function (IEC 204-1).

M

CHARACTERISTICS	
Rated operational voltage Ue	690 V
Rated impulse withstand voltage Vimp	6 kV
Frequency	40/60 Hz
Mechanical or electrical operations	100.000
Max. operating frequency	30 m/h
Current heat losses (3-phases)	5,8 W
Opening time	7 ms
Terminal section	2 x 6 mm²
Screw torque	1,2 Nm
Protection degree	IP20
Fixed magnetic trip (A)	12 x I ±20%

Code	Model	Range A	Motor 3F, AC3 kW - 400 V
35016	**M-0,16**	0,1 - 0,16	–
35000	**M-0,25**	0,16 - 0,25	0,06
35001	**M-0,4**	0,25 - 0,4	0,09
35002	**M-0,63**	0,4 - 0,63	0,12
35003	**M-1**	0,63 - 1	0,25
35004	**M-1,6**	1 - 1,6	0,55
35005	**M-2,5**	1,6 - 2,5	0,75
35006	**M-4**	2,5 - 4	1,5
35007	**M-6,3**	4 - 6,3	2,2
35008	**M-10**	6,3 - 10	4
35009	**M-16**	10 - 16	7,5
35010	**M-20**	16 - 20	9
35011	**M-25**	20 - 25	12,5
35012	**M-32**	25 - 32	15

Cold state curve.
For warm state multiply t x 0,25



AUXILIARY CONTACTS	
Rated operational voltage	500 V
Rated impulse withstand voltage	4 kV
Maximum current I_{th}	6 A
Rated current AC-15:230/400 V	3,5 / 2 A
Terminal section	2 x 2,5 mm²
Screw torque	1 Nm

Rated short circuit breaking capacity I_{cu} (DIN VDE 0660 part 101; IEC 947-2)							**Back-up fuse**			
Manual motor starter models	Switching capacity I_{cu} [kA]				With limiter M-SB		Fuses gL, aM (A)			
V	230	400	500	690	230	400	230	400	500	690
M-0,16 a M-1,6	Not required				Not required		Not required			
M - 2,5			3	2,5					25	20
M - 4			3	2,5					35	25
M - 6,3			3	2,5					50	35
M - 10		6	3	2,5		50		80	50	35
M - 16	10	6	2,5	2	100	50	80	80	63	35
M-20 a M-32	10	6	2,5	2	100	50	80	80	63	50

ACCESORIES

- Current limiter M-SB (IN=32A), increases the short circuit capacity up to 50kA/400V. Assembly: under the manual motor starter or remotely.
- Undervoltage trip and remote trip.
- Enclosures, auxiliary contacts, emergency push-button and indicator lights.

DESCRIPTION / MODEL / CODE

- Current limiter **M-SB** **03990**
- Auxiliary contacts (*NO early make)

Contact	Side mounting		Inside mounting		Front mounting	
2 NA	M-HS20	03901				
NO + NC	M-HS11	03900			FHMS11	03931
NO	M-HS10	39011	M-SHS10	03906	FHMS10	03932
2 NC	M-HS02	03903				
NC	M-HS01	39031	M-SHS01	03907	FHMS01	03933
NO*+ NC	M-VHS11	03902				

- Remote trip and undervoltage trip (Inside mounting)

V / Hz	Remote		Undervoltage	
24 / 50-60	M-AS-05	03923	M-UN-05	03913
110 / 50 120 / 60	M-AS-15	03920	M-UN-15	03910
220-240 / 50 240 / 60	M-AS-25	03921	M-UN-25	03911
380-415 / 50 440 / 60	M-AS-45	03922	M-UN-45	03912
500 / 50			M-UN-55	03915

- Enclosures

Surface mounting IP41	M-GE	03950
Flush mounting IP41	M-FP	03940
IP55 Kit (M-GE and M-FP)	M-BS	03948
IP 54 Enclosure, 5 poles CEE-17	M-GC	04055
Idem with phase inverter	M-GC1	04056

- Emergency stop-operation for M-GE and M-FP

Push-button type IP55	M-PT	03980
Self-locking type IP55	M-PV	03981
Self-locking with key IP55	M-PS	39822

- Busbar

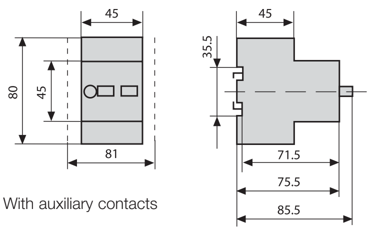
Busbar-2	M-SBD-12	03991
Busbar-3	M-SBD-13	03992
Busbar-4	M-SBD-14	03993
Busbar-5	M-SBD-15	03994
Input terminals	M-SBDE1	03995

- Others for enclosures M-GE and M-FP

Padlocking feature (max. 3)	M-VSL	03988
N-terminal	M-N	03949
Pilot light, white, 220-240V	M-LM	39701
Pilot light, white, 380-440V	M-LM1	39702
Pilot light, green, 220-240V	M-LM-G	39711
Pilot light, green, 380-440V	M-LM1-G	39712
Pilot light, red, 220-240V	M-LM-R	39721
Pilot light, red, 380-440V	M-LM1-R	39722

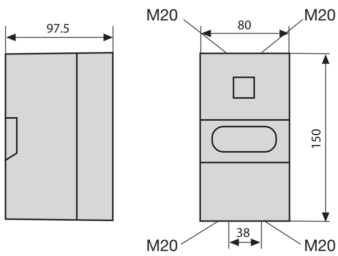
DIMENSIONS (mm)

M

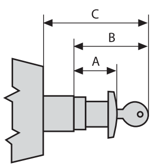


With auxiliary contacts

M-GE

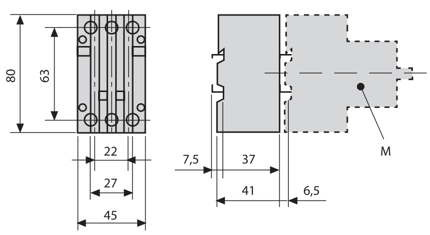


M-PT, M-PV, M-PS

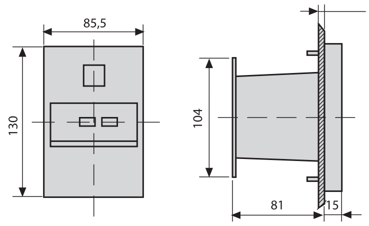


	A	B	C
M-PT	27	54	-
M-PV	28,5	55,5	-
M-PS	37	64	91

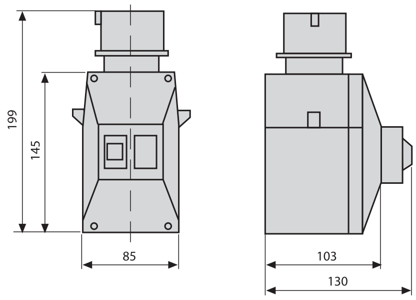
M-SB



M-FP



M-GC, M-GC1



PTC

Thermistor Sensors

THERMISTOR SENSORS PTC

- *Connected to PBM B, GL, G, ST or MT relays to protect motors against overtemperature.*
- *PTC. Positive temperature coefficient*
- *PTC 120, for internal mounting. Temperature threshold 120°C.*
- *PTCEX 70, for external mounting. Temperature threshold 70°C.*

PTC

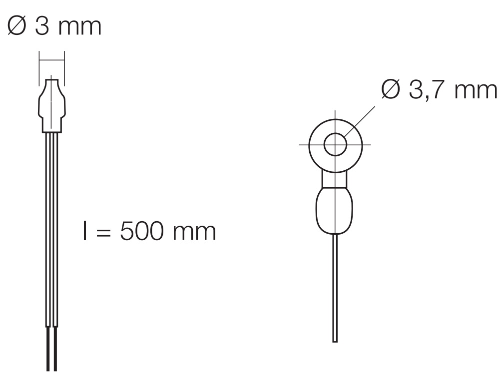
PTCEX 70

CE

Models	PTC 120	PTCEX 70
Code	**41700**	**41705**
Threshold temperature	120°C	70°C
Threshold resistance	≥ 1330 Ω	≥ 1330 Ω
Mounting	internal	external

PTC 120

DIMENSIONS PTC (mm)



CONNECTION WIRES

Models	Code	Length
CDCNB	**17008**	0.5 m
CDCN1	**17009**	1 m

THE MOTOR PROTECTION

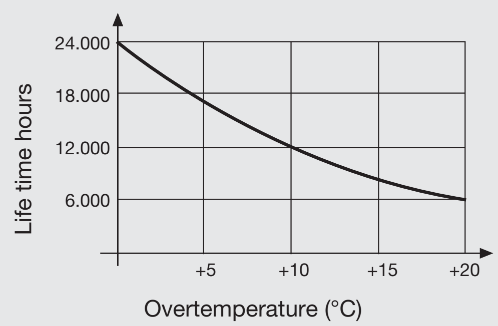
The electric motor is one of the most important operating devices in industry. Many times the shutdown of an industrial process is caused by a simple motor. High-cost production runs and valuable machinery can become paralysed at great cost, even more than the cost of rewinding the motor.

Experience shows that motor protection continues to be a problem, based on the number of breakdowns occuring every day.

Over 60% of failures are caused by overheating of the motor windings. These can be detected, and prevented, by measuring and analysing the current being absorbed by the motor, or by controlling temperature limits of the winding. The major causes are as follows:

- Overloads
- Locked rotor
- Over and undervoltage
- Phase imbalance or phase loss
- Long and heavy start-ups
- Excessive operating cycles
- Heating from non-electrical causes
- Inadequate motor ventilation
- High room temperature
- Insulation failure

The following diagram shows the dramatic decrease suffered in the electric life of a motor due to the excessive heat of the motor windings (Montsinger's rule).



As one can see, a 10ºC increase in temperature reduces the useful life of the motor by half.

The most reliable protection options in common use are:

- Fuses or circuit breakers for short-circuit protection.
- Electronic motor protection relays with thermal memory.
- Contactors for motor control.

FANOX RELAYS

Our R+D Division has allowed FANOX to develop a wide range of easy-to-install and operate electronic relays, at truly competitive prices, which will save downtime and money.

FANOX motor protection relays work with the current measured in real time. The current, which is read by three current transformers built into the relays, is electronically processed and used as a model of the thermal image of the motor, and is continously compared to the values set on the relay.

The three power supply cables to the motor are not directly connected to the relay, but pass through its corresponding CT holes.

This provides motor protection against:

- Overload: The relay creates a model of the thermal image of the motor during its heating and cooling cycles. In this way, in overload conditions, the relay will take into consideration previous operating conditions of the motor, and will trip quicker if the relay has detected previous occasions of overload. This thermal memory is independent of the auxiliary voltage supply of the relay and is stored even when this voltage is cut off or disconnected. The different trip curves available for selection in the relays allow for precise adjustment to any kind of motor start-up or work ing cycle.
- Phase imbalance and phase loss: even if the motor is running below its full load current.
- Incorrect phase sequence detection is highly important when the correct phase sequence is critical as in compressors, pumps, fans and other applications (GL, P, PF).
- Underload by undercurrent: protects the motor against working without load, very important in pumps (P and PS).
- Protection against no-load operation: underload protection by cos φ has been incorporated so that the relay differentiates precisely between very low load and no-load operations, and drops out in the latter case (PF).

In addition, when the relay is connected to thermistor sensors (PTC), it protects the motor against electrical and non-electrical overheating (GL, G).

A visual display of the cause allows maintenance personnel to identify and immediately act on the underlying causes. The use of the OD display makes this operation much easier.

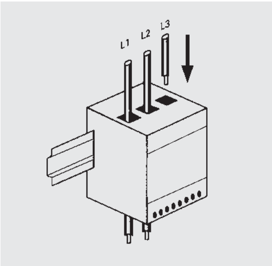
FANOX relays guarantee ideal protection for motors (pumps, compressors, fans, etc).

Installation and Adjustment guide

1 INSTALLATION

General

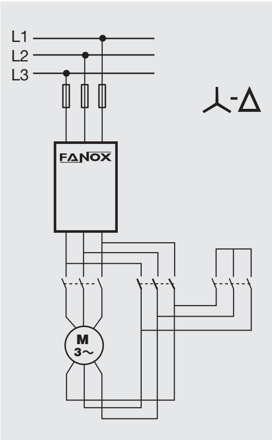
For correct installation and operation of Fanox relays, it is important to consider the following:



- After being fixed to the DIN rail, the cables for the three phases should be passed through the holes in the relay.

The maximum section of 700V insulated wires that can pass through the holes are:

C	16 mm²
GL, P, PF, G, GEN	35 mm²
GL 200	70 mm²



- Assembly attached to other components: it is recommended to separate the relays of other units or items that could cause strong magnetic fields, such as power or control transformers, contactors, frequency variators or high current busbars.

- In star-delta starting, the relay or the current transformers must be installed between the fuses or circuit breaker and the contactor.

- Relays used in combination with frequency inverters:

  a) Not to be used with frequency inverters:

  - GL relays if the protection against phase sequence selector is in the "ON" position.
  - P and PF relays.

  b) The following can be used with frequency inverters:

  - GL relays if the protection against phase sequence selector is in the "OFF" position.
  - C and G relays.

  Never connect the relay or current transformers of the auxiliary power supply to the inverter output.

- Connection between the PTC sensors and the relay (GL and G). For PTC connection lengths over 100 m or when the influence of high frequency transient voltages is expected, it is adviseable to use screened cable and connect the screen to terminal T1.

Note: every relay comes with an instruction manual providing information on its correct installation and setup. Please follow this for guidance.

2 SETUP PROCEDURE

Correct order of steps during installation:

	C	GL	G	PS	P	PF	GEN
2.1 Select the trip class / tripping time	1st	1st	1st		1st	1st	1st
2.2 Adjust the I_B current of the relay	2nd	2nd	2nd	1st	2nd	2nd	2nd
2.3 Adjust the cos φ value (underload)						3rd	
2.3 Adjust the cos φ trip delay						4th	
2.4 Adjust the undercurrent level $I<$ (underload)				2nd	3rd		
2.5 Select ON /OFF incorrect phase sequence		3rd					
2.6 Reset	3rd	4th	3rd	3rd	4th	5th	3rd

After installation and setup and before starting up the motor, make sure the motor is in a cold state. This will ensure that both the relay and motor, will operate with the same thermal memory (cold condition).

2.1 Trip class / tripping time (IEC 947-4-1). Relays C, GL, P, PF, G and GEN

The different trip classes / tripping times enable the user to select the overload protection according to the various motor applications in either short or long start-ups and for different generator uses.

The class number or the tripping time refers to the maximum approximate time in seconds allowed for the direct start of the motor from a cold condition.

To select the trip class or tripping time ($t_{6 \times I_B}$) use the corresponding dip switches. The recommended values are listed in the following tables.

Motor with direct start-up

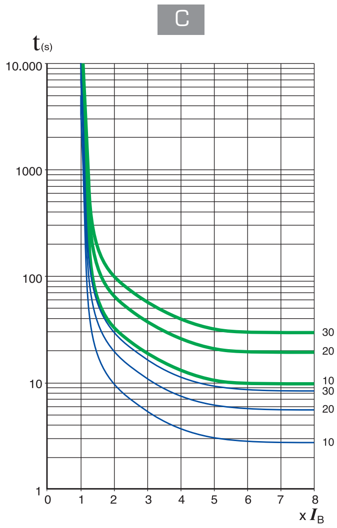
Start time (s)	Trip classes												Trip time
	Models												Model
ts	C9	C21	C45	GL16	GL40	GL90	GL200	P19	P44	P90	PF16-R	PF47-R	G17
1	10	10	10	10	10	10	10	5	5	5	10	10	4
2	10	10	10	10	10	10	10	10	10	10	10	10	6
3	10	20	20	15	15	15	15	10	10	10	20	20	10
4	20	20	20	20	20	20	20	15	15	15	20	20	12
5	20	30	30	20	20	25	25	15	15	15	20	20	16
6	20	30	30	25	25	25	25				30	30	18
7	30	30	30	30	30	30	30				30	30	22
8	30	30	30	30	30	35	35				30	30	24
9	30	30	30	35	35	35	35				30	30	28
10	30	30	30	35	35	35	35				30	30	30

Motor with star-delta start

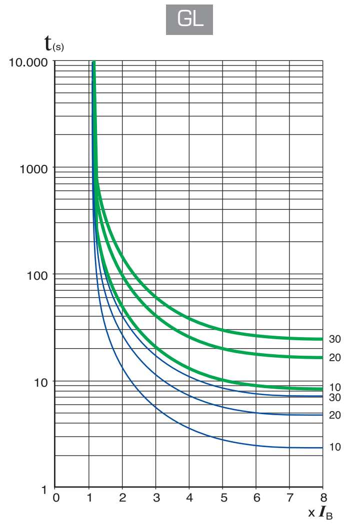
⅄-Δ Start time (s)	Trip classes												Trip time
	Models												Model
ts	C9	C21	C45	GL16	GL40	GL90	GL200	P19	P44	P90	PF16-R	PF47-R	G17
5	10	10	10	10	10	10	10	5	5	5	10	10	4
10	10	10	10	10	10	10	10	10	10	10	10	10	6
15	20	20	20	10	15	15	15	10	10	10	10	20	8
20	20	20	30	20	20	20	20	15	15	15	20	20	10
25	30	30	30	20	20	25	25	15	15	15	20	20	14
30	30	30	30	20	25	30	30				20	30	16
35	30	30	30	20	30	35	35				20	30	18
40	30	30	30	25	30	35	35				30	30	20

Average trip curves (IEC 947-4-1)

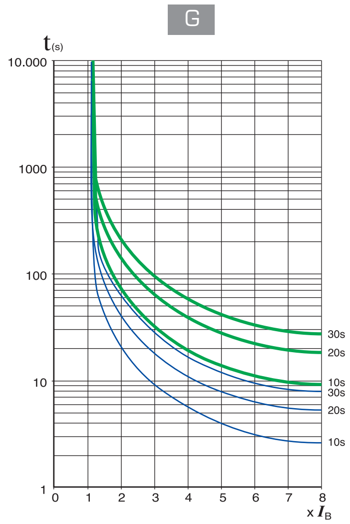
C



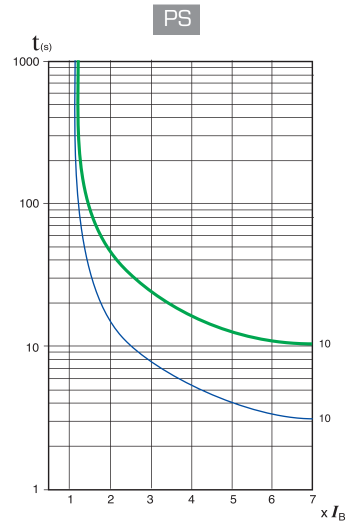
GL



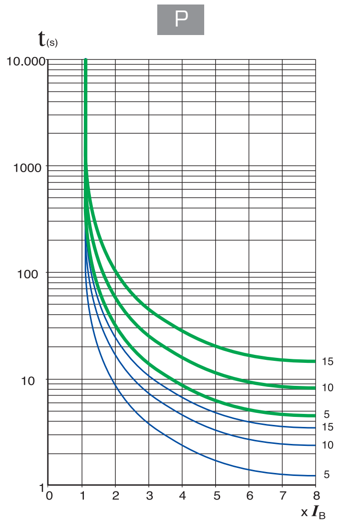
G



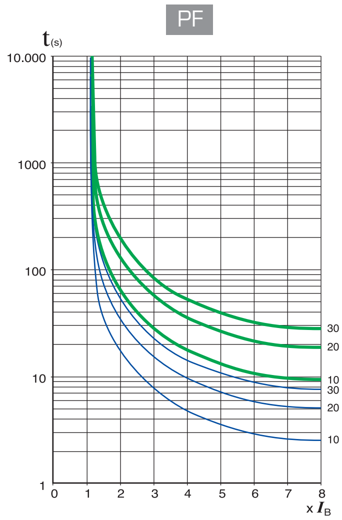
PS



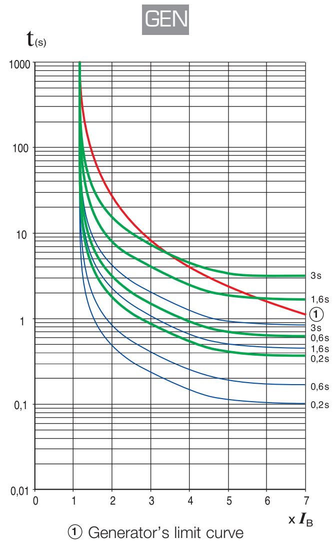
P



PF



GEN



① Generator's limit curve

Cold curve: represents the performance of the relay without any previous current flow, first start.

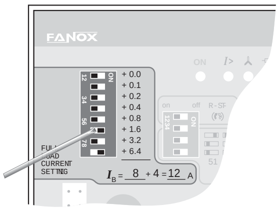
Warm curve: the tripping times decrease as the current flows, and is adapted to the motor heating condition based on the thermal memory. The warm condition (IEC-255) is reached after a current of 0.9 x I_N (motor rated current) flows during approximately 2 hours.

