domestic and industrial automation    «F&F»

**Products catalogue**

**2022**

**«F&F»**

domestic and industrial automation

# About the company

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The F&F company was established in 1992 on the basis of a trade and service company operating in the electronics industry.

Previous marketing and technical experience in the field of electronics and electrical engineering allowed us to create a production company offering a wide range of electronic control devices.

Initially, the offer of our company consisted mainly of twilight switches, automatic staircase lighting time switches, and phase failure sensors.

The company's strategy is based on the continuous expansion of the offer and seizing attractive market niches.

Currently, the F&F offer includes a wide range of devices for home and industrial automation.

The company's research and development department's cooperation with the scientific community and end customers leads to the dynamic development of the offer and allows us to create devices with an increasing degree of technological advancements, such as the PLC MAX series of programmable logic controllers and the F&Home smart home system.

Currently, the F&F is a well-known brand in Poland, and the products manufactured under it are also sold in Russia, Ukraine, Belarus, Lithuania, Latvia, Czech Republic, Slovakia, Hungary, Romania, Serbia, Germany, Greece, Ireland, Portugal, Spain, Sweden, Norway, Australia, and the United States.

# New products 2022

# Table of contents

# Legend

## Momentary buttons

|  | single button |
|---|---|
|  | single button with backlight |
|  | double button |

## Setters

|  | voltage source |
|---|---|
|  | current source |
|  | pulse generator |
|  | control timer |
|  | working hour reader |
|  | potentiometer |
|  | dimmer |

## Temperature sensors

|  | with current output |
|---|---|
|  | digital sensor of temperature DS1820 |
|  | PTC probe |
|  | KTY probe |
|  | PT100 probe |
|  | K400 probe |
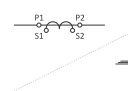
## Other sensors

|  | brightness sensor |
|---|---|
|  | wind sensor |
|  | precipitation sensor |
|  | shock sensor |
|  | flood sensor |

## Signal outputs

|  | SO pulse output |
|---|---|
|  | communication output Modbus RS-485 |
|  | communication output M-Bus |
|  | voltmeter |
|  | ammeter |
|  | OC transistor key |

## Additional markings

|  | transformer |
|---|---|
|  | switchboard |

## Power sources

|  | battery |
|---|---|
| 9÷30 V DC | power supply |

## Receivers

|  | LED |
|---|---|
|  | LED stripe |
|  | 1-Phase motor |
|  | 3-Phase motor |
|  | boiler |
|  | fan |
|  | light bulb |
|  | roller blind |
|  | gate |
|  | heater |
|  | kettle |
|  | iron |
|  | washing machine |
|  | oven |
|  | pomp |
|  | power socket |
|  | alarm indication |
|  | fuse |
|  | resistive receiver |
|  | relay/contactor |

# Section I
## Building automation devices

# Chapter 1

# Twilight switches

## Purpose

Twilight switches are used to automatically switch on the lighting of streets, squares, exhibitions, advertisements, etc. at dusk and to switch it off at dawn.

## Functioning

The switch is placed in a place with constant access to natural daylight, and under the influence of changes in the lighting intensity at dusk and dawn, it switches the lighting on and off. The lighting switching time can be adjusted by the user with a potentiometer. Turning the potentiometer towards the "moon" - will switch the lighting later, while turning it towards the "sun" - will switch the lighting earlier. The twilight switch has a system that delays switching on and off of the lighting, thus reducing the impact of various disturbances (such as atmospheric discharges) on the operation of the machine.

| Product | Power supply voltage | Maximum current load(AC-1) | Configuration of the contacts | Separation of the contact | Photosensitive element | Terminal | Installation | Page |
|---|---|---|---|---|---|---|---|---|
| AWZ | 195÷253 V AC | 16 A | 1×NO | – | built-in | 4.0 mm² screw terminals | surface-mounted | 10 |
| AWZ 24 V | 21÷27 V AC/DC | 16 A | 1×NO | – | built-in | 4.0 mm² screw terminals | surface-mounted | 10 |
| AWZ-30 | 195÷253 V AC | 30 A | 1×NO | – | built-in | 6.0 mm² screw terminals | surface-mounted | 10 |
| AZH 230 V | 195÷253 V AC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH 24 V | 21÷27 V AC/DC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH 12 V | 11÷14 V AC/DC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH-106 230 V | 195÷253 V AC | 16 A | 1×NO | – | built-in | OMY 3×1 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH-106 24 V | 21÷27 V AC/DC | 16 A | 1×NO | – | built-in | OMY 3×1 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH-106 12 V | 11÷14 V AC/DC | 16 A | 1×NO | – | built-in | OMY 3×1 mm²; l. 0.8 m | surface-mounted | 9 |
| AZH-C 230 V | 195÷253 V AC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.45 m | surface-mounted | 9 |
| AZH-C 24 V | 21÷27 V AC/DC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.45 m | surface-mounted | 9 |
| AZH-LED | 195÷253 V AC | 10 A | 1×NO | – | built-in | OMY 3×0.75 mm²; l. 0.8 m | surface-mounted | 9 |
| **AZH-MINI-LED** | **165÷265 V AC** | **10 A** | **1×NO** | **–** | **built-in** | **OMY 3×0.75 mm²; l. 0.8 m** | **surface-mounted** | **8** |
| AZH-S 230 V | 195÷253 V AC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | surface-mounted | 10 |
| AZH-S 24 V | 21÷27 V AC/DC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | surface-mounted | 10 |
| AZH-S 12 V | 11÷14 V AC/DC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | surface-mounted | 10 |
| AZH-S PLUS | 195÷253 V AC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | surface-mounted | 10 |
| AZH-S PLUS 24 V | 21÷27 V AC/DC | 16 A | 1×NO | – | external probe PLUS | 4.0 mm² screw terminals | surface-mounted | 10 |
| AZ-B 230 V | 195÷253 V AC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | for TH-35 rail | 10 |
| AZ-B 24 V | 21÷27 V AC/DC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | for TH-35 rail | 10 |
| AZ-B PLUS 230 V | 195÷253 V AC | 16 A | 1×NO | – | external probe PLUS | 4.0 mm² screw terminals | for TH-35 rail | 10 |
| AZ-B UNI | 12÷264 V AC/DC | 16 A | 1×NO | – | external probe ø10 | 4.0 mm² screw terminals | for TH-35 rail | 10 |
| AZ-B UNI PLUS | 12÷264 V AC/DC | 16 A | 1×NO | – | external probe PLUS | 4.0 mm² screw terminals | for TH-35 rail | 10 |
| AZ-112 | 195÷253 V AC | 16 A | 1×NO | ● | external probe ø10 | 2.5 mm² screw terminals | for TH-35 rail | 11 |
| AZ-112 24 V | 21÷27 V AC/DC | 16 A | 1×NO | ● | external probe ø10 | 2.5 mm² screw terminals | for TH-35 rail | 11 |
| AZ-112 PLUS | 195÷253 V AC | 16 A | 1×NO | ● | external probe PLUS | 2.5 mm² screw terminals | for TH-35 rail | 11 |
| AZ-112 PLUS 24 V | 21÷27 V AC/DC | 16 A | 1×NO | ● | external probe ø10 | 2.5 mm² screw terminals | for TH-35 rail | 11 |

(!) Make sure that the switched-on light source does not illuminate the sensor of the twilight switch.
Do not route the probe connection cable close to a parallel, live or high-current cable.

(!) The twilight switches can be specifically manufactured for voltages other than those specified in the technical data table, for example, 12 V, 24 V, 48 V, 110 V AC/DC and others.

(!) The contact current provided in the technical data is a maximum value and may be subject to restrictions.
If the information provided shows that the relay on the device is insufficient, it is advisable to use an external switching element (such as a contactor) suitable for switching large surge currents.

# AZH-MINI-LED

Miniature, hermetically sealed, for LED lightening.
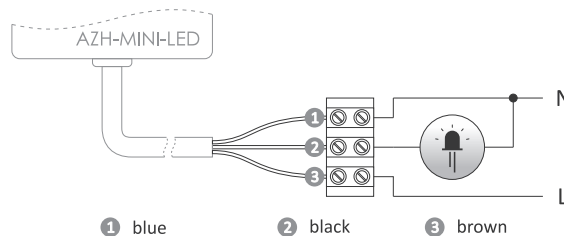
NEW!

AZH-MINI-LED

① blue   ② black   ③ brown

| | |
|---|---|
| power supply | 165÷265 V AC |
| maximum load current (AC-1) | 10 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| resistance to current surges | 120 A/20 ms |
| power consumption | 0.6 W |
| terminal | OMY 3×0.75 mm², l=0.8 m |
| working temperature | -25÷50°C |
| dimensions | 64×42×30 mm |
| mounting | surface |
| ingress protection | IP65 |

# AZH-LED

Hermetically sealed.
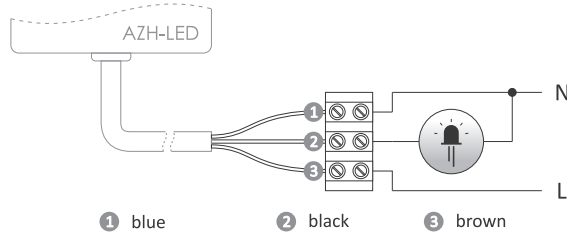


❶ blue    ❷ black    ❸ brown

| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 10 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| resistance to current surges | 160 A/20 ms |
| power consumption | 0.56 W |
| terminal | OMY 3×0.75 mm², l= 0.8 m |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP65 |

# AZH / AZH 12V / AZH 24V

Hermetically sealed.



❶ blue    ❷ black    ❸ brown
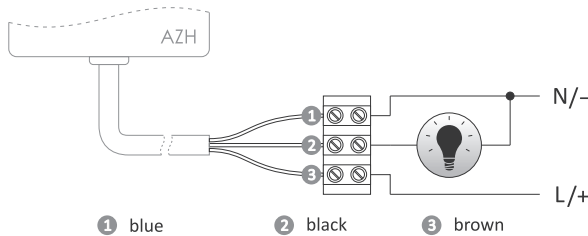
| power supply | |
|---|---|
| AZH | 195÷253 V AC |
| AZH 12 V | 11÷14 V AC/DC |
| AZH 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 10 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | OMY 3×0.75 mm², l= 0.8 m |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP65 |

# AZH-106 / AZH-106 24V / AZH-106 12V

Hermetically sealed.



❶ blue    ❷ black    ❸ brown
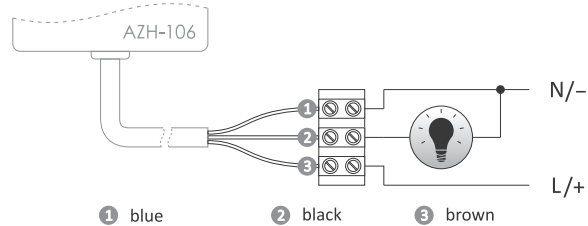
| power supply | |
|---|---|
| AZH-106 | 195÷253 V AC |
| AZH-106 24 V | 21÷27 V AC/DC |
| AZH-106 12 V | 11÷14 V AC/DC |
| maximum load current (AC-1) | 16 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | OMY 3×1 mm², l= 0.8 m |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP65 |

# AZH-C / AZH-C 24V

Compact, hermetically sealed.



❶ blue    ❷ black    ❸ brown
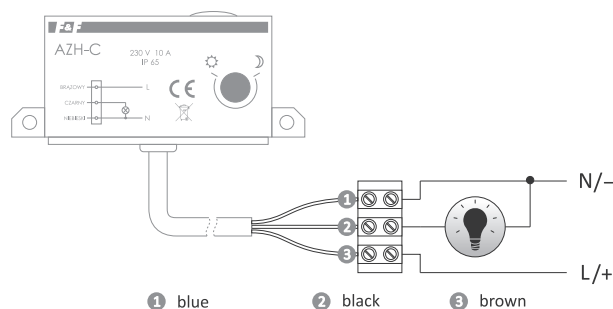
| power supply | |
|---|---|
| AZH-C | 195÷253 V AC |
| AZH-C 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 10 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | OMY 3×0.75 mm², l= 0.45 m |
| working temperature | -25÷50°C |
| dimensions | 81×33×25 mm |
| mounting | surface |
| ingress protection | IP65 |

# AWZ / AWZ 24V

Hermetically sealed. With internal connection.
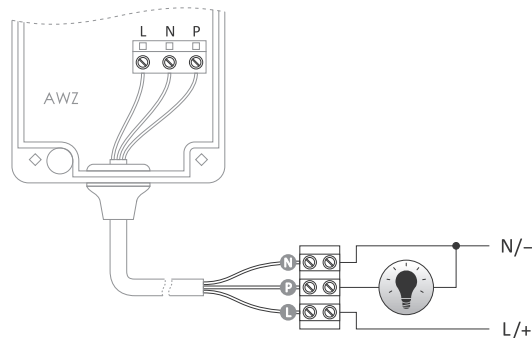


| power supply | |
|---|---|
| AWZ | 195÷253 V AC |
| AWZ 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.8 W |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 60×85×35 mm |
| mounting | surface |
| ingress protection | IP65 |

# AWZ-30

Hermetically sealed. With internal connection.
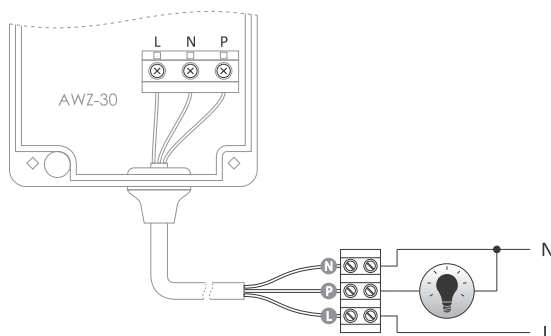


| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 30 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.8 W |
| terminal | 6.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 76×85×35 mm |
| mounting | surface |
| ingress protection | IP65 |

## With an external hermetically sealed probe

# AZH-S / AZH-S 12V / AZH-S 24V / AZH-S PLUS / AZH-S PLUS 12V / AZH-S PLUS 24V

External hermetically sealed probe ⌀10 (AZH-S, AZH-S 12 V, AZH-S 24 V) or PLUS (AZH-S PLUS, AZH-S PLUS 24 V) included in the set (p. 11).
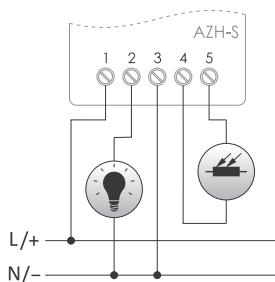


| power supply | |
|---|---|
| AZH-S | 195÷253 V AC |
| AZH-S 12 V | 11÷14 V AC/DC |
| AZH-S 24 V/AZH-S PLUS 24 V | 21÷27 V AC/DC |
| AZH-S PLUS | 195÷253 V AC |
| maximum load current (AC-1) | 16 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

# AZ-B / AZ-B 24V / AZ-B UNI / AZ-B PLUS / AZ-B PLUS UNI

External hermetically sealed probe ⌀10 (AZ-B, AZ-B 24 V, AZ-B UNI) or PLUS (AZ-B PLUS, AZ-B PLUS UNI) included in the set (p. 11).
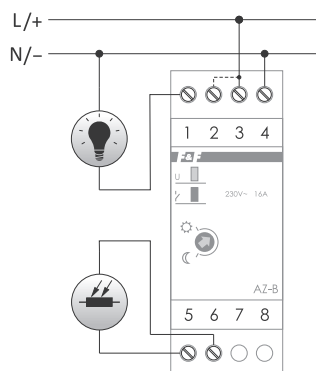


| power supply | |
|---|---|
| AZ-B/AZ-B PLUS | 195÷253 V AC |
| AZ-B 24 V | 21÷27 V AC/DC |
| AZ-B UNI/AZ-B PLUS UNI | 12÷264 V AC/DC |
| maximum load current (AC-1) | 16 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# AZ-112 / AZ-112 24V / AZ-112 PLUS / AZ-112 PLUS 24V / AZ-112-LED

External hermetically sealed probe ø10 or PLUS included in the set (p. 11).
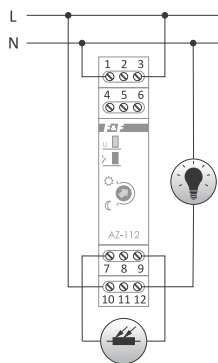
| power supply | |
|---|---|
| AZ-112/AZ-112 PLUS | 195÷253 V AC |
| AZ-112 24 V/AZ-112 PLUS 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| twilight activation (adjustable) | 2÷1000 lx |
| hysteresis | approx. 15 lx |
| switching ON delay | approx. 10 s |
| switching OFF delay | approx. 20 s |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

| Device | Application |
|---|---|
| AZ-112 | incandescent lighting |
| AZ-112-LED | incandescent lighting + LED |

## External hermetically sealed probes

# Sonda PLUS

**Purpose**

Used in sets with: AZH-S PLUS, AZ-B PLUS, AZ-B PLUS UNI, AZ-112 PLUS. Also available separately.

64 mm
42 mm
PG7 cable gland
internal airtightening flange
30 mm
lid with silicone gasket
fixing hole to the ground
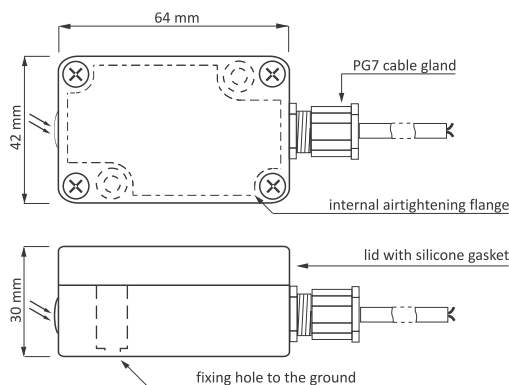
The photosensitive sensor in a special, small plastic box. Connected with round cable, max. ø7 (such as 2×0.5 mm²), through the PG7 cable gland.
Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

# Sonda ø10

**Purpose**

Used in sets with: AZH-S, AZ-B, AZ-B UNI, AZ-112. Also available separately.

38 mm
20 mm
1000 mm
Ø9,6 mm
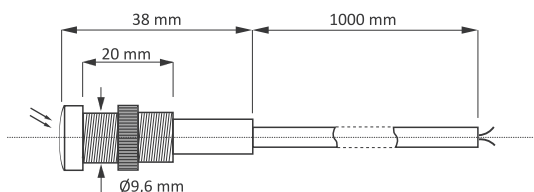
A small, easy to install photosensitive sensor, with 2×0.5 mm² 1-meter round cable that can be extended up to 10 m.

# Devices related to twilight switches

## PCZ – Astronomical clocks

The astronomical clock, based on information about the current date and geographical coordinates of the place of its installation, automatically determines the daily, program points of switching the lighting on and off.

**NFC wireless communication**
The ability to wirelessly read and write the clock configuration via an Android phone equipped with the NFC communication module.

**PCZ CONFIGURATOR app**
Free app for Android phones and tablets equipped with NFC wireless communication module.
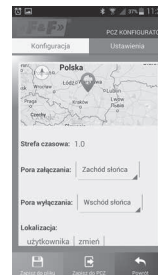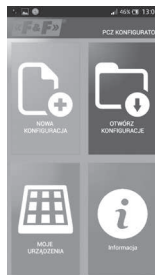
**More information on p. 130**

Android app

## MB-LS-1 Light brightness level sensor with Modbus RTU output

Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum Ø7 (for example: 4×0.5 mm²). Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

The sensor measures the illumination brightness in the range of visible light and shares the received value (lx) via the Modbus RTU communication interface.

**More information on p. 290**

| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum current consumption | 40 mA |
| measuring range | 1÷64000 lx |
| measurement accuracy | ±5% |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power consumption | 0.3 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -40÷70°C |
| dimensions | 42×64×30 mm |
| mounting | surface |
| ingress protection | IP65 |

### Interesting and practical

L
N

AZ-...
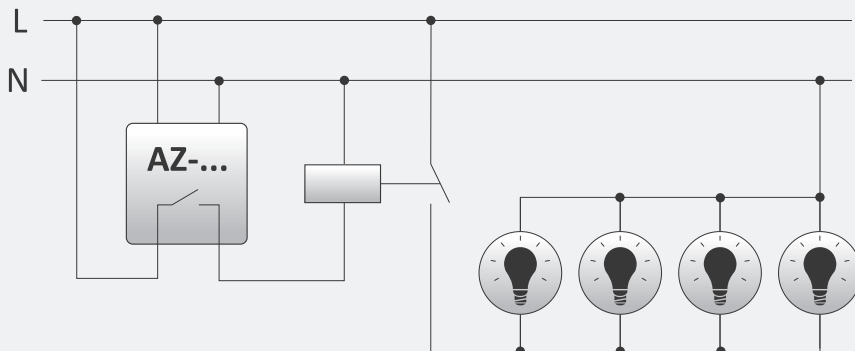
Control system of a contactor that switches on receivers with total current consumption exceeding the permissible contact load of a twilight switch

L
N

AZ-...

