



— protection & control

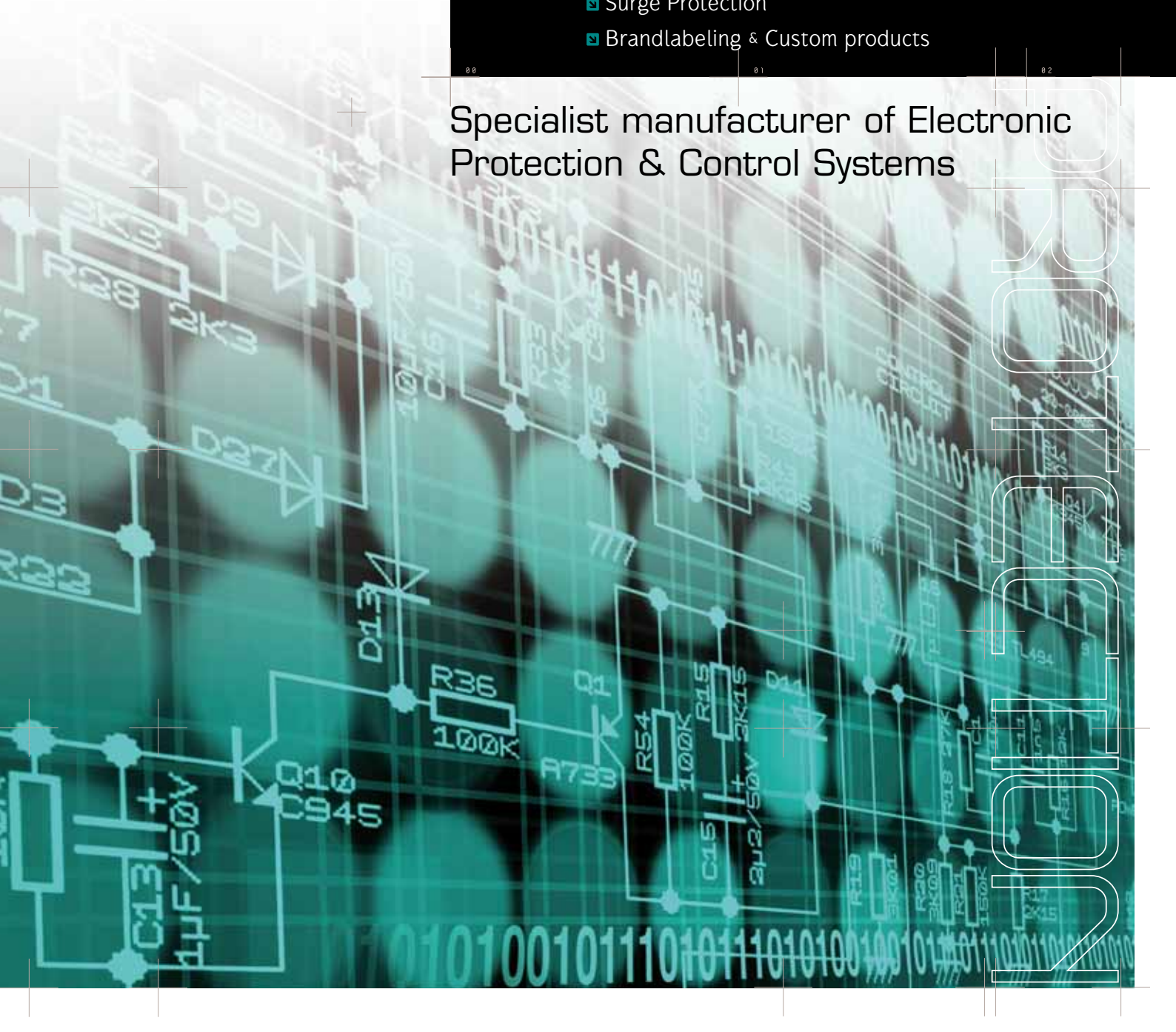
Low Voltage

GENERAL CATALOGUE

- ▣ Electronic Protection & Control of Motors, Generators and Pumps
- ▣ Control & Measurement
- ▣ Earth Leakage Protection
- ▣ Surge Protection
- ▣ Brandlabeling & Custom products

Specialist manufacturer of Electronic Protection & Control Systems

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.

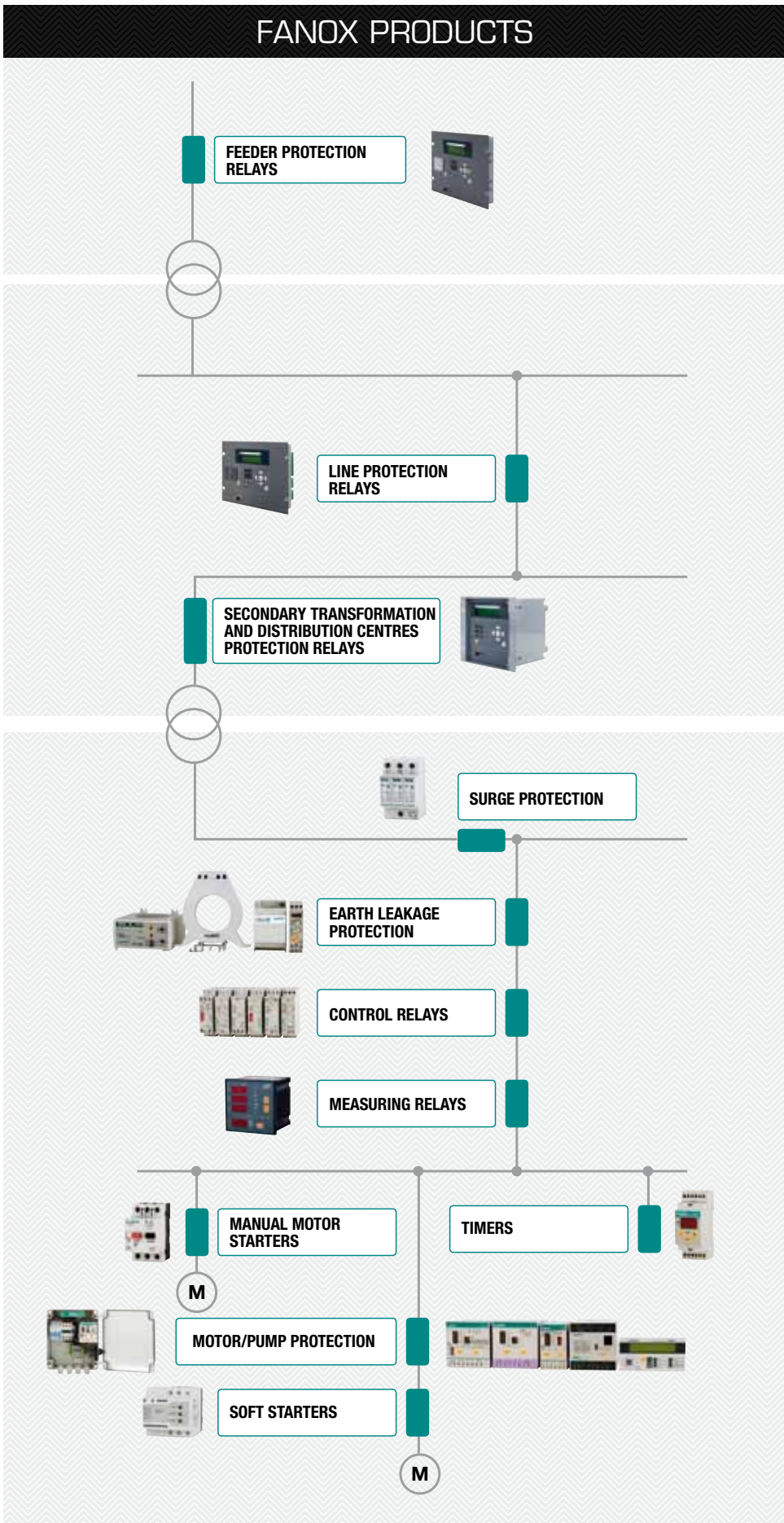
With the Quality Management System based on ISO 9001:2008 Fanox guarantees the highest quality services and products to its customers' satisfaction.

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



PRIMARY DISTRIBUTION

SECONDARY DISTRIBUTION

LOW VOLTAGE

POWER T & D

PROTECTION & CONTROL

PROTECTION



The image shows the exterior of a building with a facade of grey perforated metal panels. The word "FANOX" is mounted on the facade in large, teal-colored, three-dimensional block letters. A thin, vertical metal pole with a small spherical ornament is visible against the sky behind the building. The sky is bright blue with scattered white clouds.

FANOX

I N D E X

ELECTRONIC PROTECTION & CONTROL OF MOTORS, GENERATORS AND PUMPS



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NOX

— protection & control

PROTECTION & CONTROL SPECIALISTS

- Electronic protection & control of motors, generators and pumps
- Earth leakage protection
- Protection against transitional overvoltages

NOX

— protection & control

MOTOR MANAGEMENT SYSTEM

- Multifunction
- Fault reports
- Self-diagnosis and installation monitoring
- Test menu
- Designed for SCADA applications

NOX

— protection & control

PROTECTION AND CONTROL PANELS FOR SUBMERSIBLE PUMPS

- Maximum protection without level electrodes and level relays
- Simple, very low cost installation
- Suitable for both old and new installations

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 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



PROTECTION FUNCTIONS

- $\theta >$ Overload with thermal image
- \overline{I}_t Overheating protection (PTC sensor)
- Δ Phase imbalance or phase failure
- $(\%)$ Phase sequence
- JAM** JAM detection
- \otimes 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



| CHARACTERISTICS PBM B | |
|-----------------------|---|
| Auxiliary supply | 110/230 Vac/dc 24/48 Vcc |
| Frequency | 50/60/Variable (45-65) Hz |
| Range | Adjustable 0,8 - 6 A PBM-B 1 4 - 25 A PBM-B 5 > 25 A PBM-B 1 + 3xTI.../1 > 25 A PBM-B 5 + 3xTI.../5 |
| 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 |
| Communication | RS485 ModBus RTU |
| Signalling | 5 signalling LEDs |
| Reset model | Manual, automatic and automatic time delayed |
| Test | Specific test menu |

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

CONNECTION CABLES PBM B / PBM H

| Model | CDCNB | CDCN1 |
|---------|--------------|--------------|
| Code | 17008 | 17009 |
| Length* | 0,5 m | 1 m |

* For other cable lengths please consult.

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.

MODEL LIST

| | | | | |
|-------------------|--------|--------|---|------------------------------|
| MODULE | B | | | |
| PHASE MEASUREMENT | 1 5 | | | IB=0,8 - 6 A IB=4 - 25 A |
| POWER SUPPLY | | 1 2 | | 110/230 Vac/Vdc 24/48 Vdc |
| REVISION | | | 0 | |

PBM H

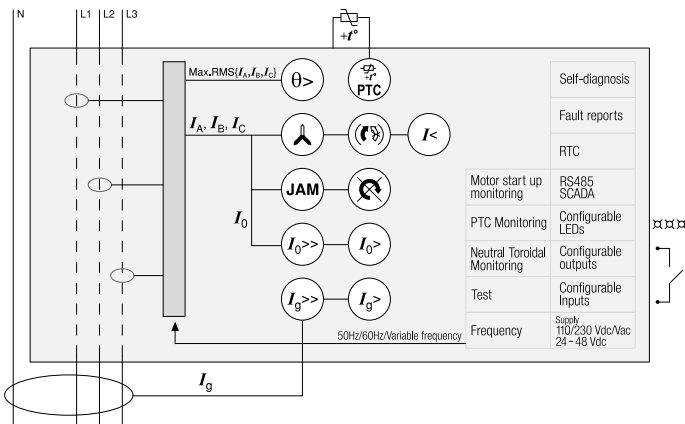
HMI MODULE

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.

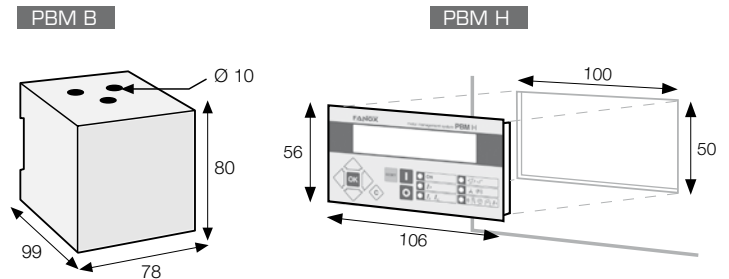
MODEL LIST

| | | | | |
|----------|---|---|------------------|--|
| MODULE | H | | | |
| HMI | | 1 | | HMI with 6 leds |
| LANGUAGE | | | E S F P | English Spanish French Polish |
| REVISION | | | 0 | |

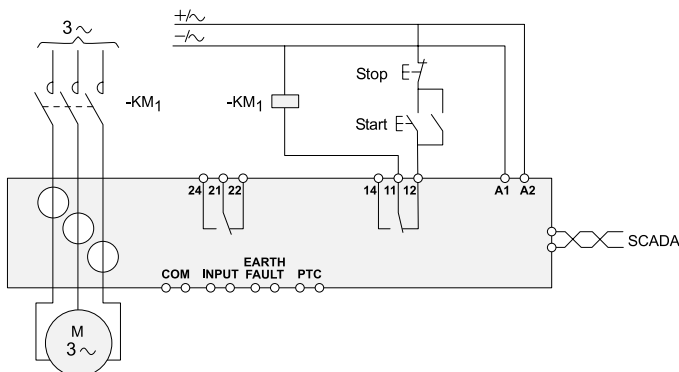
FUNCTION DIAGRAM PBM B



DIMENSIONS (mm)



CONNECTION DIAGRAM PBM B



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.

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.

GL



PROTECTION FUNCTIONS

- Overload
- Phase imbalance or phase loss
- Overtemperature
- Phase sequence

ODGL



| Models | Code | Relay type |
|--------|-------|------------|
| ODGL | 12535 | GL |

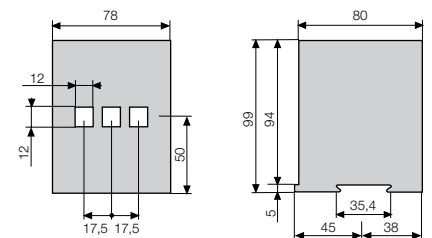
| MODELS | | GL 16 | GL 40 | GL 90 |
|---|-------------------------|---|------------|---------|
| Adjustment range Motor 400 V 50/60 Hz | I_B (A) | 4 - 16,7 | 15 - 40,5 | 40 - 91 |
| | CV | 3 - 10 | 10 - 25 | 30 - 60 |
| | kW | 2,2 - 7,5 | 7,5 - 18,5 | 22 - 45 |
| Code according to the relay voltage 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 $I_s = n \times I_n$ | | |
| For I_N of the motor above the minimum 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 $1,1 \times I_B$ |
| 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 + + + |
| 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 mm ² , 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 |

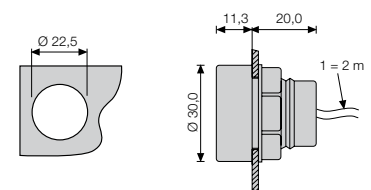


Settings and curves, see pages 27 to 33.

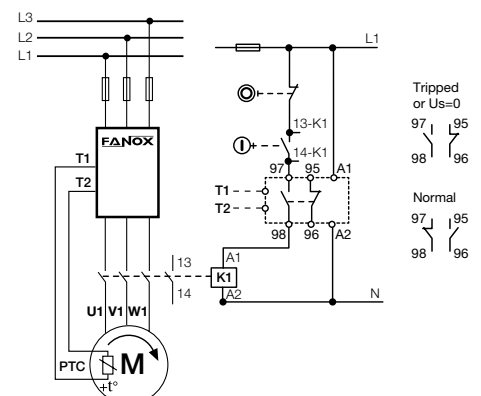
DIMENSIONS GL RELAY (mm)



DIMENSIONS ODGL MODULE (mm)



WIRING DIAGRAMS (mm)



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.

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.