Installation and Adjustment guide

2.2 Current setting I_B.

Relays C, GL, P, PF, G, BG and GEN

Adjust the current I_B on the corresponding dipswitches (full load current). When setting the current take into account that the base current of the relay always remains added to the current selected with the dipswitches in "ON" position (to the right). The total addition is the set current I_B.
Overload tripping current from 1,1 x I_B



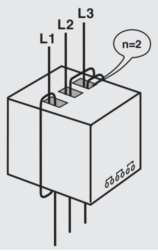
e.g.: relay GL16

I_B=8+4 =12 A

a) For motor or generator rated currents (I_N) within the range of the relay, the setting I_B must be equal to the I_N of the motor or generator.

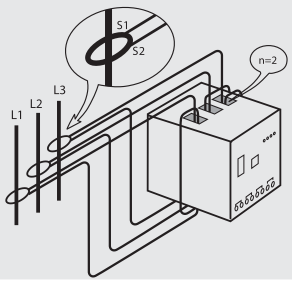
$$I_B = I_N$$

b) For motor rated currents below the range of the relay, the setting I_B must be equal to the rated current of the motor I_N multiplied by the number of times that the conductors have been passed through the relay holes.



$$I_B = I_N \times n$$

c) For motor or generator rated currents (I_N) above the range of the relay, use three current transformers .../5 in combination with the C9, GL16, P19, PF16-R, G17, BG17 or GEN10 according to application.



$$I_B = \frac{I_N \text{ motor}}{I_N \text{ trafo}} \times 5 \times n$$

always n ≥ 2

With current transformers it is always a must to pass the conductors 2 times or more through the holes of the relay.

PS relay

This adjustment is to be made according to the nominal current of the motor I_N indicated in its characteristics plate. The value to be set I_B is the same as I_N. The relay trips with overloads above 1,1 x IB I_B.

$$I_B = I_N$$

2.3 Underload by cos φ. PF.

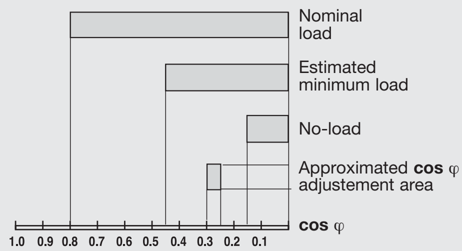
The cos φ underload trip level is set by means of a potentiometer with settings from 0,15 to 1,0.

Select this value taking into consideration the no-load motor cos φ and that corresponding to the estimated minimum operating load. Choose an intermediate value between these two cos φ levels and set it in the relay.

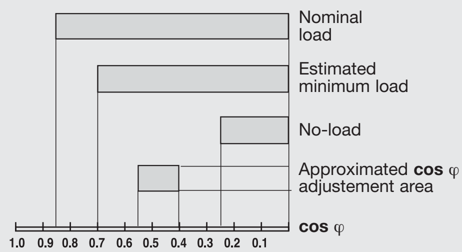
Select the underload trip delay from 5 to 45 seconds using the 3 corresponding dipswitches (trip delay).

For your guidance you can find two practical examples below.

a) A very oversized motor for its application. The cos φ of the motor is 0,15 when working without load.



b) A slightly oversized motor for its application. The cos φ of the motor is 0,25 when working without load.



If the above mentioned cos φ values are unknown, the underload trip setting can be made in the following way:

1. Set the underload trip delay to zero by moving the three dipswitches to the left (trip delay).
2. Using the potentiometer (cos φ setting), set the cos φ value to the minimum: 0,15.
3. Set the reset time to the minimum value using the potentiometer (cos φ reset time).
4. Start up the motor and run it with the minimum estimated load.
5. Slowly turn the cos φ potentiometer clockwise until the relay trips and the cos φ LED lights up.
6. Turn the cos φ potentiometer anticlockwise until the cos φ is set at approximately 30% less than the previous value (point 5).
7. Set the underload trip delay using the 3 corresponding dip switches. Set the reset time using the adequate potentiometer.

2.4 Undercurrent.

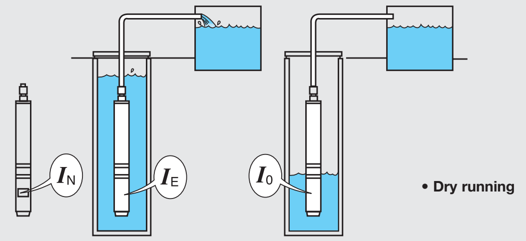
Single phase relay PS

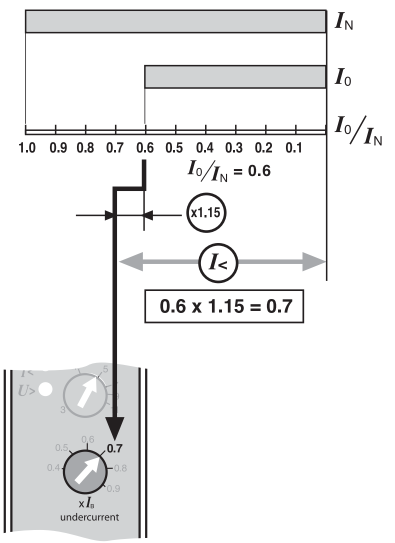
The setting of the underload trip level is made using a potentiometer in wich a factor between 0,4 and 0,9 is to be chosen. By multiplying this factor by the adjusted I_B we obtain a current value under which the relay will trip and disconnect the motor. The trip is delayed by 5 seconds.

a) If the value of the I_B of the motor without load is known:

- To avoid unwanted trips it is recommended to adjust the value 15% above the I_B of the motor without load.

Example:





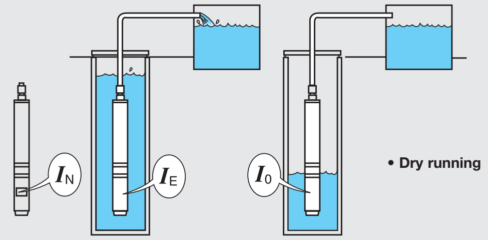
b) If the value of the I_B of the motor without load is unknown:

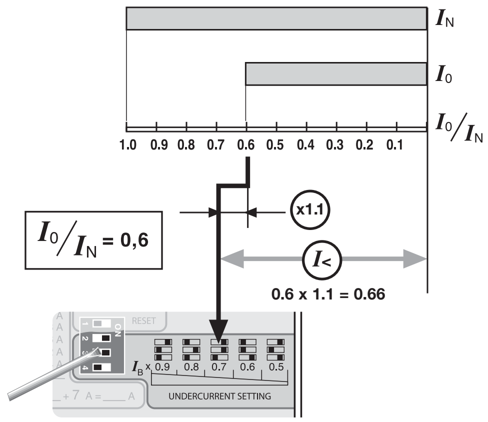
- If the pump is adequately dimensioned, the recommended value for this factor is 0,7. Adjust the potentiometer “undercurrent” to 0,7.
- If the pump is excessively dimensioned, and during its operation unwanted trips could occur, the underload adjusted factor should be reduced to approximately 0,6.

Three phase relay P

The undercurrent trip level in P relays is set using three dipswitches. To avoid nuisance trips, set this level to approximately 10% above the no-load motor current.

Example:





2.5 Phase sequence

Monitoring the current. GL and P relays

An incorrect phase sequence is detected by current sensing and it is only operative during the motor start-up. For correct detection the starting time must be longer than 0.2 s.

In GL relays the user can activate or desactivate this protection by means of a dipswitch. Should the right phase sequence be critical, move the dipswitch to the “ON” position. If this protection is not required, always leave it in the “OFF” position.

As this function is not compatible with the use of frequency inverters, where it is necessary to protect phase sequence in these installations, move the dipswitch to “OFF” and install the Fanox “S” model relay.

Monitoring the voltage. PF relays

An incorrect phase sequence is detected by voltage monitoring.
In the event that an incorrect phase sequence has been detected, the motor will not start-up since the relay has tripped because of previously detecting the wrong phase sequence.

Installation and Adjustment guide

2.6 Reset

Relays	manual	remote	autom.
C, GL, G, GEN	•	•	
P, PF	man	man	auto
PS		•	•

Manual reset:

	PS	P	PF	C	GL	G	GEN
$I>$	NO	<5 m	<7 m	<8 m	<8 m	<8 m	<1 m
$I<$	NO	2 s	-	-	-	-	-
cos φ	-	-	NO	-	-	-	-
	-	2 s	2 s (*)	2 s	2 s	2 s	2 s
	-	2 s	2 s (*)	2 s	2 s	-	-
$U>$	NO	-	-	-	-	-	-
+t°	-	-	-	-	1 s (*)	1 s (*)	-

(*) After recovering normal conditions.

Remote reset:

	PS	P	PF	C	GL	G	GEN
$I>$	<1 m	<1 m	<3 m	<3 m	<3 m	<3 m	<1 m
$I<$	10 s	10 s	-	-	-	-	-
cos φ	-	-	10 s	-	-	-	-
	-	10 s	10 s	20 s	20 s	10 s	10 s
	-	10 s	10 s	10 s	10 s	-	-
$U>$	NO	-	-	-	-	-	-
+t°	-	-	-	-	1 s (*)	1 s (*)	-

It is necessary to disconnect the auxiliar voltage more than 3 seconds after having waited the time indicated in the table.

Automatic reset:

	PS	P	PF	C	GL	G	GEN
$I>$	4 m	15 m	4 m	NO	NO	NO	NO
$I<$ PS11-R	2-70 m	15 m	-	-	-	-	-
$I<$ PS16-R	2-240 m						
cos φ	-	-	2-75m	-		-	
	-	15 m	4 m (*)	NO	NO	NO	NO
	-	15 m	4 m (*)	-	NO	-	-
$U>$	1 s (*)	-	-	-	-	-	-
+t°	-	-	-	-	NO	NO	-

(*) After recovering normal conditions.

3 OPERATING TEST. C, GL, P, PF, G and GEN

To perform the trip test for phase loss, the current which passes through the relay must be higher than 0.7 of the set current I_B .Under these conditions, push and hold the TEST button for three seconds, the relay will trip due to phase loss and the corresponding LED will light up.

4 APPLICATIONS

Industries

- OEM (Original Equipment Manufacturers)
- Chemical and petrochemical
- Quarries, gravel pits and cement factories
- Steelworks, iron and steel industry
- Automotive
- Utilities and electric generation
- Water treatment and distribution
- Mining
- Food industry, sugar industry
- Marine and shipbuilding
- Timber industry
- Elevation industry
- HVAC (Heat Ventilation Air Condition)

Installations

- Motor Control Centers (MCC)
- EEx e motors in explosive environments
- Submergible pumps, in service stations and water pumping, surface pumps, etc
- Compressors
- Fans, blowers and ventilators
- Industrial refrigeration and air conditioning
- Centrifuges
- Presses
- Cranes, elevators, escalators and lifting machinery
- Machine tool
- Conveyor belts
- Mills and mixers
- Generators and alternators.

5 NOMINAL CURRENT RATING OF ASYNCHRONOUS THREE-PHASE MOTORS

The current values listed in the following table correspond to the average ratings given by various manufacturers. In some cases, these may not coincide exactly with the ratings listed on the motor data plates.

kW			0,75	1,1	1,5	2,2	3	3,7	4	5,5	7,5	11	15	18,5	22	30	37	45	55	75	90	110
CV			1	1,5	2	3	4	5	5,5	7,5	10	15	20	25	30	40	50	60	75	100	125	150
I_N (A) Average values	MOTOR 4P	230 V 50Hz	3,5	5	6,5	9,5	11	–	15	22	28	42	54	68	80	104	130	154	192	248	312	360
		400 V 50Hz	2	2,5	3,5	5	6,5	–	8,5	11	15	22	29	35	42	57	69	81	100	131	162	195
		440 V 50Hz	1,7	2,4	3,2	4,5	6	–	8	10,5	14	20	27	33	39	52	64	76	91	120	147	178
		220/240 V 60Hz	3,2	4,4	6,2	8,5	10,5	–	14	20	26	38	50	63	74	98	122	146	180	233	290	345
		440/460 V 60Hz	1,5	2,2	3	4,3	5,5	–	7,5	10	13	19	25	31	37	49	61	73	90	116	144	173
	MOTOR 2P	400 V 50Hz	2,0	2,8	3,8	5,5	7	–	9,5	13	16,5	24	32	40	47	64	79	92	113	149	183	220
		440/460 V 60Hz	1,9	2,5	3,4	4,8	6	7,5	–	11	15	21	27	33	39	53	65	79	95	120	153	183

Selection guide

• Motor management system

MODELS	Adjustment range I_B (A)	MOTOR CHARACTERISTICS 400V		PROTECTION FUNCTIONS						
		HP	kW	I<	Phase loss / Phase imbalance	Phase sequence	Overtemperature	JAM	Locked rotor	I_g / I_o
PBM B1	0,8 - 6	0,33 - 3	0,25 - 2,2	•	•	•	•	•	•	•
PBM B5	4 - 25	3 - 15	2,2 - 11	•	•	•	•	•	•	•

• Protection relays

MODELS	Adjustment range I_B (A)	MOTOR CHARACTERISTICS 400V		PROTECTION FUNCTIONS						
		HP	kW	I>	I<	cos φ	Phase loss / Phase imbalance	Phase sequence	Overtemperature	U>
C 9	3 - 9,3	2 - 5,5	1,5 - 4	•			•			
C 21	9 - 21,6	7,5 - 12	5,5 - 9	•			•			
C 45	20 - 45,2	15 - 30	11 - 22	•			•			
GL 16	4 - 16,7	3 - 10	2,2 - 7,5	•			•	ON	•	
GL 40	15 - 40,5	10 - 25	7,5 - 18,5	•			•	ON	•	
GL 90	40 - 91	30 - 60	22 - 45	•			•	ON	•	
GL 200	60 - 200	50 - 150	37 - 110	•			•	ON	•	
PS 11-R	3 - 11	0,5 - 2	0,37 - 1,5	•	•					•
PS 16-R	3 - 16	0,5 - 3	0,37 - 2,2	•	•					•
P 19	7 - 19,6	4 - 10	3 - 7,5	•	•		•	•		
P 44	19 - 44,2	12,5 - 27,5	9,2 - 20	•	•		•	•		
P 90	40 - 90,4	27,5 - 55	20 - 40	•	•		•	•		
PF 16-R	4 - 16,6	3 - 10	2,2 - 7,5	•		•	•	•		
PF 47-R	16 - 47,5	10 - 30	7,5 - 22	•		•	•	•		
G 17	5 - 17,7	3 - 10	2,2 - 7,5	•			•		•	
GEN 10	4 - 10,3	-	-	•			•			

I>	I<	cos φ				U> / U<	I_N		JAM	I_g / I_o
Overload	Undercurrent	Underload	Phase loss Phase imbalance	Phase sequence	Overtemperature	Overvoltage / Undervoltage	Loss of neutral	Locked rotor	JAM	Earth leakage: differential/homopolar

CONTROL & MEASUREMENT

Introduction

Fanox' range of Control and Measurement relays come with many functions:

- **Phase and temperature control relays** for elevators with and without machine room. These indicate cause of failure, are self-powered and have a compact size of 22.5 mm (standard industrial size) which facilitates the installation of the product assembly.
- **Voltage relays** with direct adjustment potentiometer, which eliminates the calculation of percentage facilitating installation and commissioning.
- **Electrical multimeters** that measure up to 30 parameters of the power line being able to display all the values without programming changes.
- **Temperature and process controllers** that enable a reliable and simple, fast and accurate performance, combining PID function with Fuzzy Logic and Autotuning.
- **Timers** multifunction microprocessor with built-in battery that allows programming without connecting auxiliary voltage.

S

PHASE Control Relays

PHASE CONTROL

- ***Self-powered by the voltage to be monitored.***
- ***Visual indication of trip cause.***
- ***DIN rail mounting.***

- To protect 3-phase devices and during operation of Lifts & Elevators.
- Suitable for air conditioning, cranes, hoists and similar installations for protection during startup.
- Sensitive to incorrect phase sequence.

S

PROTECTION FUNCTIONS

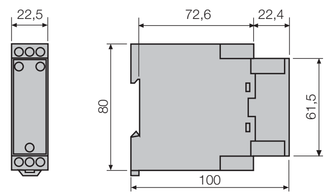
- Phase imbalance or phase loss
- Phase sequence

CE

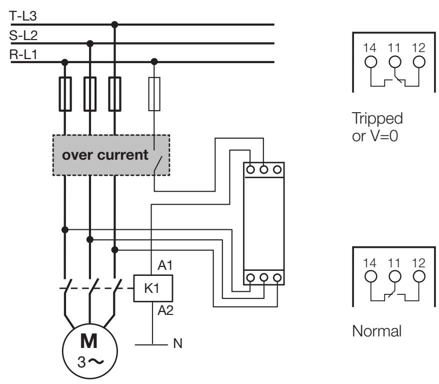
MODELS	S2	S4
Nominal voltage of the line to be monitored (±15%)	3 x 230 V	3 x 400 V
Voltage supply (±15%)	Self-powered (3-phase)	
Code	**12033**	**12034**

CHARACTERISTICS	
Nominal frequency	50/60 Hz
Control range	Phase loss: with resistive loads it trips when a phase loss occurs. With three-phase motors it trips if the voltage regenerated by the motor is lower than 60% of the main voltage. Phase imbalance > 40%
Trip time delay	< 0,1 s
Reset mode	Automatic
Signalling LED's	2 LED's: ON +
Output contacts	1 relay with 1 change over NO - NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Maximum terminal section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	7,5 VA (230 Vac) - 11 VA (400 Vac)
Protection degree / weight	IP20 / 0,12 kg
Storage / operation temperature	-30°C +70°C / -15°C +60°C

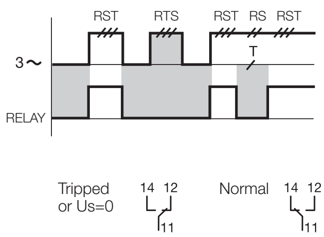
DIMENSIONS S RELAY (mm)



WIRING DIAGRAM



WORK LOGIC



ST / ST-D

FANOX
protection & control

PHASE and TEMPERATURE Relays

PHASE AND TEMPERATURE CONTROL

- ***Self-powered by the voltage to be monitored.***
- ***Visual indication of trip cause.***
- ***DIN rail mounting.***

- To protect 3-phase devices and during operation of Lifts & Elevators.
- Suitable for motors with built-in PTC sensors in applications such as elevators, cranes, hoists and similar installations.
- Sensitive to incorrect phase sequence.
- Monitoring of short circuit and ruptured wire in PTC circuit.

ST-D model:

Two output relays, one for phase imbalance, phase loss and phase sequence and the other for over temperature.

ST

ST-D

PROTECTION FUNCTIONS

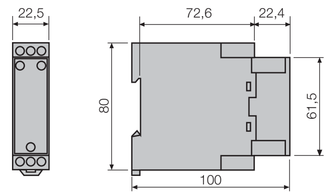
- Phase imbalance or phase loss
- Phase sequence
- Overtemperature
- Thermistor short-circuit

CE

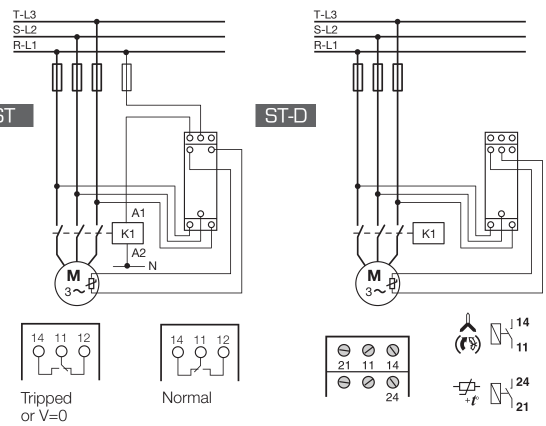
MODELS	ST2	ST4	ST2-D	ST4-D
Nominal voltage of the line to be monitored (±15%)	3 x 230 V	3 x 400 V	3 x 230 V	3 x 400 V
Voltage supply (±15%)	Self-powered (3-phase)			
Code	12001	12012	12002	12013

CHARACTERISTICS		
Nominal frequency	50/60 Hz	
Control range	Phase loss: with resistive loads it trips when a phase loss occurs. With three-phase motors it trips if the voltage regenerated by the motor is lower than 60% of the main voltage. Phase imbalance > 40%	
PTC sensor: min/max cold resist - Trip resist	100Ω / 1500Ω - 2300Ω	
Trip time delay	< 0,1 s	
Reset mode	Automatic	
Signalling LED's	3 LED's: ON + +	
Output contacts	1 relay with 1 change over NO - NC	2 relays (+) with 1 NO
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A	
Maximum terminal section / screw torque	2,5 mm^2, No. 22 - 12AWG / 20Ncm, 1.8 LB - IN	
Power consumption	7,5 VA (230 Vac) - 11 VA (400 Vac)	
Protection degree / weight	IP20 / 0,12 kg	IP20 / 0,13 kg
Storage / operation temperature	-30°C +70°C / -15°C +60°C	

DIMENSIONS ST RELAY (mm)

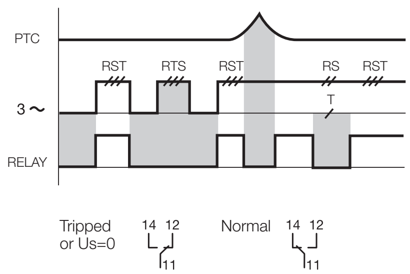


WIRING DIAGRAM

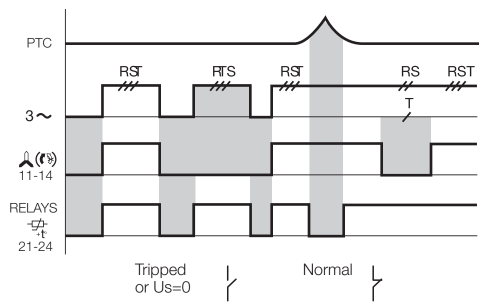


WORK LOGIC

ST



ST-D



T2 - TST24

PHASE and TEMPERATURE Control Relays (Lifts)

- ***Protection relay against variations of the ambient temperature (min/max), overtemperature of the motor, phase sequence and phase imbalance or phase loss.***
- ***DIN rail mounting.***
- ***Visual indication of trip cause.***

TEMPERATURE CONTROL

- Controls the temperature of the motor room (relay + external module OD-T2) or the temperature inside switchboards where no motor room is present. (relay + internal sensor IN-T2).
- Designed according to the EN 81-1 standard and complying with the European Union Directive for Lifts (95/16/CE).
- Two adjustable temperature thresholds.