MST-...
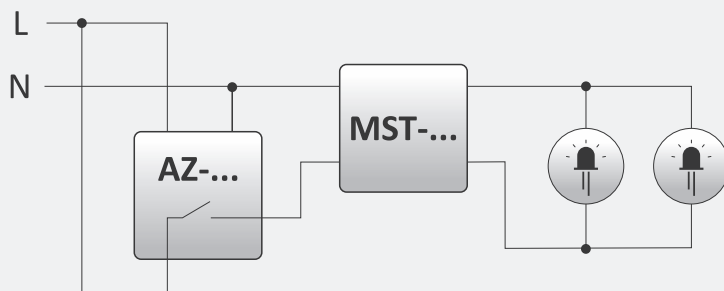
Application of MST-01/MST-02 limiters to reduce the current surge at the moment of switching on the LED lighting

# Chapter 2
# Automatic staircase lighting time switches

## Purpose

Automatic staircase lighting time switches are designed to control the lighting of corridors and staircases.

## Functioning

The automatic staircase lighting time switch switched on with the (bell) button, maintains the lighting for the preset time (from 30 s to 10 min.). After the set time has elapsed, the device will switch off the lighting automatically. When the lighting is switched off, it can be switched on again. The automatic staircase lighting time switches cannot work directly with fluorescent lamps, compact fluorescent lamps and other lamps with electronic starters.

| Product | Supply voltage | Maximum current load(AC-1) | Configuration of the contacts | Separation of the contact | Anti-lock | Signalization of switching | Cooperation with backlit buttons | Installation | Page |
|---|---|---|---|---|---|---|---|---|---|
| AS-B 24 | 21÷27 V AC/DC | 16 A | 1×NO | – | – | – | – | for TH-35 rail | 14 |
| AS-B 42 | 38÷46 V AC | 16 A | 1×NO | – | – | – | – | for TH-35 rail | 14 |
| AS-B 110 | 100÷120 V AC | 16 A | 1×NO | – | – | – | – | for TH-35 rail | 14 |
| AS-B 220 | 195÷253 V AC | 16 A | 1×NO | – | – | – | ● | for TH-35 rail | 14 |
| AS-212 | 195÷253 V AC | 16 A | 1×NO | – | – | – | ● | for TH-35 rail | 14 |
| AS-214 | 21÷27 V AC/DC | 16 A | 1×NO | – | – | ● | – | for TH-35 rail | 14 |
| **AS-220T** | **195÷253 V AC** | **16 A** | **1×NO** | – | – | ● | ● | **for TH-35 rail** | 15 |
| AS-221T | 195÷253 V AC | 10 A | 1×NO | – | – | ● | ● | for TH-35 rail | 16 |
| AS-222T | 195÷253 V AC | 10 A | 1×NO | – | ● | ● | – | for TH-35 rail | 16 |
| AS-223 | 165÷265 V AC | 16 A | 1×NO/NC | ● | ● | – | ● | for TH-35 rail | 15 |
| AS-224 | 21÷27 V AC/DC | 16 A | 1×NO | ● | ● | – | – | for TH-35 rail | 15 |
| AS-225 | 9÷30 V DC | 4 A | OC (transistor) | – | – | – | – | in flush mounted | 17 |
| **AS-225D** | **9÷30 V DC** | **12×4 A (max 24 A)** | **12×OC (transistor)** | – | – | – | – | **for TH-35 rail** | 18 |
| ASO-24 | 21÷27 V AC/DC | 10 A | 1×NO | – | – | – | – | surface-mounted | 13 |
| ASO-42 | 38÷46 V AC/DC | 1,5 A | 1×NO | – | – | – | – | surface-mounted | 13 |
| ASO-110 | 100÷120 V AC | 10 A | 1×NO | – | – | – | – | surface-mounted | 13 |
| ASO-201 | 195÷253 V AC | 16 A | 1×NO | – | – | – | ● | surface-mounted | 14 |
| ASO-202 | 195÷253 V AC | 16 A | 1×NO | – | ● | – | ● | surface-mounted | 15 |
| ASO-203 | 21÷27 V AC/DC | 16 A | 1×NO | – | ● | – | – | surface-mounted | 15 |
| ASO-204 | 21÷27 V AC/DC | 16 A | 1×NO | – | – | – | – | surface-mounted | 14 |
| ASO-205 | 195÷253 V AC | 10 A | 1×NO | – | – | – | ● | in flush mounted | 14 |
| ASO-220 | 195÷253 V AC | 10 A | 1×NO | – | – | – | ● | surface-mounted | 13 |

(!) The automatic staircase switches can be specifically manufactured for voltages other than those specified in the technical data table (12 V, 48 V and 110 V AC/DC and others). Exceptions are units AS-221T and AS-222T.

# ASO-220 / ASO-110 / ASO-42 / ASO-24

With cable connection.
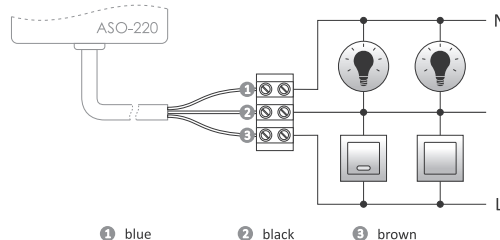


| power supply | |
|---|---|
| ASO-220 | 195÷253 V AC |
| ASO-110 | 100÷120 V AC |
| ASO-42 | 38÷46 V AC/DC |
| ASO-24 | 21÷27 V AC/DC |
| maximum load current (AC-1) | |
| ASO-220/ASO-110 | 10 A |
| ASO-42 | 1.5 A |
| ASO-24 | 10 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.56 W |
| terminal | OMY 3×0.75 mm², l=0.45 m |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP40 |

❶ blue     ❷ black     ❸ brown

(!) Only ASO-220 can work with backlit buttons.

# ASO-201 / ASO-204

With screw terminals.
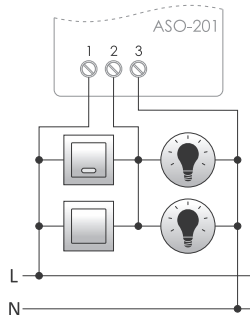


| power supply | |
|---|---|
| ASO-201 | 195÷253 V AC |
| ASO-204 | 21÷27 V AC/DC |
| maximum load current (AC-1) | |
| ASO-201/ASO-204 | 16 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

(!) Only ASO-201 can work with backlit buttons.

# ASO-205

For flush-mounted box.



❶ black   ❷ blue   ❸ brown

| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 10 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.4 W |
| terminal | 3×DY 1 mm², l= 10 cm |
| working temperature | -25÷50°C |
| dimensions | Ø55, h= 13 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

(!) ASO-205 can work with backlit buttons.

# AS-B 220 / AS-B 110 / AS-B 42 / AS-B 24



3-wire installation    4-wire installation
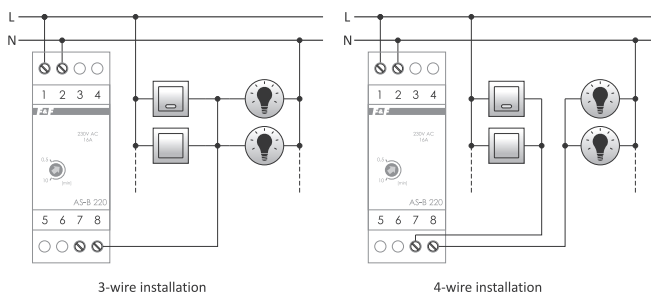
| power supply | |
|---|---|
| AS-B 220 | 195÷253 V AC |
| AS-B 110 | 100÷120 V AC |
| AS-B 42 | 38÷46 V AC |
| AS-B 24 | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 1.2 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) Only AS-B 220 can work with backlit buttons.

# AS-212 / AS-214



3-wire installation    4-wire installation
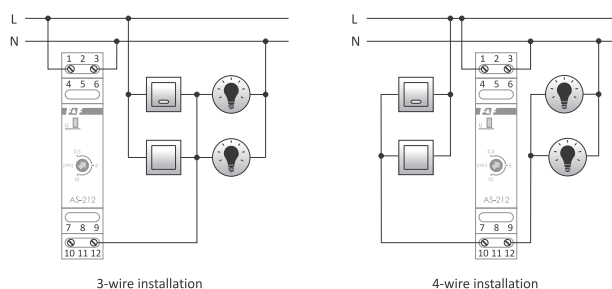
| power supply | |
|---|---|
| AS-212 | 195÷253 V AC |
| AS-214 | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) Only AS-212 can work with backlit buttons.

## With anti-lock feature

**Functioning**

The anti-lock function in the automatic staircase switch prevents the lighting from being switched on continuously in case the switch is locked (for example with a match). If that happens, the automatic switch will switch off the lighting upon the elapse of the preset time. The lighting can be switched on again after the lock has been removed.

# ASO-202 / ASO-203
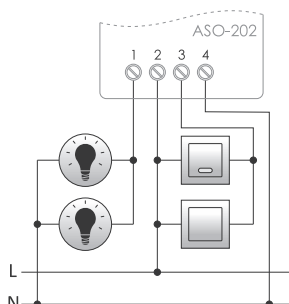


| power supply | |
|---|---|
| ASO-202 | 195÷253 V AC |
| ASO-203 | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

(!) Only ASO-202 can work with backlit buttons.

# AS-223 / AS-224



control pulse: N                control pulse: L
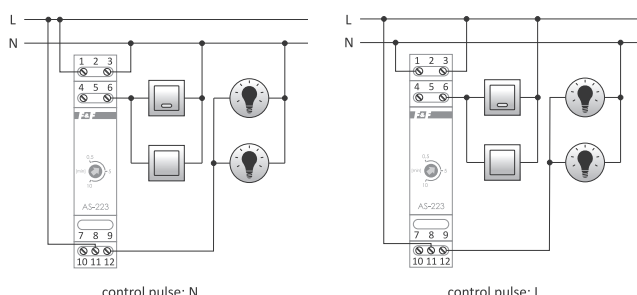
| power supply | |
|---|---|
| AS-223 | 195÷253 V AC |
| AS-224 | 21÷27 V AC/DC |
| maximum load current (AC-1) | 16 A |
| operation delay | 0.1÷0.2 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) Only AS-223 can work with backlit buttons.

## With signalling of light switch-off feature

# AS-220T

**Functioning**

When activated by momentary (bell) switch the automatic staircase switch maintains the lighting for the time set by the potentiometer (from 0.5 min. to 10 min.), after which the brightness of the lighting is reduced to the level set by the potentiometer (from 25 % to 70 %) for 30 seconds. Only after this time will the lighting be switched off completely (to avoid sudden darkness and to secure the time to reach the switch safely). During the reduced brightness the subsequent signal from the switch will switch the lighting back on to full brightness.



3-wire installation                4-wire installation
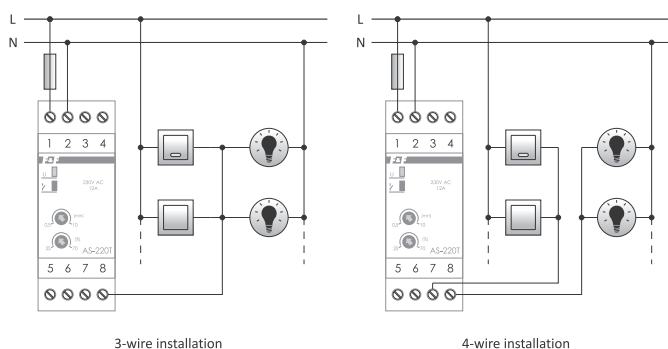
| power supply | 195÷253 V AC |
|---|---|
| contact | 1×NO |
| maximum load current (AC-1) | 12 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 30 s÷10 min. |
| time of reduced brightness | 30 s |
| reduced brightness adjustment | 25÷70% |
| anti-blockade (selected by user) | ON/OFF |
| power consumption | approx. 1 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) AS-220T can work with backlit buttons.

(!) Automatic lighting controller for: the LEDs, fluorescent lamps, compact fluorescent lamps or other lamps with electronic starters may not function properly. This may manifest itself when working with reduced brightness, for example: no dimming, blinking or complete switching off of the lamp.

# AS-221T

## Functioning

The automatic staircase lighting time switch switched on with the (bell) button maintains the lighting for the preset time (from 30 s to 10 min.). Then, after the preset time has elapsed, the brightness of the lighting is reduced by half for approximately 30 s. Only after this time will the lighting be switched off completely (to avoid sudden darkness and to secure the time to reach the switch safely). During the reduced brightness, the next signal from the switch will switch the lighting back on to full brightness.

3-wire installation          4-wire installation
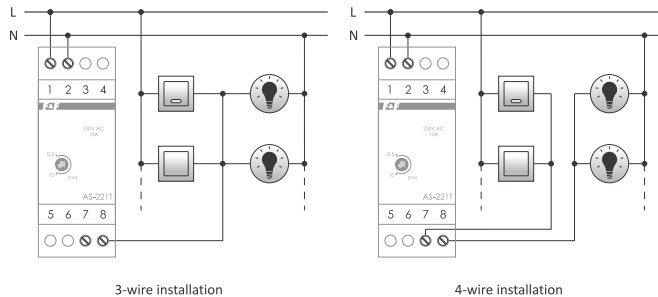
| power supply | 195÷253 V AC |
|---|---|
| maximum load current | 10 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| time of reduced brightness | 30 s |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) AS-221T can work with backlit buttons.

(!) Automatic lighting controller for: the LEDs, fluorescent lamps, compact fluorescent lamps or other lamps with electronic starters may not function properly. This may manifest itself when working with reduced brightness, for example: no dimming, blinking or complete switching off of the lamp.

# AS-222T

## Functioning

The automatic staircase switch switched on with the (bell) button, maintains the lighting for a preset time (from 30 s to 10 min.), after which the brightness of the lighting is reduced by half for approx. 30 s. Only after this time will the lighting be switched off completely (to avoid sudden darkness and to secure the time to reach the switch safely). During the reduced brightness, the next signal from the switch will switch the lighting back on to full brightness. The anti-lock function in the automatic staircase switch prevents the lighting from being constantly on in case the staircase switch is locked (for example with a match). If that happens, the automatic switch will switch off the lighting upon the elapse of the preset time. The lighting can be switched on again after the lock has been removed.

3-wire installation          4-wire installation

| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 10 A |
| operation delay | <1 s |
| switching OFF delay (adjustable) | 0.5÷10 min. |
| time of reduced brightness | 30 s |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) AS-222T cannot work with backlit buttons.

(!) Automatic lighting controller for: the LEDs, fluorescent lamps, compact fluorescent lamps or other lamps with electronic starters may not function properly. This may manifest itself when working with reduced brightness, for example: no dimming, blinking or complete switching off of the lamp.

(!) The automatic staircase switches can be specifically manufactured for voltages other than those specified in the technical data table (12 V, 48 V and 110 V AC/DC and others). Exceptions are units AS-221T and AS-222T.

# Cascading staircase machines

Cascade automatic staircase lighting switches are designed to sequentially control 12/24 V DC stair lighting allowing to achieve the effect of light moving along the stairs together with a person going up or down. Lighting can be activated by push buttons or motion/distance sensors located at the bottom and top of the stairs. Thanks to the smooth setting of the switching time of individual light points and delay time until the next light point is switched on, the lighting can be fully adapted to the walking pace on the stairs.

**Functioning**

Pressing the DOWN button will switch on the lamp 1. After the preset delay time lamp 2 will switch on. When the switch-on time of the lamp 1 has elapsed, the lamp will start to gradually switch off. Transition from lamp 2 to lamp 3,  from lamp 3 to lamp 4, etc., will take place in the same way. When going down the stairs and pressing the UP button, the sequence will be reversed - lamp number 5 will be switched on as the first one, then lamp number 4, etc.

## AS-225 1-channel cascade controller
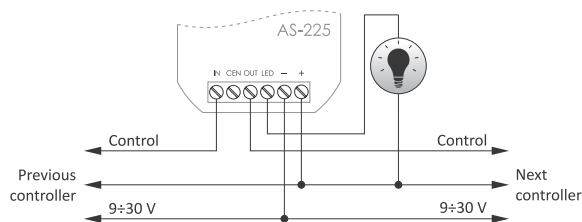


| power supply | 9÷30 V DC |
|---|---|
| output | |
|   type | transistor OC (open collector) |
|   maximum load current | 4 A |
|   maximum voltage | 30 V DC |
| input type | potential-free |
| operation delay | <1 s |
| switching OFF delay Ton (adjustable) | 3÷30s |
| switching ON delay TΔ (adjustable) | 0÷100% Ton |
| power consumption | |
|   standby | 0.3 W |
|   on | 0.5 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -15÷50°C |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

**Purpose**

AS-225 is a controller designed to control a single light point in cascade lighting control systems. It is suitable for installation in a ø60 mm installation box, directly under the controlled light source. The AS-225 connects in series, each two controllers are connected to each other by three wires, thus obtaining the ability to control the desired number of light points.

(!) DRL-12 sensors are dedicated to AS -225 staircase automatic unit. More information on p. 45.
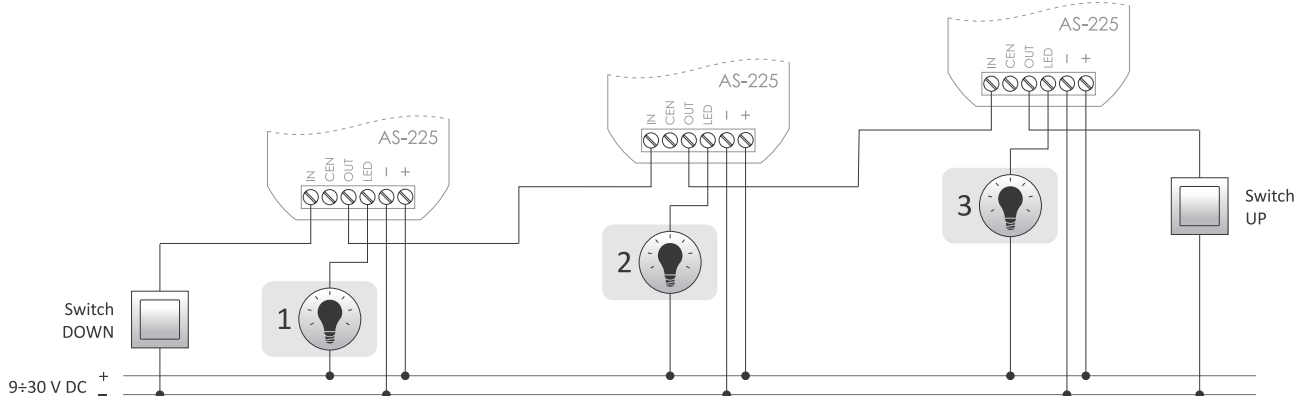


**Functions**

- Control of a multipoint lighting system;
- Ability to create a group from any number of controllers;
- Each of the controllers allows you to set your own switch-on time and the moment when the next segment will start to switch on;
- Switching on of the lighting using various setters: bell button, motion sensor, optical barrier, pressure sensor.
- The command is given potential-free by connecting the IN/OUT input to the "−" level of the power supply;
- Small housing for the installation box - can be mounted directly under the lamp;
- Easy installation (only 3 wires from the controller to controller).

# AS-225D 12-channels cascade controller



| | |
|---|---|
| power supply | 9÷30 V DC |
| output | |
|   channel quantity | 12 |
|   type | OC transistor (open collector) |
|   maximum load current (1 channel) | 4 A |
|   maximum load total (12 channels) | 24 A |
|   maximum voltage | 30 V DC |
| input type | potential-free |
| switching time (1 channel) | 3÷30 s |
| delay of switching on the next channel | 0÷switching time |
| power consumption | |
|   standby | <1 W |
|   on | <4 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -15÷50°C |
| dimensions | 4 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Purpose

AS-225D is an integrated cascade stair lighting controller that allows direct control of up to twelve lighting points.
Thanks to the serial connection of AS-225D controllers, any expansion of the system and control of unlimited number of light points is possible.