GL 200



PROTECTION FUNCTIONS

- $I >$ Overload
- Δ Phase imbalance or phase loss
- $\text{---} \overline{\text{---}} \text{---}$ Overtemperature
- (---) Phase sequence

ODGL



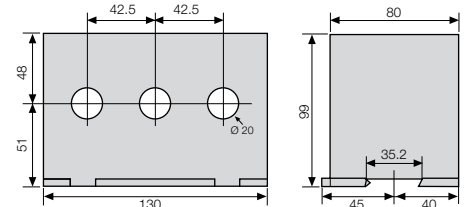
| Models | Code | Relay type |
|--------|--------------|------------|
| ODGL | 12535 | GL |

| 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 (+15% -10%) ac: 50/60 Hz | 230 Vac single phase | 11363 | |
| | 115 Vac single phase | 11362 | |
| | 24 Vac, dc single phase | 11360 | |
| For I_N of the motor below the minimum setting I_B | | Pass the cables several times (n) through the holes in the relay $I_s = n \times I_n$ | |
| For I_N of the motor above the minimum setting I_B | | Use 3 CT .../5 and the relay GL16 and pass the secondary through the holes | |
| External display module (optional) | | ODGL | |

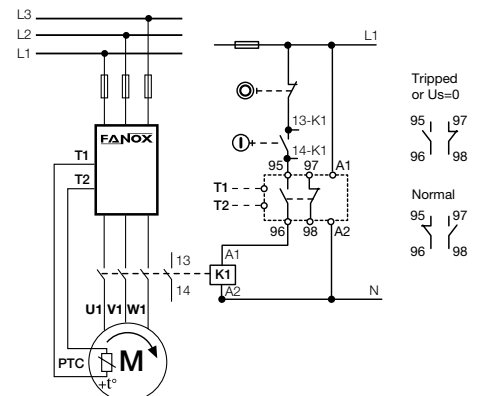
| CHARACTERISTICS | |
|---|---|
| Thermal memory / Overload trip | Yes / From $1,1 \times I_B$ |
| Maximum motor nominal voltage | 1000 Vac |
| Trip classes (IEC 947-4-1) | 5 - 10 - 15 - 20 - 25 - 30 - 35 |
| Phase sequence protection | ON <input type="checkbox"/> OFF Actuates during the motor start |
| 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 + $I >$ + Δ + (---) + $\text{---} \overline{\text{---}} \text{---}$ |
| 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 mm ² , 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 / 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 | |

Settings and curves, see pages 27 to 33.

DIMENSIONS GL RELAY (mm)



WIRING DIAGRAMS (mm)



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.

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.

C



PROTECTION FUNCTIONS

- I> Overload
- ⚡ Phase imbalance or phase loss

ODC



| Models | Code | Relay type |
|--------|-------|------------|
| ODC | 12530 | C |

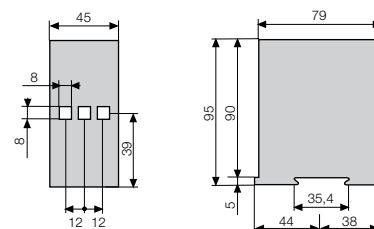
| MODELS | | C 9 | C 21 | C 45 | |
|--|---|---|----------|-----------|-------|
| Adjustment range Motor 400 V 50/60 Hz | I_B (A) | 3 - 9,3 | 9 - 21,6 | 20 - 45,2 | |
| | CV | 2 - 5,5 | 7,5 - 12 | 15 - 30 | |
| | kW | 1,5 - 4 | 5,5 - 9 | 11 - 22 | |
| Code | according to the relay voltage supply (+15% -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 $I_s = n \times I_n$ | | | |
| For I_N of the motor above the minimum 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 $1,1 \times I_B$ |
| 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 mm ² , 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 |

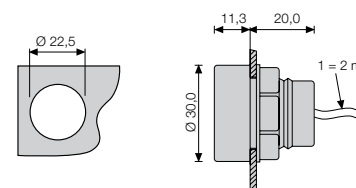


Settings and curves, see pages 27 to 33.

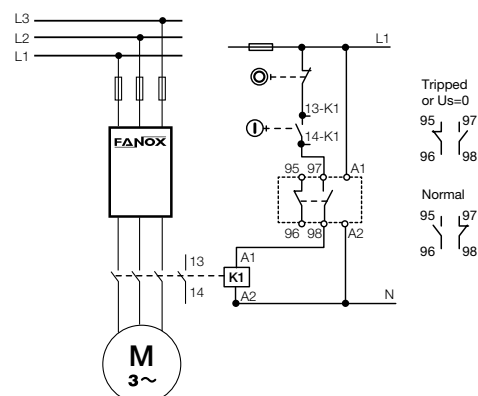
DIMENSIONS C RELAY (mm)



DIMENSIONS ODC MODULE (mm)



WIRING DIAGRAMS (mm)



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.

RELAY TO BE USED WITH THE EXTERNAL DISPLAY MODULE

With the same features and applications as the G17 relay, the BG17 relay incorporates an external display module which shows the status of the relay and allows it to be reset from the outside of the panel or the motor control center (MCC).

As the BG17 is designed for use with the ODG display module, it does not have LED's in the front of the relay.

G



PROTECTION FUNCTIONS

- Overload
- ⚡ Phase imbalance or phase loss
- 🔥 Overtemperature



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

BG



CE Ex II (3) G EEx e

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.



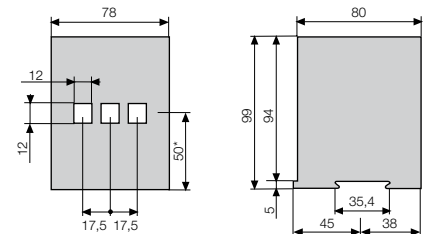
| MODELS | | G 17 | BG 17 |
|---|----------------------|---|--------------------|
| Adjustment range Motor 400 V 50/60 Hz | I_B (A) | 5 - 17,7 | |
| | CV | 3 - 10 | |
| | kW | 2,2 - 7,5 | |
| Code according to the relay voltage supply (+15% -10%) ac: 50/60 Hz | 230 Vac single phase | 10723 | 10733 |
| | 115 Vac single phase | 10722 | 10732 |
| | 24 Vdc, ac | 10720 | 10730 |
| For I_N of the motor below the minimum setting I_B | | Pass the cables several times (n) through the holes in the relay $I_B = n \times I_N$ | |
| 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 | ODG / 12505 |

| 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 U_s | 115 - 230 Vac (+15% -6%) / 24 Vdc (±10%) |
| • Frequency | 50/60 Hz (from 49 to 61,2 Hz) |
| • Consumption | 2,5 VA (115 - 230 Vac) / 1,5 W (24 Vdc) |
| • Protection fuse | GL 6 A |
| Output contacts | 1 relay with 1 NO + 1 NC |
| • Switching capacity in abnormal conditions | I_B : 5A; AC15 - 250V - 2A; DC13 - 30V - 2A |
| • Short-circuit resistance | 1000 A |
| Terminals max. section / Screw torque | 2,5 mm ² , 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 | 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 |

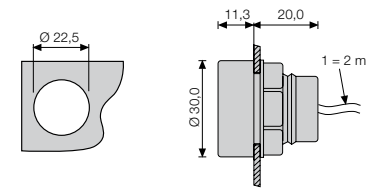


Settings and curves, see pages 27 to 33.

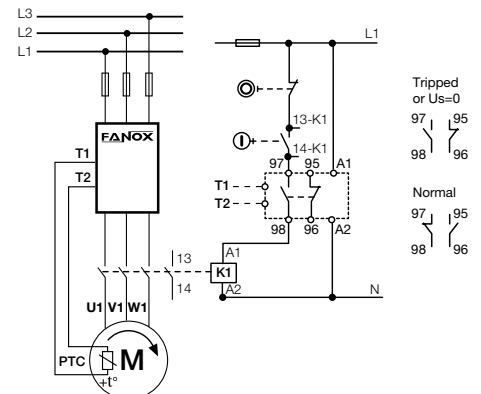
DIMENSIONS G and BG RELAYS (mm)



DIMENSIONS ODG MODULE (mm)



WIRING DIAGRAM (mm)



Pump protection relays (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



PS 16-R



PROTECTION FUNCTIONS

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

| 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 |

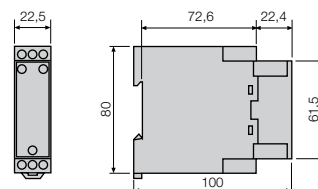
| CHARACTERISTICS | |
|---|--|
| Thermal memory / Overload trip | Yes / From $1,1 \times I_B$ |
| Maximum motor nominal voltage | 230 Vac |
| Trip classes (IEC 947-4-1) | 10 |
| Undercurrent protection adjustable / Trip delay | From 0,4 to $0,9 \times I_B / 5$ s |
| Overvoltage protection | From nominal V + 15% |
| Reset mode for protection against dry running | $I<$ automatic (adjustable) and remote. More info in page 28 |
| Reset mode for other protection functions | $I>$ automatic and remote, $U>$ automatic. More info in page 28 |
| 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 mm ² , 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 |



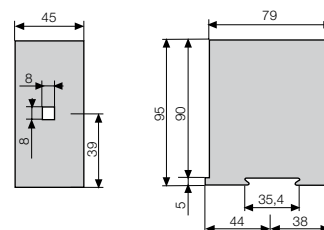
Settings and curves, see pages 27 to 33.

DIMENSIONS PS RELAY (mm)

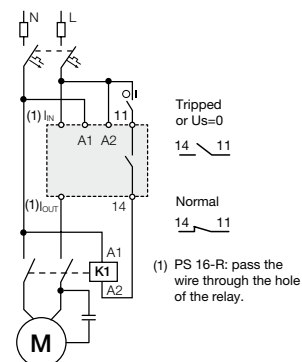
PS 11-R



PS 16-R



WIRING DIAGRAM (mm)



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 as 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.

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.

P



PROTECTION FUNCTIONS

- I> Overload
- I< Undercurrent
- ⚡ Phase imbalance or phase loss
- (R) Phase sequence

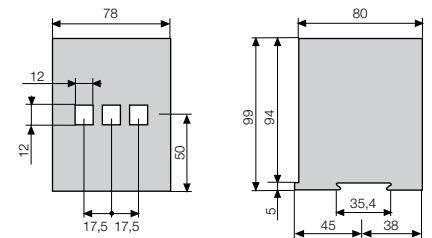
ODP



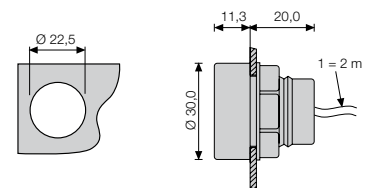
| Models | Code | Relay type |
|--------|-------|------------|
| ODP | 12540 | P |

| 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 | | |

DIMENSIONS P RELAY (mm)

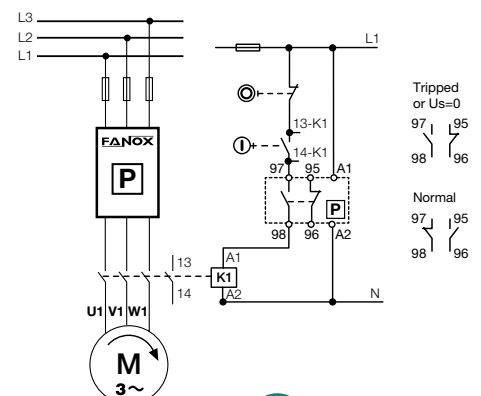


DIMENSIONS ODP MODULE (mm)



| 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 28 |
| Reset mode for other protection functions | Manual, remote and automatic (every 15 minutes) |
| Signalling LED's | 4 LED's: ON + I> + I< + ⚡ (R) |
| Output contacts | 1 relay with 1 NO + 1 NC |
| Switching power | I _n : 5A; AC15 - 250V - 2A; DC13 - 30V - 2A |
| Terminals: Max. section / screw torque | 2,5 mm ² , 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 |

WIRING DIAGRAM (mm)



Settings and curves, see pages 27 to 33.



Pump protection relays (Without level sensors)

THREE PHASE PUMP PROTECTION

Underload protection by $\cos \varphi$

- 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 $\cos \varphi$.

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 $\cos \varphi$ of the motor and stop it before a breakdown caused by dry running, cavitation or closed valve occurs.

PF



PROTECTION FUNCTIONS

- $I >$ Overload
- $\cos \varphi$ Underload
- Δ Phase imbalance or phase loss
- (Φ) Phase sequence

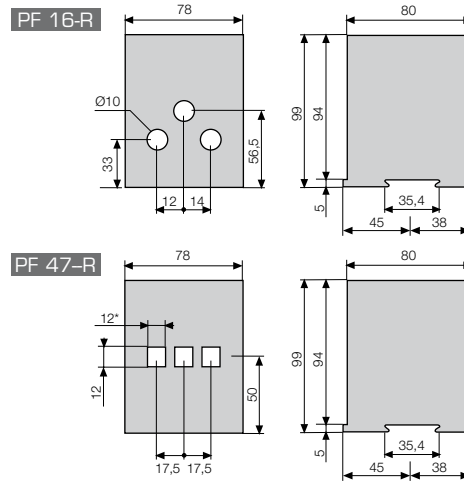
| MODELS | | PF 16-R | PF 47-R |
|---|--------------------------------|---|--------------|
| Adjustment range Motor 400 V 50/60 Hz | I_B (A) | 4 - 16,6 | 16 - 47,5 |
| | CV | 3 - 10 | 10 - 30 |
| | kW | 2,2 - 7,5 | 7,5 - 22 |
| Code according to the relay voltage supply (+15% -10%) ac: 50/60 Hz | 400/440 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 $I_B = n \times I_N$ | |
| 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 $1,1 \times I_B$ |
| 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 $\cos \varphi$ / Trip delay | $\cos \varphi$ adjustable from 0,15 to 1,0 / adjustable from 5 to 45s |
| Reset mode for protection against dry running | $\cos \varphi$ automatic (adjustable) and remote. More info in page 28 |
| Reset mode for other protection functions | $I >$ (Φ) Manual, remote and automatic. More info in page 28 |
| Signalling LED's | 4 LED's: ON + $I >$ + $\cos \varphi$ + (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 mm ² , 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 |

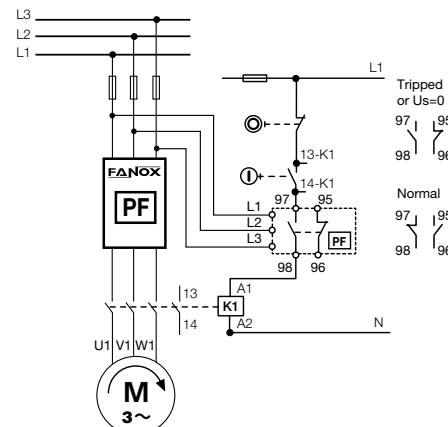


Settings and curves, see pages 27 to 33.

DIMENSIONS PS RELAY (mm)



WIRING DIAGRAM (mm)



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

RESET MODULE

For reset mode between 75 and 525 minutes, is necessary to incorporate the PF-RM timer module to FANOX electronic protection relays.

This optional module, is installed close to the PF relay and is connected to the relay by a flat cable.

It allows to multiply the reset time adjusted in the relay (x1, x2, x3, x4, x5, x6, x7).

Weight: 0,12 kg.

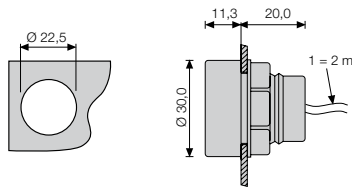
Protection degree: IP50

ODPF



| Model | Code | Relay type |
|-------|--------------|------------|
| ODPF | 12555 | PF |

DIMENSIONS ODPF MODULE (mm)

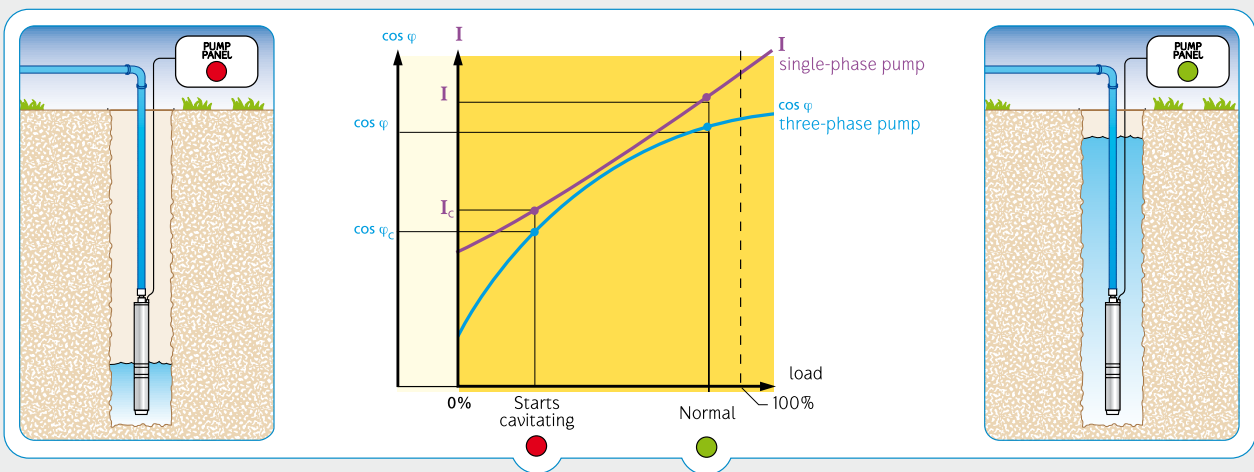
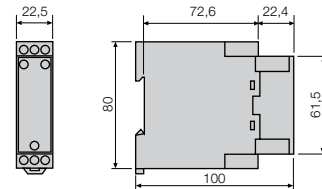


PF-RM



| Model | Code | Relay type |
|-------|--------------|------------|
| PF-RM | 12169 | PF |

DIMENSIONS PF-RM RESET MODULE (mm)



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.