PHASE AND TEMPERATURE (PTC) RELAY

- To Protect 3-phase devices.
- Suitable for Motors with built-in PTC sensors in applications such as elevators, cranes, hoists and similar installations.
- Sensitive to incorrect phase sequence.
- Monitoring of short circuit and ruptured wire in PTC circuit.

T2

ODT

ODT
External module

TST24

INT2
Internal sensor

PROTECTION FUNCTIONS T2

- Temperature variation

CE

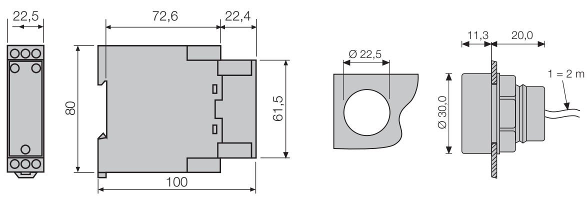
PROTECTION FUNCTIONS TST24

- Phase imbalance or phase loss
- Phase sequence
- Overtemperature
- Temperature variation
- Thermistor short-circuit

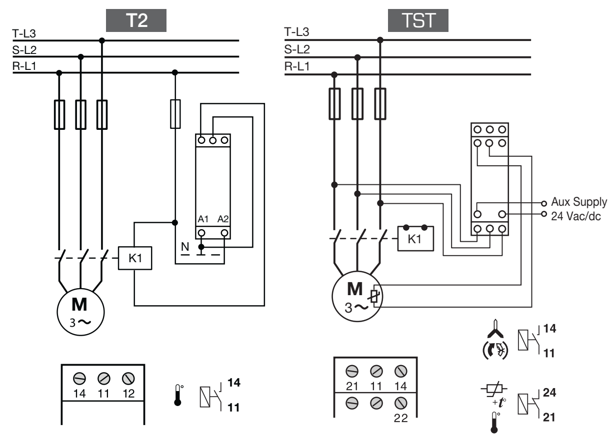
MODELS	T2		TST24	ODT2	INT2
Nominal voltage of the line to be monitored (± 15%)	-		3 x 400 V	-	-
Voltage supply (±15%)	230 Vac (Aux)	24 Vac, dc (Aux)	24 Vac, dc (Aux)	-	-
Code	**12051**	**12052**	**12090**	**12037**	**12036**

CHARACTERISTICS	T2	TST24
Nominal frequency	50/60 Hz	
Control range	Maximum temperature from 40°C to 55°C. Minimum temperature from -5°C to 5°C.	Phase loss: with resistive loads relay trips when a phase loss occurs. With three-phase motors relay trips if the voltage regenerated by the motor is lower than 60% of the main voltage. Phase imbalance > 40%. Maximum temperature setting from 40 °C a 55 °C. Minimum temperature setting from -5 °C a 5 °C.
Hysteresis	2°C	
PTC sensor: min/max cold resist - Trip resist	-	100Ω / 1500Ω - 2300Ω
Trip time delay	-	< 0,1 s
Reset mode	Automatic	
Signalling LED's	2 LED's: ON +	3 LED's: ON + +
Output contacts	1 relay with 1 change over NO - NC	1 relay NO-NC ( ) - 1 relay NO-NC ( )
Switching power	**T2:** I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A **TST24:** I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A; DC13 - 115V - 0,2A	
Maximum terminal section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN	
Power consumption	7,5 VA (230 Vac) - 11 VA (400 Vac)	
Protection degree / weight	IP20 / 0,12 kg	IP20 / 0,13 kg
Storage / operation temperature	-30°C +70°C / -15°C +60°C	

DIMENSIONS (mm)

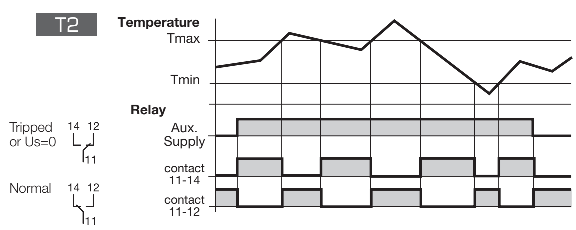


WIRING DIAGRAM

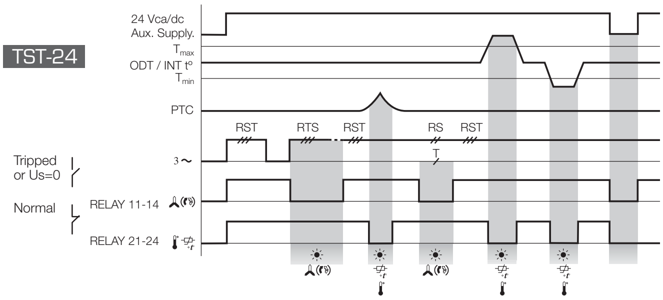


WORK LOGIC

T2



TST-24



MT2

FANOX protection & control

TEMPERATURE Control Relay by Thermistors

TEMPERATURE CONTROL BY THERMISTORS

- ***Protection of the motor against overtemperature.***
- ***DIN rail mounting.***
- ***Visual indication of trip cause.***

- Controls the temperature by the use of thermistors (PTC sensors).
- Detects short-circuit (< 25Ω) and rupture in the circuit of sensors.
- Protects the motors against over temperature caused by excessive ambient temperature, insufficient ventilation or cooling, etc.
- Applicable in transformers and other machines.

MT2

PROTECTION FUNCTIONS

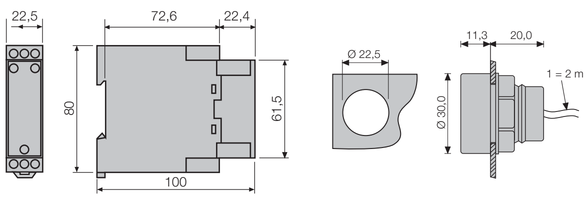
Overtemperature

Thermistor short-circuit

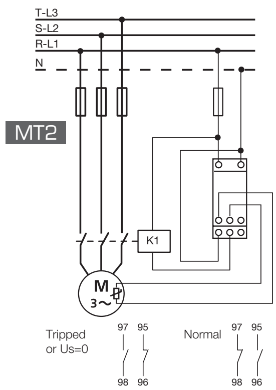
MODELS	MT2
Voltage supply (±15%)	230 Vac (Aux. supply)
Code	**12039**

CHARACTERISTICS	
Nominal frequency	50/60 Hz
Control range	According to the PTC installed
PTC sensor: min/max cold resist - Trip resist	25Ω / 1500Ω - 3600Ω. Reset 1800Ω
Trip time delay	< 0,1 s
Reset mode	Automatic (30s delay)
Signalling LED's	3 LED's: ON + +t° +
Output contacts	1 relay with NO-NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Maximum terminal section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	6 VA (230 Vac)
Protection degree / weight	IP20 / 0,12 kg
Storage / operation temperature	-30°C +70°C / -15°C +60°C

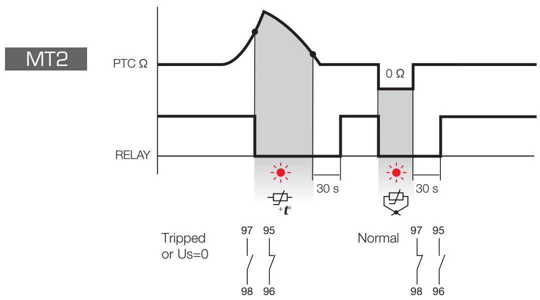
DIMENSIONS (mm)



WIRING DIAGRAM



WORK LOGIC



U1 D

VOLTAGE Control Relays

SINGLE - PHASE VOLTAGE RELAY

- ***Self-powered by the voltage to be monitored.***
- ***Visual indication of trip cause.***
- ***DIN rail mounting.***

- Minimum and maximum thresholds adjustable (two potentiometers).
- **U1D:** Adjustable trip time delay. Instantaneous reset. Protects equipment such as digital instruments or electrical equipment from voltage variations in the network.

U1 D

PROTECTION FUNCTIONS

U> Overvoltage

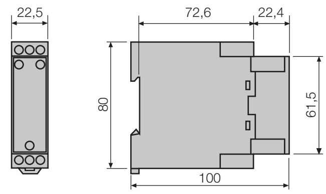
U< Undervoltage

CE

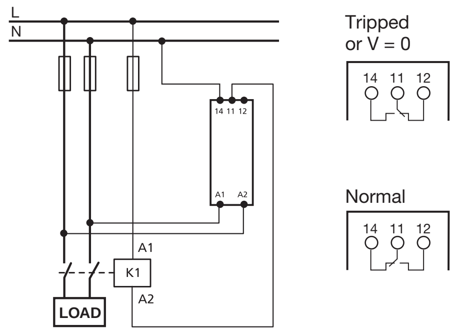
MODELS	U1D-24D	U1D-115	U1D-230
Frequency	DC	50/60 Hz	50/60 Hz
Maximum threshold V	23-28	105-135	215-275
Minimum threshold V	19-25	90-120	160-230
Code	**12028**	**12026**	**12027**

CHARACTERISTICS	
Type of supply to be monitored	Single phase
Auxiliary supply ±10%	Self-powered
Accuracy	*U>* +4% -1%; *U<* +1% -4%
Trip time delay (TD)	0,1 to 6s (±20%) for *U>* *U<*
Reset time delay (RD)	**U1D:** No / **U1M:** fix 5 min.
Reset mode	Automatic
Hysteresis	4% of the nominal voltage
Signalling LED's	3 LED's: ON + *U>* + *U<*
Output contacts	1 relay with 1 change-over NO - NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / Screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	3 VA (115 Vac) - 7 VA (230 Vac) - 0,7W (24 Vdc)
Protection degree / weight	IP20 / 0,11 kg
Storage / operation temperature	-30°C +70 °C / -15°C +60°C

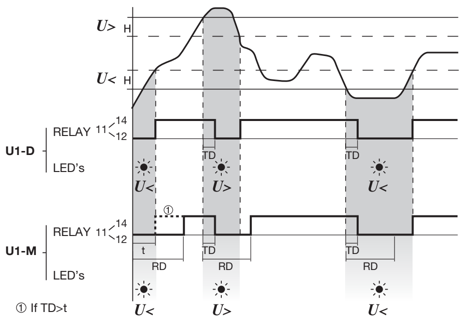
DIMENSIONS U1D RELAY (mm)



WIRING DIAGRAM



WORK LOGIC



U3

protection & control

VOLTAGE Control Relays

THREE - PHASE VOLTAGE RELAY

- ***Self-powered by the voltage to be monitored.***
- ***Visual indication of trip cause.***
- ***DIN rail mounting.***

- Protects three-phase installations against voltage variations between phases, incorrect sequence of phases and phase loss.
- Adjustable minimum and maximum thresholds.
- Adjustable trip time delay.

U3S model:
- Model U3S-420 is valid for 400 and 440 nominal voltage.

U3N models:
- Two independent output relays.
- Includes protection against neutral loss.

U3 S

U3 N

PROTECTION FUNCTIONS

- *U*> Overvoltage
- *U*< Undervoltage
- Phase imbalance or phase loss
- Phase sequence

Model U3 N includes:

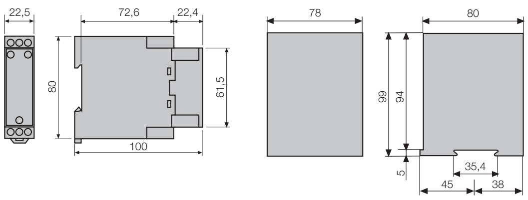
- Loss of neutral

MODELS	U3S-230	U3S-420	U3N-230	U3N-400	U3N-440
Frequency	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz	50/60 Hz
Maximum threshold V	210-290	380-500	230-260	400-460	440-500
Minimum threshold V	185-230	350-430	200-230	340-400	380-440
Code	**12071**	**12070**	**12056**	**12055**	**12057**

CHARACTERISTICS		
Type of supply to be monitored	Three phase	Three-phase with neutral
Auxiliary supply ±10%	Self-powered	
Accuracy	*U*> +4% -1%; *U*< +1% -4%	
Trip time delay (TD)	0,1 to 6s (±20%) for *U*> *U*<	0,1 to 3,7s (±20%) for *U*> *U*< N
Reset mode	Automatic	
Hysteresis	4% of the nominal voltage	
Signalling LED's	**U3S:** 4 LED's: ON + *U*> + + *U*< / **U3N:** 4 LED's: ON + *U*> + + *U*< N	
Output contacts	**U3S:** 1 relay with 1 change-over NO - NC / **U3N:** 2 relays with 1 NO	
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A	
Terminals: Max. section / Screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN	
Power consumption	**U3S:** 7,5 VA (230 Vac) - 11 VA (230 Vac) / **U3N:** 12 VA (230 Vac) - 20 VA (230 Vac)	
Protection degree / weight	IP20 / 0,11 kg	IP20 / 0,35 kg
Storage / operation temperature	-30°C +70 °C / -15°C +60°C	

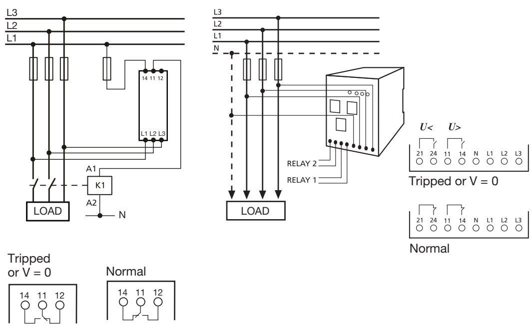
DIMENSIONS RELAYS (mm)

U3 S — U3 N



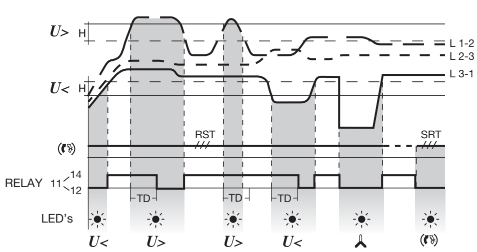
WIRING DIAGRAM

U3 S — U3 N

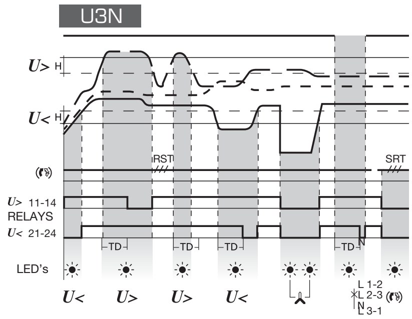


WORK LOGIC

U3S



U3N



FREQUENCY Monitoring Relays

SINGLE-PHASE FREQUENCY MONITORING RELAY

- ***Self-powered by the voltage to be monitored.***
- ***Visual indication of trip cause.***
- ***DIN rail mounting.***

- Suitable for monitoring the frequency of a single phase or 3-phase system with or without neutral.
- Suitable for generators, alternators and electrical generator sets.
- Maximum and minimum thresholds can be adjusted separately.
- Two independent output relays.

H

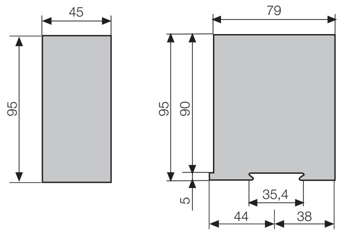
PROTECTION FUNCTIONS

Hz Frequency variation

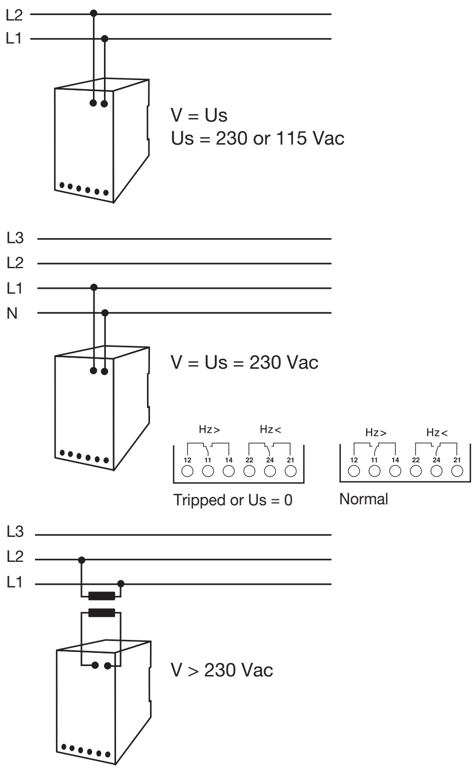
MODELS	115 Vac	230 Vac
Frequency	50/60 Hz selectable by a dip switch	
Maximum threshold V / Hz	Hz> From +0,5 to +3,5 Hz. Steps of 0,5 Hz (±0,1%)	
Minimum threshold V / Hz	Hz< From -0,5 to -3,5 Hz. Steps of 0,5 Hz (±0,1%)	
Code	**12103**	**12102**

CHARACTERISTICS	
Type of supply to be monitored	1-phase, 3-phase and 3-phase with neutral
Auxiliary supply ±10%	Self powered single phase
Accuracy	±0,1%
Trip time delay (TD)	Adjustable from 0,2 to 30 s ± 5%
Reset mode	Automatic
Hysteresis	≤ 0,5% of the nominal frequency
Signalling LED's	3 LED's: ON + **Hz>** + **Hz<**
Output contacts	2 relays, 1 per limit, with 1 change over NO - NC
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A
Terminals: Max. section / Screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN
Power consumption	3,7 VA (230 Vac)
Protection degree / weight	IP20 / 0,3 kg
Storage / operation temperature	-30°C +70°C / -15°C +60°C

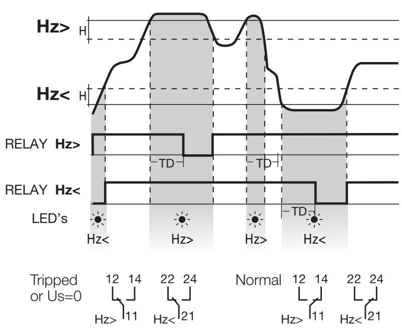
DIMENSIONS H RELAY (mm)



WIRING DIAGRAM



WORK LOGIC



MTR 10

FANOX
protection & control

Timers

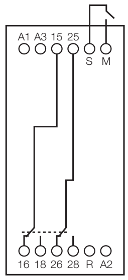
- ***Multifunction digital timer.***
- ***Possibility of programming up to 9 different times. Each time can be set from 0,1 seconds to 99 hours.***
- ***With built-in battery which allows timer to be programmed without connecting to auxiliary voltage. Complete battery discharge does not affect operation or adjustment settings.***
- For control and automation systems in industry.
- Command contact with 5 programmable functions.
- 2 digit, 7 segment LED displays and push-buttons provide programming, and during operation allow for monitoring of the time period and reviewing the programmed settings.
- 45 mm module size, 35 mm wide. DIN EN 50022-35 rail mounting.

MTR 10

Programmable parameters

- Initial state of output relays: energized (1H) or de-energized (1L).
- Working mode: cycle (C1) or non-cycle (C0).
- Number of different times per program: up to 8 in cycle mode and up to 9 in non-cycle mode.
- Time setting range: from 0,1 seconds to 99 hours.
- Command contact.

Auxiliary voltage
A1-A2: 230 Vac
A2-A3: 24 Vac, dc



MODEL	MTR 10	
Auxiliary power supply (+15 -10%)	230 V 50/60 Hz, 24 Vdc, ac	48 Vdc
Code	**12110**	**12111**

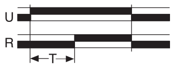
CHARACTERISTICS		
Time setting range	From 0,1 seconds to 99 hours	
Accuracy	1% ±10 ms	
Repeat accuracy	0,5%	
Number of different times per program	Up to 8 in cycle mode and 9 in no-cycle	
Output contacts	1 relay with 2 timed change over contacts NO-NC	
Switching power	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A	
Terminals: max section / screw torque	2,5 mm², No. 22 - 12AWG / 20Ncm, 1.8 LB - IN	
Mechanical / electrical life	>20 x 10^6 operations / >10^5 operations	
Consumption	8 VA (230 Vca) - 1W (24 Vdc)	2.5 VA (48 Vdc) - 1W (24 Vdc)
Protection degree / weight	IP 40 front / 0,15 kg	
Storage / operation temperature	-30°C +70°C / -20°C +55°C	
Standards	IEC 255	

CE

FUNCTION EXAMPLE DIAGRAMS

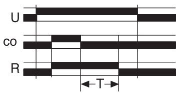
U: power supply **R**: relay output
Output relay at start: **1L** de-energized; **1H** energized.
Work mode: **CO** non-cycle; **C1** cycle.
Command contact: **cu**, **cr**, **cl**, **ci**, **co**.