!  DRL-12 sensors are dedicated to AS -225D staircase automatic unit. More information on p. 45.
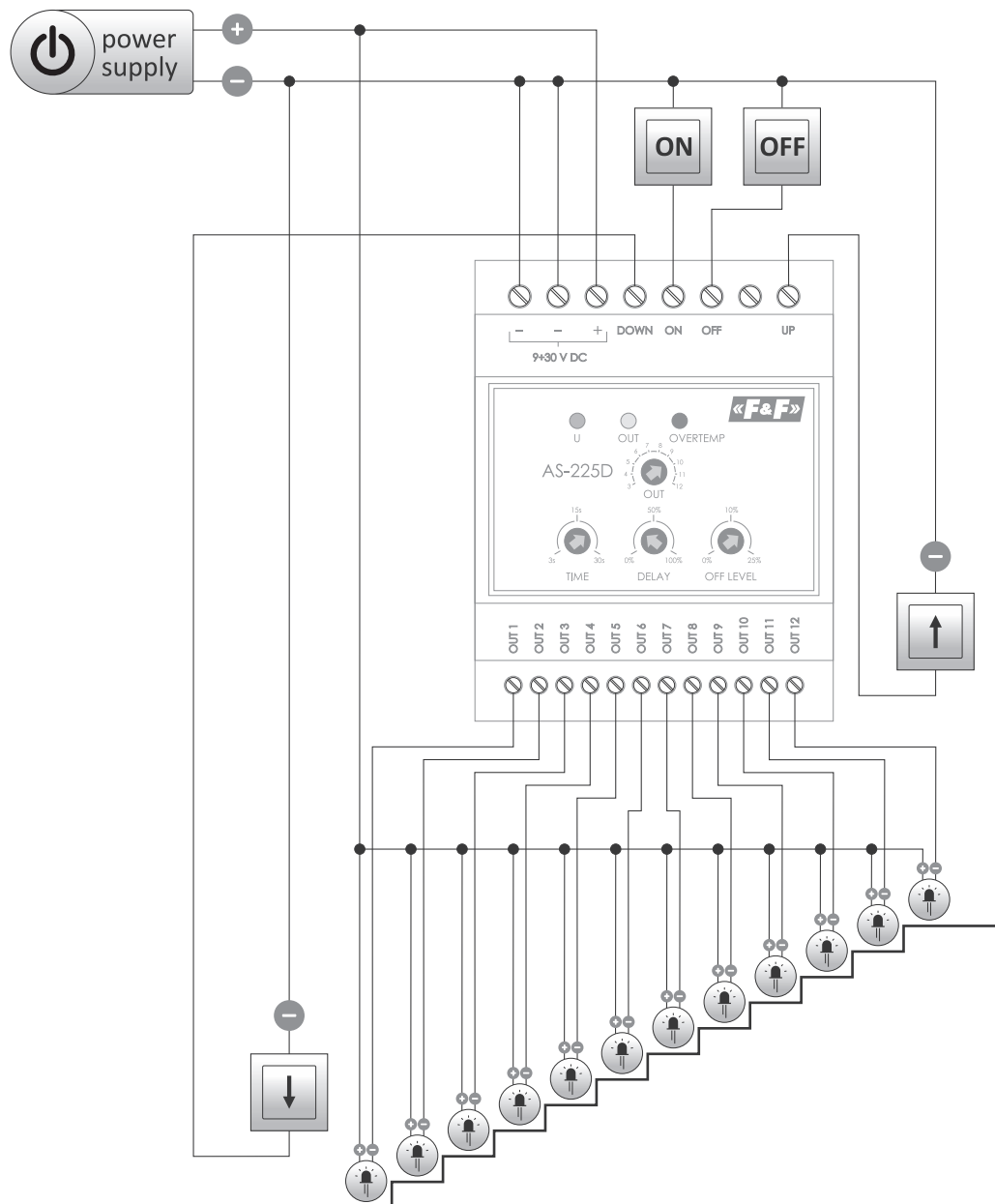
## Functions

- Control of cascading multi-point lighting system;
- The number of controllable light points can be set (from 3 to 12);
- The ability to connect controllers in series to increase the number of controlled circuits;
- Additional control inputs:
  – permanent light switching (such as for cleaning time);
  – light switching lock (such as at a signal from the brightness sensor);
- "Night light" feature – the ability to set the brightness level when off, so that the stairs are never completely dark;
- Installation of the controller on a DIN rail;
- Switching on the lighting using various controllers: bell button, motion sensor, optical barrier, pressure sensor.

## **OMS-635** power limiter with automatic staircase switch, with anti-lock function

The OMS-635 switch is used to maintain the lighting of corridors, staircases or other facilities switched on for a specified period of time, after which the lighting will be switched off automatically and to automatically switch off the power supply of the installation in case of exceeding the set value of the power consumed by the receivers in its circuit.

| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 16 A |
| switch-on time lighting (adjustable) | 0.5÷10 min. |
| power limit | 200÷1000 VA |
| operation delay | 1.5÷ 2 s |
| return supply hysteresis | 2% |
| return supply time | 30 s |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**More information on p. 177**

## Chapter 3

# LED staircase lights

**Purpose**

LED staircase lights are elements of usable and decorative lighting in such places as: stairs, corridors, public buildings, etc. The use of LED staircase lights makes the use of lighting more convenient and cheaper.

**Operation**

LED staircase lights have dimming feature - change of the power supply voltage causes the change of lighting brightness. This feature combined with dedicated automatic control systems such as AS-225 staircase sequential controller (p. 17) or selected F&Wave radio control elements (p. 74) allows you to adjust the brightness and achieve a smooth brightening and dimming effect.

# INGA

With dimming feature.

white

satin

anthracite

| power supply | 12 V DC |
|---|---|
| power consumption | 1.2 W |
| color temperature | |
| warm | 3000 K |
| cold | 6000 K |
| luminous flux | 100 lm |
| number of activations | >40.000 |
| lighting time to 100% | 0.5 s |
| working temperature | 0÷40°C |
| dimensions | |
| external | 74×74×20 mm |
| groove | ø60 mm, depth >40 mm |
| mounting hole | ø60 mm |
| screw spacing | 58 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# LINA

With dimming feature.

white

satin

anthracite

| power supply | 12 V DC |
|---|---|
| power consumption | 1.2 W |
| color temperature | |
| warm | 3000 K |
| cold | 6000 K |
| luminous flux | 100 lm |
| number of activations | >40.000 |
| lighting time to 100% | 0.5 s |
| working temperature | 0÷40°C |
| dimensions | |
| external | 85×75×20 mm |
| groove | ø60 mm, depth >40 mm |
| mounting hole | ø60 mm |
| screw spacing | 58 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# MAYA

With dimming feature.

white

satin

anthracite

| power supply | 12 V DC |
|---|---|
| power consumption | 1.2 W |
| color temperature | |
| warm | 3000 K |
| cold | 6000 K |
| luminous flux | 100 lm |
| number of activations | >40.000 |
| lighting time to 100% | 0.5 s |
| working temperature | 0÷40°C |
| dimensions | |
| external | 85×75×20 mm |
| groove | ø60 mm, depth >40 mm |
| mounting hole | ø60 mm |
| screw spacing | 58 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# VIKA

With dimming feature.
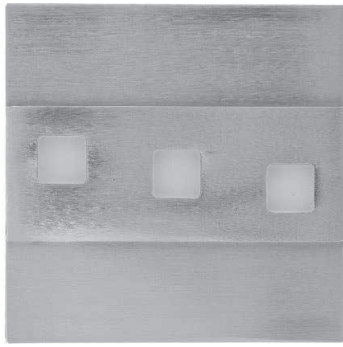

satin


white
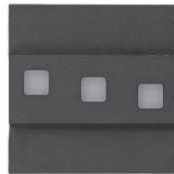

anthracite

| power supply | 12 V DC |
|---|---|
| power consumption | 1.2 W |
| color temperature | |
|   warm | 3000 K |
|   cold | 6000 K |
| luminous flux | 100 lm |
| number of activations | >40.000 |
| lighting time to 100% | 0.5 s |
| working temperature | 0÷40°C |
| dimensions | |
|   external | 75×75×20 mm |
|   groove | ø60 mm, depth >40 mm |
|   mounting hole | ø60 mm |
|   screw spacing | 58 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## Summary of product symbol designations

| Product name | Inga | | | | | | Lina | | | | | | Maya | | | | | | Vika | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Color of the housing | satin | | white | | anthracite | | satin | | white | | anthracite | | satin | | white | | anthracite | | satin | | white | | anthracite | |
| Color temp. | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm | cold | warm |
| LS-ISC | • | | | | | | | | | | | | | | | | | | | | | | | |
| LS-ISW | | • | | | | | | | | | | | | | | | | | | | | | | |
| LS-IWC | | | • | | | | | | | | | | | | | | | | | | | | | |
| LS-IWW | | | | • | | | | | | | | | | | | | | | | | | | | |
| LS-IAC | | | | | • | | | | | | | | | | | | | | | | | | | |
| LS-IAW | | | | | | • | | | | | | | | | | | | | | | | | | |
| LS-LSC | | | | | | | • | | | | | | | | | | | | | | | | | |
| LS-LSW | | | | | | | | • | | | | | | | | | | | | | | | | |
| LS-LWC | | | | | | | | | • | | | | | | | | | | | | | | | |
| LS-LWW | | | | | | | | | | • | | | | | | | | | | | | | | |
| LS-LAC | | | | | | | | | | | • | | | | | | | | | | | | | |
| LS-LAW | | | | | | | | | | | | • | | | | | | | | | | | | |
| LS-MSC | | | | | | | | | | | | | • | | | | | | | | | | | |
| LS-MSW | | | | | | | | | | | | | | • | | | | | | | | | | |
| LS-MWC | | | | | | | | | | | | | | | • | | | | | | | | | |
| LS-MWW | | | | | | | | | | | | | | | | • | | | | | | | | |
| LS-MAC | | | | | | | | | | | | | | | | | • | | | | | | | |
| LS-MAW | | | | | | | | | | | | | | | | | | • | | | | | | |
| LS-VSC | | | | | | | | | | | | | | | | | | | • | | | | | |
| LS-VSW | | | | | | | | | | | | | | | | | | | | • | | | | |
| LS-VWC | | | | | | | | | | | | | | | | | | | | | • | | | |
| LS-VWW | | | | | | | | | | | | | | | | | | | | | | • | | |
| LS-VAC | | | | | | | | | | | | | | | | | | | | | | | • | |
| LS-VAW | | | | | | | | | | | | | | | | | | | | | | | | • |

Legend (sample markings):
The LS-ISC index means: LS – staircase light, I – Inga (product name), S – satin (housing color), C – cold (color temperature);
The LS-VAW index means: LS – staircase light, I – Vika (product name), A – anthracite (housing color), W – warm (color temperature);
Cold color temperature (cold) => approx. 6000 K;
Warm color temperature (warm) => approx. 3000 K.

## Related devices

### AS-225  with sequential switching function

The AS-225 automatic switch is a controller for building a multipoint staircase lighting control system.

### AS-225D  12-channels cascade controller

AS-225D is an integrated cascade stair lighting controller that allows direct control of up to twelve lighting points.

### DRL-12  laser distance sensor

DRL-12 with a laser distance sensor operating in the range up to 2 m, a dedicated 12 V lighting control, for example, stairs, corridors, etc.

# Chapter 4

# Glass panels

**Purpose**

A product family of GP panels made of high quality polished glass can be a very elegant and functional part of any home.
The external white spot backlight gently brightens when you move your hand closer to it in order to indicate the location of the touch sensors.
Button selection is indicated by switching on a spot backlight in orange. The backlight brightness can be adjusted to suit your individual needs.
Panels can be combined with a wide range of actuator modules including: low-voltage automation controllers, 230 V bistable relays, roller shutter controllers, 230 V and LED lighting controllers, F&Wave remote control transmitters, and integrated with F&Home and F&Home Radio smart systems.

**Common characteristics**

GP panels are available in white and black, in the following sizes:
• single (81×81×12 mm), integrated with one control module;
• double (162×81×12 mm), allowing the connection of any two control modules;
• triple (243×81×12 mm), allowing the connection of any three control modules.
Single panels, along with executive modules, are installed in standard ⌀60 mm installation boxes.
Larger panels are installed accordingly: in double and triple installation boxes supplied with the panel.
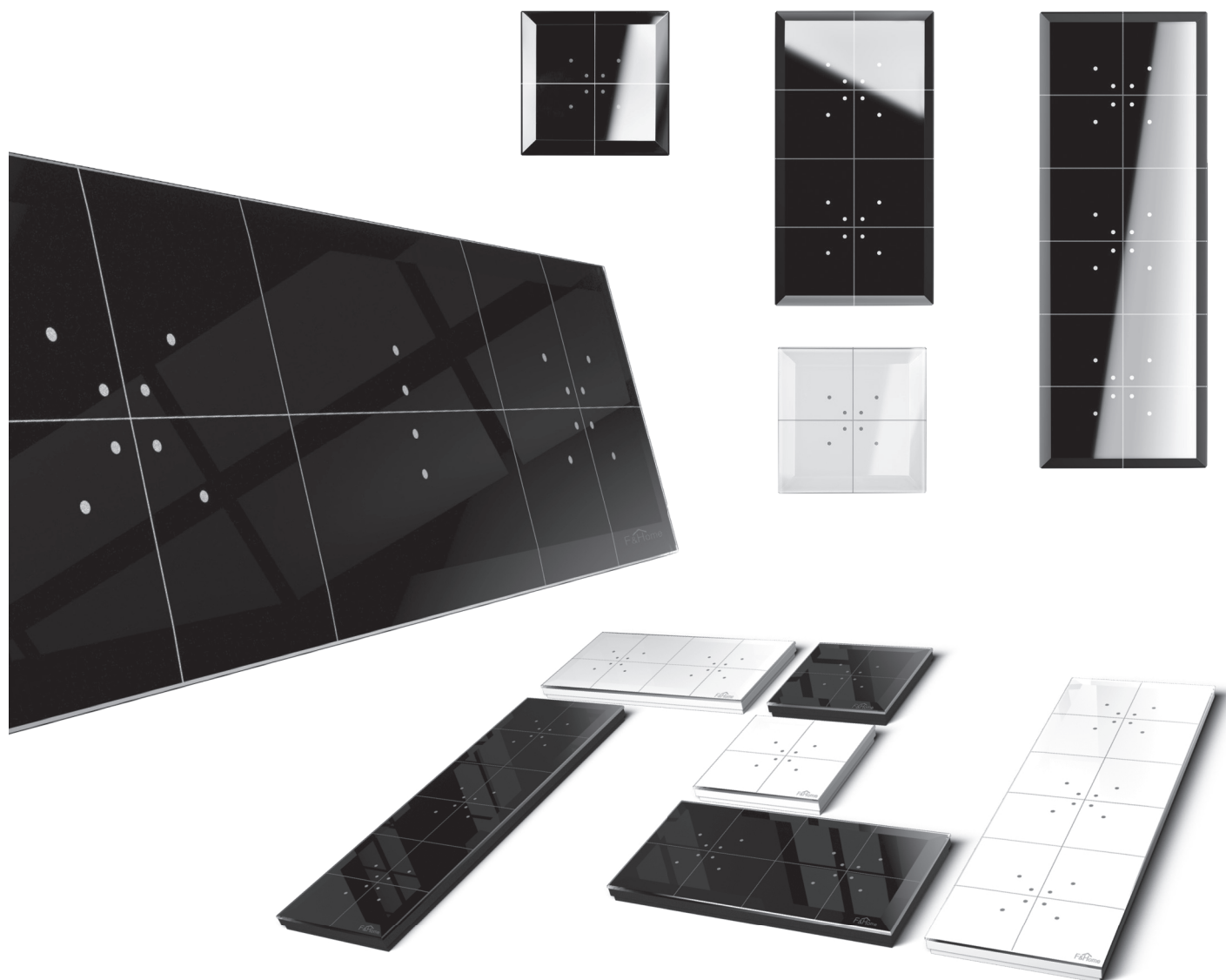
# Touch glass buttons for low-voltage 24 V automation

## GS1-DC single button / GS2-DC double button / GS4-DC quadruple button

### Purpose

Push buttons designed for integration with any low-voltage automation controllers.
They are not intended for direct control of actuator circuits such as relays or LED lighting.
Buttons can operate both as bistable (two-position) and monostable (momentary).

### Features

- 2 modes of operation: bistable and monostable;
- Single output load capacity up to 30 mA;
- Output signal:
  – voltage output;
  – potential-free output (open collector).

### Example of application



NEW!
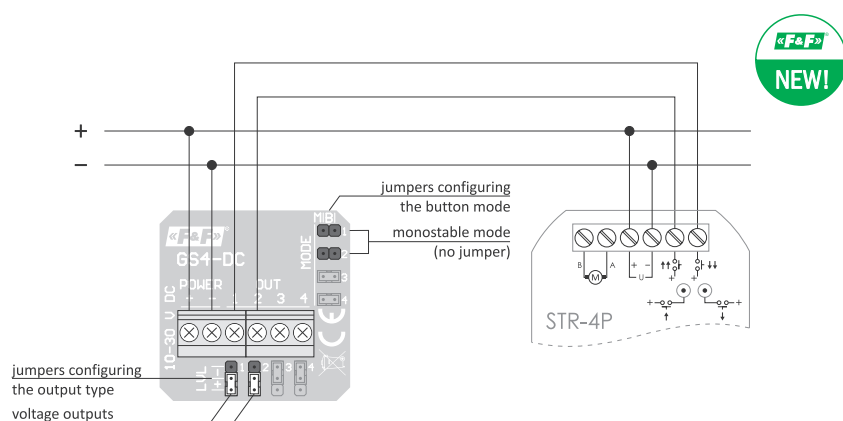
| Model | GS1-DC | GS2-DC | GS4-DC |
|---|---|---|---|
| power supply | 12÷24 V DC | | |
| working mode | monostable or bistable | | |
| executive element | transistor | | |
| outputs | | | |
| channels quantity | 1 | 2 | 4 |
| voltage output | output voltage close to the supply voltage | | |
| potential-free output | open collector | | |
| maximum load current (AC-1) | 30 mA/channel | | |
| power consumption | | | |
| standby | 0.1 W | | |
| on | 0.5 W | | |
| working temperature | -25÷50°C | | |
| terminal | 1.5 mm² screw terminals (cord) | | |
| tightening torque | 0.4 Nm | | |
| installation | in flush mounted box Ø60 | | |
| dimensions | 81×81×12 mm | | |
| protection level | | | |
| front | IP50 | | |
| back | IP20 | | |

ⓘ Panel configurations and variants of glass buttons are described on pages 26-28.

# 230 V circuit controllers

## GS1-AC-R single universal relay with central control inputs

### Purpose

The controller is designed for direct control of a single electrical circuit supplied with 230 V and with load up to 16 A.

### Features

- 2 modes of operation: bistable relay and monostable relay
- Control of 230 V AC circuits;
- 16 A (AC-1) output load capacity;
- External control inputs allowing to change the state of the relay using an external button;
- Ability to group devices and implement central control functions using external ON and OFF control inputs;
- Thermal protection to prevent damage to the unit if a connected load is too high.

### Example of application



NEW!
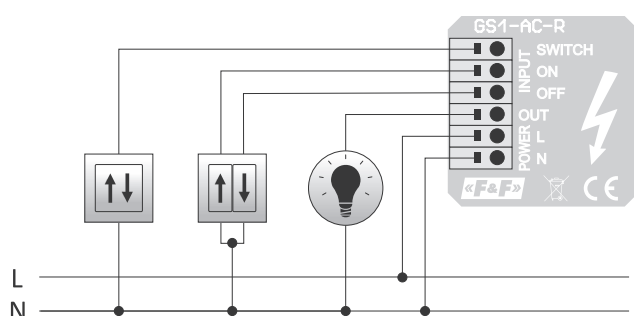
| | |
|---|---|
| power supply | 85÷265 V AC |
| working mode | monostable or bistable |
| executive element | relay |
| outputs | 1 |
| maximum load current (AC-1) | 16 A |
| control inputs | 3 |
| control voltage | 230 V |
| | triggered N level |
| power consumption | |
| standby | <0,2 W |
| on | <0,8 W |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² spring terminals |
| dimensions | 81×81×12 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | |
| front | IP50 |
| back | IP20 |

ⓘ Panel configurations and variants of glass buttons are described on pages 26-28.

# GS2-AC-R double universal relay

### Purpose

Controller designed for direct control of two electrical circuits with a total load of 20 A.

### Features

- 2 operating modes, set independently for each button: bistable relay or monostable relay;
- Control of 230 V AC circuits;

- Total load capacity of 20 A (single 16 A circuit);
- Thermal protection to prevent damage to the unit if a connected load is too high.

### Example of application
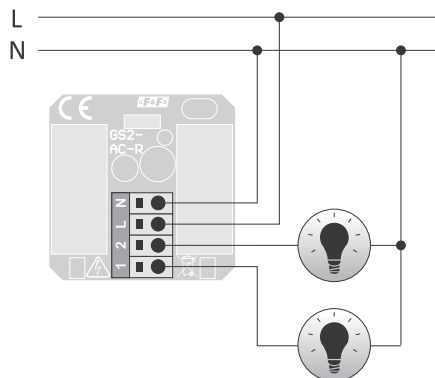


| power supply | 85÷265 V AC |
|---|---|
| working mode | monostable or bistable |
| executive element | relay |
| outputs | 2 |
| maximum load current (AC-1) | |
| single output | 16 A |
| total load of two channels | 20 A |
| power consumption | |
| standby | <0.2 W |
| on | <1 W |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² spring terminals |
| dimensions | 81×81×12 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | |
| front | IP50 |
| back | IP20 |

(!) Panel configurations and variants of glass buttons are described on pages 26-28.