PROTECTION FUNCTIONS

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

CBM

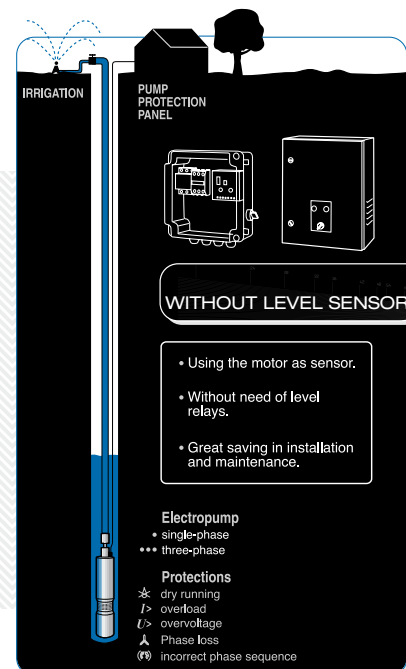


| Models | Code | Approx. motor current (Amps) | Power of single-phase 230 V motor | | Adjustable well filling time (minutes) | Dimensions (mm) |
|--------------|--------------|------------------------------|-----------------------------------|------------|--|-----------------|
| | | | HP | kW | | |
| 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.*



THREE PHASE PUMPS

- Thermal memory of motors heating and cooling cycles.
- Automatic reset for well filling. Adjustable from 2 to 75 minutes. Can be extended to 525 minutes by using the PF-RM module (see Page 17).
- 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 pi (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.

CBT



CBT-M



PROTECTION FUNCTIONS

- cos φ Underload
- $I >$ Overload
- Δ Phase imbalance or phase loss
- (φ) 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 |
| | CBT-2 | 12302 | 2.8 - 3.8 | 1.5 - 2 | 1.1 - 1.5 | 2 - 75 | 230x250x150 |
| | CBT-5 | 12305 | 5.5 - 9.5 | 3 - 5.5 | 2.2 - 4 | 2 - 75 | 230x250x150 |
| | CBT-7 | 12307 | 13 | 7.5 | 5.5 | 2 - 75 | 230x250x150 |
| | CBT-10 | 12310 | 16.5 | 10 | 7.5 | 2 - 75 | 230x250x150 |
| | CBT-15 | 12315 | 24 | 15 | 11 | 2 - 75 | 230x250x150 |
| METAL | CBT-20M | 12316 | 32 | 20 | 15 | 2 - 75 | 230x250x150 |
| | CBT-25M | 12317 | 40 | 25 | 18.5 | 2 - 75 | 230x250x150 |
| | CBT-30M | 12318 | 47 | 30 | 22 | 2 - 75 | 230x250x150 |
| | CBT-40M | 12319 | 64 | 40 | 30 | 2 - 75 | 600x500x200 |
| | CBT-50M | 12320 | 79 | 50 | 37 | 2 - 75 | 600x500x200 |
| | CBT-60M | 12332 | 92 | 60 | 45 | 2 - 75 | 600x500x200 |

• Equipment with halogen-free wiring

* Up to 525 minutes with the PF-RM module

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. Can be extended to 525 minutes by using the PF-RM module (see Page 17).
- 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 $\cos \varphi$ and shuts down the pump when it falls below the selected value.

CBS



PROTECTION FUNCTIONS

- $\cos \varphi$ Underload
- $I >$ Overload
- Δ Phase imbalance or phase loss
- (R) Phase sequence
- $I >>$ Short-circuit
- \sim Soft start
- \sim Soft stop

| | 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

* Up to 525 minutes with the PF-RM module

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.

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.

OTHER RELAYS FOR GENERATORS:

- **H:** Frequency relay (See page 42).
- **U3P:** Three-phase voltage relay (See page 41).
- **U3N:** Three-phase voltage relay (See page 41).

GEN



PROTECTION FUNCTIONS

- I> Overload
- Phase imbalance or phase loss

ODGEN



| Models | Code | Relay type |
|--------|--------------|------------|
| ODGEN | 12545 | GEN |

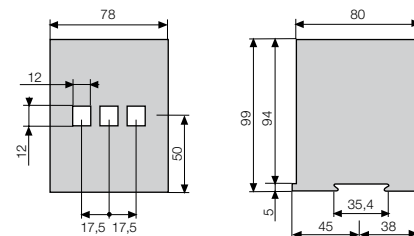
| MODELS | GEN 10 |
|---|---------------------------------|
| Adjustment range I_B (A) | 4 - 10,3 |
| Auxiliary voltage supply (+15% -10%) | 24 Vdc |
| Code | 11350 |
| For I_N of the generator above 10,3 A | Use 3 current transformers.../5 |
| External display module (optional) | ODGEN |

| CHARACTERISTICS | |
|---------------------------------------|---|
| Thermal memory / Overload trip | Yes / From $1,1 \times I_B$ |
| Maximum generator nominal voltage | 1000 Vac |
| Trip time $t_6 \times I_B$ | 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 |
| Terminals: Max.section / screw torque | 2,5 mm ² , 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 |

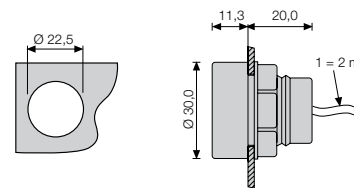


Settings and curves, see pages 27 to 33.

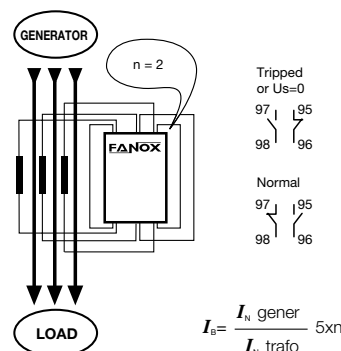
DIMENSIONS GEN RELAY (mm)



DIMENSIONS ODGEN MODULE (mm)



WIRING DIAGRAM (mm)



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

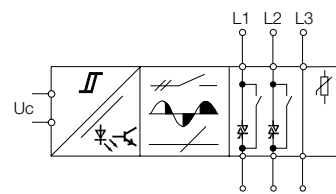
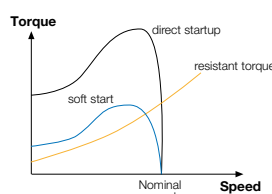
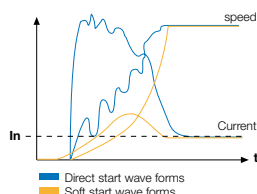
| MODELS* | ES 400-3 | ES 230-12 | ES 400-12 | ES 230-25 | ES 400-25 | ES 230-45 | ES 400-45 |
|--------------------------------------|----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Nominal voltage 50/60 Hz V \pm 15% | 400 | 230 | 400 | 230 | 400 | 230 | 400 |
|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

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

| CHARACTERISTICS | |
|------------------------------|---|
| Control voltage (\pm 15%) | A1-A2=24-100 Vac,dc / A1-A3=110-480 Vac |
| 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 |
| Ramps | yellow RAMPING yellow |
| Bypass relay | yellow BYPASS yellow |
| Semiconductors overtemperature | 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% |
| Start-up time | 0,5 - 5 s |
| Stop time | 0,5 - 5 s |



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.

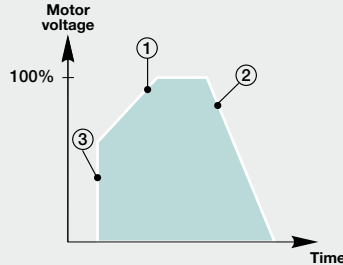
They reduce mechanical impact in motors, axles, gears and belts, significantly prolonging the operating life of the controlled units.

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

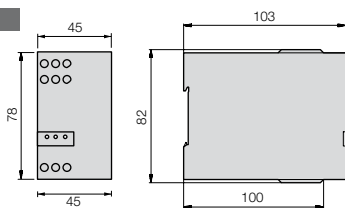
For three-phase motors in applications such as:

- 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)

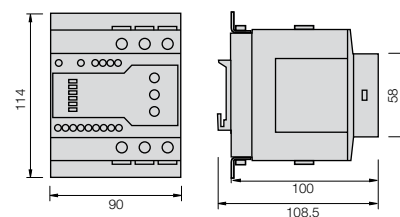
ES 230-12

ES 400-3 and ES 400-12



ES 230-25 and ES 230-45

ES 400-25 and ES 400-45

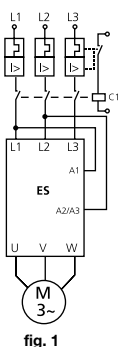


WIRING DIAGRAMS (mm)

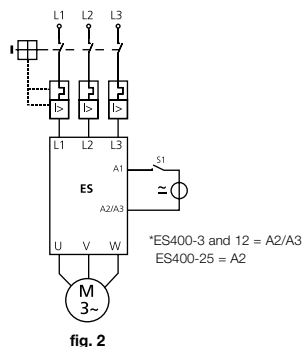
ES 230-12 and 45

ES 400-3, 12 and 25

Soft start



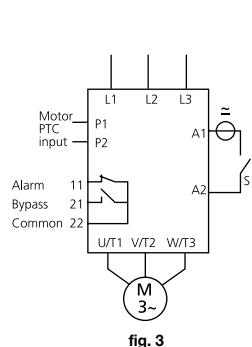
Soft start / soft stop



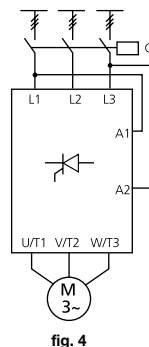
ES 230-45

ES 400-45

Soft start / soft stop



Soft start



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

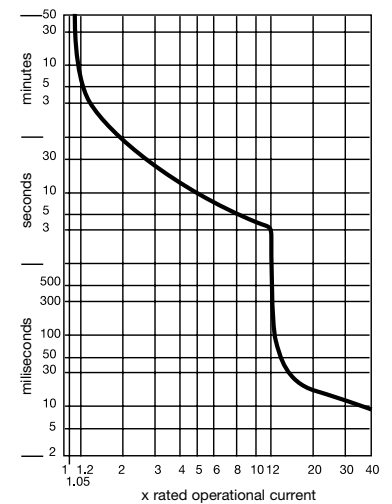


CHARACTERISTICS

| | |
|--|-----------------------|
| Rated operational voltage U _e | 690 V |
| Rated impulse withstand voltage V _{imp} | 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 mm ² |
| 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 _m | 6 A |
| Rated current AC-15:230/400 V | 3,5 / 2 A |
| Terminal section | 2 x 2,5 mm ² |
| Screw torque | 1 Nm |

| Manual motor starter models | Rated short circuit breaking capacity I _{cu} (DIN VDE 0660 part 101; IEC 947-2) | | | | | | Back-up fuse | | | |
|-----------------------------|--|-----|-----|-----|-------------------|-----|------------------|-----|-----|-----|
| | 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 | | | |
| M - 4 | 3 | | | | 2,5 | | 35 | | | |
| M - 6,3 | 3 | | | | 2,5 | | 50 | | | |
| 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 |

- Others for enclosures M-GE and M-FP

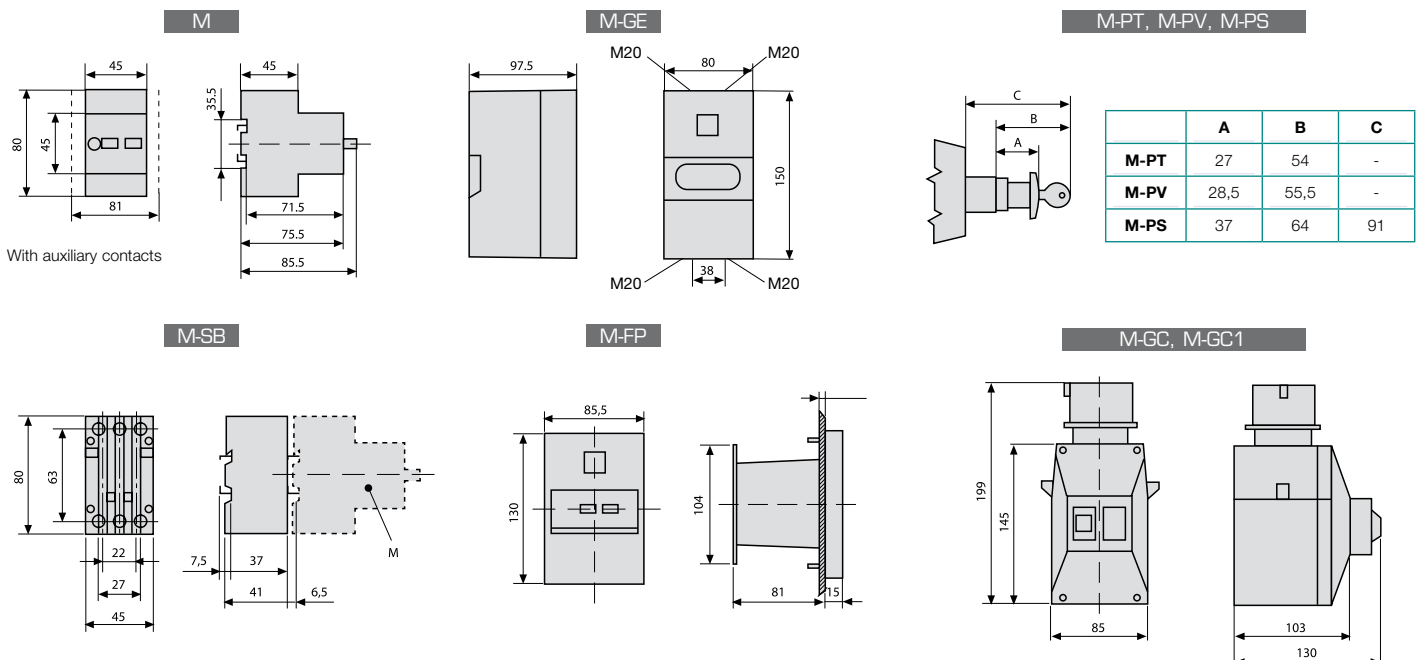
| | |
|--------------------------------------|--------------------|
| Padlocking feature (max. 3) | M-VSL 03988 |
| N-terminal | M-N 03949 |
| Indicator lights white, red or green | M-PS 39822 |

- 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 |



DIMENSIONS (mm)



Accessories

CURRENT TRANSFORMERS

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

CT

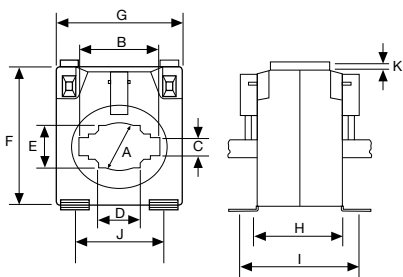


| Primary .../ 5A | Model | Code | VA class | | |
|-----------------|-------|-------|----------|-----|------|
| | | | 0,5 | 1 | 3 |
| 50 | CT20 | 41399 | - | - | 3 |
| 75 | CT20 | 41400 | - | 2 | 3,5 |
| 100 | CT20 | 41404 | 1,5 | 2,5 | 3,75 |
| 150 | CT20 | 41406 | 2,5 | 3,5 | 5 |
| 200 | CT30 | 41412 | 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