Delay on
1L - CO - cu

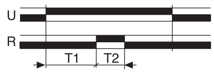


Timing on
1H - CO - cu

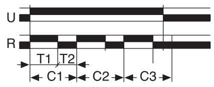
Delay off
With command contact
1H - CO - co



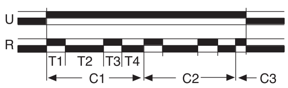
Double timing
1L - CO - cu



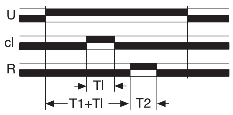
Double timing
Cycle work mode
1H - C1 - cu



Four timings
Cycle work mode
1H - C1 - cu



Timing with pause
by command contact
1L - CO - cl



Command contact Can be switched on in two ways:

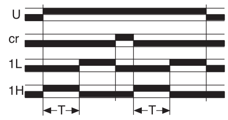
- By closing an external voltage free contact between M and S
- By connecting 5-35 Vac,dc between M(+) and R(-)

One of the following arrangements can be programmed:

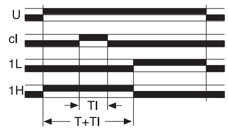
Each diagram represents the effect of the command contact for the two initial states of the output relay: de-energized (1L) and energized (1H).

cu Switched off contact
Its function is blocked

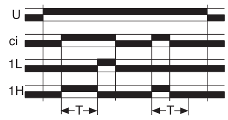
cr Reset contact
When connected the output relay is de-energized; upon disconnecting, the programmed timing starts.



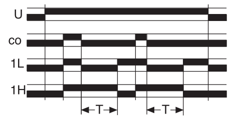
cl Pause contact
A pause in the timing takes place during its operation.



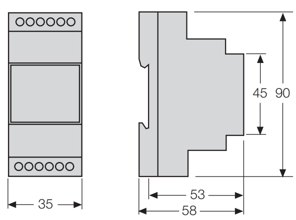
ci Delay on contact
When disconnected the output relay is de-energized; when connected the programmed timing starts.



co Delay off contact
When disconnected the output relay is de-energized. When connected, the relay is energized. When disconnected again, the programmed timing starts.



DIMENSIONS MTR 10 RELAY (mm)



EMM

Electrical Multimeters

- ***Measure and display more than 30 parameters of a three phase line with or without neutral. True RMS values.***
- ***All values can be read without making program changes.***
- ***Reduced size 96x96 mm. Flush mounted in panel.***
- ***EMM 5 and EMM 7 with ModBus communication.***

- Displays with red LED's of 3 digits with 7 segments for easy reading.
- Membrane push-buttons.
- Automatic scale of units.
- With active, reactive and apparent energy counter.
- Calculates the current demand and the active, reactive and apparent power demand.
- Models with ModBus communication.
- Suitable for all electrical switchboards used in the industrial field for instruments, motors, generators, etc.
- The multimeter **EMM 3** has the functions of Ampermeter, Voltmeter and Frequencymeter.
- The multimeter **EMM 5** has pulses output and optional communication facility.
- The multimeter **EMM 7** has the following options:
  - X: Power supply of 20~60 Vac/dc.
  - Y: Power supply of 90~250 Vac/dc.
  - A: Analogue output.
  - D: Digital input for doble tariff of energy.
  - F: Profibus protocol.
  - N: Direct neutral measure.
  - T: Galvanic insulation on current inputs.
- **NGR2 Communication software.** Available for models with communication.

EMM 3

EMM 5

EMM 7

PARAMETERS	
V	Voltage
A	Current
Cos φ	Power factor (PF)
W	Active power (P)
VAr	Reactive power (Q)
VA	Apparent power (S)
kWh	Active energy counter
kVArh	Reactive energy counter
kVAh	Apparent energy counter
Hz	Frequency
°C	Temperature
Max	Maximum values
Avg	Average values
MaxD	Maximum average values
h	Hour counter
	Alarm

MODELS				EMM 3	EMM 5-P / EMM 5-C	EMM 7
Code	according to the auxiliary supply of the electrical multimeter (±15%) 50/60 Hz	3-Phase Power Supply L2-L3	110 Vac	**41250**	**41265/41280**	**41295**
			230 Vac	**41255**	**41270/41285**	
			400 Vac	**41260**	**41275/41290**	

For 1-phase power supply please consult.

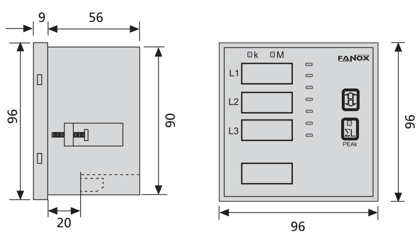
CHARACTERISTICS			
Supply	Self-powered	Self-powered	Self-powered
Voltage input	4 wire input for 3 phase with or without neutral (in this case don't connect N)		
• Input impedance	1 MΩ	1 MΩ	1 MΩ
• Continuous overload	+ 20 %	+ 20 %	+ 20 %
Current input	From 0,02 to 5 A. Use always 3 CT.../5. Multimeters self-consumption < 0,5 VA		
• CT primary I_N current	Range between 5 and 10.000 A. This value has to be programmed by the user in the multimeter		
• Continuous overload	+ 30 %	+ 30 %	+ 30 %
Communication RS485 ModBus	No	**EMM 5-P**: No / **EMM 5-C**: Yes	Yes
Digital output	No	**EMM 5-P**: Yes / **EMM 5-C**: No	Yes
Analogue output	No	No	Optional
Maximum terminal section	2,5 mm²		
Front protection degree / weight	IP52 / 0,5 kg		
Storage / operation temperature; humidity	-25 ºC to 70 ºC / -10 ºC to 60 ºC ; < 90 %		
Standards	IEC EN 50081-2, IEC EN 50082-1, IEC EN 61010-1		

FANOX protection & control

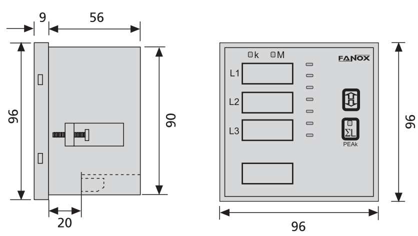
MEASURED PARAMETERS

EMM 3	EMM 5	EMM 7	Parameters	Measured parameters				Range	Accuracy % ± digits
•	•	•	**V_{L-N}** Voltage	V_{L1-N}	V_{L2-N}	V_{L3-N}	$\sum V_{L-N}$	20~290 V_{rms}	±0,5 ± 1
•	•	•	**V_{L-L}** Voltage	V_{L1-2}	V_{L2-3}	V_{L3-1}	$\sum V_{L-L}$	20~500 V_{rms}	±0,5 ± 1
•	•	•	**A** Current	I_{L1}	I_{L2}	I_{L3}	$\sum I_L$	0,02~5 A_{rms}	±0,5 ± 1
		•	**N** Neutral Current	I_n				0,02~5 A_{rms}	±0,5 ± 1
	•	•	**PF** Power factor cos φ	PF_{L1}	PF_{L2}	PF_{L3}	$\sum PF_L$	0,1~1 (+ind ; -cap)	±1 ± 1
	•	•	**W** Active power	P_{L1}	P_{L2}	P_{L3}	$\sum P_L$	0,01~9990 kW	±1 ± 1
	•	•	**VAr** Reactive power	Q_{L1}	Q_{L2}	Q_{L3}	$\sum Q_L$	0,01~9990 kVAr	±1 ± 1
	•	•	**VA** Apparent power	S_{L1}	S_{L2}	S_{L3}	$\sum S_L$	0,01~9990 kVA	±1 ± 1
	•	•	**kWh** Active energy counter	∑kWh				0~10^8 kWh	Class 2
	•	•	**kVArh** Reactive energy count.	∑kVArh				0~10^8 kVArh	Class 2
	•	•	**kVAh** Apparent energy count.	∑kVAh				0~10^8 kVAh	Class 2
•	•	•	**Hz** Frequency	F_{L1}				40~500 Hz	±0,5 ± 1
	•	•	**ºC** Temperature	T	Measured with internal sensor			0~70 ºC	±2 ºC
	•	•	◷ Hour counter	H	Resolution in 1/10 of hour				±1 %
•	•	•	**Max** Maximum values	$V_{L1-N\ max}$	$V_{L2-N\ max}$	$V_{L3-N\ max}$		Values every second	
•				$V_{L1-L2\ max}$	$V_{L2-L3\ max}$	$V_{L3-L1\ max}$			
•	•	•		$I_{L1\ max}$	$I_{L2\ max}$	$I_{L3\ max}$			
		•		$I_{N\ max}$					
	•	•		$\sum W_{max}$	$\sum VAr_{max}$	$\sum VA_{max}$			
•			**Min** Minimum values	$V_{L1-N\ min}$	$V_{L2-N\ min}$	$V_{L3-N\ min}$			
	•	•	**Avg** Average values	$I_{L1\ avg}$	$I_{L2\ avg}$	$I_{L3\ avg}$		Values over last 15 minutes	
		•		$I_{N\ avg}$					
	•	•		$\sum W_{avg}$	$\sum VAr_{avg}$	$\sum VA_{avg}$			
•	•	•	**MaxD** Maximun average val.	$I_{L1\ max\ (avg)}$	$I_{L2\ max\ (avg)}$	$I_{L3\ max\ (avg)}$		Values over last 15 minutes	
		•	$I_{N\ max\ (avg)}$						
	•	•		$\sum W_{max\ (avg)}$	$\sum VAr_{max\ (avg)}$	$\sum VA_{max\ (avg)}$			

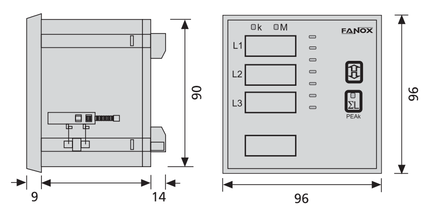
DIMENSIONS EMM 3 RELAY (mm)



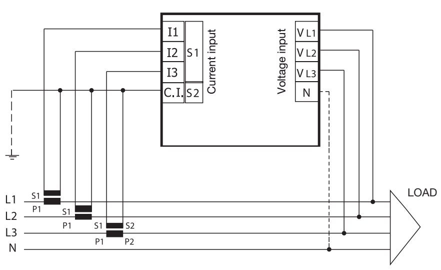
DIMENSIONS EMM 5 RELAY (mm)



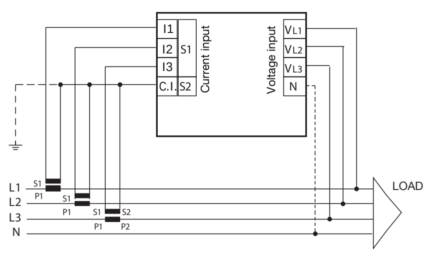
DIMENSIONS EMM 7 RELAY (mm)



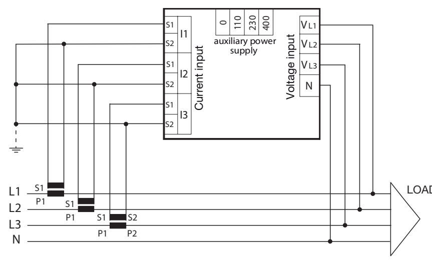
WIRING DIAGRAM EMM 3



WIRING DIAGRAM EMM 5



WIRING DIAGRAM EMM 7



TP

Temperature and Process Controllers

- *Provide simple reliable and economic control of industrial processes.*
- *Complete range of controllers adapted to most industrial applications.*
- *Quick and exact operation as result of PID action improved with FUZZY logic.*
- *Permit calculation of the most efficient parameters thanks to the AUTOTUNING function.*
- *ModBus RS485 Communication.*

INDUSTRIES AND APPLICATIONS

- Chemical Industries
- Plastics treatment industries
- Paper processing industries
- Welding equipment
- Oven manufacturing
- Other types of industries and applications...

PROCESSES

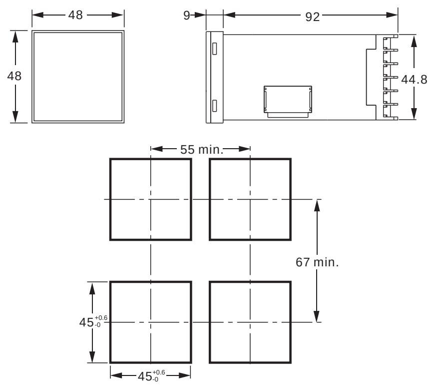
- Control of temperature, pressure, flow, level, volume processes, etc…
- Industrial equipment control
- Valve positioners control
- Servo operation and speed variators control
- Process limit values control
- Other types of processes…

TP 720

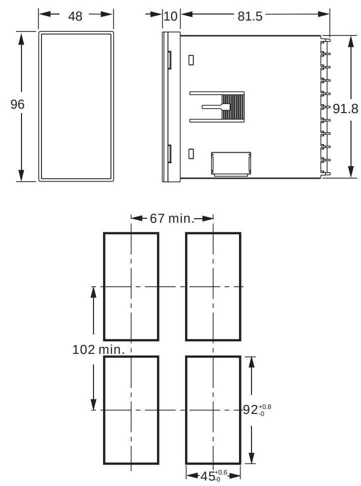
TP 731

TP 750

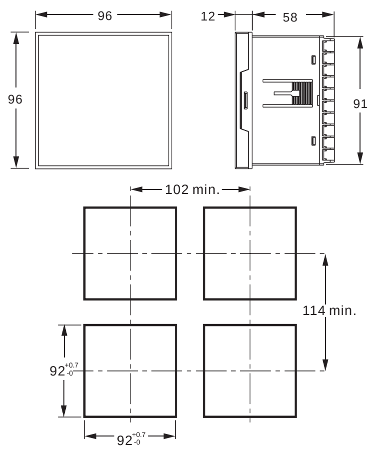
DIMENSIONS TP 720 RELAY (mm)



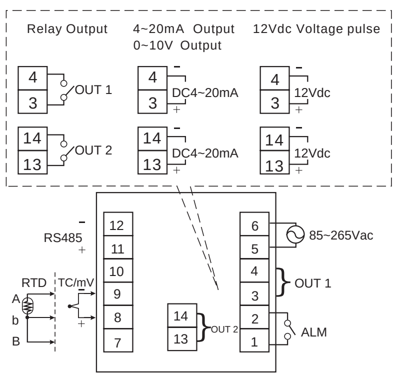
DIMENSIONS TP 731 RELAY (mm)



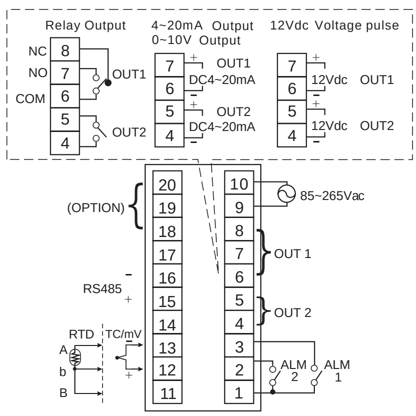
DIMENSIONS TP 750 RELAY (mm)



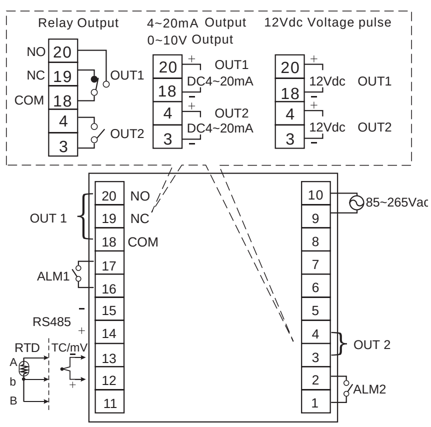
WIRING DIAGRAM TP 720



WIRING DIAGRAM TP 731



WIRING DIAGRAM TP 750



FANOX
protection & control

SPECIFICATIONS	
Power Supply	85~265 Vac, 50/60 Hz
Power Consumption	7 VA
Input resistance	> 1 MΩ
Input compensation	-1999~9999
Digital filtering	10~100 Times
Settings range	-1999~9999

INPUT SIGNAL	RANGE	ACCURACY
	Thermocouple	
K	-200 ~ 1270 ºC	0,3 % ± 1 digit
J	-210 ~ 1200 ºC	0,3 % ± 1 digit
R (1)	-50 ~ 1760 ºC	0,3 % ± 1 digit
S (1)	-50 ~ 1760 ºC	0,3 % ± 1 digit
B (2)	250 ~ 1820 ºC	± 8ºC ± 1 digit
E	-200 ~ 1000 ºC	0,3 % ± 1 digit
N	-200 ~ 1300 ºC	0,3 % ± 1 digit
T	-200 ~ 400 ºC	± 2ºC ± 1 digit
	RTD	
PT100	-200 ~ 850 ºC	0,3 % ± 1 digit
JPT100	-200 ~ 850 ºC	0,3 % ± 1 digit
	Analogue signal	
mV	0 ~ 350 mV	0,3 % ± 1 digit
mA(3)	4-20 mA	

(1) R & S, accuracy ± 19ºC when the range is 0~500ºC
(2) B does not guarantee accuracy for the range 0~400ºC
(3) mA only for TP 720

ALARM FUNCTION	
Types of alarm	Absolute value alarm Discrepancy alarm Area alarm
Set value	0 ~ 99 s
Alarm Output	SPST NA, 5A/250Vac (TP 720 3A)
Method of action	Alarm activation Deactivation delay
Output signal	Alarm relay output

OTHER FUNCTIONS	
Sensor break detection	Indication on front (TP 720)
Irregularities detection at heater supply	Alarm when there is no current or the set value is reached (TP 720)
Remote setting	Capacity to change adjustment
Parameters lock	3 access levels which permit:
Level 1	Input signal, alarm adjustment, adjustment values, control type
Level 2	Alarm adjustment, adjustment values, control type
Level 3	Total lock

MARK	EN 61010, EN 61000, EN 55011

CONTROL FUNCTIONS	
Control method	ON/OFF PID + Autotuning PID + FUZZY + Autotuning
Fraction value	0~9999
Integral time	0~9999
Differential time	0~9999
Hysteresis Alarm setting	0~9999
Sampling interval	0,2 s
Output control cycle	0,1~999,9 s

OUTPUT SIGNAL			
Main control	**TP 720**	**TP 731**	**TP 750**
Relay	SPST NO 3A/250Vac	SPDT NO-NC 5A/250Vac	SPDT NO-NC 5A/250Vac
Pulse (SSR)	0/12 Vdc (NPN) ; Max. 20 mA		
Analogue (Retransmission)	4~20 mA 0~10 Vcc Max. 600 Ω		
Secondary Control	**TP 720**	**TP 731**	**TP 750**
Relay	SPST NO 3A/250Vac	SPST NO 5A/250Vac	SPST NO 5A/250Vac
Pulse (SSR)	0/12 Vdc (NPN) ; Max. 20 mA		
Analogue (Retransmission)	4~20 mA 0~10 Vdc Max. 600 Ω		

STRUCTURE			
Models	**TP 720**	**TP 731**	**TP 750**
Assembly	On panel	On panel	On panel
IP Protection	IP 65	IP 56	IP65

COMMUNICATIONS	
Interface	RS485
Protocol	ModBus RTU or ASCII
Data Format	8 bits, Bit Check: odd/even/none Stop Bit: 1 or 2 bits
Speed (bauds)	600, 1200, 2400, 4800, 9600, 19200, 38000
Address	000~255
Memory	EEPROM

LED'S			
Models	**TP 720**	**TP 731**	**TP 750**
Output	x 1	x 2	x 2
Alarm	x 1	x 2	x 2
Celsius			x 1
Fahrenheit			x 1

7 SEGMENT DISPLAY			
Models	**TP 720**	**TP 731**	**TP 750**
Red PV	0,36"	0,36"	0,56"
Green SV	0,28"	0,36"	0,36"

TP 7 MODEL LIST

TP 7 □ □ ~ □ □ □ □ ~ □

Dimensions	20 · 48 x 48 mm 31 · 48 x 96 mm	50 · 96 x 96 mm
Control Output 1	1 · Output relay 2 · Output 4~20 mA	3 · Output 0~10 Vdc 4 · Voltage pulse (12 Vdc)
Control Output 2	0 · None 1 · Output relay	2 · Output 4~20 mA 3 · Output 0~10 Vdc 4 · Voltage pulse (12 Vdc)
Alarm Output	1 · 1 set	2 · 2 sets
Retransmission	0 · None	1 · 4~20 mA DC
Communications	0 · None 1 · RS485	2 · Heater break detection (only TP 720)

Other options, configurations or sizes, please consult

FAR

Circular Amp Chart Recorder

AMP CHART RECORDER

Circular Chart Recorder products serves industrial market requirements for high quality data acquisition and monitoring products and systems.