# GS4-AC-T quadruple controller for 230 V low-power circuits

### Purpose

The controller designed for direct control of four low-power electric circuits supplied with 230 V AC.

### Features

- 2 operating modes, set independently for each button: bistable relay and monostable relay;
- Control of 230 V AC circuits;

- Total load capacity of 20 A (single 16 A circuit);
- Thermal protection to prevent damage to the unit if a connected load is too high.

### Example of application
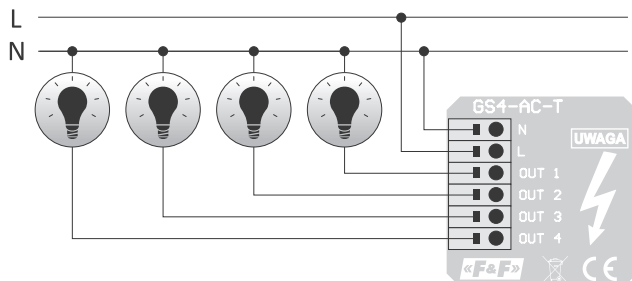


| power supply | 85÷265 V AC |
|---|---|
| working mode | monostable or bistable |
| executive element | triac |
| outputs | 4 |
| maximum load current (AC-1) | 16 A |
| single output | 100 W |
| total load of two channels | 250 W |
| power consumption | |
| standby | <0.2 W |
| on | <0.5 W |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² spring terminals |
| dimensions | 81×81×12 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | |
| front | IP50 |
| back | IP20 |

(!) Panel configurations and variants of glass buttons are described on pages 26-28.

# GS2-STR-3 230 V roller shutter controller

## Purpose

Controller designed to control 230 V AC roller shutter motor. It is equipped with central control inputs allowing the controller to be connected to group control systems, for example with other GS2-STR-3 or classic STR-3P or STR-3 controllers.

## Features

- Ability to control the pitch of the slats;
- Programming the time of opening/closing the roller shutter;
- Central control external inputs;
- Motor load capacity up to 320 W (up to 8 A in AC-1 load class);
- Protection against simultaneous powering of both windings of the roller shutter motor;
- Thermal protection to prevent damage to the unit if a connected load is too high.

## Example of application



5 wires from the switchboard to the button box

central control

4 wires from the button box to the roller shutter

roller shutter control
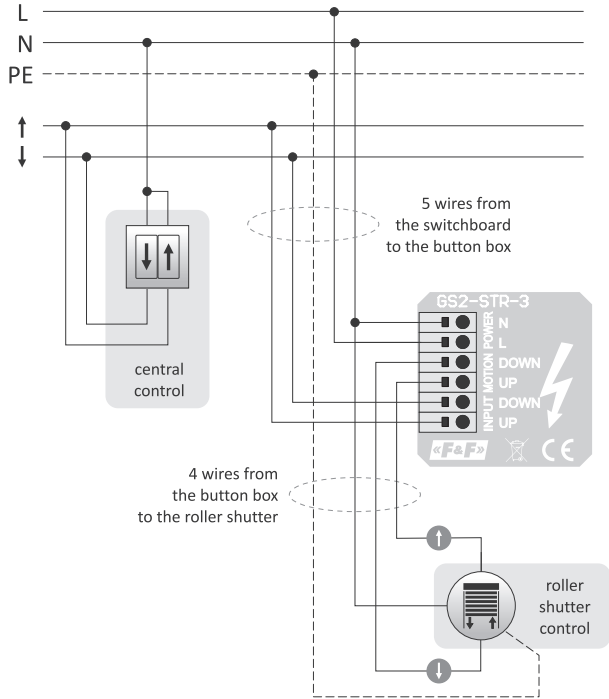
| power supply | 85÷265 V AC |
| executive element | relay |
| outputs | 2 (1 roller shutter) |
| maximum load current | |
| AC motor (AC-3) | 1.5 A (320 W) |
| load capacity (AC-1) | 8 A |
| power consumption | |
| standby | <0.2 W |
| on | <0.6 W |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² spring terminals |
| dimensions | 81×81×12 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | |
| front | IP50 |
| back | IP20 |

(!) Panel configurations and variants of glass buttons are described on pages 26-28.

## Interesting and practical
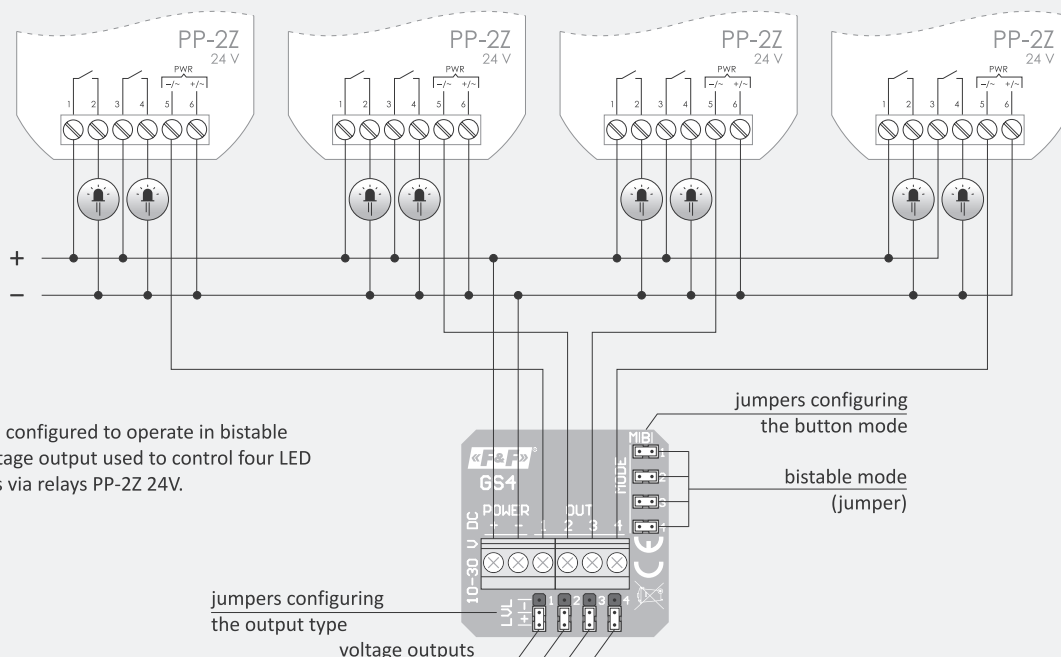


GS-4DC button configured to operate in bistable mode with voltage output used to control four LED lighting circuits via relays PP-2Z 24V.

jumpers configuring the button mode

bistable mode (jumper)

jumpers configuring the output type

voltage outputs

**Panel configurator**

**Panel size**

3

Triple panel (GP3)

2

Double panel (GP2)

GP3-421-W

**Button color**

W

White

B

Black

**Button layout**

Each digit describes the number of buttons on a given panel:

4

Quadruple button,
for actuator controllers

GS4-DC – low-voltage home automation controller
GS4-AC-T – quadruple bistable relay for low power circuits
**F&Wave series:**
FW-GS4-230 – F&Wave quadruple transmitter, 230 V power supply
FW-GS4-24 – F&Wave quadruple transmitter, 24 V power supply
**F&Home RADIO series:**
rH-S4L4-230 – F&Home RADIO quadruple transmitter, 230 V power supply
rH-S4L4-24 – F&Home RADIO quadruple transmitter, 24 V power supply

2

Double button,
for actuator controllers

GS2-DC – low-voltage home automation controller
GS2-AC-R – double bistable relay for low power circuits
GS2-STR-3 – roller shutter controller
**F&Wave series:**
FW-GS2-230 – F&Wave double transmitter, 230 V power supply
FW-GS2-24 – F&Wave double transmitter, 24 V power supply
**F&Home RADIO series:**
rH-S2L2-230 – F&Home RADIO double transmitter, 230 V power supply
rH-S2L2-24 – F&Home RADIO double transmitter, 24 V power supply

1

Single button,
for actuator controllers

GS1-DC – low-voltage home automation controller
GS1-AC-R – single bistable relay for low power circuits
**F&Wave series:**
FW-GS1-230 – F&Wave single transmitter, 230 V power supply
FW-GS1-24 – F&Wave single transmitter, 24 V power supply

**WARNING!**
The layout of the buttons should be adapted to the actuators controllers that will be connected to the panel.
The actuators controllers should be ordered together with the glass panel.
Two (identical or different) actuator modules can be connected to the GP2 panel.
Three (identical or different) actuator modules can be connected to the GP3 panel.

## Types of buttons

| Name | Button type | Panel | Description |
|------|-------------|-------|-------------|
| GS1-DC-W | single | | Button integrated with the glass panel 81×81 mm |
| GS2-DC-W | double | | Button integrated with the glass panel 81×81 mm |
| GS4-DC-W | quadruple | | Button integrated with the glass panel 81×81 mm |
| GS1-DC-B | single | | Button integrated with the glass panel 81×81 mm |
| GS2-DC-B | double | | Button integrated with the glass panel 81×81 mm |
| GS4-DC-B | quadruple | | Button integrated with the glass panel 81×81 mm |
| GS2-DC | double | – | Executive module for integration with glass panels GP2 (162×81 mm) or GP3 (243×81 mm ). Requires ordering with GP2 or GP3 glass panel suitable for double (for GS2-DC) or quadruple (for GS4-DC) buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| GS4-DC | quadruple | – | Executive module for integration with glass panels GP2 (162×81 mm) or GP3 (243×81 mm ). Requires ordering with GP2 or GP3 glass panel suitable for double (for GS2-DC) or quadruple (for GS4-DC) buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| GS1-AC-R-W | single | | Universal relay integrated with the glass panel 81×81 mm |
| GS1-AC-R-B | single | | Universal relay integrated with the glass panel 81×81 mm |
| GS2-AC-R-W | double | | Universal relay integrated with the glass panel 81x81 mm |
| GS2-AC-R-B | double | | Universal relay integrated with the glass panel 81x81 mm |
| GS2-AC-R | double | – | Universal relay integrated with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm). Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| GS4-AC-T-W | quadruple | | 230 V circuit controller integrated with the glass panel 81×81 mm |
| GS4-AC-T-B | quadruple | | 230 V circuit controller integrated with the glass panel 81×81 mm |
| GS4-AC-T | quadruple | – | Quadruple controller of 230 V circuits for integration into GP2 (162×81 mm) or GP3 (243×81 mm) glass panels. Requires ordering with GP2 or GP3 glass panel suitable for quadruple buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| GS2-STR-3-W | double | | 230V roller shutter controller integrated with the glass panel 81×81 mm |
| GS2-STR-3-B | double | | 230V roller shutter controller integrated with the glass panel 81×81 mm |
| GS2-STR-3 | double | – | 230 V roller shutter integrated with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm ). Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| FW-GS1-230-W | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS2-230-W | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS4-230-W | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS1-24-W | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS2-24-W | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS4-24-W | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS1-230-B | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS2-230-B | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS4-230-B | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS1-24-B | single type | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS2-24-B | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS4-24-B | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |

Row groups: F&F (GS1-DC-W … GS2-STR-3), F&Wave (FW-GS1-230-W … FW-GS4-24-B)

## Types of buttons (cont.)

| Name | Button type | Panel | Description |
|---|---|---|---|
| FW-GS2-230 | double | – | F&Wave module for integration with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm), 230 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double (for FW-GS2) or quadruple (for FW-GS4) buttons. The GP2 and GP3 panel configurator is shown on page 23. |
| FW-GS4-230 | quadruple | – | F&Wave module for integration with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm), 230 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double (for FW-GS2) or quadruple (for FW-GS4) buttons. The GP2 and GP3 panel configurator is shown on page 23. |
| FW-GS2-24 | double | – | F&Wave module for integration with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm), 24 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double (for FW-GS2) or quadruple (for FW-GS4) buttons. The GP2 and GP3 panel configurator is shown on page 23. |
| FW-GS4-24 | quadruple | – | F&Wave module for integration with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm), 24 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double (for FW-GS2) or quadruple (for FW-GS4) buttons. The GP2 and GP3 panel configurator is shown on page 23. |
| rH-S1L1-230-W | single | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S2L2-230-W | double | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S4L4-230-W | quadruple | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S1L1-24-W | single | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| rH-S2L2-24-W | double | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| rH-S4L4-24-W | quadruple | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| rH-S1L1-230-B | single | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S2L2-230-B | double | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S4L4-230-B | quadruple | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| rH-S1L1-24-B | single | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| rH-S2L2-24-B | double | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| rH-S4L4-24-B | quadruple | | F&Home Radio transmitter integrated with the glass panel 81×81 mm, 24 V power supply |

## Glass panels

Single button, white
GS1-W

Double button, white
GS2-W

Quadruple button, white
GS4-W
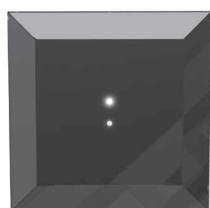
Single button, black
GS1-B
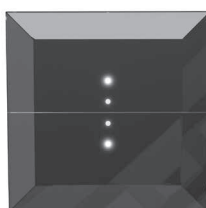
Double button, black
GS2-B
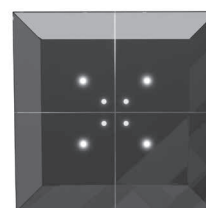
Quadruple button, black
GS4-B

## Glass touch buttons designed for the F&Wave system

Works with system **F&Wave**

«F&F» NEW!

### FW-GS1-230-W / FW-GS1-230-B
Single button with 1-channel F&Wave transmitter, 230 V power supply, white or black

### FW-GS1-24-W / FW-GS1-24-B
Single button with 1-channel F&Wave transmitter, 24 V power supply, white or black

### FW-GS2-230-W / FW-GS2-230-B
Double button with 2-channels F&Wave transmitter, 230 V power supply, white or black

### FW-GS2-24-W / FW-GS2-24-B
Double button with 2-channels F&Wave transmitter, 24 V power supply, white or black

### FW-GS4-230-W / FW-GS4-230-B
Quadruple button with 4-channels F&Wave transmitter, 230 V power supply, white or black

### FW-GS4-24-W / FW-GS4-24-B
Quadruple button with 4-channels F&Wave transmitter, 24 V power supply, white or black

| Product | FW-GS1-24 | FW-GS2-24 | FW-GS4-24 | FW-GS1-230 | FW-GS2-230 | FW-GS4-230 |
|---|---|---|---|---|---|---|
| power supply | 9÷30 V DC | | | 85÷265 V AC/DC | | |
| channels quantity | 1 | 2 | 4 | 1 | 2 | 4 |
| button function configuration | – | • | • | – | • | • |
| function | | | | | | |
|   on/up | – | • | • | – | • | • |
|   off/down | – | • | • | – | • | • |
|   switch/raise/lower/brighten/dim | • | • | • | • | • | • |
| power consumption | | | | | | |
|   standby | <0.2 W | | | | | |
|   on | <0.5 W | | | | | |
| working temperature | -25÷50°C | | | | | |
| terminal | 1.5 mm² screw terminals (cord) | | | | | |
| tightening torque | 0.4 Nm | | | | | |
| mounting | in flush mounted box ø60 | | | | | |
| dimensions | 81×81×12 mm | | | | | |
| protection level | | | | | | |
|   front | IP50 | | | | | |
|   back | IP20 | | | | | |

## Glass touch buttons designed for the F&Home RADIO system

Works with system **F&Home RADIO**

«F&F» NEW!

### rH-S1L1-230-W / rH-S1L1-230-B
Single button with F&Home Radio controller, 230 V power supply, white or black

### rH-S1L1-24-W / rH-S1L1-24-B
Single button with F&Home Radio controller, 24 V power supply, white or black

### rH-S2L2-230-W / rH-S2L2-230-B
Double button with F&Home Radio controller, 230 V power supply, white or black

### rH-S2L2-24-W / rH-S2L2-24-B
Double button with F&Home Radio controller, 24 V power supply, white or black

### rH-S4L4-230-W / rH-S4L4-230-B
Quadruple button with F&Home Radio controller, 230 V power supply, white or black

### rH-S4L4-24-W / rH-S4L4-24-B
Quadruple button with F&Home Radio controller, 24 V power supply, white or black

| Product | rH-S1L1-24 | rH-S2L2-24 | rH-S4L4-24 | rH-S1L1-230 | rH-S2L2-230 | rH-S4L4-230 |
|---|---|---|---|---|---|---|
| power supply | 9÷30 V DC | | | 85÷265 V AC/DC | | |
| channels quantity | 1 | 2 | 4 | 1 | 2 | 4 |
| power consumption | | | | | | |
|   standby | <0.2 W | | | | | |
|   on | <0.5 W | | | | | |
| radio frequency | 868 MHz | | | | | |
| working temperature | -25÷50°C | | | | | |
| terminal | 1.5 mm² screw terminals (cord) | | | | | |
| tightening torque | 0.4 Nm | | | | | |
| mounting | in flush mounted box ø60 | | | | | |
| dimensions | 81×81×12 mm | | | | | |
| protection level | | | | | | |
|   front | IP50 | | | | | |
|   back | IP20 | | | | | |

# Chapter 5

# Bistable relays

**Purpose**

Electronic bistable pulse relays enable switching on and off the lighting or other devices from several different points by means of parallel-connected, momentary (bell) control switches.