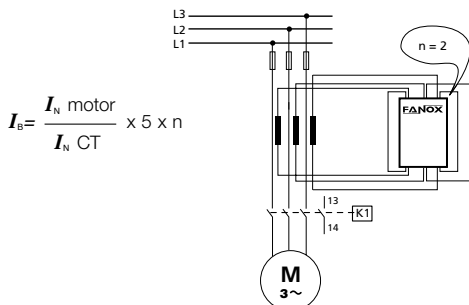
| | |
|--|--------------------|
| Overload | 1,2 I _N |
| Max. line voltage bus-bars / cable 1000V | 660V / 1000V |
| Max. size: bus-bars / Ø cable (mm) CT 20 | 25 x 5 / Ø 20 |
| Max. size: bus-bars / Ø cable (mm) CT 30 | 40 x 10 / Ø 28 |
| Max. size: bus-bars / Ø cable (mm) CT 50 | 60 x 12 / Ø 44 |

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 - BG (mm)



THERMISTOR SENSORS

- Connected to GL, G, BG, 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

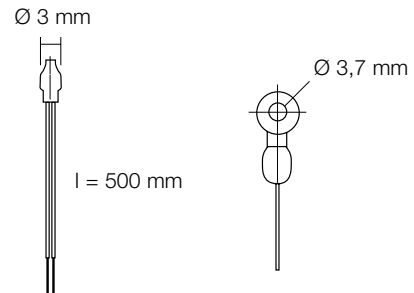


PTCEX 70

PTC 120

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

DIMENSIONS PTC (mm)



CONNECTION WIRES

| Models | Code | Length |
|--------|-------|--------|
| CDCNB | 17008 | 0.5 m |
| CDCN1 | 17009 | 1 m |

For toroidal transformers see pag. 54

THE MOTOR PROTECTION

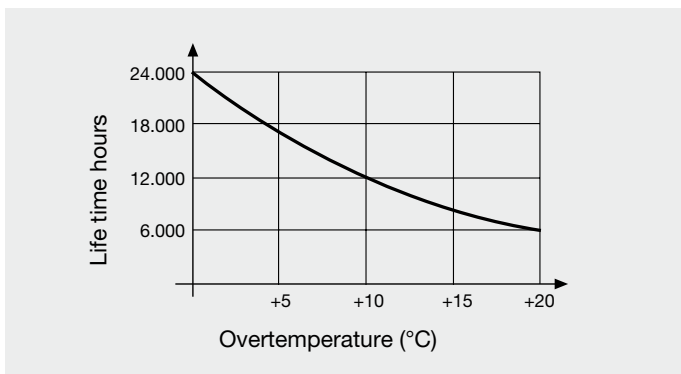
The electric motor is one of the most important operating devices in industry. Many times the shutdown of an industrial process is caused by a simple motor. High-cost production runs and valuable machinery can become paralysed at great cost, even more than the cost of rewinding the motor.

Experience shows that motor protection continues to be a problem, based on the number of breakdowns occurring 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 10°C 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 continuously 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 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 $\cos \varphi$ 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 and BG).

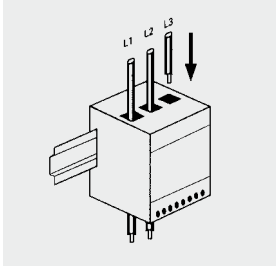
A visual display of the cause allows maintenance personnel to identify and immediately act on the underlying causes. The use of the OD display makes this operation much easier.

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

1 INSTALLATION

General

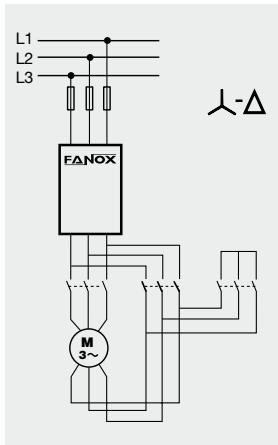
For correct installation and operation of Fanox relays, it is important to consider the following:



- 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 mm ² |
| GL, P, PF, G, BG, GEN | 35 mm ² |
| GL 200 | 70 mm ² |



- 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, G and BG 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, G and BG). For PTC connection lengths over 100 m or when the influence of high frequency transient voltages is expected, it is advisable 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/BG | PS | P | PF | GEN |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 2.1 Select the trip class / tripping time | 1 st | 1 st | 1 st | | 1 st | 1 st | 1 st |
| 2.2 Adjust the I_B current of the relay | 2 nd | 2 nd | 2 nd | 1 st | 2 nd | 2 nd | 2 nd |
| 2.3 Adjust the $\cos \varphi$ value (underload) | | | | | | 3 rd | |
| 2.3 Adjust the $\cos \varphi$ trip delay | | | | | | 4 th | |
| 2.4 Adjust the undercurrent level $I_{<}$ (underload) | | | | 2 nd | 3 rd | | |
| 2.5 Select ON /OFF incorrect phase sequence | | 3 rd | | | | | |
| 2.6 Reset | 3 rd | 4 th | 3 rd | 3 rd | 4 th | 5 th | 3 rd |

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, BG 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.

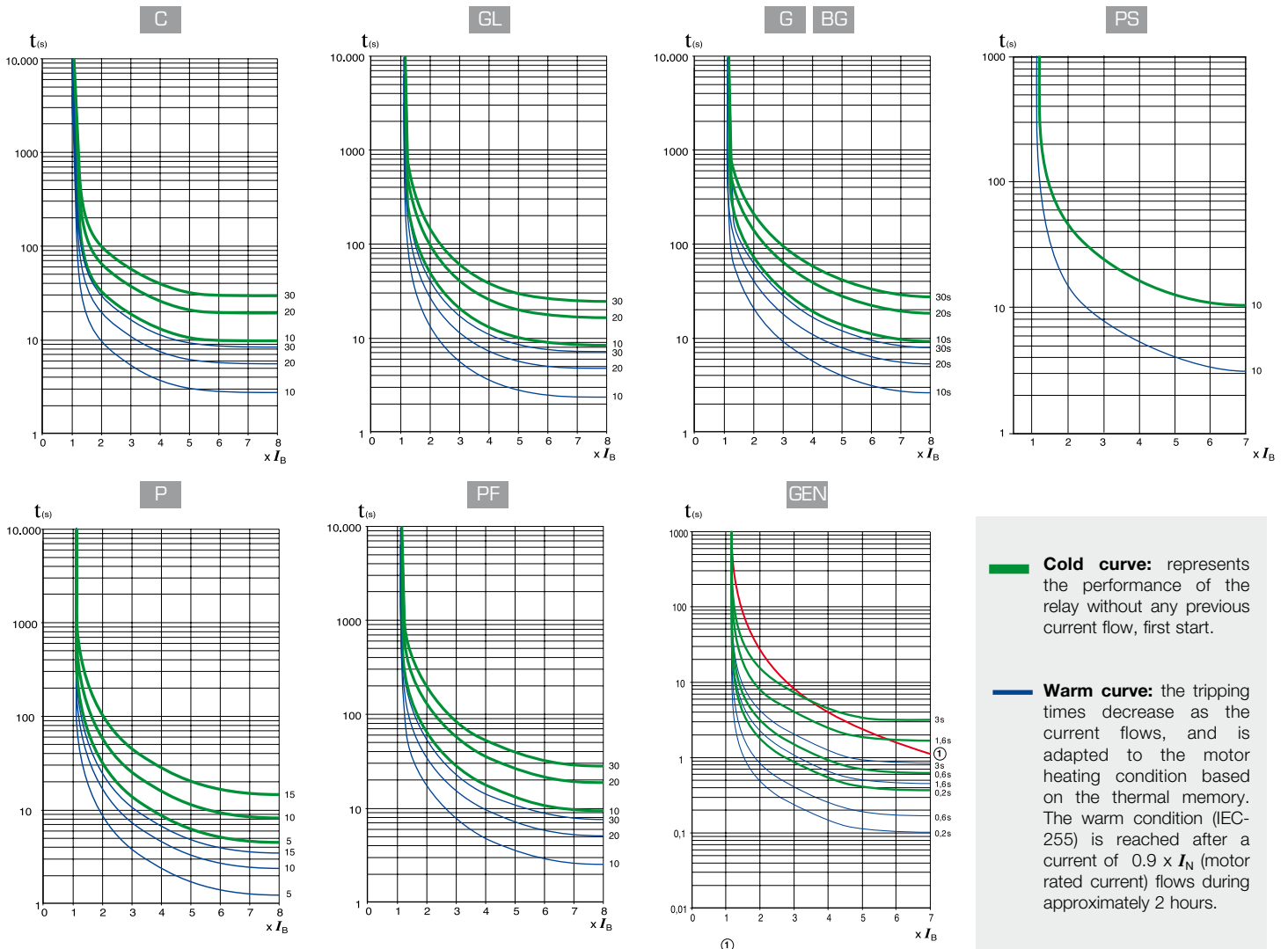
Motor with direct start-up

| Start time (s) | Trip classes | | | | | | | | | | | | | | Trip time | |
|----------------|--------------|-----|-----|------|------|------|-------|-----|-----|-----|--------|--------|-----|------|-----------|--|
| | Models | | | | | | | | | | | | | | Models | |
| | C9 | C21 | C45 | GL16 | GL40 | GL90 | GL200 | P19 | P44 | P90 | PF16-R | PF47-R | G17 | BG17 | | |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 5 | 10 | 10 | 4 | 4 | | |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 6 | 6 | | |
| 3 | 10 | 20 | 20 | 15 | 15 | 15 | 15 | 10 | 10 | 10 | 20 | 20 | 10 | 10 | | |
| 4 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 15 | 15 | 15 | 20 | 20 | 12 | 12 | | |
| 5 | 20 | 30 | 30 | 20 | 20 | 25 | 25 | 15 | 15 | 15 | 20 | 20 | 16 | 16 | | |
| 6 | 20 | 30 | 30 | 25 | 25 | 25 | 25 | | | | 30 | 30 | 18 | 18 | | |
| 7 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | | | 30 | 30 | 22 | 22 | | |
| 8 | 30 | 30 | 30 | 30 | 30 | 35 | 35 | | | | 30 | 30 | 24 | 24 | | |
| 9 | 30 | 30 | 30 | 35 | 35 | 35 | 35 | | | | 30 | 30 | 28 | 28 | | |
| 10 | 30 | 30 | 30 | 35 | 35 | 35 | 35 | | | | 30 | 30 | 30 | 30 | | |

Motor with star-delta start

| Start time (s) | Trip classes | | | | | | | | | | | | | | Trip time | |
|----------------|--------------|-----|-----|------|------|------|-------|-----|-----|-----|--------|--------|-----|------|-----------|--|
| | Models | | | | | | | | | | | | | | Models | |
| | C9 | C21 | C45 | GL16 | GL40 | GL90 | GL200 | P19 | P44 | P90 | PF16-R | PF47-R | G17 | BG17 | | |
| 5 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 5 | 5 | 5 | 10 | 10 | 4 | 4 | | |
| 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 6 | 6 | | |
| 15 | 20 | 20 | 20 | 10 | 15 | 15 | 15 | 10 | 10 | 10 | 10 | 20 | 8 | 8 | | |
| 20 | 20 | 20 | 30 | 20 | 20 | 20 | 20 | 15 | 15 | 15 | 20 | 20 | 10 | 10 | | |
| 25 | 30 | 30 | 30 | 20 | 20 | 25 | 25 | 15 | 15 | 15 | 20 | 20 | 14 | 14 | | |
| 30 | 30 | 30 | 30 | 20 | 25 | 30 | 30 | | | | 20 | 30 | 16 | 16 | | |
| 35 | 30 | 30 | 30 | 20 | 30 | 35 | 35 | | | | 20 | 30 | 18 | 18 | | |
| 40 | 30 | 30 | 30 | 25 | 30 | 35 | 35 | | | | 30 | 30 | 20 | 20 | | |

Average trip curves (IEC 947-4-1)



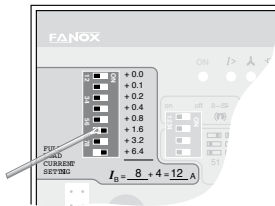
Cold curve: represents the performance of the relay without any previous current flow, first start.

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 $0.9 \times I_N$ (motor rated current) flows during approximately 2 hours.

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 $1,1 \times I_B$

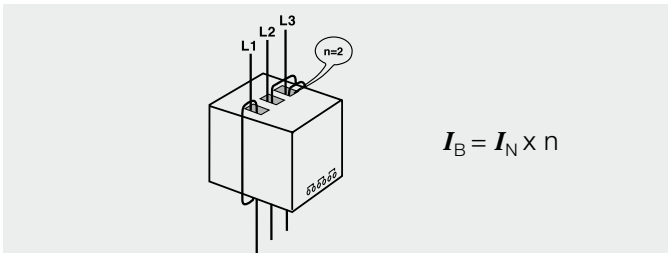


e.g.: relay GL16
 $I_B = 8 + 4 = 12 \text{ A}$

- 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.

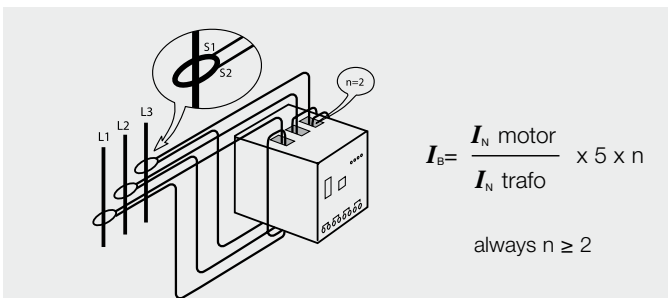
$$I_B = I_N$$

- 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 $n \geq 2$

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 $1,1 \times I_B$.

$$I_B = I_N$$

2.3 Underload by $\cos \varphi$. PF.

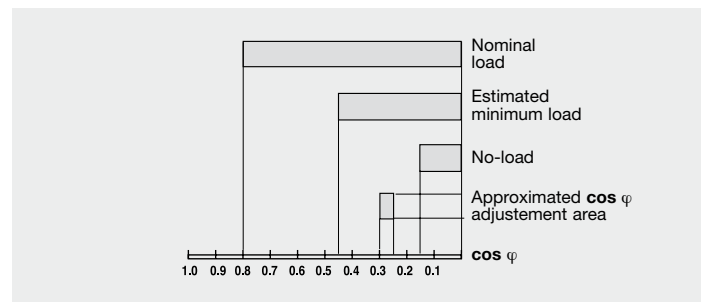
The $\cos \varphi$ underload trip level is set by means of a potentiometer with settings from 0,15 to 1,0.

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

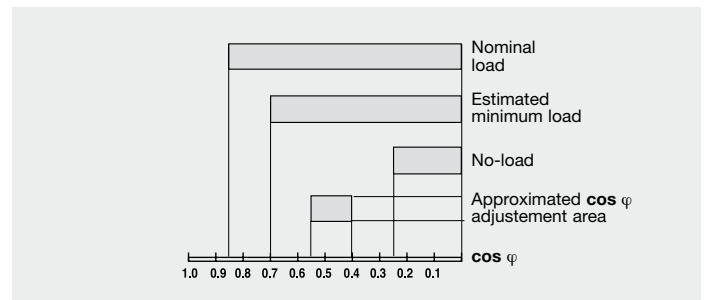
Select the underload trip delay from 5 to 45 seconds using the 3 corresponding dipswitches (trip delay).

For your guidance you can find two practical examples below.

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



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



If the above mentioned $\cos \varphi$ 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 ($\cos \varphi$ setting), set the $\cos \varphi$ value to the minimum: 0,15.
3. Set the reset time to the minimum value using the potentiometer ($\cos \varphi$ reset time).
4. Start up the motor and run it with the minimum estimated load.
5. Slowly turn the $\cos \varphi$ potentiometer clockwise until the relay trips and the $\cos \varphi$ LED lights up.
6. Turn the $\cos \varphi$ potentiometer anticlockwise until the $\cos \varphi$ 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.