- ***Highly Precise sealed potentiometer as a feedback element.***
- ***Highly precise & Accurate Stepper motor.***
- ***Calibration through 2 potentiometers.***
- ***Simple Interface***
- ***IP 65***

Registers most of the variable processes such as temperature, pH, conductivity, humidity or alternant current.
High reliability through servomotor.

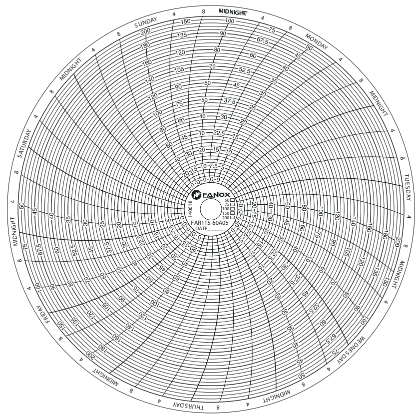
FAR

Model	Code
FAR 115-60A05	**41725**

CHARACTERISTICS

Power Supply	110 VAC - 50 / 60 Hz
Accuracy	1.5 % F.S.
Input Signal Range	0-5 Aac Current
Chart Speed	Selectable 24 HRS/REV or 168 HRS/REV
Chart Speed Variation	±2% 50/60 Hz
Operating Conditions	0 to 50 ºC & 0 to 80% RH
Disposable Fiber tip Pen	Red/Green
Mounting	Wall / Panel mountable Encloser

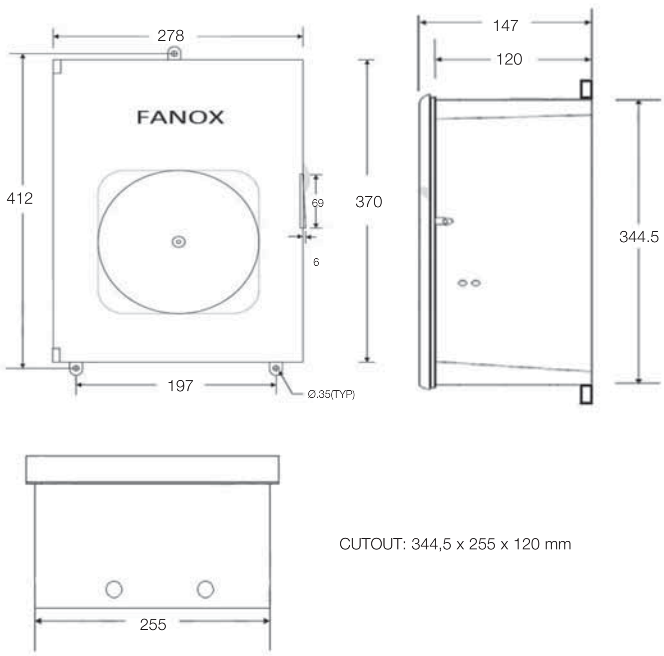
CIRCULAR CHART REGISTRY



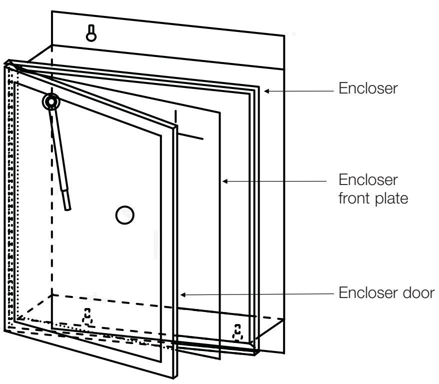
ACCESORIES

Charts	25 for each recorder
Pens	5 for each recorder

DIMENSIONS and CUTOUT (mm)



DESIGN



CT-M

Current Measurement for Chart Recorder

MULTITAP TRANSFORMER

- *Ratings: 200 / 150 / 100 / 75 / 50:5, 10VA.*
- *600V, 10 kV.*
- *Laminated Steel Core.*
- *Ext. PVC coating.*

Model	Code
CT MULTITAP 50-75-100-150-200/5	**41726**

Accuracy class 0.5

Primary .../ 5A	Burden
50	5VA
75	5VA
100	5VA
150	7.5VA
200	10VA

CT-M

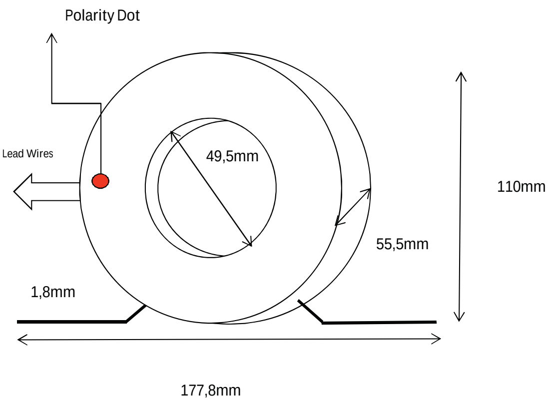
STANDARDS

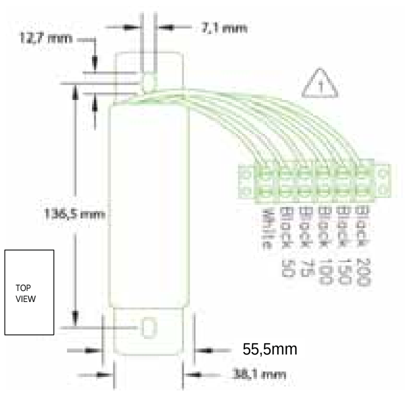
STANDARDS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (7.1) Short circuit
UNE-EN 60 044-1 (7.2) Heating test
UNE-EN 60 044-1 (11.4) Determination of errors
UNE-EN 60.695-2-11 Glow wire test

INDIVIDUAL TESTS

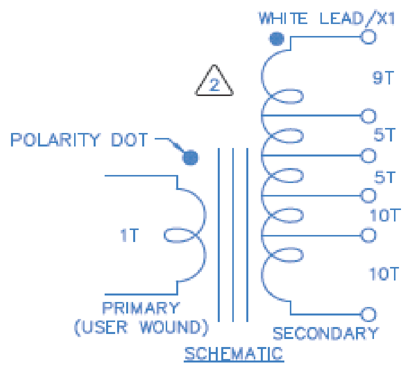
INDIVIDUAL TESTS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (5.3) Frequency withstand volt. between secondary windings
UNE-EN 60 044-1 (8.4) Overvoltage tests between turns
UNE-EN 60 044-1 (11.4, 11.5) Determination of errors

DIMENSIONS (mm)





WINDING



NOTES:
- LEAD WIRES ARE #12 AWG STYLE 1015, 105°C, 600V, 2,5 mm^2
- WINDING WIRE IS REA #14 AWG HTAIH
- LEAD WIRES LENGTH 180 mm

Selection guide

CONTROL RELAYS

MODELS	NOMINAL VOLTAGE	RANGE			+t°			U>	U<	N	Hz> / Hz<
S2	3 x 230 Vac		•	•							
S4	3 x 400 Vac		•	•							
ST2	3 x 230 Vac		•	•	•		•				
ST4	3 x 400 Vac		•	•	•		•				
ST2-D	3 x 230 Vac		•	•	•		•				
ST4-D	3 x 400 Vac		•	•	•		•				
T2	230 Vca	-5° C / +5° C -40° C / +55° C				•					
T2	24 Vac-dc	-5° C / +5° C -40° C / +55° C				•					
TST-24	24 Vac-dc	-5° C / +5° C -40° C / +55° C	•	•	•	•	•				
MT2	230 Vac				•		•				
U1D-24D	24 Vdc	19 - 28						•	•		
U1D-115	115 Vac	90 - 135						•	•		
U1D-230	230 Vac	160 - 275						•	•		
U3S-230	230 Vac	185 - 290	•	•				•	•		
U3S-420	420 Vac	350 - 500	•	•				•	•		
U3N-230	230 Vac	200 - 260	•	•				•	•	•	
U3N-400	400 Vac	340 - 460	•	•				•	•	•	
U3N-440	440 Vac	380 - 500	•	•				•	•	•	
H	115 Vac	50/60 ± 3,5 Hz									•
H	230 Vac	50/60 ± 3,5 Hz									•

I> Overload

I< Undercurrent

cos φ Underload

Phase loss
Phase imbalance

Phase sequence

+t° Overtemperature

U> / U< Overvoltage / Undervoltage

N Loss of neutral

Hz> / Hz< Overfrequency / Underfrequency

Max / Min temperature

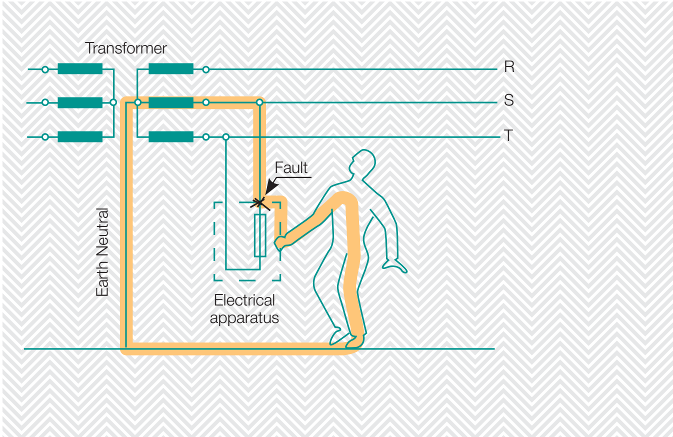
Thermistor short-circuit

EARTH LEAKAGE PROTECTION

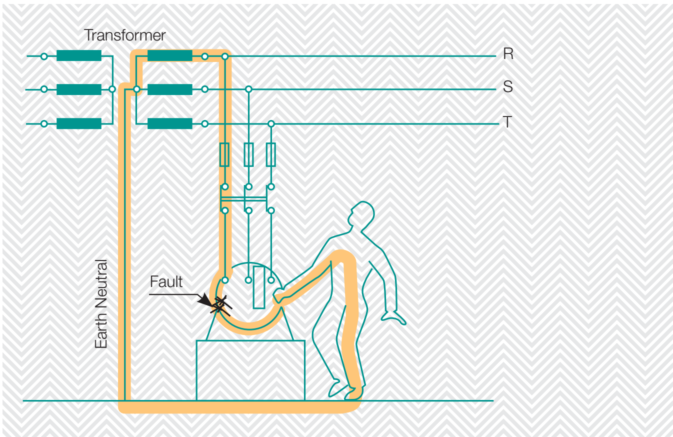
Introduction

The safety of people and human capital is always important. Fanox Earth Leakage Relays are the most effective devices to ensure protection against the dreaded risk of electrical leakage at low voltage.

Our relays feature characteristics that are ideal for preventing hazardous situations, such as:



- **Super Immune:** Our relays are specially designed to work in environments with extreme electrical noise, providing signal immunity to interferences such as frequency. This helps avoiding false alarms and unnecessary stops.
- **Enhanced security:** The enhanced security feature is a backup metering channel. An alarm is triggered to inform of the need for maintenance at the next halt.
- **Easy maintenance:** The equipment allows for testing without the need to stop any ongoing processes.
- **Small size of 22.5 mm:** The D30 relay is also known for its small size. It is ideal for manufacturers of MCC's which have limited panel space.
- **Versatile:** Positive or negative logic can be selected making the relay more flexible at use.



ELR

Earth Leakage Relays WITH BUILT-IN Toroidal Transformer

MULTIRANGE RELAY

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***
- Sensitivity from 0,025 to 25A.
- Trip time delay from 0,02 to 5s.
- Modular size. DIN rail mounting.
- Protection front cover.

ELR-A

MULTIRANGE RELAY

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***
- Sensitivity from 0,025 to 25A.
- Trip time delay from 0,02 to 5s.
- Compact device. Suitable for motor control centers (MCC).

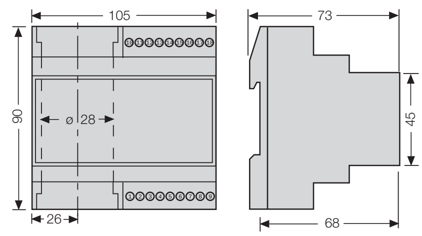
ELR-T

MODELS	ELR-A		ELR-T60		ELR-T110	
Sensitivity	Adjustable from 0,025 A to 25 A		Adjustable from 0,025A to 25 A			
Trip time delay	Adjustable from 0,02 s to 5 s		Adjustable from 0,02 s to 5 s			
Aux. voltage supply 50/60 Hz	24-48 Vdc, ac	110 Vdc, ac 230-400 Vac	24-48 Vdc, ac	110 Vdc, ac 230-400 Vac	24-48 Vdc, ac	110 Vdc, ac 230-400 Vac
Code	**41017**	**41015**	**41107**	**41105**	**41102**	**41100**

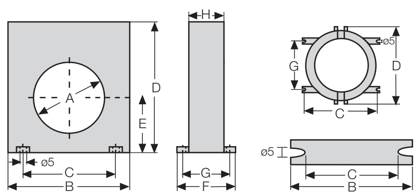
CHARACTERISTICS	
Toroidal transformer	**ELR-A:** Built-in Ø28 mm / **ELR-T:** Built-in Ø60 mm and Ø110 mm
Max. length between relay and transformer	-
Reset mode	Automatic, manual and remote (in manual mode disconnect the aux. supply during 1s)
Signalling LED's	2 LED's: ON + Trip
Output contacts mode	**ELR-A:** Selectable: normally de-energized or energized **ELR-T:** Normally de-energized
Output contacts	**ELR-A:** 2 change over NO-NC / **ELR-T:** 1 change over NO-NC
Switching power (resistive load)	5A - 250V
Maximum terminal section	2,5 mm²
Maximum consumption	3 VA
Modular size	**ELR-A:** 6 modules x 17,5 mm = 105 mm / **ELR-T:** No
Frequency	50/60 Hz
Protection degree / weight	**ELR-A:** IP-20 / 0,4 kg / **ELR-T:** IP-20 / 0,4 y 0,6 kg
Storage / operation temperature	-10°C +60°C
Standards	IEC 41-1, IEC 255, VDE 0664, EN 50081-1, EN 50082-2

DIMENSIONS (mm)

ELR-A



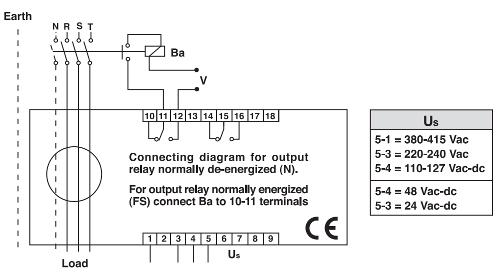
ELR-T



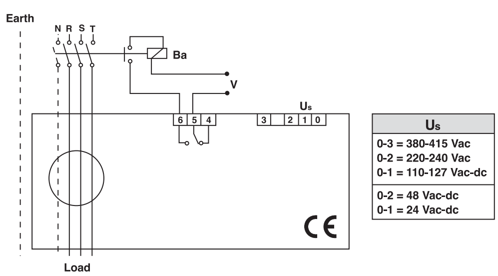
	A	B	C	D	E	F	G	H	K
ELR-T60	60	100	60	110	47	70	60	50	-
ELR-T110	110	150	110	160	70	70	60	50	-

WIRING DIAGRAM

ELR-A



ELR-T



Earth Leakage Relays WITHOUT BUILT-IN Toroidal Transformer

RELAY WITH ADJUSTABLE DELAY TIME AND SENSITIVITY

ELR-B

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***
- To be used with CT-1 and CTD-1 toroidal transformers (See page 120).
- Modular size. DIN rail mounting.
- Sealable front cover.

MULTIRANGE RELAY

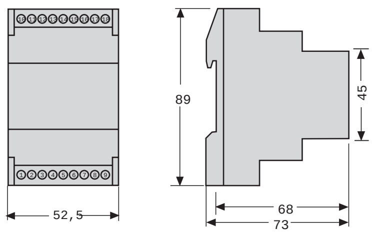
ELR-3C

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***
- To be used with CT-1 and CTD-1 toroidal transformers (See page 120).
- Modular size. DIN rail mounting.
- Sealable front cover.

CE

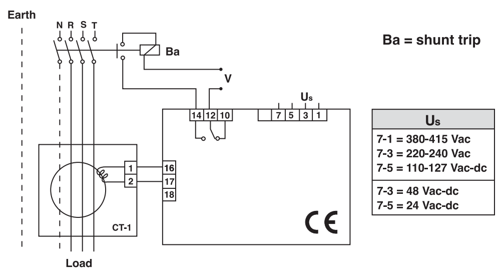
MODELS	ELR-B		ELR-3C	
Sensitivity	0,3 A or 0,5 A		Adjustable from 0,025 A to 25 A	
Trip time delay	0,02 s or 0,5 s		Adjustable from 0,02 s to 5 s	
Aux. voltage supply 50/60 Hz	24-48 Vdc, ac	110 Vdc, ac 230-400 Vac	24-48 Vdc, ac	110 Vdc, ac 230-400 Vac
Code	**41012**	**41010**	**41005**	**41000**

DIMENSIONS (mm)



CHARACTERISTICS	
Toroidal transformer	In combination with CT-1
Max. length between relay and transformer	20 m with cables twisted
Reset mode	Automatic, manual and remote (in manual mode disconnect the aux. supply during 1s)
Signalling LED's	2 LED's: ON + Trip
Output contacts mode	Normally de-energized
Output contacts	1 change over NO-NC
Switching power (resistive load)	5A - 250V
Maximum terminal section	2,5 mm^2
Maximum consumption	3 VA
Modular size	3 modules x 17,5 mm = 52,5 mm
Frequency	50/60 Hz
Protection degree / weight	IP-20 / 0,2 kg
Storage / operation temperature	-10°C +60°C
Standards	IEC 41-1, IEC 255, VDE 0664, EN 50081-1, EN 50082-2

WIRING DIAGRAM



D30 / DM30

Earth Leakage Relays WITHOUT BUILT- IN Toroidal Transformer

SUPERIMMUNIZED MULTIRANGE RELAY 22,5 mm

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***

- Very high level of immunity.
- 22,5 mm wide. Saving space in the distribution board.
- DIN rail mounting.
- To be used with CT-1 and CTD-1 toroidal transformers (See page 120).
- Suitable for Motor Control Centres (MCC), electrical distribution boards and control panels in general.

D30

SUPERIMMUNIZED MULTIRANGE RELAY

- ***Electronic relays with adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***

- Very high level of immunity.
- Modular size. DIN rail mounting.
- To be used with CT-1 and CTD-1 toroidal transformers (See page 120).
- Suitable for electrical distribution boards and control panels in general.
- Sealable front cover

DM30

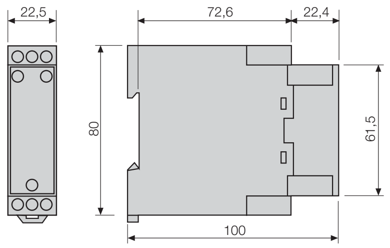
CE

MODELS	D30		DM30	
Sensitivity	Adjustable from 0,03 A to 30 A		Adjustable from 0,03 A to 30 A	
Trip time delay	Adjustable from 0,02 s to 5 s		Adjustable from 0,02 s to 5 s	
Aux. voltage supply 50/60 Hz	120 Vac	230 Vac	120 Vac	230 Vac
Code	**41021**	**41020**	**41023**	**41022**

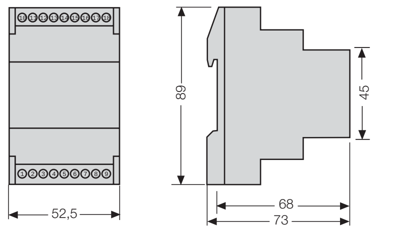
CARACTERÍSTICAS				
Toroidal transformer	In combination with CT-1			
Max. length between relay and transformer	Cable section mm²			
	0,22 mm²	0,75 mm²	1 mm²	1,5 mm²
	Max. lenght m			
	15 m	55 m	75 m	110 m
Reset mode	Automatic, manual and remote (in manual mode disconnect the aux. Supply during 1s)			
Signalling LED's	2 LED's: ON + ⚡ (trip)			
Output contacts mode	Selectable: normally de-energized (N) or energized (P)			
Output contacts	1 change over NO-NC			
Switching power (resistive load)	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A			
Maximum terminal section	2,5 mm²			
Maximum consumption	7 VA - 230 V		2,5 VA (120 - 230 V)	
Modular size	No. 22,5 mm wide		3 modules x 17,5 mm = 52,5 mm	
Frequency	50/60 Hz			
Protection degree / weight	IP-20 / 0,2 kg			
Storage / operation temperature	-10°C +60°C			
Standards	EN 50263, EN 61543 (A11), EN 60255-5, VDE 0664, 61008-1/A14, 61000-4-11			

DIMENSIONS (mm)

D30

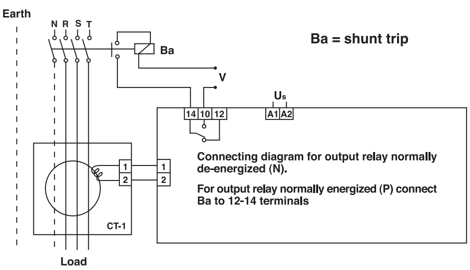


DM30

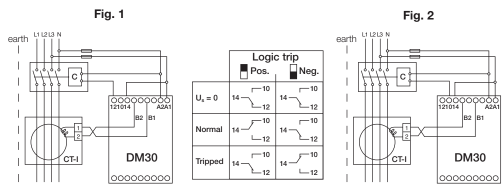


WIRING DIAGRAM

D30



DM30



	Undervoltage trip coil Contactor	Shunt trip coil	Trip Logic
Safety Priority	Fig. 2	Fig. 1	Posit. P
Service Priority	Fig. 1	Fig. 2	Negat. N

DR30

FANOX protection & control

SUPERIMMUNIZED MULTIRANGE RELAY WITH AUTOMATIC RECLOSING

- ***Electronic relays with automatic reclosing up to 3 attempts with defined (1 m) or adjustable (1 to 60 s) time.***
- ***Adjustable time delay and sensitivity.***
- ***Suitable for direct pulse current.***
- ***Immune to external disturbances.***

- Very high level of immunity.
- Modular size. DIN rail mounting.
- To be used with CT-1 and CTD-1 toroidal transformers (See page 120).
- Suitable for electrical distribution boards in general.
- Sealable front cover.