| Product | Supply voltage | Maximum load current (AC-1) | Contact configuration | Contact separation | Resistance to shock currents | Number of channels | Functionality | Front button | Cooperation with backlit buttons | Status memory after power failure | Function "Switch on for a time" | Central control dedicated inputs | Mounting | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BIS-402 | 165÷265 V AC | 10 A | 1×NO/NC | ● | – | 1 | on/off | – | – | – | – | – | in flush mounted box | 31 |
| BIS-403 | 195÷253 V AC | 10 A | 1×NO | – | – | 1 | on/off | – | – | – | ● | – | in flush mounted box | 33 |
| BIS-404 | 165÷265 V AC | 2×8 A | 2×NO | – | – | 2 | gang (light) switch | – | ● | – | – | – | in flush mounted box | 35 |
| BIS-408 | 165÷265 V AC | 16 A | 1×NO | – | – | 1 | on/off | – | ● | – | – | – | in flush mounted box | 31 |
| BIS-408-LED | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | – | ● | 1 | on/off | – | ● | – | – | – | in flush mounted box | 31 |
| BIS-409 | 165÷265 V AC | 2×8 A | 2×NO | – | – | 2 | sequential | – | ● | – | – | – | in flush mounted box | 36 |
| BIS-410 230 V | 165÷265 V AC | 16 A | 1×NO | – | – | 1 | on/off | – | ● | – | ● | – | in flush mounted box | 33 |
| BIS-410 24 V | 9÷30 V AC/DC | 16 A | 1×NO | – | – | 1 | on/off | – | – | – | ● | – | in flush mounted box | 33 |
| BIS-410-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | – | ● | 1 | on/off | – | ● | – | ● | – | in flush mounted box | 33 |
| BIS-410-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | – | – | ● | – | in flush mounted box | 33 |
| BIS-411 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | ● | – | – | – | for TH-35 rail | 32 |
| BIS-411 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | – | – | – | – | for TH-35 rail | 32 |
| BIS-411-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | ● | – | – | – | for TH-35 rail | 32 |
| BIS-411-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | – | – | – | – | for TH-35 rail | 32 |
| **BIS-411B 230 V** | **165÷265 V AC** | **16 A** | **1×NO/NC** | ● | – | 1 | on/off | ● | ● | – | – | – | for TH-35 rail | 32 |
| **BIS-411B-LED 230 V** | **165÷265 V AC** | **16 A (120 A/20 ms)** | **1×NO** | ● | ● | 1 | on/off | ● | ● | – | – | – | for TH-35 rail | 32 |
| **BIS-411BM 230 V** | **165÷265 V AC** | **16 A** | **1×NO/NC** | ● | – | 1 | on/off | ● | ● | ● | – | – | for TH-35 rail | 32 |
| **BIS-411BM-LED 230 V** | **165÷265 V AC** | **16 A (120 A/20 ms)** | **1×NO** | ● | ● | 1 | on/off | ● | ● | ● | – | – | for TH-35 rail | 32 |
| BIS-411M 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | ● | ● | – | – | for TH-35 rail | 32 |
| BIS-411M 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | – | ● | – | – | for TH-35 rail | 32 |
| BIS-411M-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | ● | ● | – | – | for TH-35 rail | 32 |
| BIS-411M-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | – | ● | – | – | for TH-35 rail | 32 |
| BIS-411 1R1Z 230 V | 165÷265 V AC | 2×8 A | 1×NO, 1×NC | ● | – | 1 | on/off | – | ● | – | – | – | for TH-35 rail | 32 |
| BIS-411 1R1Z 24 V | 9÷30 V AC/DC | 2×8 A | 1×NO, 1×NC | ● | – | 1 | on/off | – | ● | – | – | – | for TH-35 rail | 32 |
| BIS-411 2Z 230 V | 165÷265 V AC | 2×8 A | 2×NO | ● | – | 1 | on/off | – | ● | – | – | – | for TH-35 rail | 32 |
| BIS-411 2Z 24 V | 9÷30 V AC/DC | 2×8 A | 2×NO | ● | – | 1 | on/off | – | – | – | – | – | for TH-35 rail | 32 |
| BIS-412 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | group (hotel) | – | ● | – | – | ● | for TH-35 rail | 34 |
| BIS-412 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | group (hotel) | – | – | – | – | ● | for TH-35 rail | 34 |
| BIS-412-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | group (hotel) | – | ● | – | – | ● | for TH-35 rail | 34 |
| BIS-412-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | group (hotel) | – | – | – | – | ● | for TH-35 rail | 34 |
| BIS-412M 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | group (hotel) | – | ● | ● | – | ● | for TH-35 rail | 34 |
| BIS-412M 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | group (hotel) | – | – | ● | – | ● | for TH-35 rail | 34 |
| BIS-412M-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | group (hotel) | – | ● | ● | – | ● | for TH-35 rail | 34 |
| BIS-412M-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | group (hotel) | – | – | ● | – | ● | for TH-35 rail | 34 |
| BIS-412P 230 V | 165÷265 V AC | 16 A | 1×NO | – | – | 1 | group (hotel) | – | ● | – | – | ● | in flush mounted box | 34 |
| BIS-413 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | ● | – | ● | – | for TH-35 rail | 33 |
| BIS-413 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | – | – | ● | – | for TH-35 rail | 33 |
| BIS-413-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | ● | – | ● | – | for TH-35 rail | 33 |
| BIS-413-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | – | – | ● | – | for TH-35 rail | 33 |
| BIS-413M 230 V | 165÷265 V AC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | ● | ● | ● | – | for TH-35 rail | 33 |
| BIS-413M 24 V | 9÷30 V AC/DC | 16 A | 1×NO/NC | ● | – | 1 | on/off | – | – | ● | ● | – | for TH-35 rail | 33 |
| BIS-413M-LED 230 V | 165÷265 V AC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | ● | ● | ● | – | for TH-35 rail | 33 |
| BIS-413M-LED 24 V | 9÷30 V AC/DC | 16 A (120 A/20 ms) | 1×NO | ● | ● | 1 | on/off | – | – | ● | ● | – | for TH-35 rail | 33 |
| BIS-414 230 V | 165÷265 V AC | 2×16 A | 2×NO/NC | ● | – | 2 | gang (light) switch | – | ● | – | – | – | for TH-35 rail | 35 |
| BIS-414 24 V | 9÷30 V AC/DC | 2×16 A | 2×NO/NC | ● | – | 2 | gang (light) switch | – | – | – | – | – | for TH-35 rail | 35 |
| BIS-414-LED 230 V | 165÷265 V AC | 2×16 A (120 A/20 ms) | 2×NO | ● | ● | 2 | gang (light) switch | – | ● | – | – | – | for TH-35 rail | 35 |
| BIS-414-LED 24 V | 9÷30 V AC/DC | 2×16 A (120 A/20 ms) | 2×NO | ● | ● | 2 | gang (light) switch | – | – | – | – | – | for TH-35 rail | 35 |
| BIS-416 230 V | 165÷265 V AC | 2×8 A | 2×NO | – | – | 2 | on/off | – | ● | – | – | – | in flush mounted box | 32 |
| BIS-419 230 V | 165÷265 V AC | 2×16 A | 2×NO/NC | ● | – | 2 | sequential | – | ● | – | – | – | for TH-35 rail | 36 |
| BIS-419 24 V | 9÷30 V AC/DC | 2×16 A | 2×NO/NC | ● | – | 2 | sequential | – | – | – | – | – | for TH-35 rail | 36 |
| BIS-419-LED 230 V | 165÷265 V AC | 2×16 A (120 A/20 ms) | 2×NO | ● | ● | 2 | sequential | – | ● | – | – | – | for TH-35 rail | 36 |
| BIS-419-LED 24 V | 9÷30 V AC/DC | 2×16 A (120 A/20 ms) | 2×NO | ● | ● | 2 | sequential | – | – | – | – | – | for TH-35 rail | 36 |

## With the "on/off" feature

The receiver is switched on after a current pulse caused by pressing any momentary (bell) button connected to the relay. After the next pulse, the receiver will be switched off. The relay does not have a "memory" of the contact position, which means in the event of a power failure and its subsequent return, the relay contact will be set to "off". This prevents the controlled receivers from being switched on automatically without supervision after a prolonged power failure.

# BIS-402
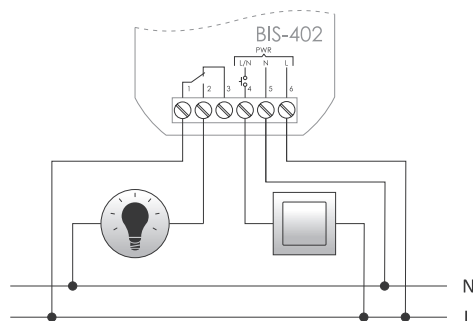


| power supply | 165÷265 V AC |
|---|---|
| contact | 1×NO/NC |
| maximum load current (AC-1) | 10 A |
| control pulse current | <1 mA |
|  | triggered with L or N level |
| operation delay | 0.1÷ 0.2 s |
| power consumption | 0.4 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

(!) BIS-402 cannot work with backlit buttons.

# BIS-408 / BIS-408-LED
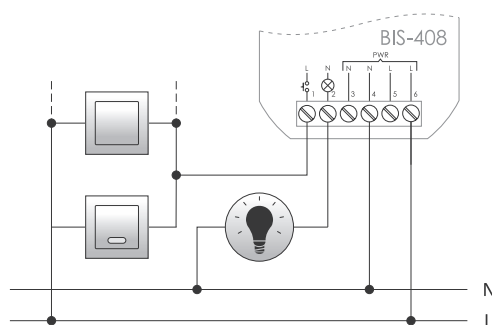


| power supply | 165÷265 V AC |
|---|---|
| contact | 1×NO |
| maximum load current (AC-1) | |
| BIS-408 | 16 A |
| BIS-408-LED | 16 A (120 A / 20 ms) |
| control pulse current | <5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | ø54 (size 48×43 mm), h= 25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

(!) BIS-408 / BIS-408-LED can work with backlit buttons.

(!) Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.
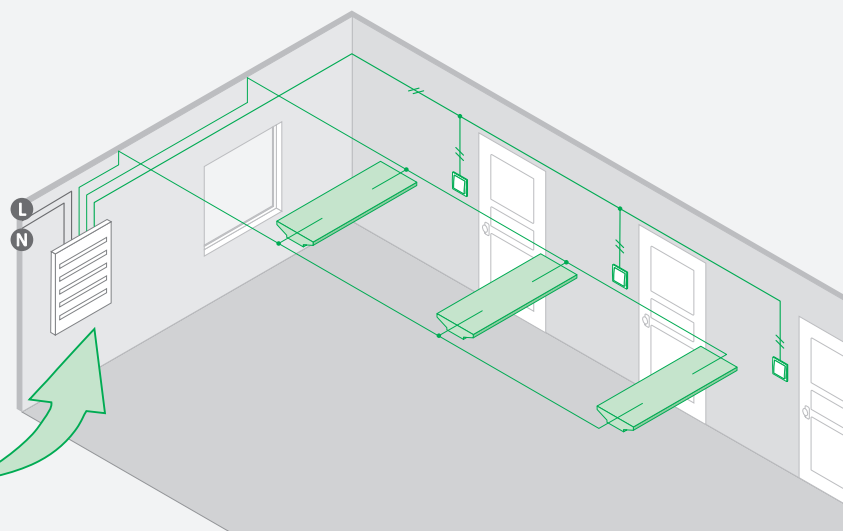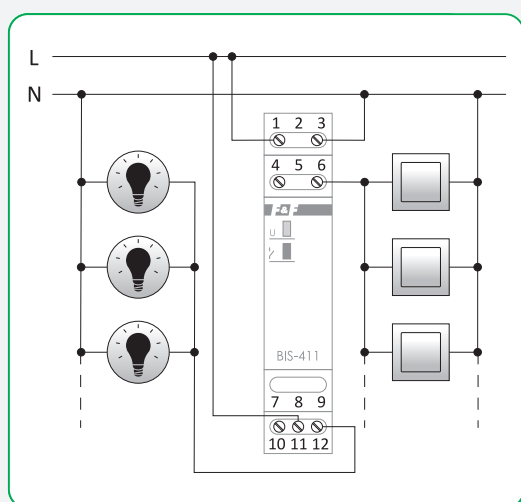
Example of a lighting control system with three points in a corridor

# BIS-411 / ...



Example of connection
with control pulse N



| BIS-411 | |
| 11 — 10 | |
| — 12 | |

| BIS-411-LED | |
| 11 — 12 | |

| BIS-411 2Z | |
| 7 — 9 | |
| 10 — 12 | |

| BIS-411 1R1Z | |
| 7 — 9 | |
| 10 — 12 | |

| power supply | |
| --- | --- |
| BIS-411... 230 V | 165÷265 V AC |
| BIS-411... 24 V | 9÷30 V AC/DC |
| contact/maximum load current (AC-1) | |
| BIS-411 | separated 1×NO/NC / 16 A |
| BIS-411-LED | separated 1×NO/16 A (120 A/20 ms) |
| BIS-411M | separated 1×NO/NC / 16 A |
| BIS-411M-LED | separated 1×NO/16 A (120 A/20 ms) |
| BIS-411 2Z | separated 2×NO/2×8 A |
| BIS-411 1R1Z | separated 1×NO, 1×NC/2×8 A |
| control pulse current | 5 mA |
| operation delay | 0.1÷ 0.2 s |
| power indication | LED green |
| power operation | LED red |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# BIS-411B / ...    with an additional button on the front



NEW!



Example of connection
with control pulse N
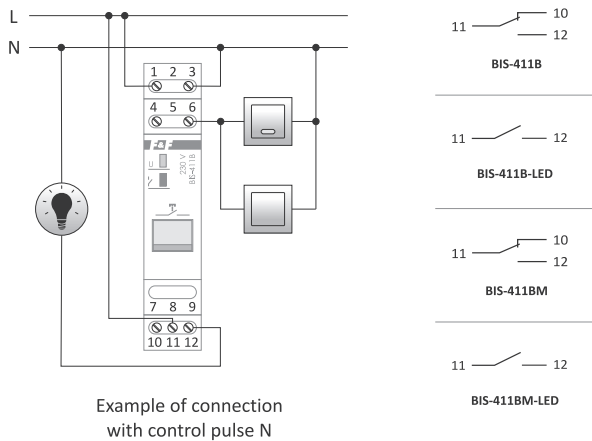
| BIS-411B | |
| 11 — 10 | |
| — 12 | |

| BIS-411B-LED | |
| 11 — 12 | |

| BIS-411BM | |
| 11 — 10 | |
| — 12 | |

| BIS-411BM-LED | |
| 11 — 12 | |

| power supply | 165÷265 V AC |
| --- | --- |
| contact/maximum load current (AC-1) | |
| BIS-411B | separated 1×NO/NC / 16 A |
| BIS-411B-LED | separated 1×NO / 16 A (120 A/20 ms) |
| BIS-411BM | separated 1×NO/NC / 16 A |
| BIS-411BM-LED | separated 1×NO / 16 A (120 A/20 ms) |
| control pulse current | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power operation | LED red |
| mechanical life of the button | $10^6$ cycles |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) Relays powered by 230 V can cooperate with backlit buttons.

(!) Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

(!) Version with the "M" index - version with "memory" of the contact position, which means when the power supply is switched back on, the relay will be restored to the state it was when the power supply was switched off.

# BIS-416    double bistable relay

**Functioning**

The relay has 2 independently controlled channels. Control takes place via two separate signal inputs.
The pulse at input S1 controls output R1. The same applies to the pair of input S2 and output R2.



| power supply | 165÷265 V AC |
| --- | --- |
| contact | 2×NO |
| maximum load current (AC-1) | 2×8A |
| control pulse current | <5 mA |
| operation delay | 0.1÷ 0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

(!) BIS-416 can work with backlit buttons.

## With timer switch

The receiver is switched on after a current pulse caused by pressing any momentary (bell) button connected to the relay. Switching off the receiver will occur after the next pulse or automatically after the set time of switching off.

Pressing and holding the control button for more than 2 seconds will switch the lighting on permanently until the next pulse is given, which will switch off the relay.



# BIS-403
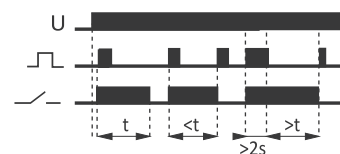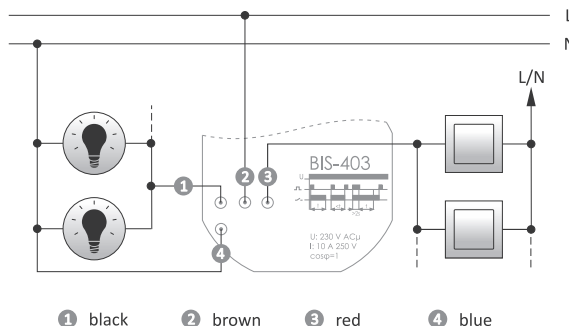


| ① black | ② brown | ③ red | ④ blue |

| power supply | 195÷253 V AC |
|---|---|
| contact | 1×NO |
| maximum load current (AC-1) | 10 A |
| control pulse current | <1 mA |
| | triggered with L or N level |
| operation delay | 0.1÷0.2 s |
| adjustment time | 1÷12 min. |
| power consumption | 0.8 W |
| terminal | 4×DY 1 mm², l = 10 cm |
| working temperature | -25÷50°C |
| dimensions | Ø55, h = 13 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

⚠ BIS-403 cannot work with backlit buttons.

# BIS-410 / BIS-410-LED
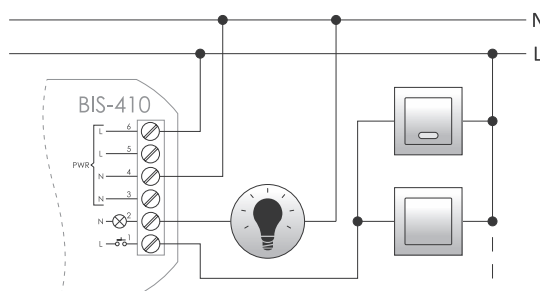


| power supply | |
|---|---|
| BIS-410 230 V | 165÷265 V AC |
| BIS-410 24 V | 9÷30 V AC/DC |
| contact | 1×NO |
| maximum load current (AC-1) | |
| BIS-410 | 16 A |
| BIS-410-LED | 16 A (120 A / 20 ms) |
| control pulse current | <5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.7 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h = 25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |
| ingress protection | IP20 |

⚠ BIS-410 / BIS-410-LED can work with backlit buttons with a maximum current of 5 mA.

⚠ Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

# BIS-413 / BIS-413-LED / BIS-413M / BIS-413M-LED
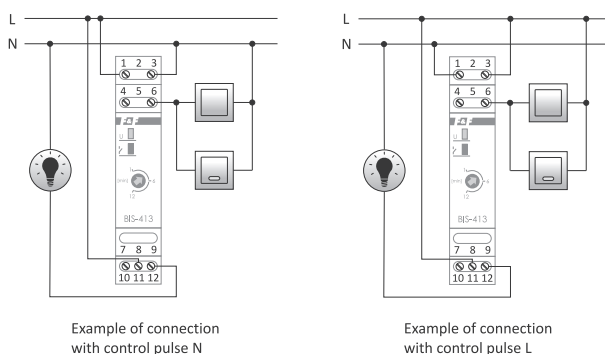


Example of connection with control pulse N

Example of connection with control pulse L

| power supply | |
|---|---|
| BIS-413... 230 V | 165÷265 V AC |
| BIS-413... 24 V | 9÷30 V AC/DC |
| contact | |
| BIS-413/BIS-413M | 1×NO/NC |
| BIS-413-LED/BIS-413M-LED | 1×NO |
| maximum load current (AC-1) | |
| BIS-413/BIS-413M | 16 A |
| BIS-413-LED/BIS-413M-LED | 16 A (120 A / 20 ms) |
| control pulse current | <5 mA |
| | triggered with L or N level |
| operation delay | 0.1÷0.2 s |
| adjustment time | 1÷12 min. |
| power indication | LED green |
| power operation | LED red |
| power consumption | |
| standby | 0.15 W |
| on | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

⚠ Only relays supplied with 230 V can operate with backlit buttons with maximum current 5 mA.

⚠ Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

⚠ Version with the "M" index - version with "memory" of the contact position, which means when the power supply is switched back on, the relay will be restored to the state it was when the power supply was switched off.

# Group (hotel) with "Switch on everything" and "Switch off everything" control inputs

**Purpose**

Relays are designed to work in a group system. A single relay allows the controlled receiver to be switched on and off after each current pulse caused by pressing the momentary (bell) button of the local control. The group system allows you to switch off or on the central control buttons of all receivers connected to individual relays.

## BIS-412 / BIS-412-LED / BIS-412M / BIS-412M-LED
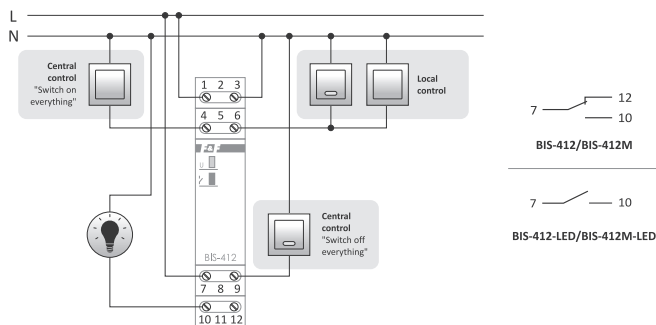


| power supply | |
|---|---:|
| BIS-412... 230V | 165÷265 V AC |
| BIS-412... 24V | 9÷30 V AC/DC |
| contact | |
| BIS-412/BIS-412M | separated 1×NO/ NC |
| BIS-412-LED/BIS-412M-LED | separated 1×NO |
| maximum load current (AC-1) | |
| BIS-412/BIS-412M | 16 A |
| BIS-412-LED/BIS-412M-LED | 16 A (120 A/20 ms) |
| control pulse current | ≤5 mA |
| | triggered with L or N level |
| total backlight current control buttons | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power indication | LED red |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

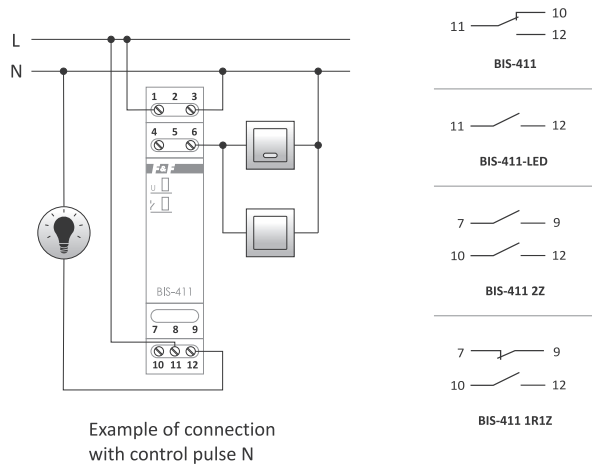(!) Only relays supplied with 230 V can operate with backlit buttons.

(!) Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

(!) Version with the "M" index - version with "memory" of the contact position, which means when the power supply is switched back on, the relay will be restored to the state it was when the power supply was switched off.

## BIS-412P  for flush-mounted box ø60
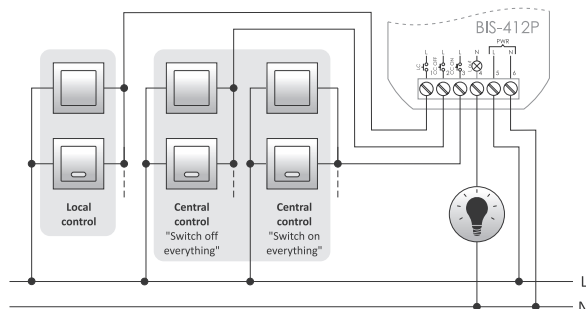


| power supply | 165÷265 V AC |
|---|---:|
| contact | 1×NO |
| maximum load current (AC-1) | 16 A |
| control pulse current | <1 mA |
| total backlight current control buttons | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.7 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | ø54 (size 48×43 mm), h= 25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

**Functioning**

• **Local control**
 The receiver is switched on after a current pulse caused by pressing anyone momentary button from the local control group.
 The relay contact will be closed.  After the next pulse, the contact will be open.
• **Central control**
 – switch everything off – after the current impulse caused by pressing the momentary button, all connected relays will be switched off;
 – switch everything on – after the current impulse caused by pressing the momentary button, all connected relays will be switched on.