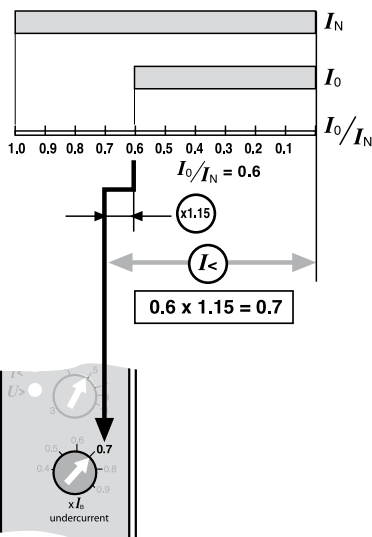
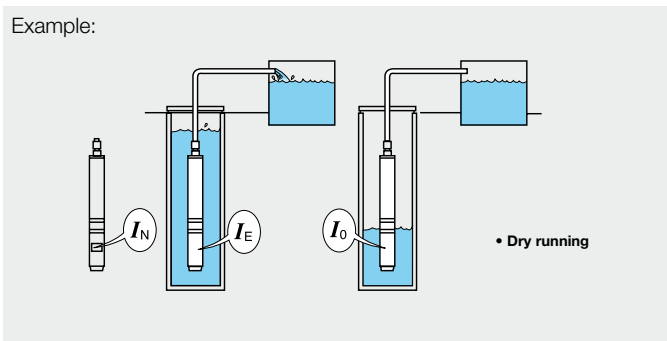
Single phase relay PS

The setting of the underload trip level is made using a potentiometer in which 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:



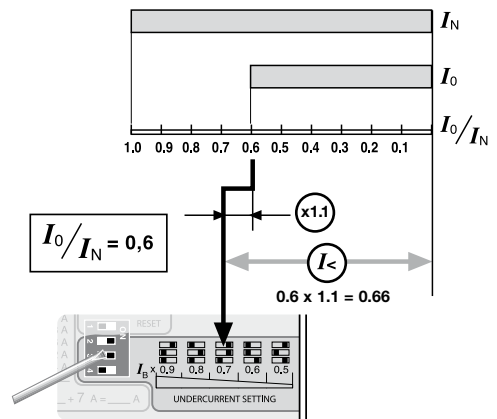
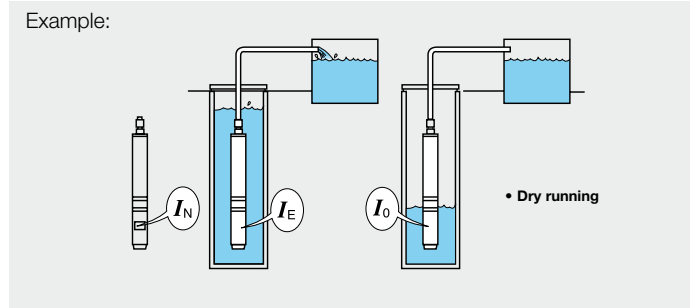
b) If the value of the I_b of the motor without load is unknown:

- 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 deactivate 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.

2.6 Reset




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

Manual reset:

| | PS | P | PF | C | GL | G, BG | GEN |
|---|----|------|---------|------|---------|---------|------|
| $I >$ | NO | <5 m | <7 m | <8 m | <8 m | <8 m | <1 m |
| $I <$ | NO | 2 s | - | - | - | - | - |
| $\cos \varphi$ | - | - | NO | - | - | - | - |
|  | - | 2 s | 2 s (*) | 2 s | 2 s | 2 s | 2 s |
|  | - | 2 s | 2 s (*) | 2 s | 2 s | - | - |
| $U >$ | NO | - | - | - | - | - | - |
|  | - | - | - | - | 1 s (*) | 1 s (*) | - |




(*) After recovering normal conditions.

Remote reset:

| | PS | P | PF | C | GL | G,BG | GEN |
|---|------|------|------|------|---------|---------|------|
| $I >$ | <1 m | <1 m | <3 m | <3 m | <3 m | <3 m | <1 m |
| $I <$ | 10 s | 10 s | - | - | - | - | - |
| $\cos \varphi$ | - | - | 10 s | - | - | - | - |
|  | - | 10 s | 10 s | 20 s | 20 s | 10 s | 10 s |
|  | - | 10 s | 10 s | 10 s | 10 s | - | - |
| $U >$ | NO | - | - | - | - | - | - |
|  | - | - | - | - | 1 s (*) | 1 s (*) | - |

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

Automatic reset:

| | PS | P | PF | C | GL | G,BG | GEN |
|---|----------------|------|----------------|----|----|------|-----|
| $I >$ | 4 m | 15 m | 4 m | NO | NO | NO | NO |
| $I <$ | PS11-R 2-70 m | 15 m | - | - | - | - | - |
| | PS16-R 2-240 m | | | | | | |
| $\cos \varphi$ | - | - | 2-75m | - | - | - | - |
| | | | - PF-RM 2-525m | | | | |
|  | - | 15 m | 4 m (*) | NO | NO | NO | NO |
|  | - | 15 m | 4 m (*) | - | NO | - | - |
| $U >$ | 1 s (*) | - | - | - | - | - | - |
|  | - | - | - | - | NO | NO | - |

(*) After recovering normal conditions.

3 OPERATING TEST. C, GL, P, PF, G, BG 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
- Submersible 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< |  |  |  |  |  | I _g / I _o |
| PBM B1 | 0,86 - 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 |  |  |  |  |
| 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 | • | | | • |  | • | |
| GL 40 | 15 - 40,5 | 10 - 25 | 7,5 - 18,5 | • | | | • |  | • | |
| GL 90 | 40 - 91 | 30 - 60 | 22 - 45 | • | | | • |  | • | |
| GL 200 | 60 - 200 | 50 - 150 | 37 - 110 | • | | | • |  | • | |
| 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 | 2 - 10 | 1,5 - 7,5 | • | | • | • | • | | |
| PF 47-R | 16 - 47,5 | 10 - 30 | 7,5 - 22 | • | | • | • | • | | |
| G 17 - BG 17 | 5 - 17,7 | 3 - 10 | 2,2 - 7,5 | • | | | • | | • | |
| GEN 10 | 4 - 10,3 | - | - | • | | | • | | | |

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



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 fire, 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.



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

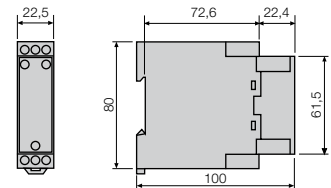
- ☝ Phase imbalance or phase loss
- ⚡ Phase sequence

CE

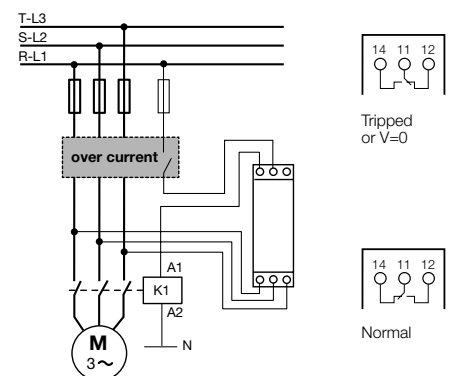
| MODELS | S2 | S4 |
|--|------------------------|-----------|
| Nominal voltage of the line to be monitored (±15%) | 3 x 230 V | 3 x 400 V |
| Voltage supply (±15%) | Self-powered (3-phase) | |
| Code | 12033 | 12034 |

| 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 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 |
| Storage / operation temperature | -30°C +70°C / -15°C +60°C |

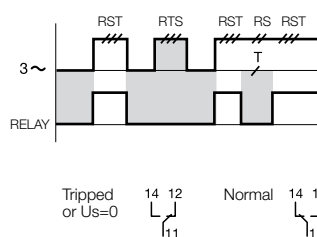
DIMENSIONS S RELAY (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



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
- 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



PROTECTION FUNCTIONS

- ⏏ Phase imbalance or phase loss
- (F) Phase sequence
- ⚡ Overtemperature

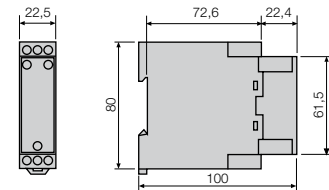
ST-D



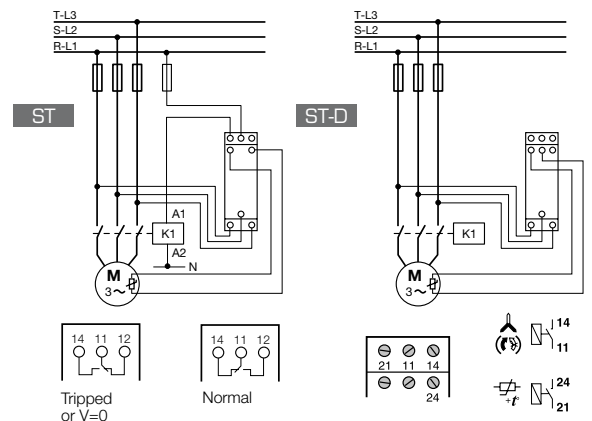
| MODELS | ST2 | ST4 | ST2-D | ST4-D |
|--|------------------------|-----------|-----------|-----------|
| Nominal voltage of the line to be monitored (±15%) | 3 x 230 V | 3 x 400 V | 3 x 230 V | 3 x 400 V |
| Voltage supply (±15%) | Self-powered (3-phase) | | | |
| Code | 12001 | 12012 | 12002 | 12013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

| 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 + ⏏ (F) + ⚡ |
| Output contacts | 1 relay with 1 change over NO - NC 2 relays (⏏ (F) + ⚡) 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 |

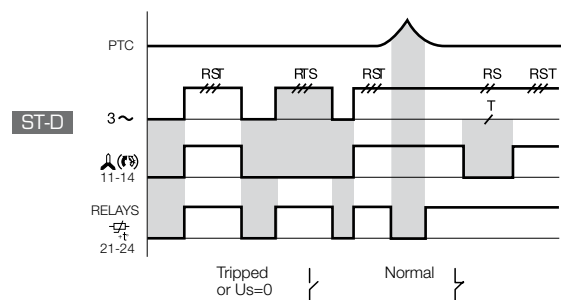
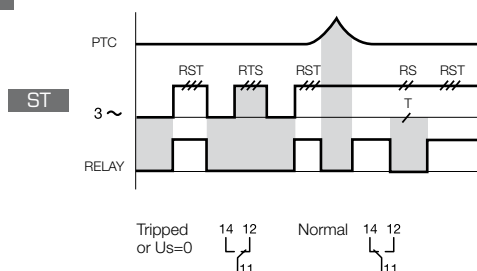
DIMENSIONS ST RELAY (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



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



PROTECTION FUNCTIONS T2

- Temperature variation

TST24



PROTECTION FUNCTIONS TST24

- Phase imbalance or phase loss
- Phase sequence
- Overtemperature
- Temperature variation



ODT
External module



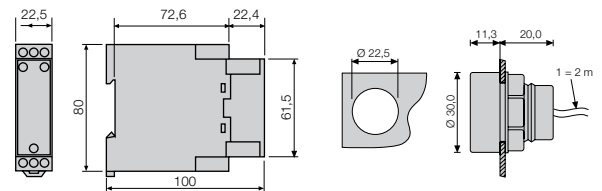
INT2
Internal sensor



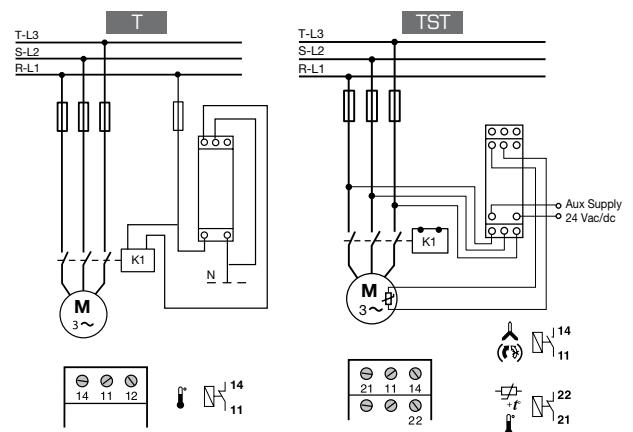
| MODELS | T2 | | TST24 | ODT2 | INT2 |
|--|---------------|------------------|------------------|-------|-------|
| Nominal voltage of the line to be monitored ($\pm 15\%$) | - | | 3 x 400 V | - | - |
| Voltage supply ($\pm 15\%$) | 230 Vac (Aux) | 24 Vac, dc (Aux) | 24 Vac, dc (Aux) | - | - |
| Code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

| CHARACTERISTICS | |
|---|--|
| Nominal frequency | 50/60 Hz |
| Control range | Maximum temperature from 40°C to 55°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 + |
| Output contacts | 1 relay with 1 change over 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 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 |
| Storage / operation temperature | -30°C +70°C / -15°C +60°C |

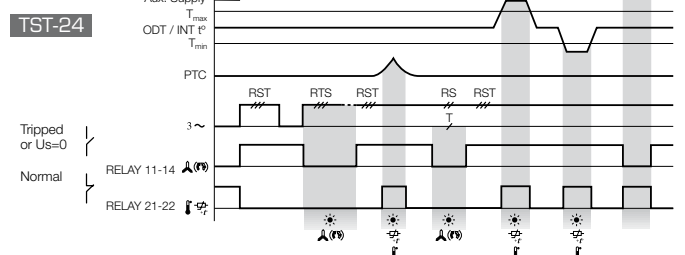
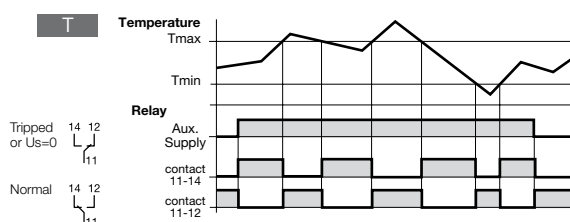
DIMENSIONS (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



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-R model:

With selectable trip reset mode.

MT



MT2-R



PROTECTION FUNCTIONS

- Overtemperature
- Thermistor short-circuit



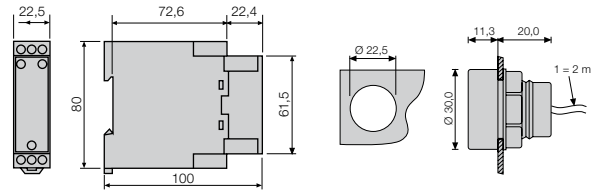
OD-MT
External module



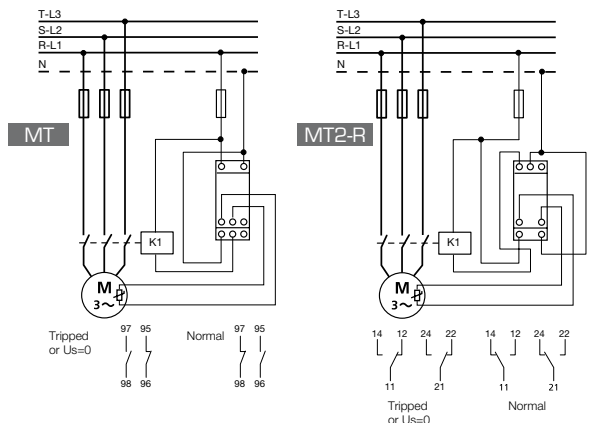
| MODELS | MT | MT2-R | OD-MT |
|-----------------------|-----------------------|-------|-------|
| Voltage supply (±15%) | 230 Vac (Aux. supply) | | - |
| Code | 12039 | 12048 | 12560 |

| 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) Automatic (30s delay) or manual |
| Signalling LED's | 3 LED's: ON + + |
| Output contacts | 1 relay with NO-NC |
| Switching power | I _n : 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 | 6 VA (230 Vac) |
| Protection degree / weight | IP20 / 0,12 kg IP20 / 0,13 kg |
| Storage / operation temperature | -30°C +70°C / -15°C +60°C |

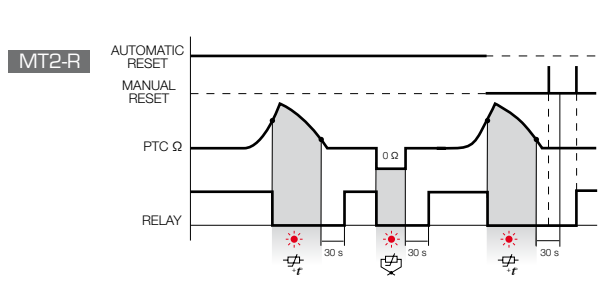
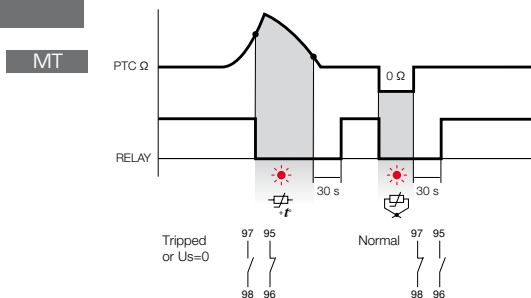
DIMENSIONS (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



VOLTAGE & FREQUENCY monitoring 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.
- **U1M:** Adjustable trip time delay. Fixed reset delay (5 minutes). Suitable for single phase air conditioning systems..