DR30F

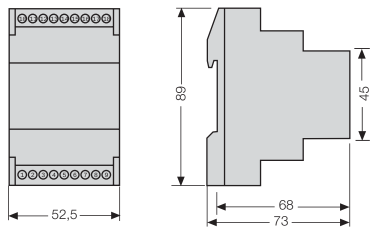
DR30A

MODELS	DR30F			DR30A		
Reclosing time	60 s			Adjustable from 1 s to 60 s		
Sensitivity	Adjustable from 0,03 A to 30 A					
Trip time delay	Adjustable from 0,02 s to 5 s					
Aux. voltage supply 50/60 Hz	120 Vac	230 Vac	24 Vdc	120 Vac	230 Vac	24 Vdc
Code	**41026**	**41024**	**41027**	**41028**	**41019**	**41029**

CHARACTERISTICS				
Toroidal transformer	In combination with CT-1			
Max. length between relay and transformer	Cable section mm²			
	0,22 mm²	0,75 mm²	1 mm²	1,5 mm²
	Max. lenght m			
	15 m	55 m	75 m	110 m
Reset mode	Automatic, manual and remote (in manual mode disconnect the aux. Supply during 1s)			
Signalling LED's	2 LED's: ON + ⚡ (trip) / 2 LED's: Numbers of reclosing / 4 LED´s: % measurement			
Output contacts mode	Selectable: normally de-energized (N) or energized (P)			
Output contacts	2 change over NO-NC			
Switching power (resistive load)	I_{th}: 5A; AC15 - 250V - 2A; DC13 - 30V - 2A			
Maximum terminal section	2,5 mm²			
Maximum consumption	2,5 VA - 230 V			
Modular size	3 modules x 17,5 mm = 52,5 mm			
Frequency	50/60 Hz			
Protection degree / weight	IP-20 / 0,2 kg			
Storage / operation temperature	-10°C +60°C			
Standards	EN 50263, EN 61543 (A11), EN 60255-5, VDE 0664, 61008-1/A14, 61000-4-11			

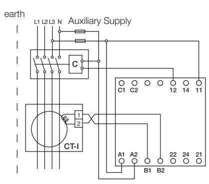
DIMENSIONS (mm)

DR30



WIRING DIAGRAM

Fig. 1



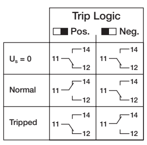
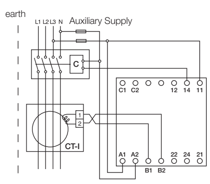


Fig. 2



	C Undervoltage trip coil Contactor	C Shunt trip coil	Trip Logic
Safety Priority	Fig. 2	Fig. 1	Posit. N P
Service Priority	Fig. 1	Fig. 2	Negat. N P

LOW AND MEDIUM VOLTAGE TRANSFORMERS

FANOX protection & control

Introduction

Current Transformers

Current transformers sample the line current and convert it into safety and measurable values for the normalized standards of instruments, metering devices and other metering and control devices.

Nominal values of the current transformers are defined as the ratio between the primary and the secondary current.

They are classified according to the main isolation used:

Wound Primary type, Bar Primary type, Toroidal type and for Terminal blocks type.

These current transformers can be used for two different purposes: Measurement or Protection. The correct choice of the CT is essential in order to avoid faults and degradation that would lead into economic losses or even into dangerous situations.

Both Measurement and Protection current transformers have to provide a secondary current that is proportional to the one of the primary.

- **The main purpose of Measurement Transformers** is to measure currents without the activation of corrective responses when abnormal values arise. Within the range of the nominal current good accuracy is needed while out of the threshold of the nominal range that accuracy is unnecessary. For that reason, the measurement transformers have a very low saturation factor and a high security factor to avoid overloads in the metering devices.
- **Protection transformers** are designed to give a warning or correction advice when abnormal values are measured. With high values of fault current, a high saturation factor is required in order to maintain a good accuracy. The secondary current, proportional to the primary, could reach very high values and should always be supported by protection devices.

Power transformers

The Power Transformers have a special winding which allows them to have a high voltage primary and a low voltage secondary. They have a very low nominal power and their unique purpose is to give a voltage sample of the power system to measure it with the incorporated instruments.

Being their principal objective the voltage sampling, they must be specially accurate so that they do not to distort the real values. The selection of the transformer will be conditioned by the accuracy required in its readings.

CT

Protection & Measurement for Low Voltage

CURRENT TRANSFORMERS

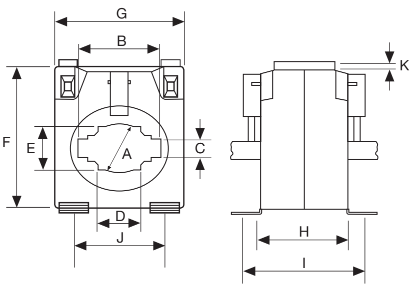
- *Up to 1000 A of primary current.*
- *Transformer ratio .../5.*
- *S ealable terminal box connection, metal brackets for fitting and bus-bar holders included.*
- *Standards: IEC 60044-1, BS 2627*

CT

Primary .../ 5A	Model	Code	VA class		
			0,5	1	3
50	CT20	41399	-	-	3
75	CT20	41400	-	2	3,5
100	CT20	41404	1,5	2,5	3,75
150	CT20	41406	2,5	3,5	5
200	CT30	41412	3,5	5	7,5
250	CT30	41414	5	7,5	10
300	CT30	41416	5	7,5	10
400	CT30	41418	5	7,5	10
500	CT50	41422	7,5	10	20
600	CT50	41424	10	15	25
800	CT50	41426	15	20	30
1000	CT50	41428	15	20	30

CHARACTERISTICS	
Overload	1,2 I_N
Max. line voltage bus-bars / cable1000V	660V / 1000V
Max. size: bus-bars / Ø cable (mm) CT 20	25 x 5 / Ø 20
Max. size: bus-bars / Ø cable (mm) CT 30	40 x 10 / Ø 28
Max. size: bus-bars / Ø cable (mm) CT 50	60 x 12 / Ø 44

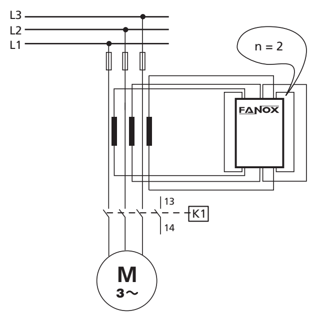
DIMENSIONS CT (mm)



mm	CT 20	CT 30	CT 50
A Ø	20,3	28,5	44
B	25,6	40,6	60,6
C	5,6	10,6	12,5
D	15,6	20,6	50,6
E	15,6	25,2	30,6
F	70	80,5	102
G	58	64	84,5
H	32	44	50
I	48	60	64
J	39	46	-
K	4,5	4,5	4,5

WIRING DIAGRAM FOR C9 - GL16 - P19 - PF16 - G

$$I_B = \frac{I_N \text{ motor}}{I_N \text{ CT}} \times 5 \times n$$



CT

FANOX
protection & control

Protection & Measurement for Low Voltage

TOROIDAL TRANSFORMERS

- *Provided burden up to 15 VA.*
- *Transformer ratio .../5.*
- *Fixing base incluided.*

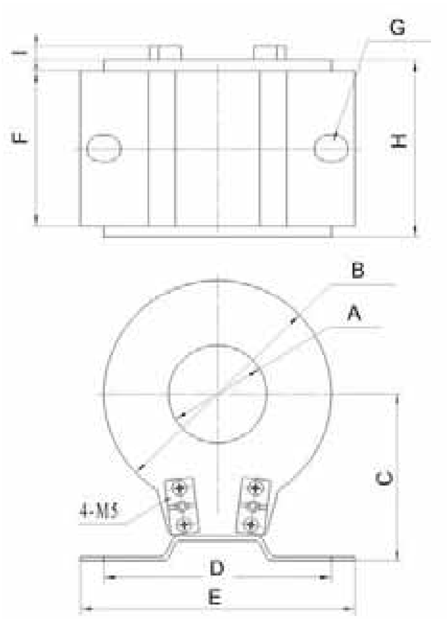
CT

Primary .../ 5A	Code	Model	VA class
			0,5
50	**41365**	CT50A	5
75	**41366**	CT50B	5
100	**41367**	CT50C	5
150	**41368**	CT50C	15
200	**41369**	CT50C	15
300	**41371**	CT50C	15

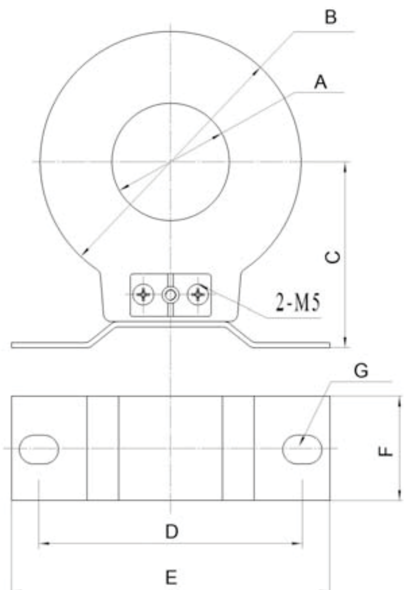
CHARACTERISTICS	
Line voltage	600 V
Ø cable (mm) CT50A	Ø 44
Ø cable (mm) CT50B	Ø 44
Ø cable (mm) CT50C	Ø 45

DIMENSIONS (mm)

CT50A and CT50B models



CT50C models



mm	CT50A	CT50B	CT50C
A Ø	44	44	45
B	102	102	100
C	74	74	73
D	102	102	101
E	123	123	122
F	120	80	40
G	12x15	12x15	12x15
H	8	8	NA
I	80	80	NA

CT-1 / CTD-1

Earth Leakage Protection & Measurement for Low Voltage

TOROIDAL TRANSFORMERS

- To be used with ELR-B, ELR-3C, D30, DM30 and DR30 relays.
- The transformer and relay assembly sensitivity is fixed by the relay.
- The toroidal transformer CTD-1/28 is specifically designed for DIN rail mounting.

Working principles: The toroidal transformer is installed between the source and the load. The system works on the current balance principle. In a correct installation the vector sum of the currents is zero and the relay will not trip.

In case of an insulation fault on the circuit a leakage current flows to earth. Now the vector sum of the current passing through the transformer is not zero, this imbalance is detected by the transformer, which induces a current in the secondary winding which is connected to the relay.

If the fault level is higher than the selected sensitivity, and when the trip time delay has elapsed, the relay trips and actuates on the shunt trip of a circuit breaker or the coil of a contactor interrupting the supply to the load.

The dimensioning of the toroidal transformer depends on the diameter of all active wires (not earth conductors) put through the transformers.

Type	Code	Inner Ø	Weight (kg)
CTD-1/28	**41055**	28 mm	0,2
CT-1/35	**41060**	35 mm	0,2
CT-1/60	**41065**	60 mm	0,3
CT-1/80	**41070**	80 mm	0,5
CT-1/110	**41075**	110 mm	0,5
CT-1/160	**41080**	160 mm	1,4
CT-1/210	**41085**	210 mm	1,5
CTA-1/110	**41076**	110 mm	0,5
CTA-1/160	**41081**	160 mm	1,4
CTA-1/210	**41086**	210 mm	1,5

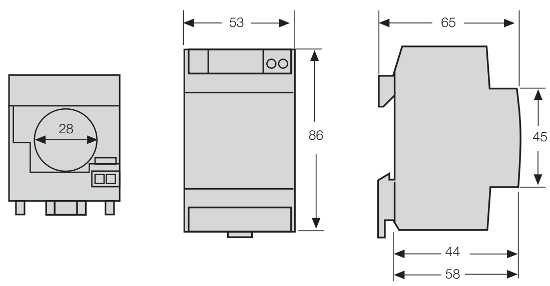
CT-1

CTD-1

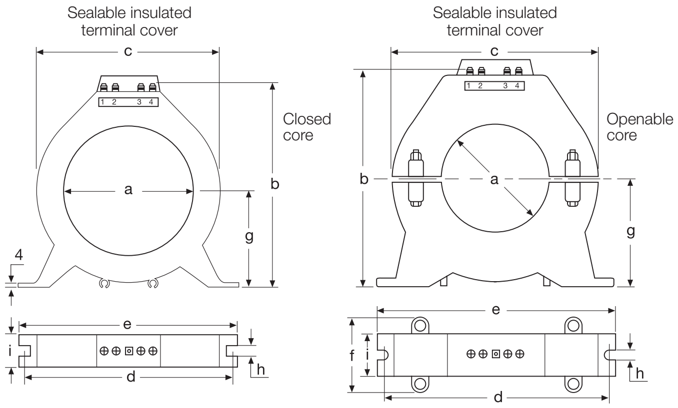
CE

Characteristics	CT-1
Thermoplastic material	UL 94-V0
Operating frequency	47-63 Hz
Insulation	2,5 Kv 50 Hz, 1 min
Protection degree	IP 20
Continuous overload	1000A
Thermal overload	40 kA (1sec)
Operating temperature	De 0 a + 50 ºC, U.R./R.H <90% n.c.
Storage temperature	De -20 a +70 ºC
Connections	Tornillo, Max 1,5 mm2

DIMENSIONS CTD-1 (mm)



DIMENSIONS CT-1 (mm)



	Core	a	b	c	d	e	f	g	h	i
CT-1/35	Closed	35	88	73	92	100	-	40	6	28
CT-1/60	Closed	60	112	98	116	125	-	55	6	28
CT-1/80	Closed	80	132	118	136	146	-	65	6	28
CT-1/110	Closed	110	158	148	166	178	-	78	6	28
CT-1/160	Closed	160	265	255	265	275	-	130	8,5	45
CT-1/210	Closed	210	315	305	310	325	-	155	8,5	45
CTA-1/60	Open	60	125	116	13	140	45	60	8,5	34
CTA-1/110	Open	110	215	205	220	235	70	105	8,5	40
CTA-1/160	Open	160	265	255	265	275	75	130	8,5	45
CTA-1/210	Open	210	315	305	310	325	75	155	8,5	45

CT60II EXT

Electric Energy Measurement for Remote Management in Low Voltage

CT60II EXT

CURRENT TRANSFORMER FOR OUTDOOR

- *Designed for **outdoor** installation.*
- *Transformer ratio 400/5.*
- *Compact size.*
- *With core and cable incorporated, spliceless.*

Primary .../ 5A	Model	Code	VA class 0,5 s
400	CT60II EXT/1,5	**41443**	5
400	CT60II EXT/2,5	**41442**	5

MECHANICAL CHARACTERISTICS	CT60II EXT/1,5	CT60II EXT/2,5
Material	Resin DIAPOL 509	
Secondary cable	RZ1-K Black	
Cable type	Bipolar (Blue and Brown)	
Terminals	Without terminals	
Cable section	1,5 mm^2	2,5 mm^2
Cable length	6 m	10 m
Inner diameter	60 mm maximum	
Outer diameter	110 x 90 mm	
Height	35 mm	

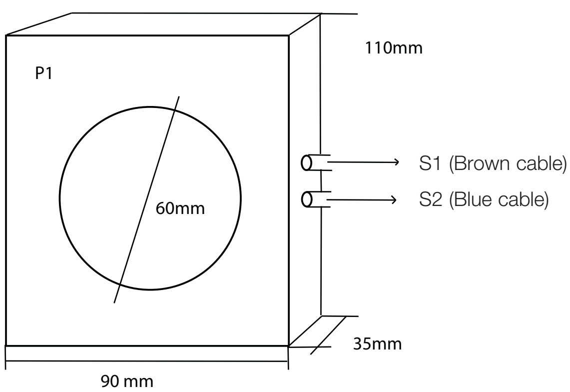
ELECTRICAL CHARACTERISTICS	
Frecuency	50/60 Hz
Transformer ratio	400/5
Maximum Voltage secondary open	48 Vpeak
Accuracy voltage	5 VA
Maximum Voltage Um	0,72 kV
Isolation voltage	3 kV
Accuracy class	0,5s
Security factor	5
Protection degree	IP 65
Accuracy limit	150 %
Insulation class	E

INDIVIDUAL TESTS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (7.1) Short circuit
UNE-EN 60 044-1 (7.2) Heating test
UNE-EN 60 044-1 (11.4) Determination of errors
UNE-EN 60.695-2-11 Glow wire test
UNE-EN 60 044-1 (7.4) Wet test for outdoor type transformers
UNE-EN 62208 (9.11) Verification of resistance to weathering
UNE-EN 20324 Degrees of protection provided by enclosures (IP65)

ADMISSIBLE STEPS	
1x50, 2x50, 1x95 (terminals included)	Suitable
1x150 (terminals included)	Suitable
2x95, 2x150, 3x150, 3x95 (terminals included)	Suitable
1x240, pletina 60x10 (terminals included)	Suitable

INDIVIDUAL TESTS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (5.3) Frequency withstand volt. between secondary windings
UNE-EN 60 044-1 (8.4) Overvoltage tests between turns
UNE-EN 60 044-1 (11.4, 11.5) Determination of errors

DIMENSIONS CT (mm)



CT80II / CT4II

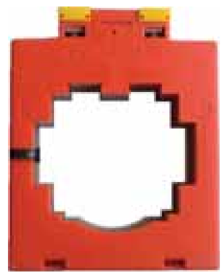
Electric Energy Measurement for Remote Management in Low Voltage

CURRENT TRANSFORMERS UP TO 1800 A

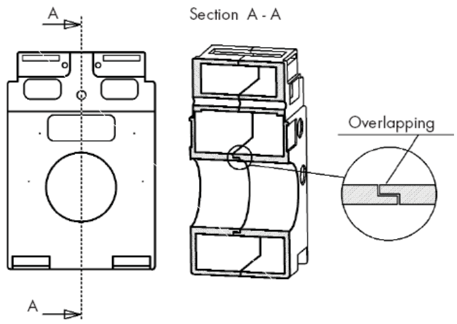
- *Up to 1800 A of primary current.*
- *Transformer ratio 1200/5.*
- *Sealable plastic cover, fixing base and bus-bar.*
- *Certificate model for pricing.*

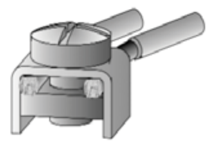
Primary .../ 5A	Model	Code	VA class 0,5 s
1200	CT80II	**41440**	5
1200	CT4II	**41445**	5

CT80II



CT4II





Housing clousing detail

Section
2,5x4 mm

CHARACTERISTICS	
Overload	1,5 I_N
Frecuency	50/60 Hz
Maximum Voltage Um	0,72 kV
Isolation voltage	3 kV
Short circuit thermal current Ith	72 kA
Short circuit dynamic current Idyn	2,5 x Ith
Accuracy limit	150 %
Security factor	5
Insulation class	E

STANDARDS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (7.1) Short circuit
UNE-EN 60 044-1 (7.2) Heating test
UNE-EN 60 044-1 (11.4) Determination of errors
UNE-EN 60695-2-11 Glow wire test

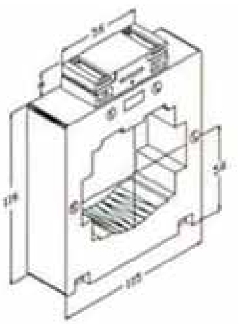
INDIVIDUAL TESTS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (5.3) Frequency withstand volt. between secondary windings
UNE-EN 60 044-1 (8.4) Overvoltage tests between turns
UNE-EN 60 044-1 (11.4, 11.5) Determination of errors

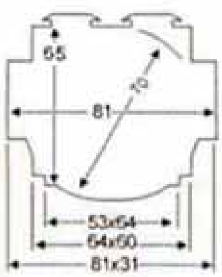
SUITABLE WIRES AND SECTORS CT80II
1x240 mm² / 2x240 mm² / 3x240 mm² / 4x240 mm² / 5x240 mm²
1x300 mm² / 2x300 mm² / 3x300 mm²
Primary passing through minimum dimensions (mm²) 81x65

SUITABLE WIRES AND SECTORS CT4II
Cu: 1x300 mm² / 2x300 mm² / 3x300 mm² / 4x300 mm²
Al: 2x240 mm² / 3x240 mm² / 4x240 mm² / 5x240 mm²
Primary passing through minimum dimensions (mm²) 3x100x12 mm