## Sequential (gang switch) – single-function

The sequential relay has 2 separate outputs. Each time the button is pressed, the status of the outputs will change according to the operating schedule shown below.
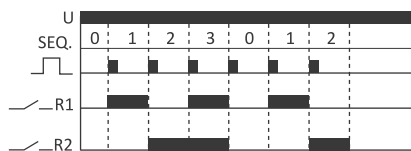


| Sequence | Contact position |
|---|---|
| 0 | Sections R1 and R2 open |
| 1 | Only section R1 closed |
| 2 | Only section R2 closed |
| 3 | Sections R1 and R2 closed |

- Subsequent pressings of a button repeat the sequence 0-3.

## BIS-404



| | |
|---|---|
| power supply | 165÷265 V AC |
| contact | 2×NO |
| maximum load current (AC-1) | 2×8A |
| control pulse current | <1 mA |
| total backlight current | |
| control buttons | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.7 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | ⌀54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box ⌀60 |
| ingress protection | IP20 |

(!) BIS-404 can work with backlit buttons.

## BIS-414 / BIS-414-LED
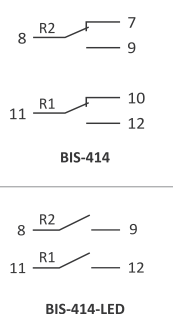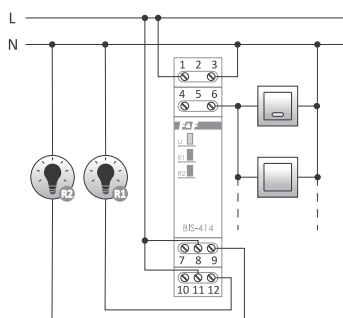


| | | |
|---|---|---|
| power supply | | |
| BIS-414... 230 V | | 165÷265 V AC |
| BIS-414... 24 V | | 9÷30 V AC/DC |
| contact | | |
| BIS-414 | | 2×NO/NC |
| BIS-414-LED | | 2×NO |
| maximum load current (AC-1) | | |
| BIS-414 | | 2×16 A |
| BIS-414-LED | | 2×16 A (120 A / 20 ms) |
| control pulse current | | <1 mA |
| total backlight current | | |
| control buttons | | 5 mA |
| operation delay | | 0.1÷0.2 s |
| power indication | | LED green |
| power indication | | 2×LED red |
| power consumption | | |
| standby | | 0.15 W |
| on | | 0.7 W |
| terminal | | 2.5 mm² screw terminals |
| tightening torque | | 0.4 Nm |
| working temperature | | -25÷50°C |
| dimensions | | 1 module (18 mm) |
| mounting | | for TH-35 rail |
| ingress protection | | IP20 |

(!) Only the 230 V relays can work with the backlit buttons.

(!) Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

### Interesting and practical
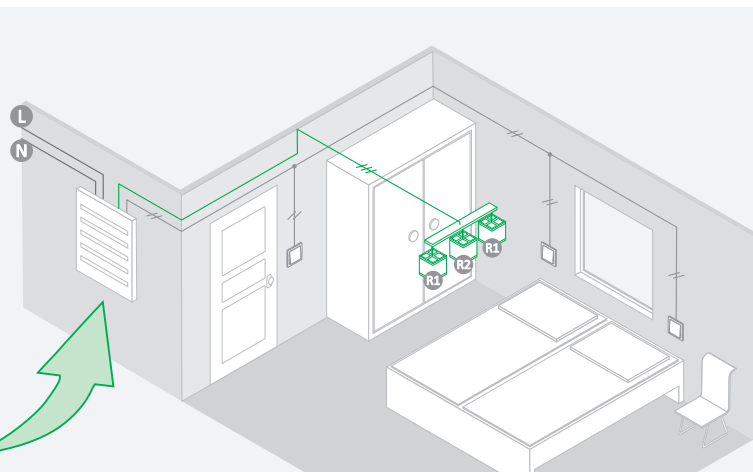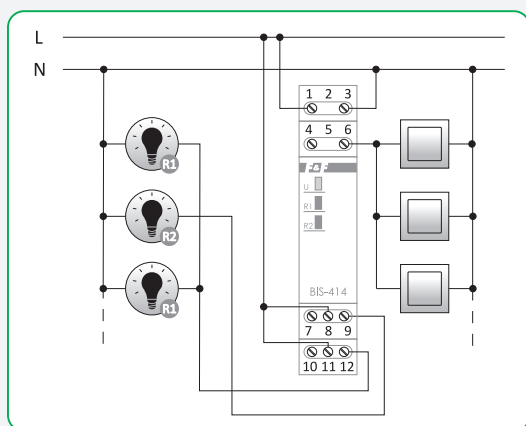


Example of a lighting system for controlling the light intensity by switching on sections R1 and R2 respectively

# Sequential (gang switch) – four-function

## A mode
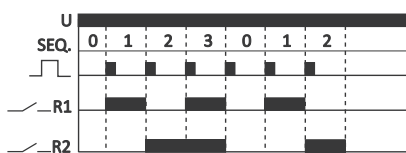


- Subsequent pressings of a button repeat the sequence 0-3.

## B mode
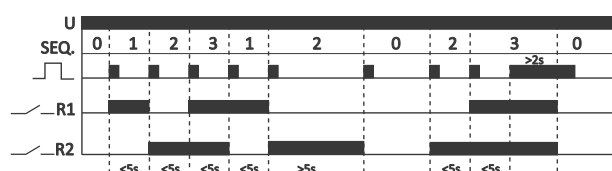


- Pressing the button again in less than 5 seconds repeats sequences 1-3.
- Pressing the button again after more than 5 seconds opens both contacts (sequence 0).
- A long press of the button - in any sequence - opens both contacts (sequence 0).
- After switching off both relays, pressing the button again restores the state from before switching off (state memory). This does not apply to relay power failure.

## C mode
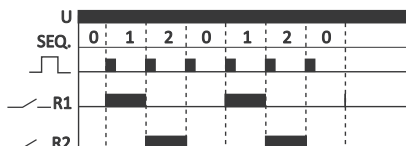


- Subsequent pressings of a button repeat the sequence 0-2.

## D mode
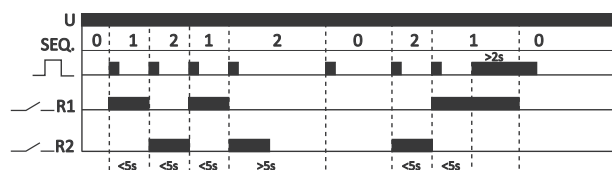


- Pressing the button again in less than 5 seconds repeats sequences 1-2.
- Pressing the button again after more than 5 seconds opens both contacts (sequence 0).
- A long press of the button - in any sequence - opens both contacts (sequence 0).
- After switching off both relays, pressing the button again restores the state from before switching off (state memory). This does not apply to relay power failure.

# BIS-409



| | |
|---|---|
| power supply | 165÷265 V AC |
| contact | 2×NO |
| maximum load current (AC-1) | 2×8 A |
| control pulse current | <1 mA |
| total backlight current control buttons | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power consumption | |
| standby | 0.15 W |
| on | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h=20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

(!) BIS-409 can work with backlit buttons.

# BIS-419 / BIS-419-LED
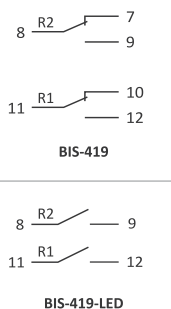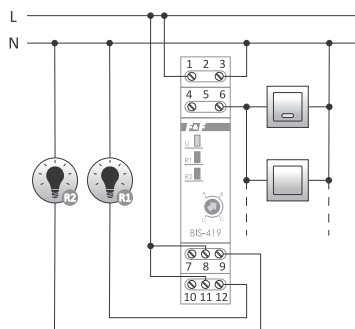


| | |
|---|---|
| power supply | |
| BIS-419 230 V | 165÷265 V AC |
| BIS-419 24 V | 9÷30 V AC/DC |
| contact / maximum load current (AC-1) | |
| BIS-419 | separated 2×NO/NC / 2×16 A |
| BIS-419-LED | separated 2×NO / 2×16 A (120 A / 20 ms) |
| control pulse current | <1 mA |
| total backlight current control buttons | 5 mA |
| operation delay | 0.1÷0.2 s |
| power indication | LED green |
| power operation | 2×LED red |
| power consumption | |
| standby | 0.15 W |
| on | 0.9 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) Only the 230 V relays can work with the backlit buttons.

(!) Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

# Chapter 6

# Lighting dimmers

Lighting dimmer is used for switching on and off the lighting with the ability to adjust its intensity.

**Functioning**

The lighting is switched on after a current pulse caused by pressing the momentary (bell) button connected to the dimmer. The lighting will be switched off after the next pulse. Press and hold the button for >1 second to set the desired illumination level (smooth adjustment of the lighting in the loop: brighter/ darker/brighter).
The lighting can be controlled with multiple buttons connected in parallel and placed at different points in the room.
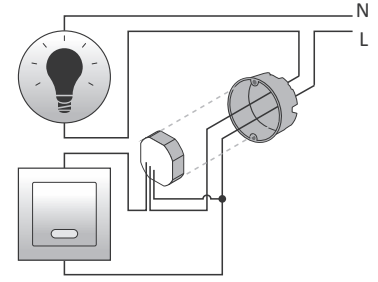
## For incandescent and halogen lamps

A group of dimmers designed for incandescent and halogen lamps (also powered by a transformer or electronic power supply, adapted to cooperate with dimmers). With some electronic power supplies, dimmers may work incorrectly (causing, for example, a flickering of the lighting). For some types, you should connect light bulbs or halogens with a total power of at least 50% of the rated power of the power supply. Dimmers can work with backlit buttons. **It is recommended to carry out tests before the final installation.**

### Without "memory" of light intensity settings

**Functioning**

After each switching on, the lighting returns to maximum brightness.

## SCO-801  300 W
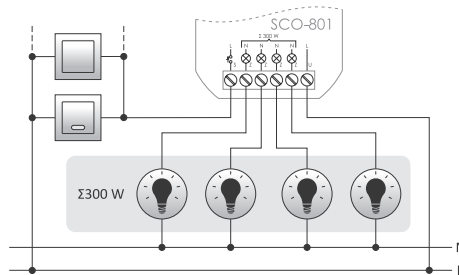
| power supply | 195÷265 V AC |
|---|---|
| maximum load current | 1.3 A |
| maximum power connected light bulbs | 300 W |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## SCO-811  350 W
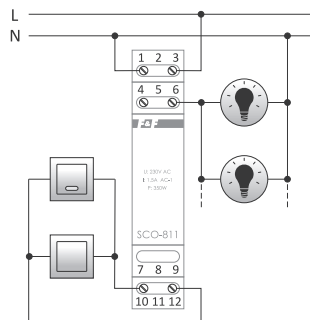
| power supply | 195÷265 V AC |
|---|---|
| maximum load current | 1.5 A |
| maximum power connected light bulbs | 350 W |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## SCO-813  1000 W
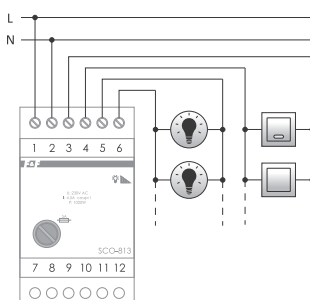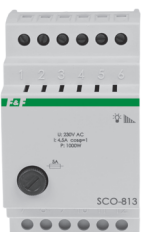
| power supply | 195÷265 V AC |
|---|---|
| maximum load current | 4.5 A |
| maximum power connected light bulbs | 1000 W |
| power consumption | 0.3 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# With "memory" of light intensity settings

After switching on the lighting by pressing the button, the lighting returns to the previously set value.

> ( ! ) After a dimmer power failure, the first switching on sets the brightness to 100%. Does not apply to SCO-802-LED.

........................................................................................................

## SCO-802-LED  150 W, for LED lighting
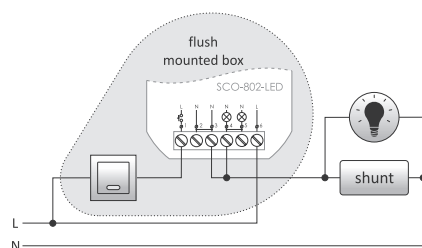


| | |
|---|---|
| power supply | 195÷265 V AC |
| power tolerance | -20/+10% |
| maximum load current (AC-1) | 1.3 A |
| maximum power connected lamps | 150 W |
| power consumption | <0.25 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

**Functions**

• Can be connected to both 3-wire and 2-wire installation, without available neutral wire, in the installation box;
• Memory of set brightness level (also after power failure and its return);

• Programmable minimum brightness level (elimination of LED lamps flashing at low brightness levels).

........................................................................................................

## SCO-802  300 W, for incandescent lighting
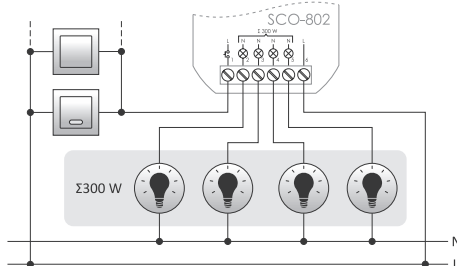


| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current | 1.3 A |
| maximum power connected lamps | 300 W |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

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## SCO-812  350 W
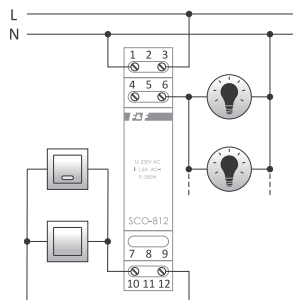


| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current | 1.5 A |
| maximum power connected lamps | 350 W |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

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## SCO-814  1000 W
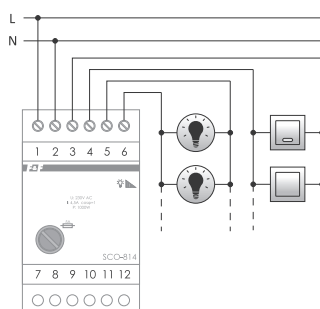


| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current | 4.5 A |
| maximum power connected light bulbs | 1000 W |
| overload protection | fuse |
| | electronic and safety 6.3 A |
| power consumption | 0.3 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## For 12 V LED lighting

### With "memory" of light intensity settings

**Functioning**

After each switching on, the lighting returns to previously set brightness.

## SCO-803  36 W



① brown
② black

③ red
④ black
⑤ blue
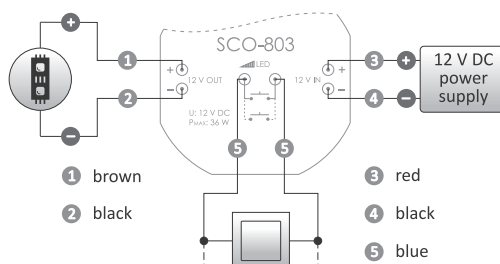
| | |
|---|---|
| power supply | 11÷14 V DC |
| maximum load current | 3 A |
| maximum power connected bulbs | 36 W |
| power consumption | 0.1 W |
| terminal | 6×LY 0.75 mm², l=10 cm |
| working temperature | -25÷50°C |
| dimensions | Ø55, h=13 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

## For incandescent and halogen lamps as well as LED and compact fluorescent lamps with dimming capability

## SCO-815  up to 500 W



230 V AC
N L

N L
9÷230 V AC/DC
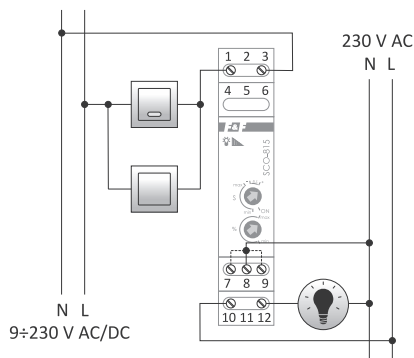
| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current | 2 A |
| maximum power connected lamps | |
| (R) | 500 W |
| (L) | 500 W |
| (C) | 500 W |
| (ESL) | 100 W |
| (LED) | 100 W |
| control voltage | 9÷230 V AC/DC |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Purpose**

The universal lighting dimmer that allows you to adjust the brightness of the lighting of the following light sources:
• Standard incandescent and halogen lamps (resistive load R);
• Lamps powered by a toroidal transformer (inductive load L);
• Lamps powered by an electronic transformer (capacitive load C);
• Energy-saving compact fluorescent lamps (ESL) with dimming function;
• LED lamps (230 V) with the dimming function.

**Functioning**

The lighting is switched on after pressing the momentary (bell) button connected to the dimmer. The lighting can be controlled with multiple buttons connected in parallel and placed at different points in the room. The next press of a button will switch off the lighting. Press and hold the button for more than 1 second to set the desired light intensity.

**Functions**

• Automatic detection of the nature of the R+L and R+C load. The use of ESL and LED lamps require manual adjustment of the load characteristic using the knob on the front of the dimmer.
• Set the speed of the brightness adjustment;
• "Memory" function of lighting intensity settings - after each switching on, the lighting returns to the previously set brightness;
• "Soft start" feature – holding the button for >1 second while switching on the lighting causes its smooth illumination from "zero" (darker => brighter);
• Setting the minimum light level of the controlled lamp (particularly important for ESL lamps, which require a minimum starting and back-up current);
• ON mode – switching lighting on to maximum brightness without the ability to dim it;
• Control input is galvanically isolated from the mains with a wide range of input voltage 9÷230 V AC/DC;
• Smooth lighting and dimming to extend the life of the controlled lamp.

# For high power receivers (up to 3500 W)

## SCO-816     basic version
## SCO-816A    with 1÷10 V analog input
## SCO-816D    with DALI protocol
## SCO-816M    with Modbus RTU protocol

### Purpose

The SCO-816 universal dimmer is designed to control the brightness of dimmable high power light sources, such as: incandescent and halogen lamps, toroidal transformers and adjustable electronic transformers, dimmable LED bulbs and dimmable energy-saving LED lamps.

### Functioning

The lighting is switched on by a current pulse caused by the momentary press of a button. A subsequent short press of the button switches off the light. A long press of a button brightens/dims the light. The Dimmer has a memory function - subsequent switching on by the short press of the button will restore the last set brightness level.

Thanks to the ability of zero power switching, the sharp current surge that occurs when the capacitive receivers are switched on is reduced, which prevents overloading of the installation. Built-in dual overcurrent protection (fast electronic fuse and safety fuse) increases the operating safety of the device in the event of an output overload. The built-in fan and temperature control system prevents the excessive rise of the temperature of the device. If the alarm temperature is exceeded, the load will be automatically disconnected.

If the thermal protection or overload protection is triggered, the light is automatically switched off.

It is possible to switch on the light again after the elimination of the cause of the failure and subsequent pressing of the button.

| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current | 16 A |
| maximum power connected lamps | |
|   incandescent and halogen | 3500 W |
|   inductive and capacitive | 2300 W |
| overload protection | fuse |
| | electronic and safety 20 A |
| power consumption | 0.1 W |
| terminal | |
|   low voltage side | |
| | 2.5 mm² screw terminals (cord) |
|   high voltage side | |
| | 4.0 mm² screw terminals (wire) |
| | 2.5 mm² screw terminals (cord) |
| tightening torque | 0.5 Nm |
| working temperature | 0÷40°C |
| dimensions | 188×90×93 mm |
| mounting | |
| ingress protection | IP20 |

### Load

3500 W – resistive load: incandescent and halogen lamps.

2300 W – inductive and capacitive load: toroidal transformers, adjustable electronic transformers, and dimmable LED and ESL bulbs.



LOAD:
P(R):  3600 W
P(L,C): 2500 W
P(LED): 1500 W
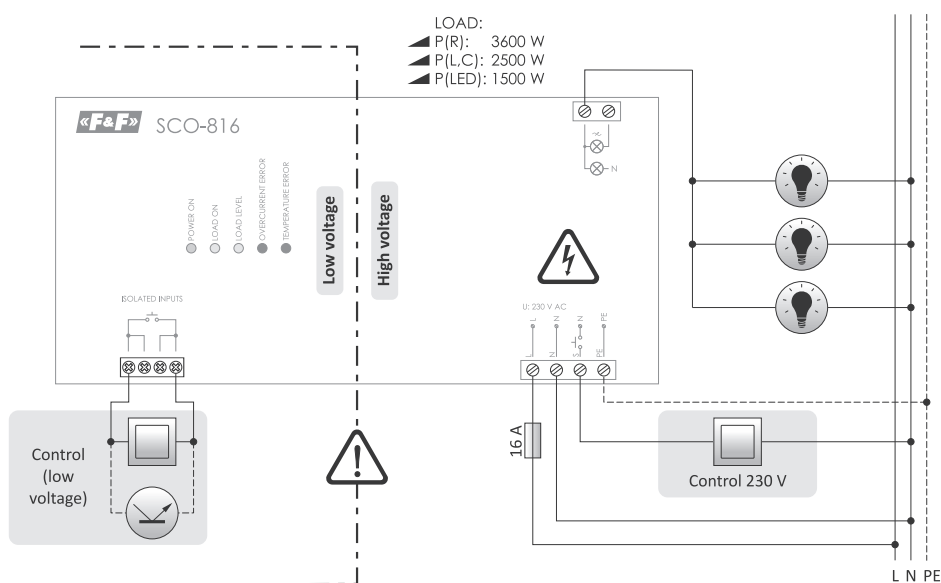
> The actual load limit value depends on the ambient temperature.
> If the operating temperature exceeds the limit value, the permissible load value is reduced.