U1 D



U1 M



PROTECTION FUNCTIONS

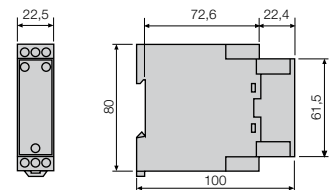
- $U>$ Overvoltage
- $U<$ Undervoltage



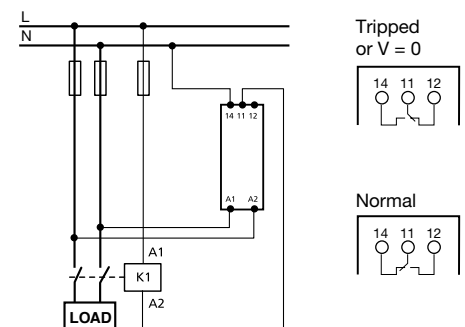
| MODELS | U1D-24D | U1D-115 | U1D-230 | U1M-24D | U1M-115 | U1M-230 |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Frequency | DC | 50/60 Hz | 50/60 Hz | DC | 50/60 Hz | 50/60 Hz |
| Maximum threshold V / Hz | V / Hz | 105-135 | 215-275 | 23-28 | 105-135 | 215-275 |
| Minimum threshold V / Hz | V / Hz | 90-120 | 160-230 | 19-25 | 90-120 | 160-230 |
| Code | 12028 | 12026 | 12027 | 12080 | 12081 | 12082 |

| CHARACTERISTICS | |
|--|---|
| Type of supply to be monitored | Single phase |
| Auxiliary supply $\pm 10\%$ | Self-powered |
| Accuracy | $U>$ +4% -1%; $U<$ +1% -4% |
| Trip time delay (TD) | 0,1 to 6s ($\pm 20\%$) 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_n : 5A; AC15 - 250V - 2A; DC13 - 30V - 2A |
| Terminals: Max. section / Screw torque | 2,5 mm ² , 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 |

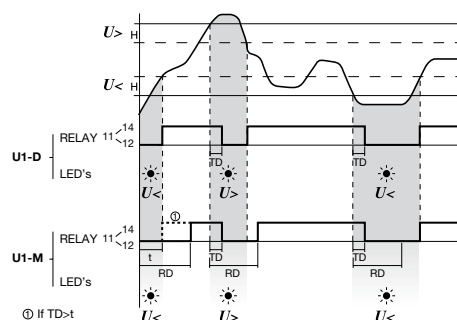
DIMENSIONS U1D and U1M RELAYS (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



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.

U3P and U3N models:

- Two independent output relays.
- U3N model includes protection against neutral loss.

U3 S



U3 P



U3 N



PROTECTION FUNCTIONS

- $U>$ Overvoltage
- $U<$ Undervoltage
- Phase imbalance or phase loss
- (Φ) Phase sequence

Model U3 N includes:

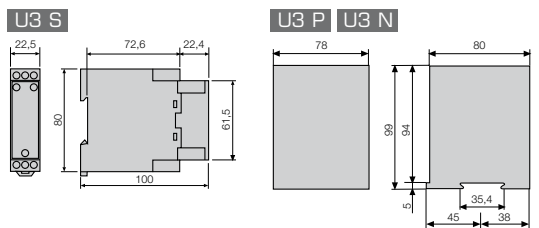
- Loss of neutral



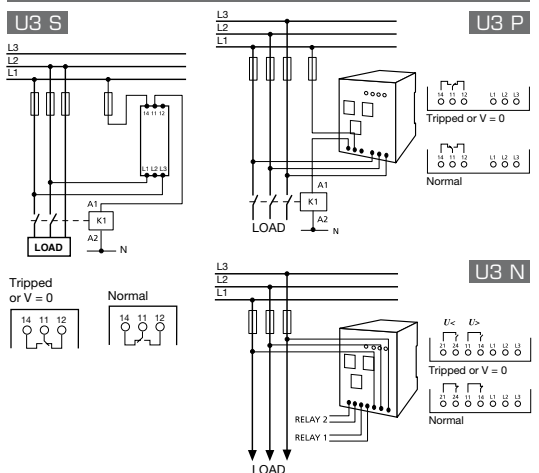
| MODELS | U3S-230 | U3S-420 | U3P-230 | U3P-400 | U3P-440 | U3N-230 | U3N-400 | U3N-440 |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
| Frequency | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz | 50/60 Hz |
| Maximum threshold V / Hz | 210-290 | 380-500 | 230-260 | 400-460 | 440-500 | 230-260 | 400-460 | 440-500 |
| Minimum threshold V / Hz | 185-230 | 350-430 | 200-230 | 340-400 | 380-440 | 200-230 | 340-400 | 380-440 |
| Code | 12071 | 12070 | 12066 | 12065 | 12067 | 12056 | 12055 | 12057 |

| CHARACTERISTICS | |
|--|---|
| Type of supply to be monitored | Three phase / Three-phase with neutral |
| Auxiliary supply $\pm 10\%$ | Self-powered |
| Accuracy | $U>$ +4% -1%; $U<$ +1% -4% |
| Trip time delay (TD) | 0,1 to 6s ($\pm 20\%$) for $U>U<$ / 0,1 to 3,7s ($\pm 20\%$) for $U>U<$ / 0,1 to 3,7s ($\pm 20\%$) for $U>U<I_N$ |
| Reset mode | Automatic |
| Hysteresis | 4% of the nominal voltage |
| Signalling LED's | U3S and U3P: 4 LED's: ON + $U>$ + (Φ) + $U<$ / U3N: 4 LED's: ON + $U>$ + (Φ) + $U<$ + I_N |
| Output contacts | U3S: 1 relay with 1 change-over NO - NC / U3P y U3N: 2 relays with 1 NO |
| Switching power | I_{th} : 5A; AC15 - 250V - 2A; DC13 - 30V - 2A |
| Terminals: Max. section / Screw torque | 2,5 mm ² , No. 22 - 12AWG / 20Ncm, 1,8 LB - IN |
| Power consumption | U3S: 7,5 VA (230 Vac) - 11 VA (230 Vac) / U3P y U3N: 12 VA (230 Vac) - 20 VA (230 Vac) |
| Protection degree / weight | IP20 / 0,11 kg / IP20 / 0,35 kg / IP20 / 0,35 kg |
| Storage / operation temperature | -30°C +70 °C / -15°C +60°C |

DIMENSIONS RELAYS (mm)



WIRING DIAGRAM (mm)

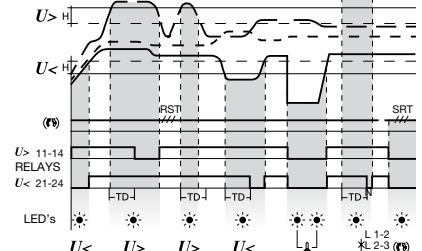
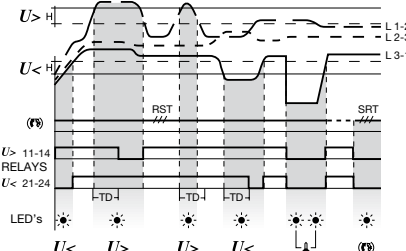
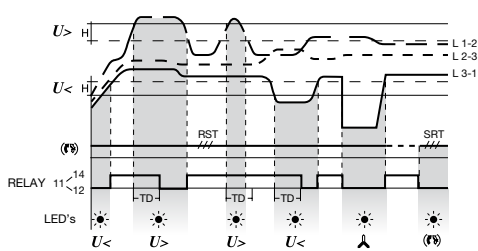


WORK LOGIC

U3S

U3P

U3N



VOLTAGE & FREQUENCY monitoring relays

SINGLE-PHASE FREQUENCY MONITORING RELAY

H

PROTECTION FUNCTIONS

Hz Frequency variation

- 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.

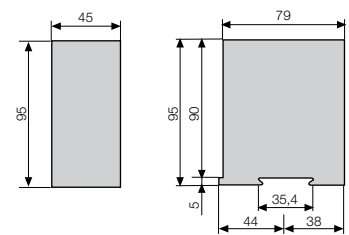


CE

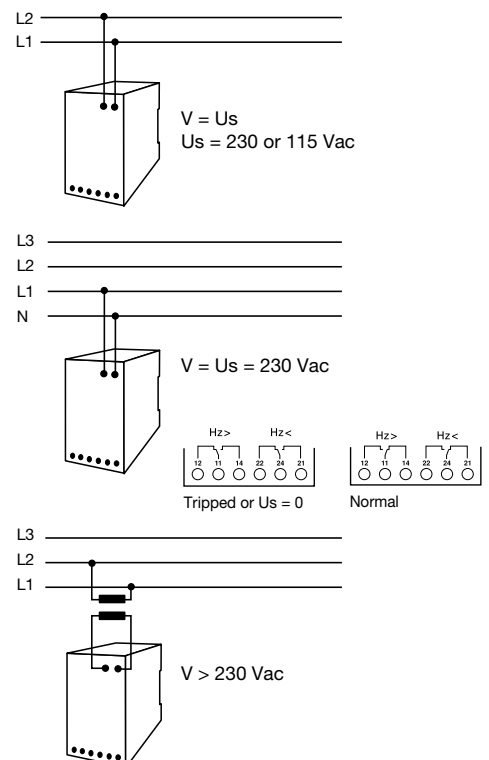
| MODELS | 115 Vac | 230 Vac |
|--------------------------|---|---------|
| Frequency | 50/60 Hz selectable by a dip switch | |
| Maximum threshold V / Hz | Hz> From +0,5 to +3,5 Hz. Steps of 0,5 Hz (±0,1%) | |
| Minimum threshold V / Hz | Hz< From -0,5 to -3,5 Hz. Steps of 0,5 Hz (±0,1%) | |
| Code | 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 _m : 5A; AC15 - 250V - 2A; DC13 - 30V - 2A |
| Terminals: Max. section / Screw torque | 2,5 mm ² , 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 |

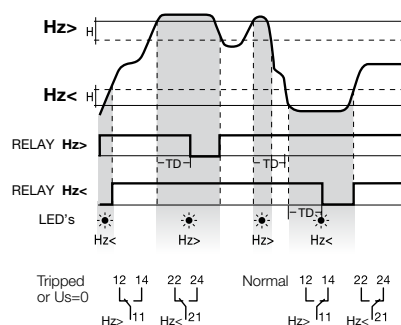
DIMENSIONS H RELAY (mm)



WIRING DIAGRAM (mm)



WORK LOGIC



Timers

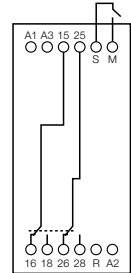
- **Multifunction digital timer.**
- **Possibility of programming up to 9 different times. Each time can be set from 0,1 seconds to 99 hours.**
- **With built-in battery which allows timer to be programmed without connecting to auxiliary voltage. Complete battery discharge does not affect operation or 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 |
| Code | 12110 |

| 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 mm ² , No. 22 - 12AWG / 20Ncm, 1.8 LB - IN |
| Mechanical / electrical life | >20 x 10 ⁶ operations / >10 ⁶ operations |
| Consumption | 8 VA (230 Vca) - 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 |

- 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(-)

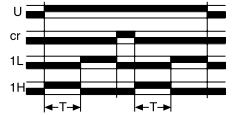
One of the following arrangements can be programmed:
Each diagram represents the effect of the command contact for the two initial states of the output relay: de-energized (1L) and energized (1H).

cu Switched off contact

Its function is blocked

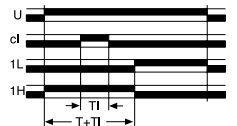
cr Reset contact

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.



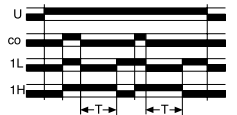
ci Delay on contact

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.



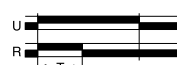
FUNCTION EXAMPLE DIAGRAMS

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.**

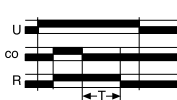
Delay on
1L - CO - cu



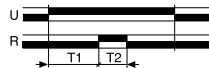
Timing on
1H - CO - cu



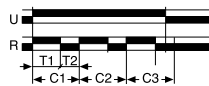
Delay off
With command contact
1H - CO - co



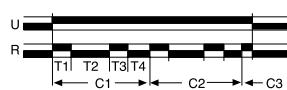
Double timing
1L - CO - cu



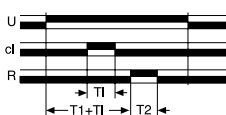
Double timing
Cycle work mode
1H - C1 - cu



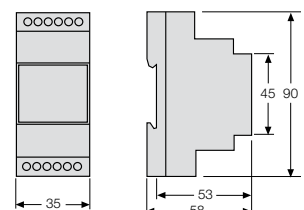
Four timings
Cycle work mode
1H - C1 - cu



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



DIMENSIONS MTR 10 RELAY (mm)



- 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 Amperemeter, Voltmeter and Frequency meter.
- 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 double tariff of energy.
 - F: Profibus protocol.
 - N: Direct neutral measure.
 - T: Galvanic insulation on current inputs.



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
- kVAh** 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 |
| | | | 230 Vac | 41255 | 41270/41285 |
| | | | 400 Vac | 41260 | 41275/41290 |
| | | | | | 41295 |

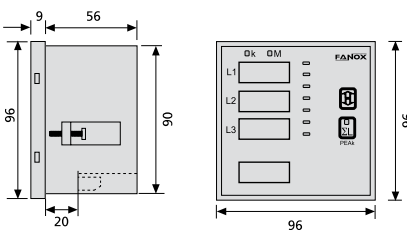
For 1-phase power supply please consult.

| 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 mm ² | | |
| Front protection degree / weight | IP52 / 0,5 kg | | |
| Storage / operation temperature; humidity | -25 °C a 70 °C / -10 °C a 60 °C ; < 90 % | | |
| Standards | IEC EN 50081-2, IEC EN 50082-1, IEC EN 61010-1 | | |

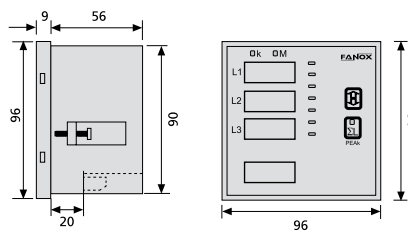
MEASURED PARAMETERS

| 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} | ∑V _{L-N} | 20~290 V _{rms} | ±0,5 ± 1 |
| • | • | • | V_{L-L} Voltage | V _{L1-2} | V _{L2-3} | V _{L3-1} | ∑V _{L-L} | 20~500 V _{rms} | ±0,5 ± 1 |
| • | • | • | A Current | I _{L1} | I _{L2} | I _{L3} | ∑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} | ∑PF _L | 0,1~1 (+ind ; -cap) | ±1 ± 1 |
| | • | • | W Active power | P _{L1} | P _{L2} | P _{L3} | ∑P _L | 0,01~9990 kW | ±1 ± 1 |
| | • | • | VAr Reactive power | Q _{L1} | Q _{L2} | Q _{L3} | ∑Q _L | 0,01~9990 kVAr | ±1 ± 1 |
| | • | • | VA Apparent power | S _{L1} | S _{L2} | S _{L3} | ∑S _L | 0,01~9990 kVA | ±1 ± 1 |
| | • | • | kWh Active energy counter | ∑kWh | | | | 0~10 ⁹ kWh | Class 2 |
| | • | • | kVArh Reactive energy count. | ∑kVArh | | | | 0~10 ⁹ kVArh | Class 2 |
| | • | • | kVAh Apparent energy count. | ∑kVAh | | | | 0~10 ⁹ kVAh | Class 2 |
| • | • | • | Hz Frequency | F _{L1} | | | | 40~500 Hz | ±0,5 ± 1 |
| | • | • | °C Temperature | T | Measured with internal sensor | | | 0~70 °C | ±2 °C |
| | • | • | ⊕ 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} | | | | | |
| | • | • | | ∑W _{max} | ∑VAr _{max} | ∑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} | | | | | |
| | • | • | | ∑W _{avg} | ∑VAr _{avg} | ∑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)} | | | | | |
| | • | • | | ∑W _{max (avg)} | ∑VAr _{max (avg)} | ∑VA _{max (avg)} | | | |

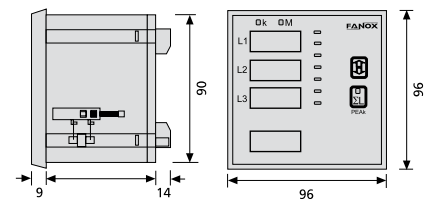
DIMENSIONS EMM 3 RELAY (mm)