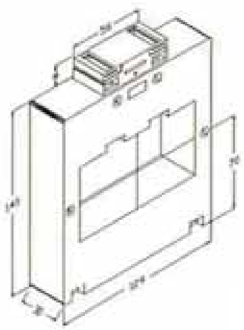
DIMENSIONS CT (mm) and MOUNTING

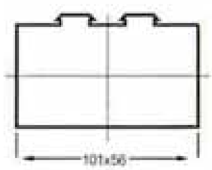
CT80II

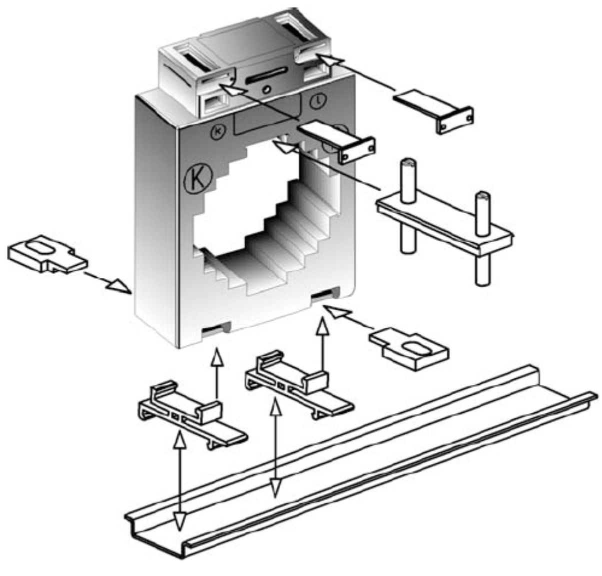




CT4II







Mounting detail

CT80II ABR

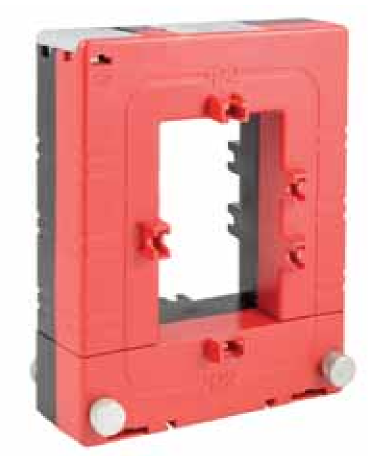
Electric Energy Measurement for Remote Management in Low Voltage

TRANSFORMADOR DE INTENSIDAD DE RANGO ABRIBLE

- *Up to 1800 A of primary current.*
- *Transformer ratio 1200/5.*
- *Sealable plastic cover, fixing base and bus-bar.*
- *Certificate model for pricing.*

Primary .../ 5A	Model	Code	VA class
			0,5 s
1200	CT80II ABR	**41441**	5

CT80II ABR



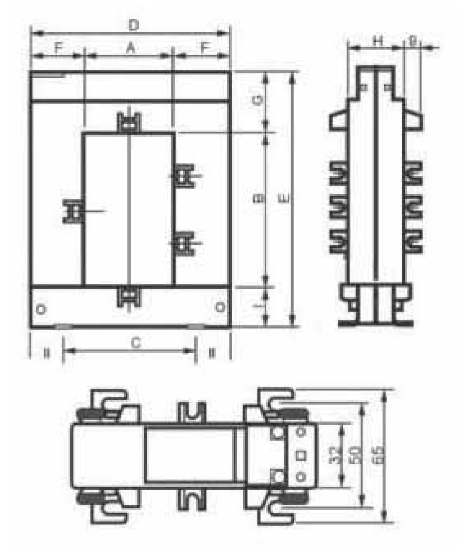
CHARACTERISTICS	
Overload	1,5 I_N
Frecuency	50/60 Hz
Short circuiting terminal blocks for opensecondary	YES
Maximum voltage secondary open	48 V
Maximum Voltage Um	0,72 kV
Isolation voltage	3 kV
Short circuit thermal current Ith	72 kA
Short circuit dynamic current Idyn	2,5 x Ith
Accuracy limit	150 %
Security factor	5
Insulation class	E

STANDARDS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (7.1) Short circuit
UNE-EN 60 044-1 (7.2) Heating test
UNE-EN 60 044-1 (11.4) Determination of errors
UNE-EN 60695-2-11 Glow wire test

INDIVIDUAL TESTS
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (5.3) Frequency withstand volt. between secondary windings
UNE-EN 60 044-1 (8.4) Overvoltage tests between turns
UNE-EN 60 044-1 (11.4, 11.5) Determination of errors

ADMISSIBLES STEPS	
1x240, 2x240, 1x300, 2x300 (terminals included)	Suitable
Bar 80x50	Suitable

DIMENSIONS CT (mm)



mm	CT80II EXT
A	50
B	80
C	78
D	114
E	145
F	32
G	32
H	32
I	33

CT-M

Current Measurement for Chart Recorder

MULTITAP TRANSFORMER

- *Ratings: 200 / 150 / 100 / 75 / 50:5, 10VA.*
- *600V, 10 kV.*
- *Laminated Steel Core.*
- *Ext. PVC coating.*

Model	Code
CT MULTITAP 50-75-100-150-200/5	41726

CT

Accuracy class 0.5

Primary .../ 5A	Burden
50	5VA
75	5VA
100	5VA
150	7.5VA
200	10VA

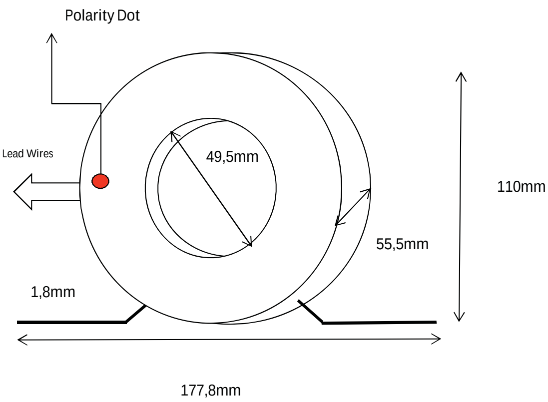
STANDARDS

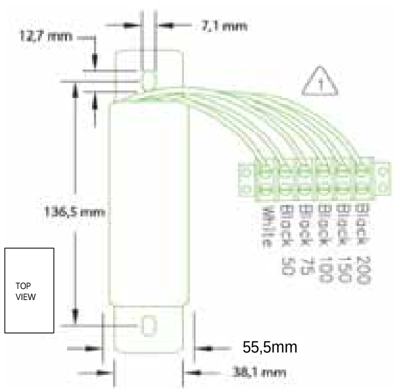
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (7.1) Short circuit
UNE-EN 60 044-1 (7.2) Heating test
UNE-EN 60 044-1 (11.4) Determination of errors
UNE-EN 60.695-2-11 Glow wire test

INDIVIDUAL TESTS

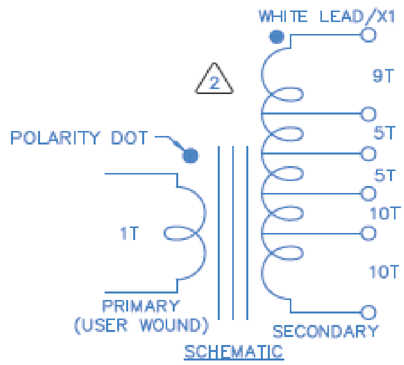
UNE-EN 60 044-1 (8.1, 11.7, 12.7) Terminal marking and nameplate
UNE-EN 60 044-1 (5.3) Frequency withstand volt. between secondary windings
UNE-EN 60 044-1 (8.4) Overvoltage tests between turns
UNE-EN 60 044-1 (11.4, 11.5) Determination of errors

DIMENSIONS (mm)





WINDING



NOTES:
- LEAD WIRES ARE #12 AWG STYLE 1015, 105°C, 600V, 2,5 mm²
- WINDING WIRE IS REA #14 AWG HTAIH
- LEAD WIRES LENGTH 180 mm

CT-SPMT

FANOX protection & control

Protection & Measurement for Medium Voltage

CURRENT TRANSFORMER FOR MV

- *Up to 1200 A of primary current.*
- *Transformer ratio 1000/1.*
- *Terminal cover, poka yoke xing base*
- *Certicate model.*

CT-SPMT

Primary .../ 5A	Model	Code	Accuracy	
			Measurement	Protection
1000	CT SPMT 1000/1A	**41446**	0,2 s	5P10

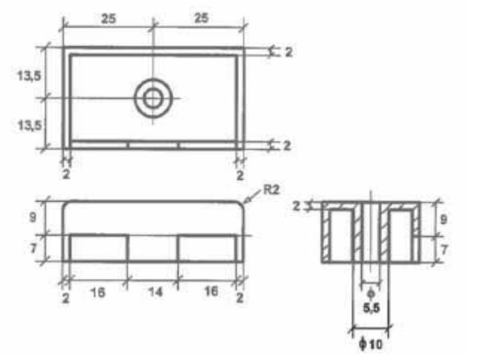
TESTS

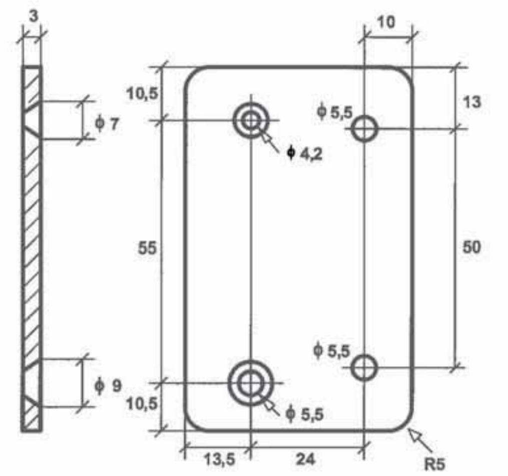
QUALIFICATION TESTS	STANDARDS
Heating test	UNE EN 61869-2 ap. 7.1.2
Accuracy test	UNE EN 61869-2 ap. 7. 1.3.1, 7.1.3.3
Short-time current tests	UNE EN 61869-2 ap. 7.1.4
Verification of the degree of protection provided by enclosure	UNE EN 61869-2 ap. 7.1.5
Tests with open secondary in fault conditions	UNE EN 61869-2 ap. 7.1.6
Saturation test for current and demagnetization	UNE EN 61869-2 ap. 7.1.3.4
Glow wire test	UNE EN 60.695-2-11 ap. 7.1.7

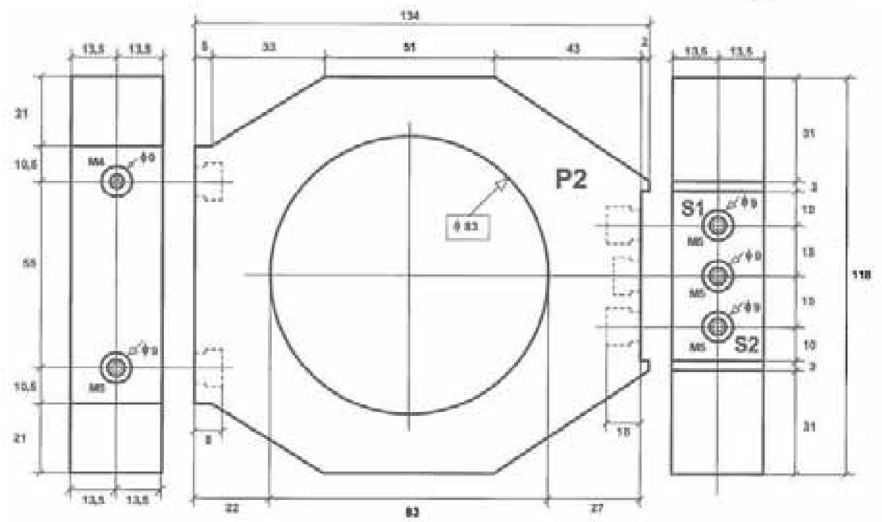
INDIVIDUAL TESTS	STANDARDS
Power-frequency withstand voltage test for primary winding insulation	UNE EN 61869-2 ap. 7.1.2
Power-frequency withstand voltage test for secondary terminals	UNE EN 61869-2 ap. 7.2.2
Determination of errors	UNE EN 61869-2 ap. 7.2.3.1, 7.1.3.3
Overvoltage test between turns	UNE EN 61869-2 ap. 7.2.3.4
Verification of markings	UNE EN 61869-2 ap. 7.3.3

CHARACTERISTICS AND DIMENSIONS

CHARACTERISTICS	
Overload	1,2 I_N
Frequency	50/60 Hz
Maximum Voltage Um	0,72 kV
Isolation Voltage	3 kV
Short circuit thermal current Ith	20 kA
Short circuit dynamic current Idyn	2,5xIth
Accuracy limit	150%
Security factor	5
Insulation class	E







CLR

PT

Current Limiting & Filtering

CURRENT LIMITANT INPUT REACTOR

- *Nominal Current: 250 A*
- *Input voltage: 480 V (Up to 690V)*
- *Inductance: 0.095mH*
- *Linearity whitout saturation until: 1.5 x In*
- *Maximum thermal overload: 1.3 x In*
- *Frequency: 50 or 60 Hz*
- *Thermal Class: F (140 ºC) / Ta= 40ºC*
- *Protection against indirect contacts*
- *Connections by terminals*
- *Winding Class H (200ºC) and Isolating Class F (140º), Voltage Test 3KV against mass*

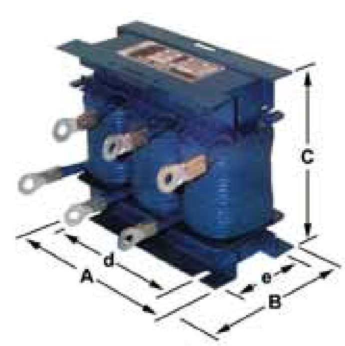
Three phase reactor to absorb line spikes, switching voltage dips, to eliminate harmonics or decrease the di/dt that semiconductors are affected.Ripple decrease at switching frequency and its main harmonics. Continuous service and inner installation.

CLR

Model	Code
CLR 250A INPUT REACTOR	41735

STANDARDS
IEC 60289
IEC 60076
IEC 60726
Directives 2006/95/CEE

DIMENSIONS (mm)



Dimensions mm	
A	240
B	210
C	230
d	185
e	85

Voltage transformation for Low Voltage

POTENTIAL TRANSFORMER

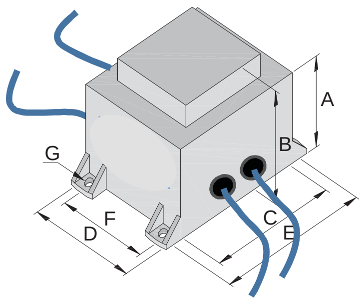
Transformer designed in double cell, encapsulated in poliuretane.

- *Dielectrical strength 3000Vac 50Hz between primary and secondary.*
- *Input voltage: 480V ± 5%.*
- *Output voltage: 120V.*
- *Burden: 50VA Max.*
- *Weight: 1,2kg.*
- *Possibility of soldering over PCB.*
- *Accuracy class: 1.*

PT

Model	Code
PT 50VA 480/120	41460

DIMENSIONS (mm)



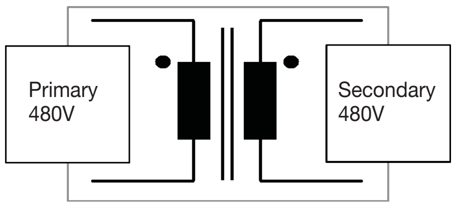
Dimensions mm	
A	52
B	65
C	81
D	68
E	91
F	57
G	4,5

Cables

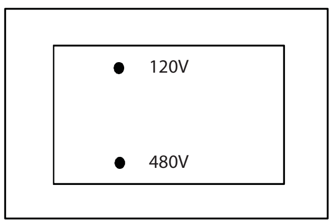
Lenght: 150 mm minimum

Section: 0,75 mm maximum

ELECTRIC SCHEME



MARKING



SURGE PROTECTION

Introduction

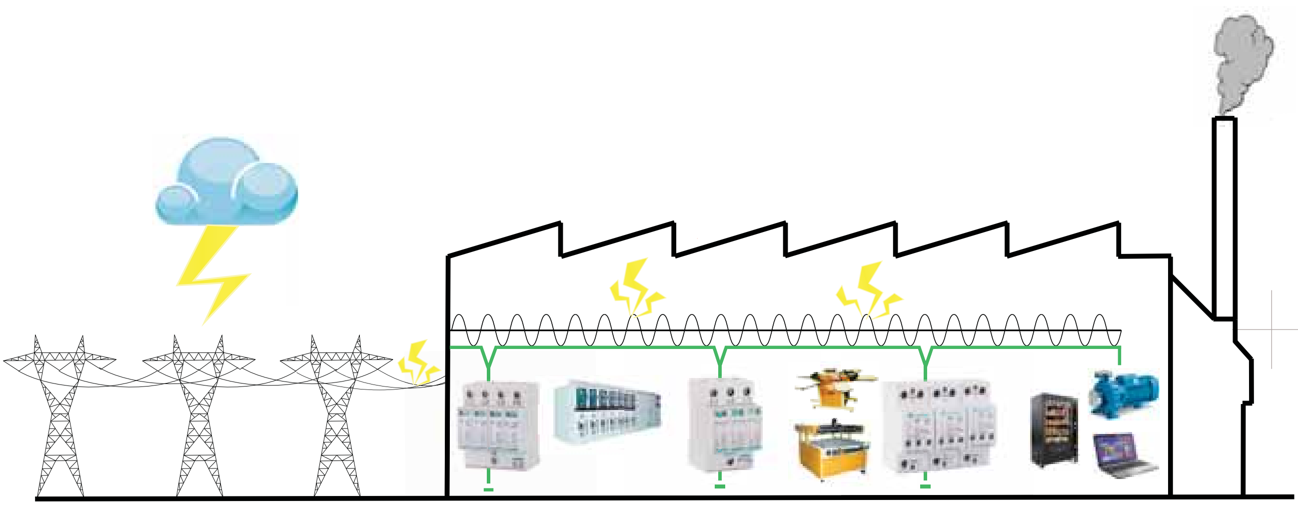
The surge protection relays protect installations and eliminate the effects of power surges. They offer the highest level of security in low voltage lines, continuous processes, domestic and tertiary facilities, etc.

They are suitable for manufacturers and system integrators of industrial equipment, photovoltaic applications, wind turbines, etc.

Devices connected to the mains are increasingly susceptible to electrical disturbances in the grid. Hence it is essential to provide adequate protection to avoid major economic and material losses.

The most visible and destructive power surges are often caused by atmospheric discharges (lightning strikes). However, this is not the most common source of such disturbances, as in most cases, the main sources of surges are within the facility installation itself, amongst others for the following reasons:

- Performance of circuit breakers and fuses.
- Connection and disconnection of inductive loads.
- Switching of motors and machines.
- Electrostatic discharge.
- Capacitor’s power factor correction.
- Energy transfers in generator sets.