# Chapter 7
# Motion sensors

## Purpose

Motion sensors are used for automatic, timed switching on of the lighting in case a person or other object appears in such places as: corridors, courtyards, driveways, garages, etc. The use of motion sensors to automatically switch on the lighting makes the lighting more convenient and cheaper to use.

## PIR (infrared)

### Functioning

The sensor detects the movement of infrared radiation sources. The efficiency of operation depends on the size of the object, its temperature, direction and speed of movement. When motion is detected, the lighting is switched on. When the movement is no longer detected, the light will remain switched on for a user-defined period of time. The motion sensor has a built-in twilight switch which makes it impossible to switch on the controlled lighting during the day. The DR sensors can operate indoors and outdoors, in places where they are not exposed to direct rainfall/snow and cannot be splashed with water or other liquids.
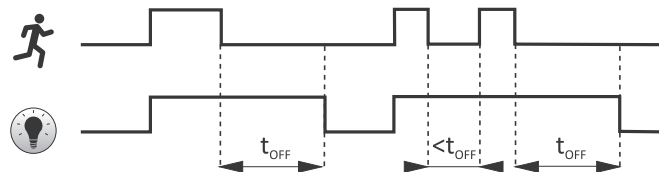


## DR-03 white
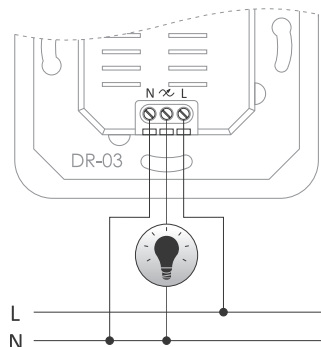


| power supply | 195÷265 V AC |
|---|---|
| maximum load current (AC-1) | 3 A |
| twilight activation threshold | 3÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 10 s (±3 s)÷7 min. (±2 min.) |
| horizontal detection field | 160° |
| vertical detection field | 45° |
| maximum radius detection (T<24°C) | 9 m |
| sensor mounting height | 1.0÷1.8 m |
| power consumption | 0.5 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -10÷40°C |
| dimensions | |
| external | 80×80×62 mm |
| groove | ø60 mm, depth=32 mm |
| mounting hole | ø60 mm |
| screw spacing | 58 mm |
| mounting | surface, in flush mounted box ø60 |
| ingress protection | IP20 |

## DR-04W / DR-04B white/black, hermetically sealed IP65
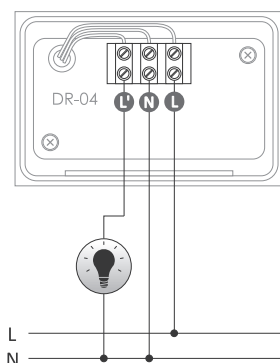


| power supply | 195÷265 V AC |
|---|---|
| maximum load current (AC-1) | 5 A |
| twilight activation threshold | 3÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 10 s (±3 s)÷15 min. (±2 min.) |
| horizontal detection field | 180° |
| vertical detection field | 45° |
| maximum radius detection (T<24°C) | 12 m |
| range of head rotation (horizontally) | 60° |
| range of head rotation (vertically) | 180° |
| sensor mounting height | 1.8÷2.5 m |
| power consumption | 0.5 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -20÷40°C |
| dimensions | |
| head set horizontally | 80×52×120 mm |
| head set vertically | 80×52×95 mm |
| mounting | surface |
| ingress protection | IP65 |

(!) The sensor head can move in two planes, allowing for precise adjustment of the detection field depending on the individual requirements of the user.

# DR-05W / DR-05W 24v / DR-05B / DR-05B 24v  white/black
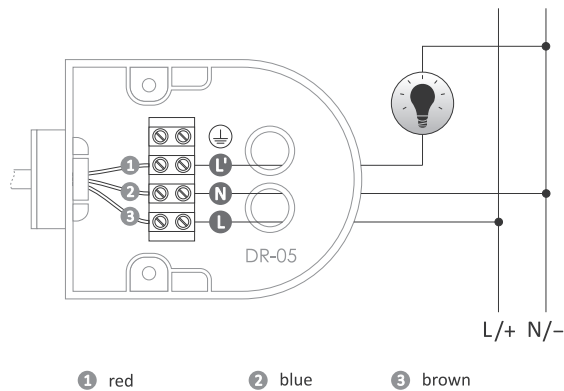
| power supply | |
|---|---|
| DR-05B/DR-05W | 195÷265 V AC |
| DR-05B 24 V/DR-05W 24 V | 9÷30 V DC |
| maximum load current (AC-1) | 5 A |
| twilight activation threshold | 3÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-on time | 10 s÷7 min. |
| horizontal detection field | 0÷180° |
| vertical detection field | 0÷90° |
| maximum radius detection (T<24°C) | 5÷12 m |
| range of head rotation (horizontally) | 180° |
| range of head rotation (vertically) | 90° |
| sensor mounting height | 1.8÷2.5 m |
| power consumption | 0.5 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -20÷40°C |
| dimensions | |
| head set horizontally | 70×205×45 mm |
| head set vertically | 70×140×110 mm |
| mounting | surface |
| ingress protection | IP44 |

❶ red          ❷ blue          ❸ brown

L/+ N/−

> The sensor head can move in two planes, allowing for precise adjustment of the detection field depending on the individual requirements of the user.

# DR-06W / DR-06W 24v / DR-06B / DR-06B 24v  white/black
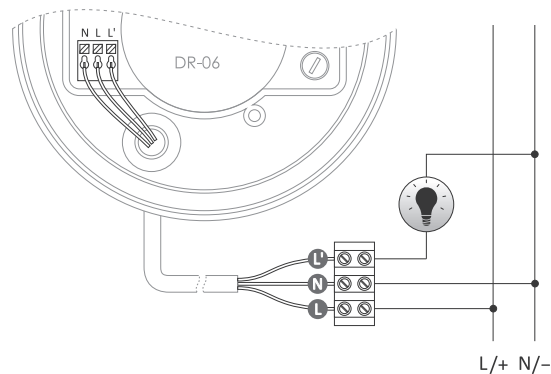
| power supply | |
|---|---|
| DR-06B/DR-06W | 195÷265 V AC |
| DR-06B 24 V/DR-06W 24 V | 9÷30 V DC |
| maximum load current (AC-1) | 4 A |
| twilight activation threshold | 10÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 3 s÷12 min. (±3 min.) |
| horizontal detection field | 360° |
| maximum radius detection (for h= 2.3÷3.5 m, T<24°C) | 5 m |
| sensor mounting height | 2.5÷3.5 m |
| power consumption | |
| standby | 0.10 W |
| on | 0.45 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -10÷40°C |
| dimensions | ø115 mm, h= 47 mm |
| mounting | surface |
| ingress protection | IP40 |

L/+ N/−

# DR-07  ceiling-mounted, built-in
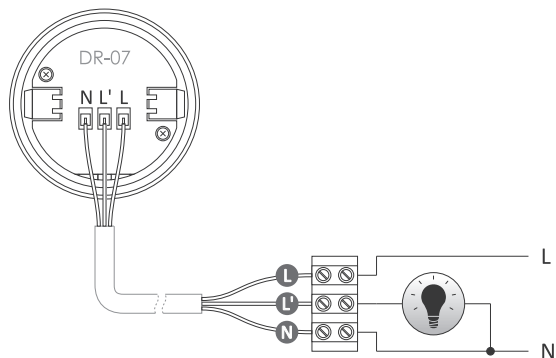
| power supply | 195÷265 V AC |
|---|---|
| maximum load current (AC-1) | 1.5 A |
| twilight activation threshold | 10÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 3 s÷9 min. (±2 min.) |
| horizontal detection field | 360° |
| maximum radius detection (for h= 2.3÷3.5 m, T<24°C) | 4 m |
| sensor mounting height | 2.5÷3.5 m |
| power consumption | |
| standby | 0.10 W |
| on | 0.45 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -10÷40°C |
| dimensions | |
| external | ø50 mm, h= 52 mm |
| groove | ø39 mm, h= 35 mm |
| mounting hole | ø40 mm |
| screw spacing | 33 mm |
| mounting | for built-in |
| ingress protection | IP20 |

# DR-08   for ø60 flush-mounted box

| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current (AC-1) | 5 A |
| twilight activation threshold | 3÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 3 s÷9 min. (±2 min.) |
| horizontal detection field | 360° |
| maximum radius detection for (h=2.3÷3.0 m, T<24°C) | 2 m |
| sensor mounting height | 2.5÷3.0 m |
| power consumption | |
| standby | 0.10 W |
| on | 0.45 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -10÷40°C |
| dimensions | |
| external | ø105 mm; h=71.5 mm |
| groove | ø50 mm; h=43 mm |
| mounting hole | ø51 mm |
| screw spacing | 79 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## The DR-08 sensor detection field



2,5÷3m
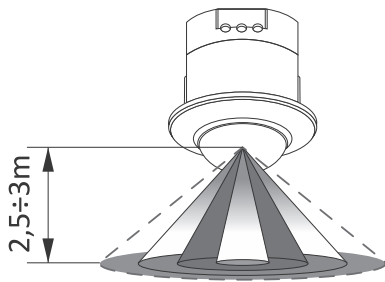
Height of the sensor installation



Max: 2 m (radius)
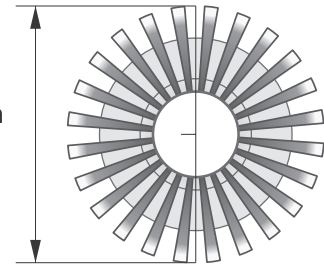
Adjustable range of the detection field

# DR-09   ceiling-mounted

| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current (AC-1) | 10 A |
| twilight activation threshold | 3÷2000 lx |
| motion of detection | 0.6÷1.5 m/s |
| switch-off time | 3 s÷9 min. (±2 min.) |
| horizontal detection field | 360° |
| maximum radius detection (for h=2.5 m, T<24°C) | 20 m |
| sensor mounting height | 2÷6 m |
| power consumption | 0.5 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -20÷40°C |
| dimensions | 102×102 mm, h=55 mm |
| mounting | surface |
| ingress protection | IP20 |

A red   N blue   L brown

## The DR-09 sensor detection field



2,2÷6 m

10 m   10 m

Detection field



presence: 6 m
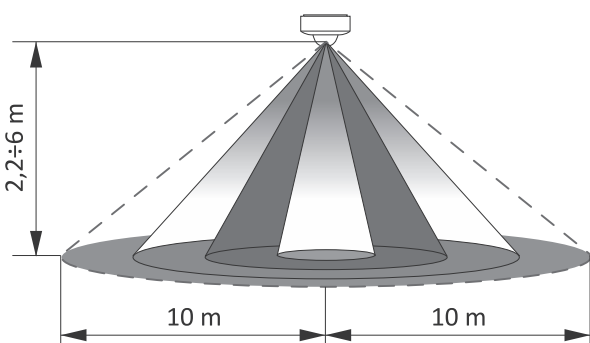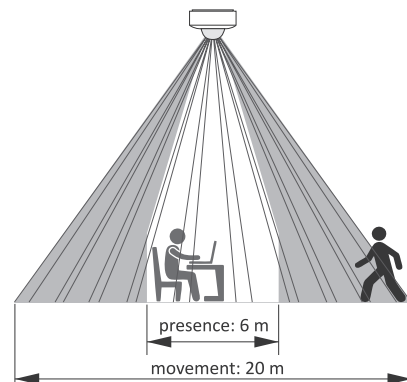
movement: 20 m

Direction of movement in the detection field

# Microwave sensor with occupancy sensor feature

The microwave sensor detects changes in the reflection of high-frequency electromagnetic waves caused by the movement of objects. It is characterized by high detection sensitivity and independence from the influence of temperature. When motion is detected, the lighting is switched on. If a motion is no longer detected, the light will remain switched on for the set period of time. The motion sensor has a built-in twilight switch which makes it impossible to switch on the controlled lighting during the day.

**The sensor can also detect movement through wooden, plasterboard, glass and plastic panels.**

**The power of microwave radiation is low and completely safe for humans and animals. Its value is below 10 mW.**

**For comparison, the mobile phone radiates with a power of approx. 1000 mW (100 times stronger).**

## DRM-01 / DRM-01 24V   for build-in
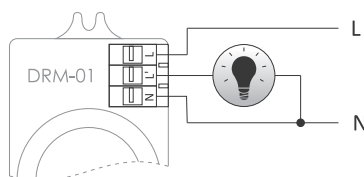


| power supply | |
|---|---|
| DRM-01 | 195÷265 V AC |
| DRM-01 24 V | 21÷27 V AC |
| maximum load current (AC-1) | 5 A |
| frequency of microwaves radiation | 5.8 GHz |
| radiation power | 10 mW |
| detection field | 360° |
| detection radius (adjustable) | |
| for h= 2.5 m | 1÷10 m |
| twilight activation (adjustable) | 2÷2000 lx |
| switch-on time of receiver (adjustable) | 5 s÷12 min. |
| operation delay | 1 s |
| power consumption | 0.9 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -25÷50°C |
| dimensions | 46×93×42 mm |
| mounting | for build-in |
| mounting height | 2÷6 m |
| ingress protection | IP20 |

## DRM-02 / DRM-02 24V   ceiling-mounted
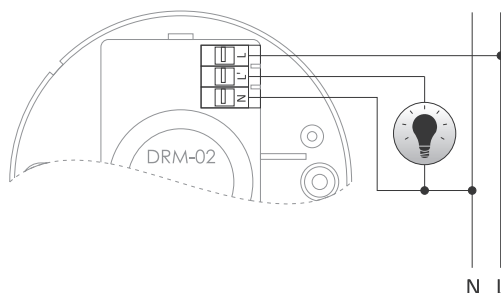


| power supply | |
|---|---|
| DRM-02 | 195÷265 V AC |
| DRM-02 24 V | 21÷27 V AC |
| maximum load current (AC-1) | 5 A |
| frequency of microwaves radiation | 5.8 GHz |
| radiation power | 10 mW |
| detection field | 360° |
| detection radius (adjustable) | |
| for h= 2.5 m | 1÷10 m |
| twilight activation (adjustable) | 2÷2000 lx |
| switch-on time of receiver (adjustable) | 5 s÷12 min. |
| operation delay | 1 s |
| power consumption | 0.9 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -25÷50°C |
| dimensions | ∅103 mm; h= 44 mm |
| mounting | surface |
| mounting height | 2÷6 m |
| ingress protection | IP40 |

(!) Czujnik DRM-02 może współpracować z lampami LED.

## DRM-07   for ø60 flush-mounted box
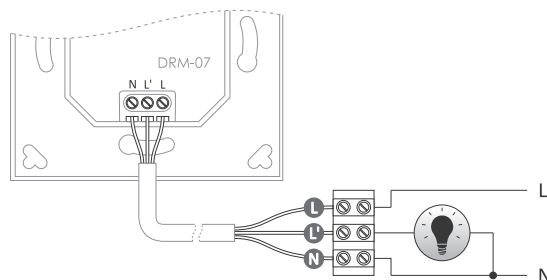


| power supply | 195÷265 V AC |
|---|---|
| maximum load current (AC-1) | 6 A |
| frequency of microwaves radiation | 5.8 GHz |
| radiation power | 0.2 mW |
| motion of detection | 0.6÷1.5 m/s |
| detection field | 180° |
| maximum radius detection (adjustable) | |
| for h= 1÷1.8 m | 1÷8 m |
| twilight activation (adjustable) | 3÷2000 lx |
| switch-on time of receiver (adjustable) | 10 s(±3s)÷12 s(±1 min.) |
| operation delay | <1 s |
| power consumption | 0.9 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -25÷50°C |
| dimensions | |
| external | 80×80×48 mm |
| groove | ∅55 mm, h= 33 mm |
| mounting hole | ∅60 mm |
| screw spacing | 58 mm |
| mounting | in flush mounted box ø60 |
| mounting height | 1.0÷1.8 m |
| ingress protection | IP20 |

# DRM-08   ceiling-mounted
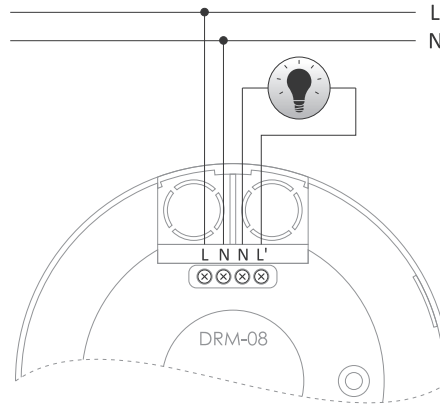
| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current (AC-1) | 10 A |
| frequency of microwaves radiation | 5.8 GHz |
| radiation power | 10 mW |
| motion of detection | 0.6÷1.5 m/s |
| detection field | 360° |
| maximum radius detection (adjustable) for h= 2.5 m | 1÷8 m |
| twilight activation (adjustable) | 3÷2000 lx |
| switch-on time of receiver (adjustable) | 10 s(±3)÷12 min.(±1) |
| operation delay | <1 s |
| power consumption | 0.9 W |
| terminal | 1.0 mm² screw terminals |
| tightening torque | 0.25 Nm |
| working temperature | -25÷50°C |
| dimensions | Ø115, h= 24 mm |
| mounting | surface |
| mounting height | 2÷6 m |
| ingress protection | IP20 |

# Laser sensors

# DRL-12   with a distance sensor

## Functioning

The DRL-12 is a laser distance sensor that detects obstacles in the range of zero to two meters. Thanks to the low dispersion angle of the beam and precise detection range adjustment, it is ideal for switching on lighting circuits for example in open staircases, where it is important that the sensor detects presence only on stairs and ignores everything that happens outside them.
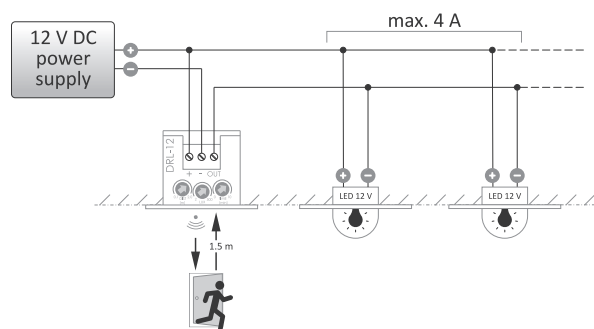
| | |
|---|---|
| power supply | 9÷27 V DC |
| maximum load current (AC-1) | 4 A |
| detection range (adjustable) | 0.1÷2.0 m |
| brightness level (adjustable) | 2÷500 lx |
| switch-on time (adjustable) | 0÷10 min. |
| detection | |
| sensor | laser sensor ToF |
| wave length | 940 nm |
| security | 1 class |
| beam scattering | ±18° |
| power consumption | 0.3 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -10÷45°C |
| dimensions | |
| external | 45×45×1.5 mm |
| internal (box) | Ø32, depth= 45 mm |
| mounting | in flush mounted box Ø40 |
| ingress protection | IP40 |

## Functions

• Laser distance sensor of the ToF (Time of Flight) type;
• Detection range can be smoothly adjusted in the range of 0.1 to 2 m;
• Brightness sensor that prevents the light from being switched on during the day;
• Adjustable switch-on time;
• Possibility of the direct control of 12/24 V lighting circuits (load capacity up to 4 A, which can be increased by connecting LED-AMP amplifiers);

• Soft start and soft shutdown feature available for controlled lighting circuits (in combination with dimmable LED lamps, for example with F&F staircase light fittings);
• Ability to trigger AS-225 cascade controllers;
• Compact size; can be mounted in a Ø40 mm box supplied with the sensor;
• LED indicating the operating status of the sensor.