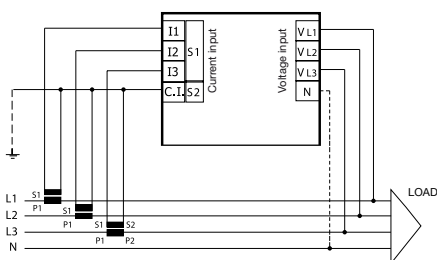
DIMENSIONS EMM 5 RELAY (mm)



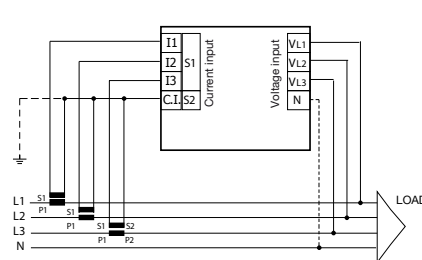
DIMENSIONS EMM 7 RELAY (mm)



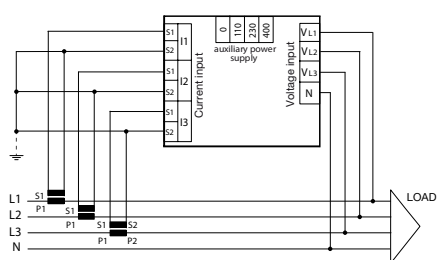
WIRING DIAGRAM EMM 3 (mm)



WIRING DIAGRAM EMM 5 (mm)



WIRING DIAGRAM EMM 7 (mm)



Temperature and Process Controllers TP 7

- 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



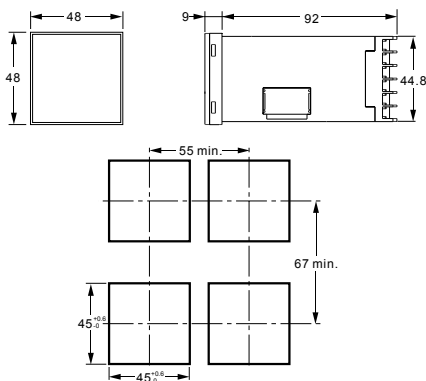
TP 731



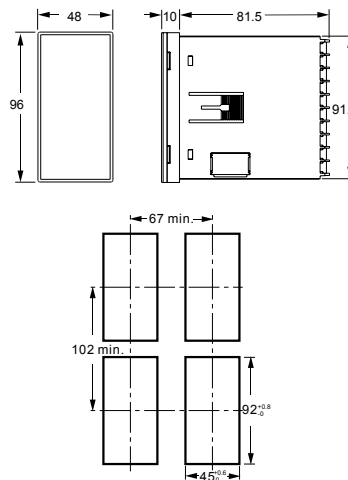
TP 750



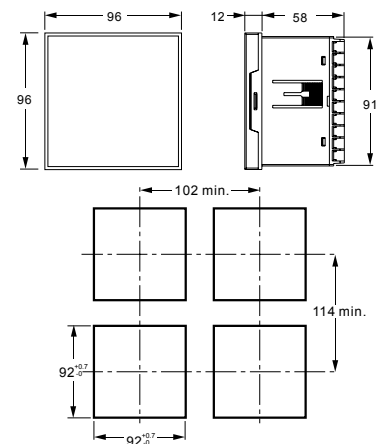
DIMENSIONS TP 720 RELAY (mm)



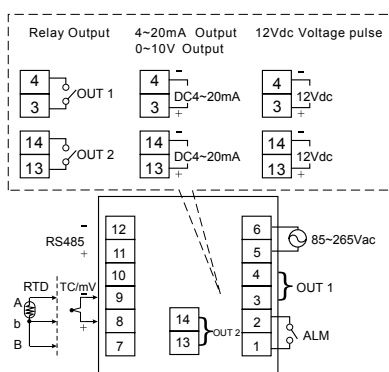
DIMENSIONS TP 731 RELAY (mm)



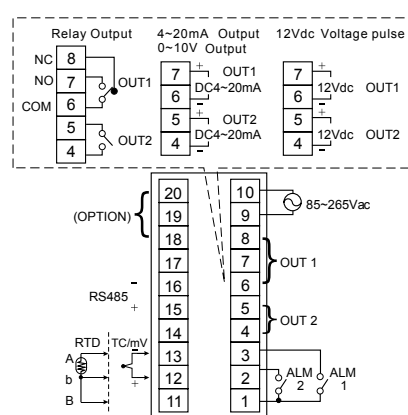
DIMENSIONS TP 750 RELAY (mm)



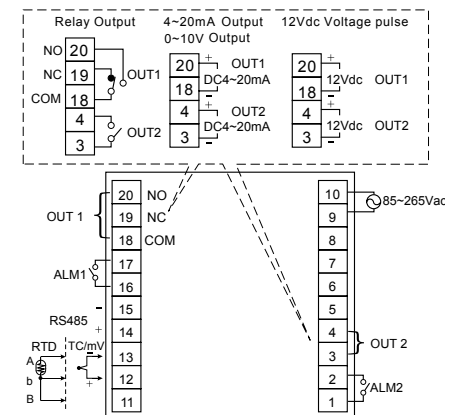
WIRING DIAGRAM TP 720 (mm)



WIRING DIAGRAM TP 731 (mm)



WIRING DIAGRAM TP 750 (mm)



| 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 °C | 0,3 % ± 1 digit |
| J | -210 ~ 1200 °C | 0,3 % ± 1 digit |
| R (1) | -50 ~ 1760 °C | 0,3 % ± 1 digit |
| S (1) | -50 ~ 1760 °C | 0,3 % ± 1 digit |
| B (2) | 250 ~ 1820 °C | ± 8°C ± 1 digit |
| E | -200 ~ 1000 °C | 0,3 % ± 1 digit |
| N | -200 ~ 1300 °C | 0,3 % ± 1 digit |
| T | -200 ~ 400 °C | ± 2°C ± 1 digit |
| RTD | | |
| PT100 | -200 ~ 850 °C | 0,3 % ± 1 digit |
| JPT100 | -200 ~ 850 °C | 0,3 % ± 1 digit |
| Analogue signal | | |
| mV | 0 ~ 350 mV | 0,3 % ± 1 digit |
| mA(3) | 4~20 mA | |

(1) R & S, accuracy ± 19°C when the range is 0~500°C
(2) B does not guarantee accuracy for the range 0~400°C
(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 |

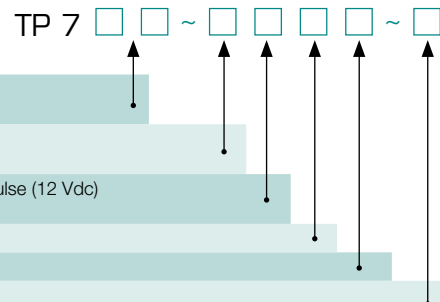
| LED'S | | | |
|------------|---------------|---------------|---------------|
| Models | TP 720 | TP 731 | TP 750 |
| Output | x 1 | x 2 | x 2 |
| Alarm | x 1 | x 2 | x 2 |
| Celsius | | | x 1 |
| Fahrenheit | | | x 1 |

| 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






| | | | |
|------------------|--|---|----------------------------|
| 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



Selection guide

CONTROL RELAYS

| MODELS | NOMINAL VOLTAGE | RANGE |  |  |  |  |  | $U >$ | $U <$ | I_N | $\frac{Hz >}{Hz <}$ |
|---------|-----------------|----------------------------------|---|---|---|---|---|-------|-------|-------|---------------------|
| 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 | | | | • | | | | | • | |
| MT2-R | 230 Vac | | | | • | | | | | • | |
| U1D-24D | 24 Vdc | 19 - 28 | | | | | | • | • | | |
| U1D-115 | 115 Vac | 90 - 135 | | | | | | • | • | | |
| U1D-230 | 230 Vac | 160 - 275 | | | | | | • | • | | |
| U1M-24D | 24 Vdc | 19 - 28 | | | | | | • | • | | |
| U1M-115 | 115 Vac | 90 - 135 | | | | | | • | • | | |
| U1M-230 | 230 Vac | 160 - 275 | | | | | | • | • | | |
| U3S-230 | 230 Vac | 185 - 290 | • | • | | | | • | • | | |
| U3S-420 | 420 Vac | 350 - 500 | • | • | | | | • | • | | |
| U3P-230 | 230 Vac | 200 - 260 | • | • | | | | • | • | | |
| U3P-400 | 400 Vac | 340 - 460 | • | • | | | | • | • | | |
| U3P-440 | 440 Vac | 380 - 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 $\cos \varphi$
Underload
Phase loss
Phase imbalance
Phase sequence
Overtemperature $\frac{U >}{U <}$
Overvoltage /
Undervoltage I_N
Loss of neutral $\frac{Hz >}{Hz <}$
Overfrequency /
Underfrequency
Max / Min
temperature
Thermistor
short-circuit

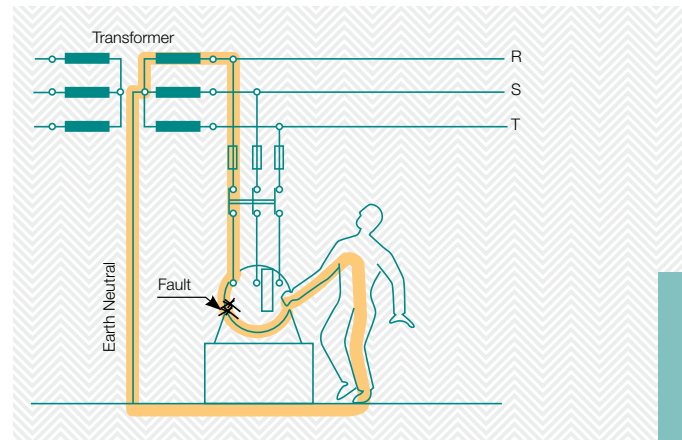
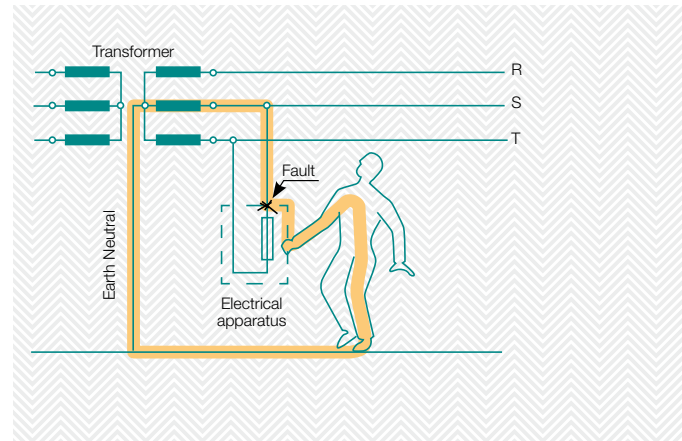
EARTH LEAKAGE PROTECTION

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.



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).

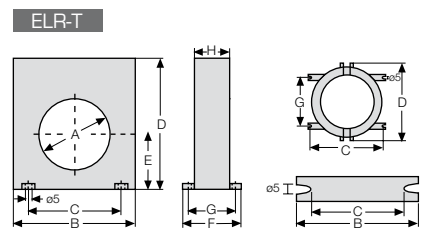
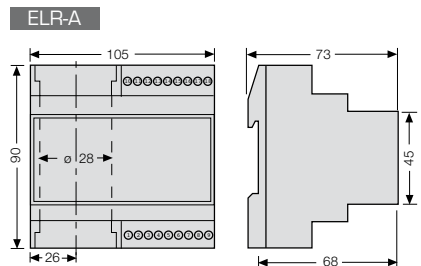
ELR-T



| 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 | 115 Vdc, ac 230-400 Vac | 24-48 Vdc, ac | 115 Vdc, ac 230-400 Vac | 24-48 Vdc, ac | 115 Vdc, ac 230-400 Vac |
| Code | 41017 | 41015 | 41107 | 41105 | 41102 | 41100 |

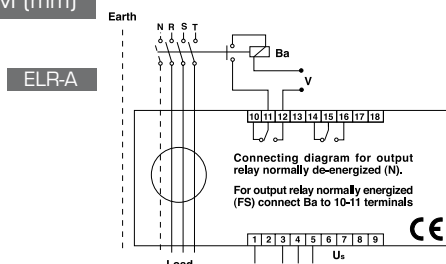
| CHARACTERISTICS | |
|---|---|
| Toroidal transformer | ELR-A: Built-in Ø28 mm / ELR-T: Built-in Ø60 mm and Ø110 mm |
| Max. length between relay and transformer | - |
| Reset mode | Automatic, manual and remote (in manual mode disconnect the aux. supply during 1s) |
| Signalling LED's | 2 LED's: ON + 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 mm ² |
| 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)



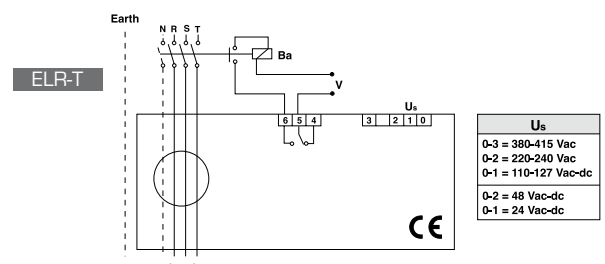
| | A | B | C | D | E | F | G | H | K |
|-----------------|-----|-----|-----|-----|----|----|----|----|---|
| ELR-T60 | 60 | 100 | 60 | 110 | 47 | 70 | 60 | 50 | - |
| ELR-T110 | 110 | 150 | 110 | 160 | 70 | 70 | 60 | 50 | - |

WIRING DIAGRAM (mm)



Us

| |
|----------------------|
| 5-1 = 380-415 Vac |
| 5-3 = 220-240 Vac |
| 5-4 = 110-127 Vac-dc |
| 5-4 = 48 Vac-dc |
| 5-3 = 24 Vac-dc |



Us

| |
|----------------------|
| 0-3 = 380-415 Vac |
| 0-2 = 220-240 Vac |
| 0-1 = 110-127 Vac-dc |
| 0-2 = 48 Vac-dc |
| 0-1 = 24 Vac-dc |

Earth leakage relays WITHOUT BUILT-IN toroidal transformer

RELAY WITH ADJUSTABLE DELAY TIME AND SENSITIVITY

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

ELR-B



MULTIRANGE RELAY

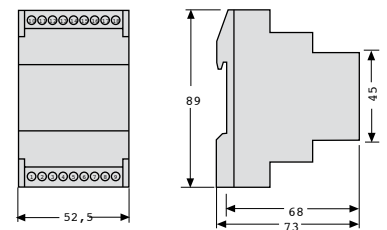
- **Electronic relays with adjustable time delay and sensitivity.**
- **Suitable for direct pulse current.**
- **Immune to external disturbances.**
- To be used with CT-1 transformers.
- Modular size. DIN rail mounting.
- Sealable front cover.

ELR-3C



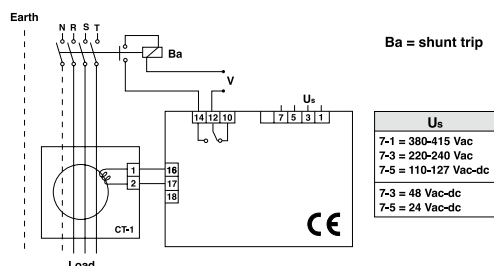
| MODELS | ELR-B | | ELR-3C | |
|------------------------------|-----------------|----------------------------|---------------------------------|----------------------------|
| Sensitivity | 0,3 A or 0,5 A | | Adjustable from 0,025 A to 25 A | |
| Trip time delay | 0,02 s or 0,5 s | | Adjustable from 0,02 s to 5 s | |
| Aux. voltage supply 50/60 Hz | 24-48 Vdc, ac | 115 Vdc, ac 230-400 Vac | 24-48 Vdc, ac | 115 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 (mm)



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 transformers.
- Suitable for Motor Control Centres (MCC), electrical distribution boards and control panels in general.