VP B

Power Supply Systems & Installations

SURGES TYPE B (CLASS I)

- *Compact equipments for all distribution systems.*
- *High discharge capacity by “Spark Gap” technology.*
- *Visual indication of a fault in the equipment.*
- *With thermal separation device.*
- *Remote signalling of the protection status.*

	POWER SUPPLY NETWORK							
Code	**41648**	**41642**	**41643**	**41644**	**41645**	**41646**	**41641**	**41647**
Model	**VP B25 255/NPE**	**VP B25 275/1**	**VP B25 275/1+NPE**	**VP B25 275/2**	**VP B25 275/2+NPE**	**VP B25 275/3**	**VP B25 275/3+NPE**	**VP B25 275/4**
According to IEC 61643-1 (Class)	Class I							
Type of network	TT	TN-S	TT/TN-S	TN-S	TT/TN-S	TN-S	TN-S	TT/TN-S
Electrical line	-	1F+NPE (TN-C)	1F+N+PE(TT)	1F+N+PE (TN-S) 2F+NPE (TN-C)	2F+N+PE (TT)	2F+N+PE (TN-S) 3F+PE (TN-S) 3F+NPE (TN-C)	3F+N+PE (TN-S)	3F+N+PE (TT) 3F+PE (TT)
Nominal voltage **Un** (Vac)	230 Vac							
Maximum continuous operating voltage **Uc** (Vac)	255 Vac	275 Vac						
Nominal discharge current (8/20 µs) **In** (kA)	50 kA							
Maximum discharge current (8/20 µs) **Imax** (kA)	100 kA							
Impulse current (10/350 µs) **Iimp** (kA)	25 kA							
Protection level **Up** (kV) at 30 kA	< 1,8 kV							
Response time **ta** (ns)	< 100 ns	< 25 ns						
Maximum back-up fuse (A gL/gG)	160							
Nº Modules	4		2		1			

VP B+C

Power Supply Systems & Installations

SURGES TYPE B+C (CLASS I+II)

- *Compact equipments for all distribution systems.*
- *High discharge capacity by “Spark Gap” technology.*
- *Visual indication of a fault in the equipment.*
- *With thermal separation device.*
- *Remote signalling of the protection status.*
- *Plug-in protection modules which facilitate maintenance.*

	POWER SUPPLY NETWORK							
Code	**41631**	**41632**	**41633**	**41636**	**41637**	**41638**	**41639**	**41640**
Model	**B+C60 255/NPE**	**B+C60 255/1***	**B+C60 275/1+NPE*****	**B+C60 275/2****	**B+C60 275/2+NPE**	**B+C60 275/3**	**B+C60 275/4**	**B+C60 275/3+NPE**
According to IEC 61643-1 (Class)	I+II (Class)							
Type of network	TT	TN-S	TT/TN-S	TN-S	TT/TN-S	TN-S	TN-S	TT/TN-S
Electrical line	-	1F+NPE (TN-C)	1F+N+PE(TT)	1F+N+PE (TN-S) 2F+NPE (TN-C)	2F+N+PE (TT)	2F+N+PE (TN-S) 3F+PE (TN-S) 3F+NPE (TN-C)	3F+N+PE (TN-S)	3F+N+PE (TT) 3F+PE (TT)
Nominal voltage **Un** (Vac)	230 Vac							
Maximum continuous operating voltage **Uc** (Vac)	255 Vac	275 Vac						
Nominal discharge current (8/20 μs) **In** (kA)	30 kA							
Maximum discharge current (8/20 μs) **Imax** (kA)	60 kA							
Protection level **Up** (kV) at 30 kA	< 1,5 kV							
Response time **ta** (ns)	< 25 ns							
Maximum back-up fuse (A gL/gG)	125							
Nº Modules	4		2		1			

(*) 4 Plug-in modules

(**) 2 Plug-in modules

VP C

Power Supply Systems & Installations

SURGES TYPE C (CLASS II)

- *Compact equipments for all distribution systems.*
- *High discharge capacity via zinc oxide varistors and gas dischargers.*
- *With thermal separation device.*
- *Visual indication of a fault in the equipment.*
- *Remote signalling of the protection status.*
- *Plug-in protection modules which facilitate maintenance.*

	POWER SUPPLY NETWORK									
Code	**41600**	**41602**	**41603**	**41604**	**41607**	**41606**	**41610**	**41609**	**41624**	**41625**
Model	**VP C40 275/1**	**VP C40 250/NPE**	**VP C40 275/2**	**VP C40 275/1+NPE**	**VP C40 275/3**	**VP C40 275/2+NPE**	**VP C40 275/4**	**VP C40 275/3+NPE**	**VP C20 275/1+NPE**	**VP C20 275/3+NPE**
According to IEC 61643-1 (Class)	Class II									
Type of network	TT/TN	TT	TT/TN	TT	TT/TN	TT	TT/TN	TT		
Electrical line	1P+NPE (1) (2) (3)	1P+N 2P+N 3P+N 3P	1F+N+PE 2F+NPE	1F+N	2P+N+PE 3P+PE 3P+NPE	2P+N	3P+N+PE	3P+N 3P	1P+N	3P+N 3P
Nominal voltage **Un** (Vac)	230 Vac									
Maximum continuous operating voltage **Uc** (Vac)	275 Vac	250 Vac	275 Vac							
Nominal discharge current (8/20 µs) **In** (kA)	20 kA								10	
Maximum discharge current (8/20 µs) **Imax** (kA)	40 kA								20	
Protection level **Up** (kV)	< 1,2 kV	< 1,5 kV	< 1,2 kV						< 1,0 kV	
Protection level at 5 kA (kV)	< 1,0 kV	--	< 1,0 kV						< 0,95 kV	
Response time **ta** (ns)	< 25 ns	<100 ns	< 25 ns							
Maximum back-up fuse (A gL/gG)	125	--	125						100	
Nº Modules	1	1	2	2	3	3	4	4	2	4
Plug-in modules code	**41611**	**41612**	**41611**	**41611/41612**	**41611**	**41611/41612**	**41611**	**41611/41612**	**41626/41627**	**41626/41627**

By using individual devices instead of compact ones, they can be installed in:

(1) TN-S System:
- 2 units of VP C40 275/1 ➔ 1F+N+PE
- 3 units of VP C40 275/1 ➔ 2F+N+PE or 3F+PE
- 4 units of VP C40 275/1 ➔ 3F+N+PE

(2) TN-C System:
- 2 units of VP C40 275/1 ➔ 2F+NPE
- 3 units of VP C40 275/1 ➔ 3F+NPE

(3) TT System:
- 1 unit of VP C40 275/1 + 1 unit VP C40 250/NPE ➔ 1F+N
- 2 units of VP C40 275/1 + 1 unit VP C40 250/NPE ➔ 2F+N
- 3 units of VP C40 275/1 + 1 unit VP C40 250/NPE ➔ 3F+N or 3F

FANOX protection & control

TYPE B (Class I)

TYPE B + C (Class I+II)

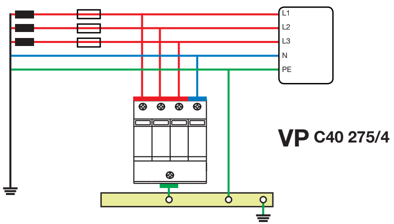
TYPE C (Class II)

CE

WIRING DIAGRAM

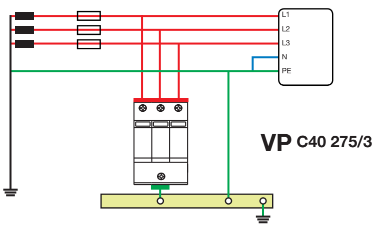
TN-S SYSTEM

3F + N + PE



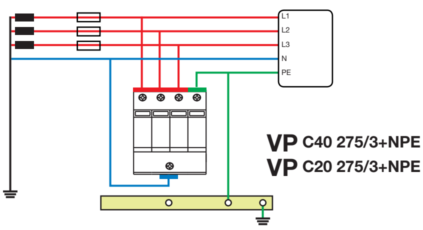
TN-C SYSTEM

3F + NPE



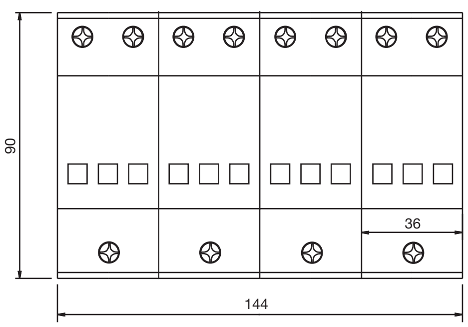
TT SYSTEM

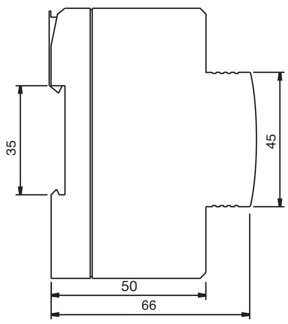
3F + N



DIMENSIONS (mm)

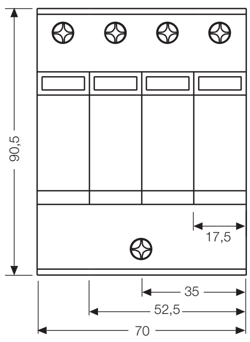
TYPE B (Class I)

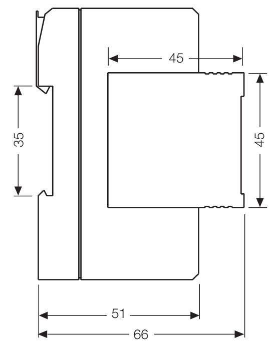




*Width depending on number of modules

TYPE B + C (Class I+II) and TYPE C (Class II)





*Width depending on number of modules

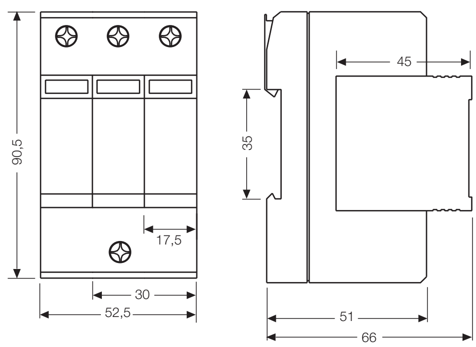
VP C

PHOTOVOLTAIC Applications

- *Compact equipment for photovoltaic installations.*
- *High discharge capacity via zinc oxide varistors and gas dischargers.*
- *With thermal separation device.*
- *Visual indication of a fault in the equipment.*
- *Remote signalling of protection status.*
- *Plug-in protection modules which facilitate maintenance.*

	PHOTOVOLTAIC APPLICATIONS	
Code	**41605**	**41608**
Model	**VP C40 PV500**	**VP C40 PV1000**
According to IEC 61643-1 (Class)	II	
Photovoltaic line	2F+PE	2F+PE
Maximum service voltage in direct current **Uoc_{max}** (Vdc)	< 500	< 1000
Maximum continuous operating voltage **Uc** (L-PE) (Vdc)	250	500
Nominal discharge current (8/20 µs) **In** (kA)	20	
Maximum discharge current (8/20 µs) **Imax** (kA)	40	
Protection level **Up** (kV)	< 1,8	< 3,6
Protection level at 5 kA (kV)	< 1,5	< 3
Response time **ta** (ns)	< 25	< 25
Maximum back-up fuse (A gL/gG)	125	125
Nº Modules	3	3
Plug-in modules code	**41614**	**41616**

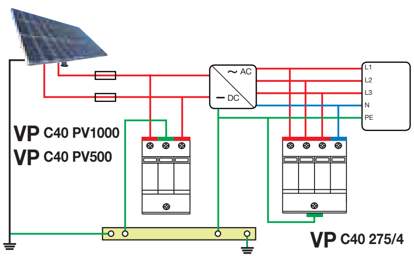
DIMENSIONS (mm)



WIRING DIAGRAM

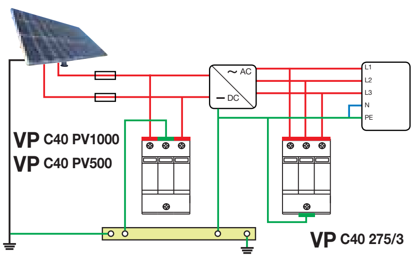
TN-S SYSTEM

3F + N + PE



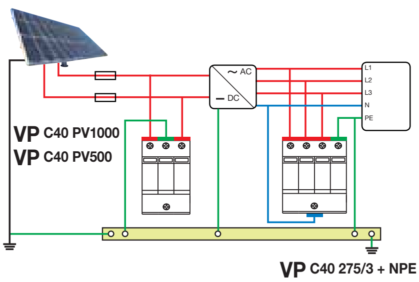
TN-C SYSTEM

3F + NPE



TT SYSTEM

3F + N



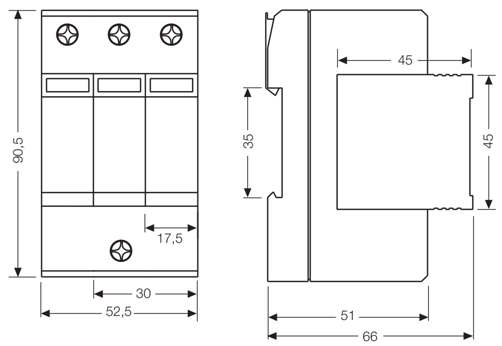
VP C

WIND Power Applications

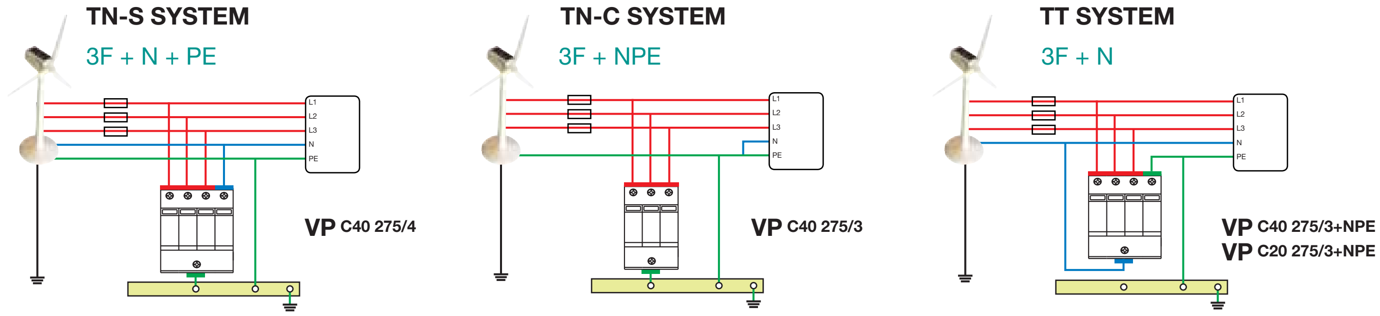
- *Compact equipment for wind power installations.*
- *High discharge capacity via zinc oxide varistors and gas dischargers.*
- *With thermal separation device.*
- *Visual indication of a fault in the equipment.*
- *Remote signalling of protection status.*
- *Plug-in protection modules which facilitate maintenance.*

	WIND POWER APPLICATIONS
Code	**41622**
Model	**VP C30 600/3**
According to IEC 61643-1 (Class)	II
Type of network	TT/TN
Eolic line	2F+N+PE 3F+PE 3F+NPE
Nominal voltage **Un** (Vca)	600
Maximum continuous operating voltage **Uc** (Vca)	600
Nominal discharge current (8/20 µs) **In** (kA)	15
Maximum discharge current (8/20 µs) **Imax** (kA)	30
Protection level **Up** (kV)	< 2,8
Protection level at 5 kA (kV)	< 2,4
Response time **ta** (ns)	< 25
Maximum back-up fuse (A gL/gG)	63
Nº modules	3
Plug-in modules code	**41623**

DIMENSIONS (mm)



WIRING DIAGRAM



SST

Protection against Transient Overvoltage

SURGE ARRESTERS

Surge arrester for low voltage power supply systems. Protection against transient overvoltage that may arise in the electrical supply, at the boundaries

from lightning protection zone 0B-1 and higher.

- *UL 1449 3rd with SCCR 200KArms.*
- *MOV technology, high energy discharge capacity.*
- *Thermaly protected.*
- *Visual fault indication*
- *Remote signalling.*
- *Low voltage protection level.*
- *Metalic box.*
- *Surge event counter.*
- *Failure pre-test.*
- *Filtering function.*

Ideal for applications with low discharge capacity required such as:

- *Instalations with electronic equipments and microprocessor-based systems.*
- *Switchboards.*
- *Secondary panels.*

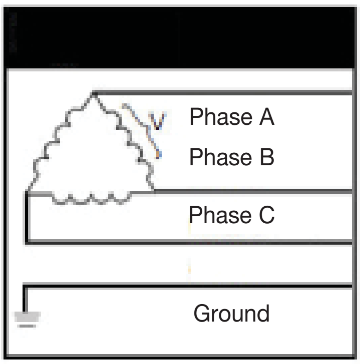
SST

TECHNICAL PARAMETERS

Model	**SST480D200AF/M**
Nominal voltage	480 V
Discharge capacity	200 KA
Maximum continuois operating voltaje Uc	550 V
Current counter	≥ 200 A (Reset button)
Failure pre-test	Press 2S (Test button)
Filtering	L-N, N-PE, L = PE
Power status indication	LED ON encendido = OK
Working status indication	LED ON Blue = OK ; Blue LED ON Azul OFF y Red LED ON = FAILURE
Power connecting cable	8 AWG L1 = Yeloww L2 = Green L3 = Red N = Blue/Brown PE = Black
Signal cable	16 AWG C = Red NC = Blue NO = Brown
Working temperature range	-40ºC + 70ºC
Working humidity relative	5-95% (25ºC)
Working altitude	≤ 2 km
Dimensions W x D x H (mm)	256 x 205 x 104
Net weight	5,4 Kg

	L-N	L-L	L-G
Nominal voltage level	N/A	480	480
Voltage protection ratings (VPR @6KV/ 3kA)	N/A	2200	1900

DISTRIBUTION DIAGRAM



3 Hots + Grnd

Other models available

OTHER MODELS AVAILABLE

Code configuration for other models is done as follows:

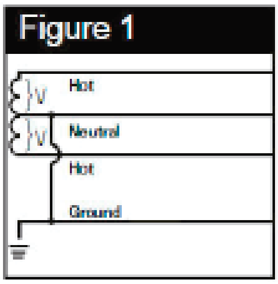
Code: SST ☐ ☐ ☐ / P (Plastic) or M (Metal)

Optional functions:
- C= Surge counter
- T= Failure test
- A= Remote alarm
- F= Noise filtering

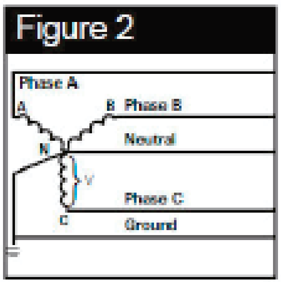
Max. surge current per phase (from 50KA - 300 KA/Phase)

Voltage for power distribution system

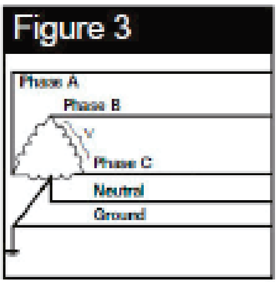
Figures	Distribution diagrams	L-N	L-L	L-G	Model
Figure 1	2 Hots + 1 Neu + 1 Grnd (2L+N+G)	120	240	120	120SP
Figure 2	3 Hots + 1 Neu + 1 Grnd (3L+N+G)	127	220	127	127Y
		220	380	220	220Y
		240	415	240	240Y
		277	480	277	277Y
		347	600	347	347Y
Figure 3	3 Hots + (B-HIGH) + 1 Neu + 1 Grnd (3L+N+G)	120	240	120	120H
Figure 4	3 Hots + Grnd (3L+G)	N/A	240	240	240D
		N/A	480	480	480D
		N/A	600	600	600D
Figure 5	1 Hot + 1 Neu + 1 Grnd (L+N+G)	127	N/A	127	127S
		240	N/A	240	240S



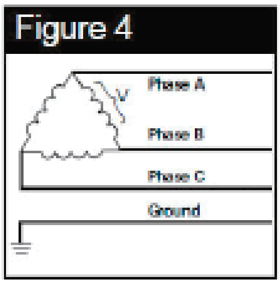
SPLIT



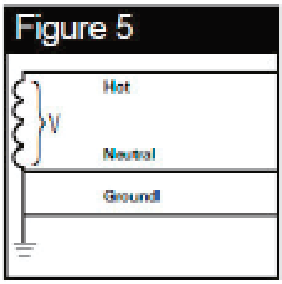
WYE



HI-LEG DELTA (B High)



DELTA & HRG WYE



SINGLE POLE

"We fulfill our customers necessities adapting our product. We give solutions"

FANOX

protection & control

CUSTOMIZED PRODUCTS AND BRANDLABELING

FANOX protection & control

Introduction

Every day an increasing number of companies are considering the option of outsourcing their design and product development.

Fanox is the perfect technology partner to carry out these activities. Our R & D department is prepared to operate as an integral part of our clients business – adapting to their needs by developing custom designs.

Fanox is a leader in the customization of products for reputable manufacturers, and we offer added value at a very competitive price. Fanox provides additional performance characteristics to the equipment thanks to continuous improvement of electronics – spear heading a rapidly moving technology sector.

We have **high expertise** in the area of **electronics** related to:

- Protection
- Control
- Measurement
- Communication

We provide you with important assets of **high skills and experience** in:

- Systems Engineering (Hardware, Software and Communication)
- Ability to adapt to different protocols (RTU's)
- Conformity and adaptation to international standards
- Design of systems and schemes tailored to the needs of customers
- Prototype design and production
- Testing
- Delivery of finished product – Brand Labelling

Some of our custom developments:

- Digital controller for fan coil units, which includes power and alarm management functions, which is incorporated in centralized control systems for hotels and large office buildings through Modbus communication protocol.
- Control equipment for electric transformer substations, which set levels of communication speed and immunity to external disturbances beyond the reach of any industrial PLC.
- Load limiter for lifting systems being used by leading manufacturers of overhead cranes and lifting platforms.
- Control and management of SF6 Switchgear for high/medium voltage substations.
- 3-Phase distribution line switch disconnection with incorporated Electronic Sectionaliser
- Fault passage detection system and geographical location of power failures in the section between an electrical substation and the consumer. Designed to detect faults in medium and high voltage, with remote real-time indication at Control Centre.
- Management Systems for Zigbee Communication protocols.

"A company focused on customer service and innovation"

Fanox is the perfect technology partner for companies that may arise the externalization of electronic products's design & developmen in the field of the ***protection, control, measurement and communication****.*

Since 1992

Since 1992

The quality of all of our products has been certificated by independent & recognized ***laboratories****, and approved in several* ***Electrical Utilities around the world****.*

The quality of our products and services are in line with ***international standards****.*

100% of Fanox relays are quality tested several times throughout the production process.

Fanox was by IQNET awarded the QUALITY MANAGEMENT SYSTEM certificate in 1993 – ***ISO 9001:2008***

*As specialists in the design and manufacture of protection and control equipment for **Low and Medium Voltage**, all of our relays incorporate new industry trends: **remote communication, high number of protection and control functions, self-designed software** for control of each device etc., all in a competitive package.*
All these improvements are aimed at facilitating the implementation of Smart Grid and predictive maintenance of networks, technologies defined as the medium term future of the electrical sector.

FANOX
protection & control

Parque Tecnológico de Bizkaia
Astondo bidea, Edif. 604
48160 DERIO (Spain)

tel.: (+34) 94 471 14 09
fax.: (+34) 94 471 05 92
mail: fanox@fanox.com

www.fanox.com

01/2014/Rev0