D 30



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 transformers.
- Suitable for electrical distribution boards and control panels in general.
- Sealable front cover

DM30

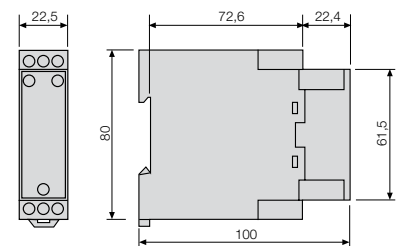


| MODELS | D 30 | | DM30 | |
|------------------------------|--------------------------------|--------------|--------------------------------|--------------|
| Sensitivity | Adjustable from 0,03 A to 30 A | | Adjustable from 0,03 A to 30 A | |
| Trip time delay | Adjustable from 0,02 s to 5 s | | Adjustable 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 |

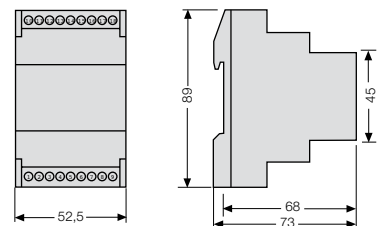
| CARACTERÍSTICAS | | | | |
|---|--|----------------------|-------------------------------|---------------------|
| Toroidal transformer | In combination with CT-1 | | | |
| Max. length between relay and transformer | Cable section mm ² | | | |
| | 0,22 mm ² | 0,75 mm ² | 1 mm ² | 1,5 mm ² |
| | Max. length 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 + $\frac{1}{2}$ (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 mm ² | | | |
| 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)

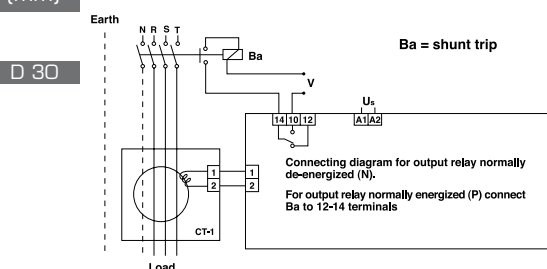
D 30



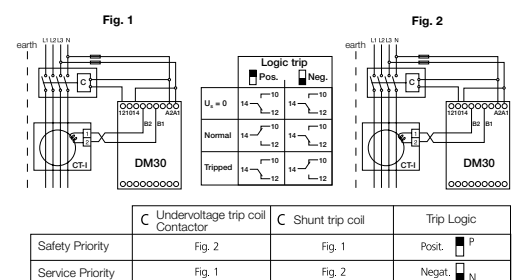
DM30



WIRING DIAGRAM (mm)



DM30



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 transformers.
- Suitable for electrical distribution boards in general.
- Sealable front cover.

DR30F



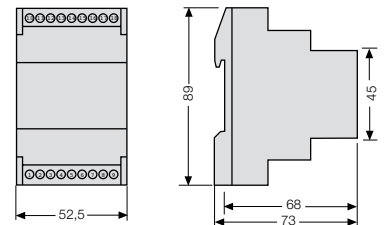
DR30A



| 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 |

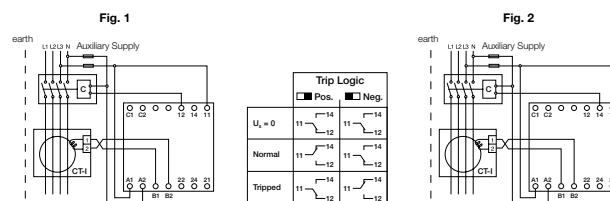
DIMENSIONS (mm)

DR30



| CHARACTERISTICS | |
|---|---|
| Toroidal transformer | In combination with CT-1 |
| Max. length between relay and transformer | Cable section mm ² |
| | 0,22 mm ² 0,75 mm ² 1 mm ² 1,5 mm ² |
| | Max. length 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 + $\frac{1}{2}$ (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 mm ² |
| 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 |

WIRING DIAGRAM (mm)



| | C Undervoltage trip coil Contactor | C Shunt trip coil | Trip Logic |
|------------------|------------------------------------|-------------------|--|
| Safety Priority | Fig. 2 | Fig. 1 | Posit. N <input type="checkbox"/> P <input type="checkbox"/> |
| Service Priority | Fig. 1 | Fig. 2 | Negat. N <input type="checkbox"/> P <input type="checkbox"/> |

TOROIDAL TRANSFORMERS

- To be used with ELR-B, ELR-3C and D30 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 |

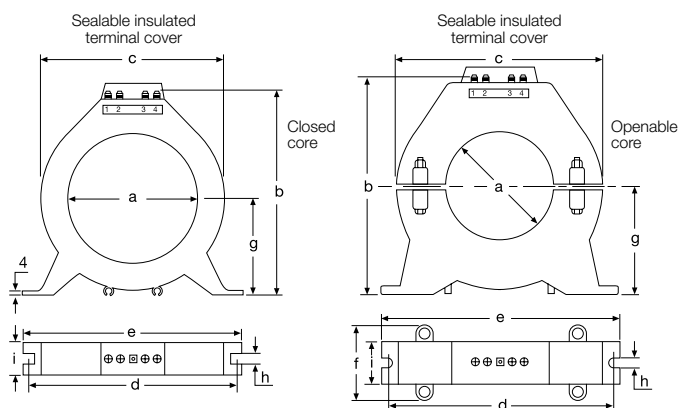
CT-1



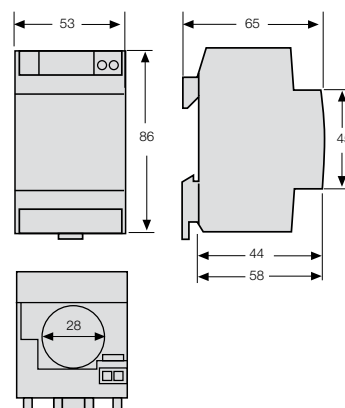
CTD-1



DIMENSIONS CT-1 (mm)



DIMENSIONS CTD-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 |

SURGE PROTECTION VP Class II

Introduction

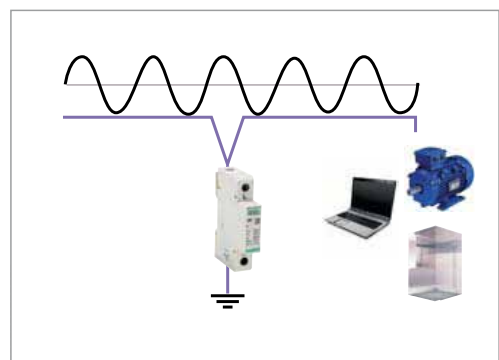
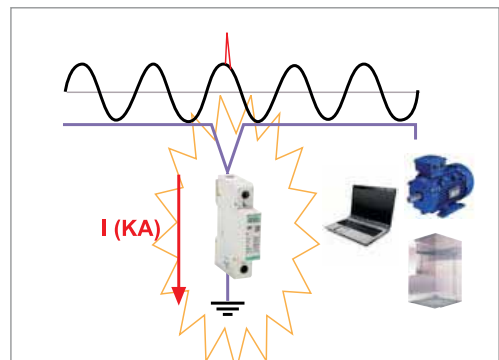
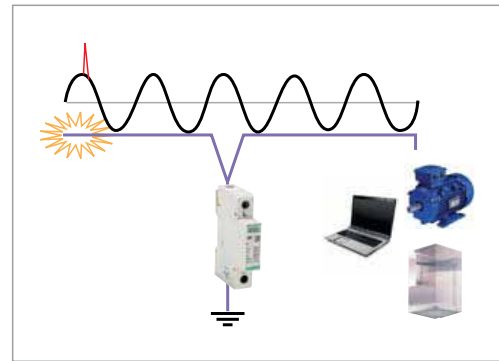
The Class II VP surge protection relays protect installations and eliminate the effects of power surges. They offer the highest level of security in low voltage lines, continuous processes, domestic and tertiary facilities, etc.

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.



- 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.



| Code | POWER SUPPLY NETWORK | | | | | | | | | |
|--|-----------------------|----------------------------|-------------------|--------------------|----------------------------|--------------------|--------------|--------------------|--------------------|--------------------|
| | 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) | 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 | | | | | | | | | |
| Maximum continuous operating voltage Uc (Vac) | 275 | 250 | 275 | | | | | | | |
| Nominal discharge current (8/20 μs) In (kA) | 20 | | | | | | | | 10 | |
| Maximum discharge current (8/20 μs) Imax (kA) | 40 | | | | | | | | 20 | |
| Protection level Up (kV) | < 1,2 | < 1,5 | < 1,2 | | | | | < 1,0 | | |
| Protection level at 5 kA (kV) | < 1,0 | -- | < 1,0 | | | | | < 0,95 | | |
| Response time ta (ns) | < 25 | <100 | < 25 | | | | | | | |
| Maximum back-up fuse (A gL/gG) | 125 | -- | 125 | | | | | | 100 | |
| N° 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:

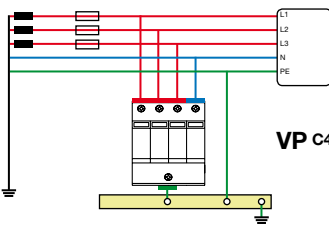
- 1 unit of VP C40 275/1 + 1 unit VP C40 250/NPE → 1F+N
- 2 units of VP C40 275/1 + 1 unit VP C40 250/NPE → 2F+N
- 3 units of VP C40 275/1 + 1 unit VP C40 250/NPE → 3F+N or 3F



WIRING DIAGRAM [mm]

TN-S SYSTEM

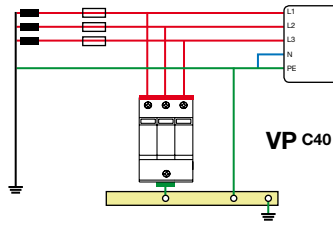
3F + N + PE



VP C40 275/4

TN-C SYSTEM

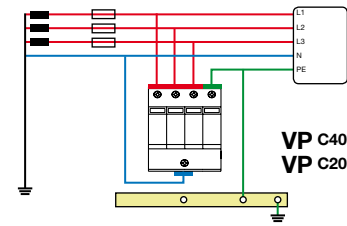
3F + NPE



VP C40 275/3

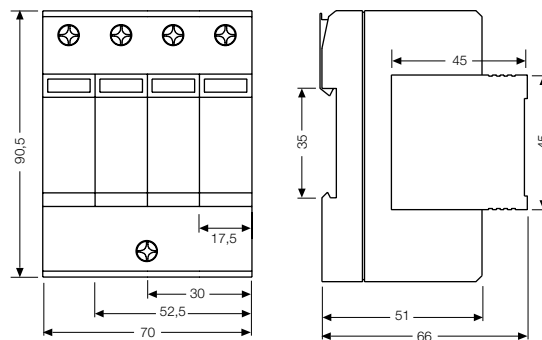
TT SYSTEM

3F + N



VP C40 275/3+NPE
VP C20 275/3+NPE

DIMENSIONS [mm]



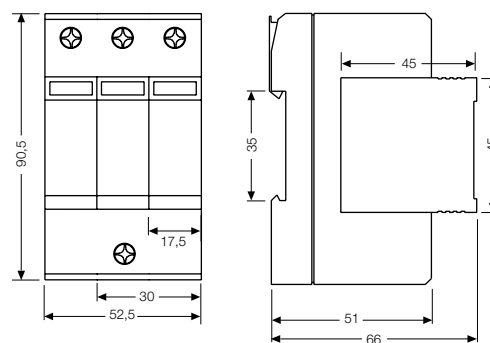
*Width depending on number of modules

- 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.



| Code | PHOTOVOLTAIC APPLICATIONS | |
|--|---------------------------|---------------|
| | 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 $U_{oc,max}$ (Vdc) | < 500 | < 1000 |
| Maximum continuous operating voltage U_c (L-PE) (Vdc) | 250 | 500 |
| Nominal discharge current (8/20 μ s) I_n (kA) | 20 | |
| Maximum discharge current (8/20 μ s) I_{max} (kA) | 40 | |
| Protection level U_p (kV) | < 1,8 | < 3,6 |
| Protection level at 5 kA (kV) | < 1,5 | < 3 |
| Response time t_a (ns) | < 25 | < 25 |
| Maximum back-up fuse (A gL/gG) | 125 | 125 |
| N° Modules | 3 | 3 |
| Plug-in modules code | 41614 | 41616 |

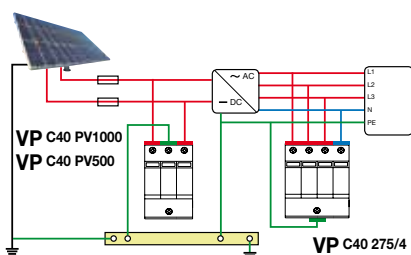
DIMENSIONS (mm)



WIRING DIAGRAM (mm)

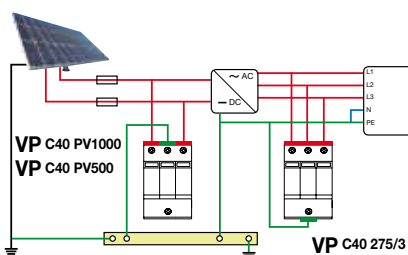
TN-S SYSTEM

3F + N + PE



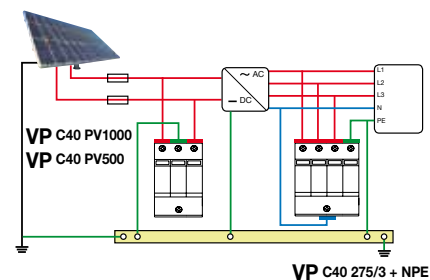
TN-C SYSTEM

3F + NPE



TT SYSTEM

3F + N



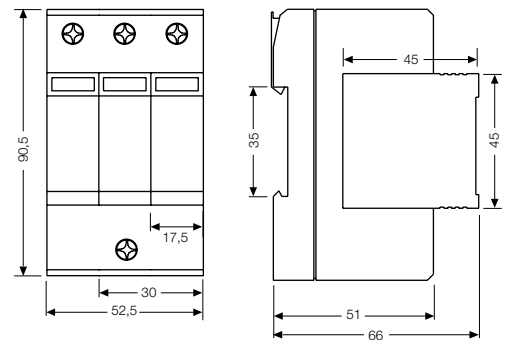
Wind power applications

- 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.

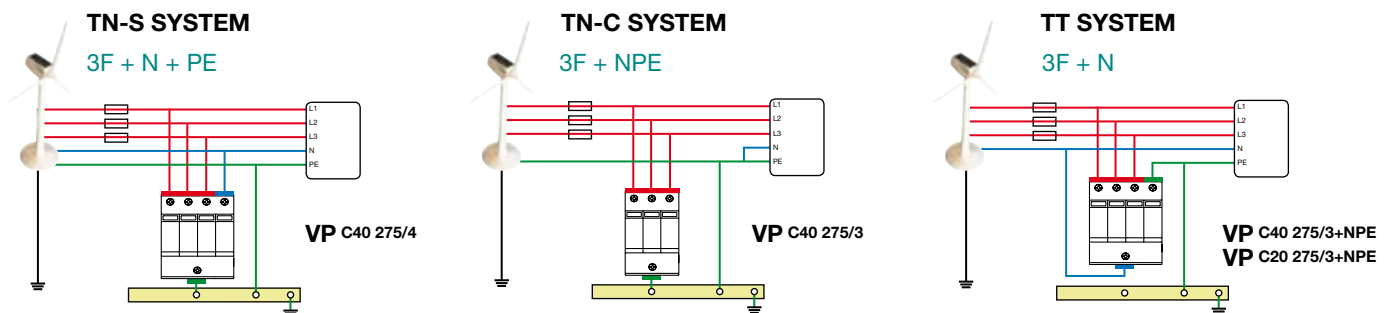


| WIND POWER APPLICATIONS | |
|---|----------------------------|
| Code | 41622 |
| Model | VP C30 600/3 |
| According to IEC 61643-1 (Class) | II |
| Type of network | TT/TN |
| Eolic line | 2F+N+PE 3F+PE 3F+NPE |
| Nominal voltage Un (Vca) | 600 |
| Maximum continuous operating voltage Uc (Vca) | 600 |
| Nominal discharge current (8/20 μs) In (kA) | 15 |
| Maximum discharge current (8/20 μs) I_{max} (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 |
| N° modules | 3 |
| Plug-in modules code | 41623 |

DIMENSIONS (mm)



WIRING DIAGRAM (mm)





S O L U T I O N S



CUSTOMIZED PRODUCTS AND BRAND LABELING

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.





power T&D



POWER TRANSMISSION & DISTRIBUTION

- ▣ Primary distribution and machines
- ▣ Secondary Distribution



FANOX is a well-known manufacturer of industrial electronic products specialised in modern systems of protection and control. The main aim of the Company is to offer an excellent quality and innovative products and services at very competitive prices.



▣ PRIMARY DISTRIBUTION AND MACHINES

SIL: Line protection

SIM: Protection system of motors & generators

▣ SECONDARY DISTRIBUTION

SIA: Self-powered protection system

SMTU: Faults indicator



“

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.

”



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