## Color variants

| Type | standard | afromosia | beech | oak | ash | merbau | walnut | pine |
|---|---|---|---|---|---|---|---|---|
| white | ● | – | – | – | – | – | – | – |
| black | ● | – | ● | ● | ● | ● | ● | ● |
| satin | – | ● | ● | ● | ● | ● | ● | ● |

# Ceiling lights with built-in microwave motion sensor

## DRM-04   LED (×96) 15 W
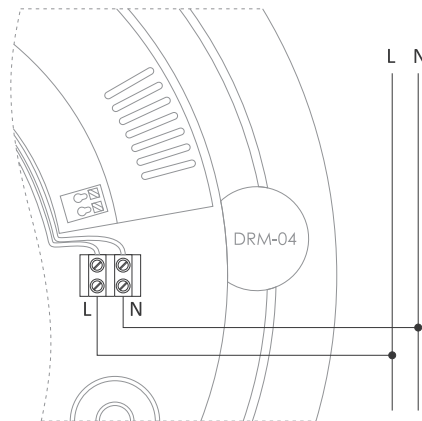
| | |
|---|---|
| power supply | 195÷265 V AC |
| lighting | |
| power | 15 W |
| luminous flux | 1030 lm |
| color | 6000 K |
| frequency of microwaves radiation | 5.8 GHz |
| motion sensors | |
| radiation power | 10 mW |
| motion of detection | 0.6÷1.5 m/s |
| detection field | 360° |
| detection radius (adjustable) for h= 2.5 m | 1÷8 m |
| twilight activation (adjustable) | 2÷2000 lx |
| switch-on time of receiver (adjustable) | 5 s÷15 min. |
| operation delay | 1 s |
| power consumption (standby) | 0.9 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -25÷50°C |
| dimensions | ∅295, h= 100 mm |
| mounting | surface |
| mounting height | 2÷6 m |
| lampshade | HDPE material, milky white |
| ingress protection | IP40 |

## DRM-05   E27 25 W
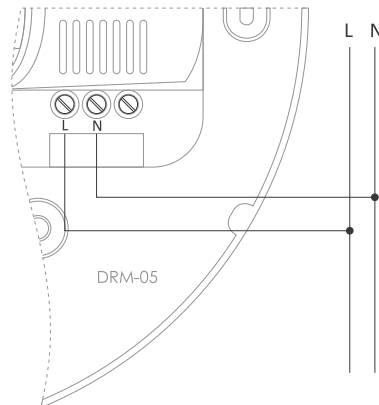
| | |
|---|---|
| power supply | 195÷265 V AC |
| maximum load current (AC-1) | 0.1 A |
| frequency of microwaves radiation | 5.8 GHz |
| radiation power | 0.3 mW |
| motion of detection | 0.6÷1.5 m/s |
| detection field | 360° |
| detection range (adjustable) | 3÷9 m |
| twilight activation (adjustable) | 2÷2000 lx |
| switch-on time of receiver (adjustable) | 8 s÷12 min. |
| operation delay | 1 s |
| power consumption (standby) | 0.9 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -25÷50°C |
| dimensions | ∅280, h= 100 mm |
| mounting | surface |
| mounting height | 2.5÷3.5 m |
| lampshade | HDPE material, milky white |
| ingress protection | IP40 |

## DRM-06   LED (×160) 10 W
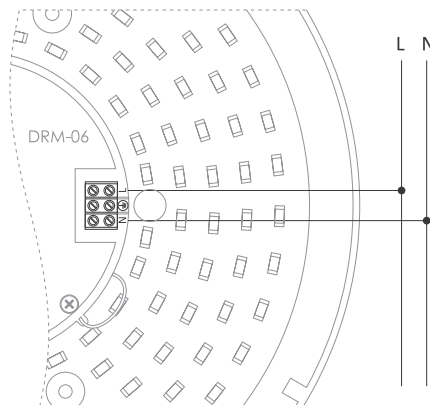
| | |
|---|---|
| power supply | 195÷265 V AC |
| lighting | |
| power | 10 W |
| luminous flux | 970 lm |
| color | 6000 K |
| frequency of microwaves radiation | 5.8 GHz |
| motion sensors | |
| radiation power | 0.2 mW |
| motion of detection | 0.6÷1.5 m/s |
| detection field | 360° |
| detection range (adjustable) | 1÷8 m |
| twilight activation (adjustable) | 2÷2000 lx |
| switch-on time of receiver (adjustable) | 5 s÷12 min. |
| operation delay | 1 s |
| power consumption | 0.9 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| working temperature | -25÷50°C |
| dimensions | ∅260, h= 90 mm |
| mounting | surface |
| mounting height | 2÷6 m |
| lampshade | HDPE material, milky white |
| ingress protection | IP40 |

# Chapter 8
# Lighting controllers

## Current surge arresters

**Purpose**

The MST is used for the reduction of current surges occurring when LED lighting, halogen lamps, impulse power supplies, etc. are switched on.
In addition to extending the service life of the MST receivers, it also prevents overcurrent protection from being triggered by a sharp current surge.

**Functioning**

At the moment the device is connected into series with a load, an additional NTC thermistor is switched on to limit the current to a value safe for the installation and typical overcurrent protection. After an approximately 1 s the thermistor is disconnected and from this moment the receiver is supplied with full mains voltage.

(!) There is no effect of gradual illumination of lamps.

## MST-01

| | |
|---|---|
| input voltage IN | 195÷253 V AC |
| output voltage OUT | $U_{OUT}=U_{IN}$ |
| maximum load current (AC-1) | 8 A |
| executive element | relay+NTC thermistor |
| switching time | 1 s |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## MST-02

| | |
|---|---|
| input voltage IN | 195÷253 V AC |
| output voltage OUT | $U_{OUT}=U_{IN}$ |
| maximum load current (AC-1) | 8 A |
| executive element | relay+NTC thermistor |
| switching time | 1 s |
| power consumption | 0.1 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

## MST-03   inrush current limiter for 230 V AC circuits

**Purpose**

MST-03 is designed to limit current overcurrents occurring when switching on the power supply of circuits with inductive or capacitive characteristics (such as LED lighting, pulse power supplies, lighting fixtures) or non-linear characteristics (such as incandescent and halogen lamps).
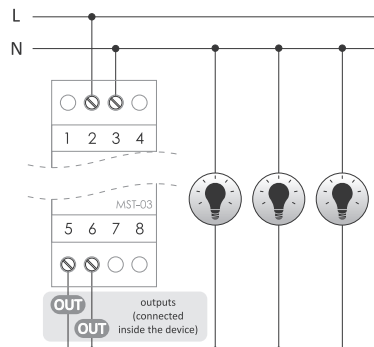
| | |
|---|---|
| input voltage IN | 195÷253 V AC |
| output voltage OUT | UOUT=UIN |
| maximum load current (AC-1) | 30 A |
| executive element | relay+NTC thermistor |
| switching time | 1÷1,5 s |
| power consumption | <1 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) MST-03 is not designed for smooth lighting brightening.

# Lighting brightness controls with weekly timer

**Purpose**

Brightness controllers with weekly timer are designed for program control of brightness levels according to the individual time program set by the user.

**Functions**

- Up to 480 program steps can be programmed (day/days of the week, hour, minute, brightness level);
- Operation in the following modes:
  – automatic – according to the commands programmed by the user in the timer memory;
  – manual – manual control of switching on/off and brightness level;
  – semi-automatic – the ability to manually control the brightness level in automatic mode.
  The change will be effective until the next switch on/off resulting from the automatic operation cycle.
- Local input – the ability to control the brightness using an additional button connected to the controller;
- Programmable brightening/dimming time;
- Automatic change of time;
- Date preview and current program preview;
- Output status memory in the case of a manual operation mode;
- Replaceable battery type 2032.

## PCZ-531LED with LED 9÷30 V control output
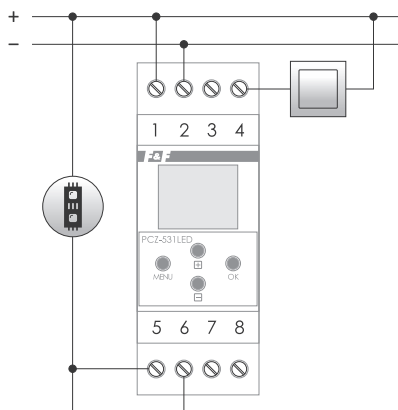
| | |
|---|---|
| power supply | 9÷30 V DC |
| output | open collector OC |
| maximum load current | 8 A/50 V DC |
| input | potential-free (triggered with 0 V) |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| display maintenance | none |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 480 |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

**Funkctions**

- 9÷30 V DC power supply;
- Direct load control up to 8 A;
- Programmable brightness characteristics – the ability to adapt to any dimmable lamp or LED strip.

## PCZ-531A10 with 1÷10 V analog output
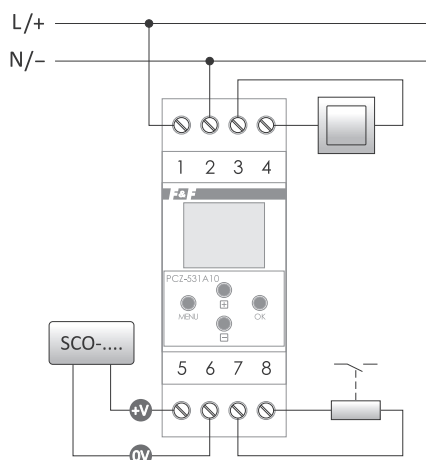
| | |
|---|---|
| power supply | 85÷265 V AC/DC |
| analog output | 1÷10 V/30 mA |
| auxiliary contact | separated 1×NO |
| maximum load of the auxiliary contact | 6 A/250 V AC |
| input | potential-free (short-circuit 3-4) |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| display maintenance | none |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 480 |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

**Functions**

- 85÷265 V AC/DC power supply;
- 1÷10 V analog output voltage;
- Additional 6 A/250 V AC relay output activated when the light is switched on. To be used, for example, as a contactor control for switching on the power supply of the controlled lamps.

# LED-AMP-1D

Power supply signal amplifier for LED lighting, for DIN rail

**Purpose**

The LED-AMP-1D controller is an amplifier of the signal powering the LED lighting 12/24 V DC.  The principle of operation is to reproduce at the output of the amplifier the PWM control signal supplied to the input system. The energy to supply the next lighting segment is taken from the power supply unit connected to the amplifier.  Galvanic separation between the input and output of the amplifier enables unlimited expansion of the lighting chain, without the risk of problems associated with supplying power from different phases or long ground loops.



| power supply | 9÷30 V DC |
|---|---|
| input | |
| voltage | 6÷30 V DC |
| current | 5 mA |
| control signal | PWM |
| output | |
| voltage | as the power supply voltage |
| current (max) | 16 A |
| actuator | transistor |
| separation between the output and the input | |
| type | galvanic |
| level | 2.5 kV |
| power consumption | |
| Iout= 0 A | <0.05 W |
| Iout= 16 A | <1.2 W |
| working temperature (without condensation of steam) | -15÷50°C |
| temperature protection | 65°C |
| indication | power, brightness level, temperature exceeding |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| mounting | for TH-35 rail |
| dimensions | 1 module (18 mm) |
| ingress protection | IP20 |

# LED-AMP-1P

Power supply signal amplifier for LED lighting, for ø60 flush-mounted box

**Purpose**

The LED-AMP-1P controller is an amplifier of the signal powering the LED lighting 12/24 V DC. The principle of operation is to reproduce at the output of the amplifier the PWM control signal supplied to the input system. The energy to supply the next lighting segment is taken
from the power supply unit connected to the amplifier. Galvanic separation between the input and output of the amplifier enables unlimited expansion of the lighting chain, without the risk of problems associated with supplying power from different phases or long ground loops.



| power supply | 9÷30 V DC |
|---|---|
| input | |
| voltage | 6÷30 V DC |
| current | 5 mA |
| control signal | PWM |
| output | |
| voltage | as the power supply voltage |
| current (max) | 16 A |
| actuator | transistor |
| separation between the output and the input | |
| type | galvanic |
| level | 2.5 kV |
| power consumption | |
| Iout= 0 A | <0.05 W |
| Iout= 16 A | <1.2 W |
| working temperature (without condensation of steam) | -15÷50°C |
| temperature protection | 65°C |
| indication | power, brightness level, temperature exceeding |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| mounting | in flush mounted box ø60 |
| dimensions | 48×43×20 mm |
| ingress protection | IP20 |

**Interesting and practical**

max. 4 A

12 V DC
power supply

DRL-12

+ – OUT

1.5 m

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC
power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC
power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC
power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

LED 12 V
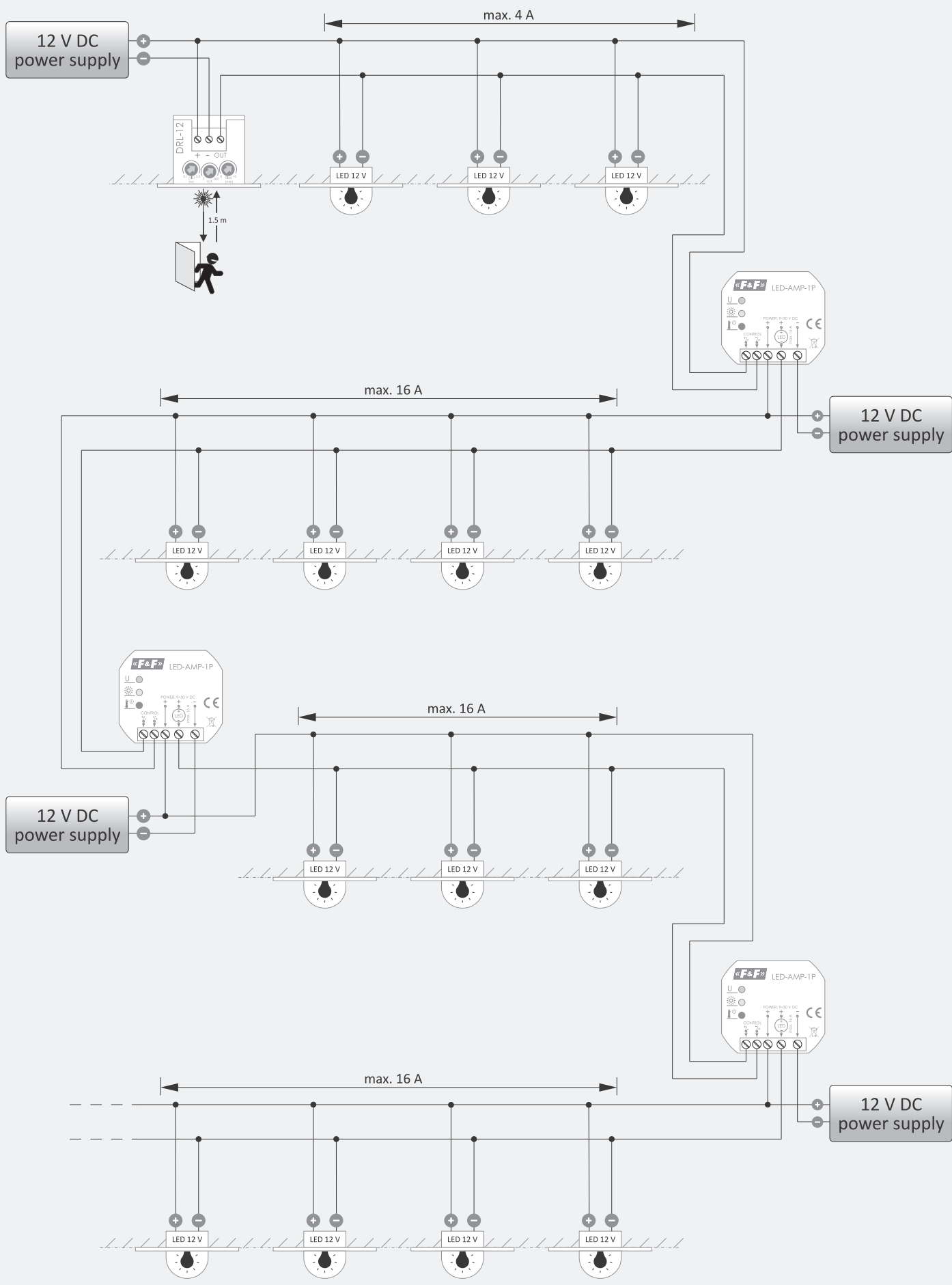
Use of LED-AMP amplifiers to increase the number of controlled lamps

# Section II

# Building automation systems

# Chapter 9
# Roller shutter controllers

**Purpose**

Roller shutter controllers are designed to control roller shutters (up/down) or other devices driven by a single-phase AC motor (such as gates). The control is carried out by means of monostable (bell) buttons. The controller can operate as a stand-alone device (designed to open/close one roller shutter), or it can be combined into groups allowing for central control of multiple roller shutters.
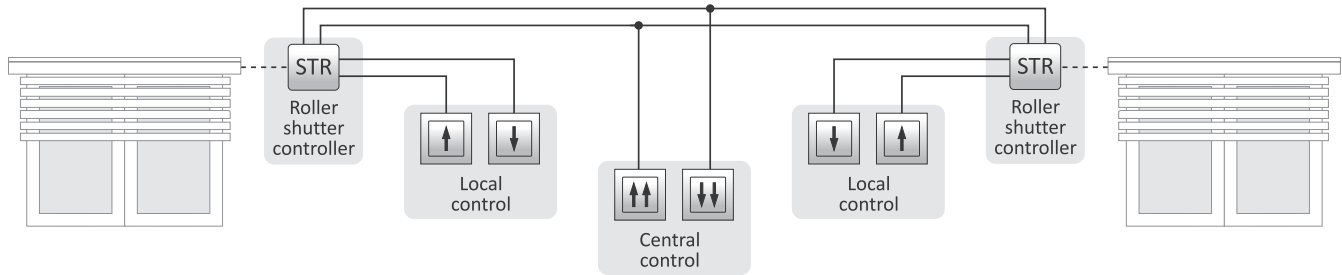
**Functioning**

The roller shutter motor is activated by pressing a button connected to one of the control inputs. The motor is switched on for a time programmed earlier by the user, allowing the roller shutter to be fully raised or lowered. It is possible to stop the running roller shutter at a level selected by the user (incomplete opening or closing of the roller shutter).

## Universal

**Functions**

- Local and central control;
- Universal one-button or two-button control (not applicable for GS2-STR-3 controller);
- Lock function – a permanent signal at the "Central-Down" input; prevents all buttons from being controlled until the signal is removed;
- Direction memory – for local and central control. If the controller executes the "Central-Up" command, then the next pressing of the local button will start the roller shutter down;
- Asynchronous start – the time of switching on the roller shutter in the central control is randomly delayed (by maximum 1 second) in order to minimize the current surge in the mains caused by simultaneous switch-on of many motors.

**Functioning**

- **Local control**

  Depending on the connection method, the controller can operate in one-button or two-button mode:

  Two local buttons

  Each movement direction has its own local button. Short press (<0.5 seconds) of a button causes the roller shutter to start to move in a preset direction for a programmed period of time. If the roller shutter is already in motion when the button is pressed, it will be stopped. Long press (>0.5 seconds) of a button causes the roller shutter to start to move in a preset direction for the whole time the button is pressed (this function allows you, for example, to adjust the tilt of the slats).

  One local button

  The local control input "Down" is permanently connected to the N line (STR-3 controllers) or + line (STR-4 controllers). A button is connected to the "Up" local control input, which alternately switches the roller shutter to operate in one direction or the other. Short press (<0.5 seconds) of a button switches on the roller shutter for a programmed period of time. If the roller shutter is already in motion when the button is pressed, it will be stopped. Long press (>0.5 seconds) of a button causes the roller shutter to switch on for the whole time the button is pressed. Each subsequent press of the button will activate the roller shutter in the opposite direction to the previous one.

- **Central control**

  The controller always cooperates with two central control inputs. The central control system allows the roller shutters to be switched on for movement only in the selected direction. The roller shutter will stop only after the programmed time has elapsed or after any local control button has been pressed. The "Central-Down" button performs an additional function of closing and locking the roller shutter in the closed position. If the "Central-Down" button is pressed and left in the ON position, the controller will close the roller shutter and will not allow it to be opened until the "Central-Down" button is released (the operation of the remaining inputs will then be disabled). This function allows you to block roller blinds in case of, for example, alarm arming, rainfall detection (after using the additional STR-R rain sensor) or too strong wind (after using the additional STR-W wind sensor).

# STR-3P  for 230 V AC motors

Cables from the switchgear to the STR-3P controller:
4+PE – if central control is used or
2+PE – without central control

PE N L

STR-3P

Local control

Central control

Cables from the STR-3P controller to the motor: 3+PE

| power supply | 100÷265 V AC |
|---|---|
| load capacity (AC-1/AC-3) | 8 A/1.5 A |
| power consumption | |
| standby | <0.15 W |
| on | <0.6 W |
| control | triggered with N level |
| switch-on time (adjustable) | 1 s÷15 min. |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| local control terminal | 2×DY 1 mm²/ l= 10 cm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# STR-4P  for 12/24 V DC motors

Cables from the switchgear to the STR-4P controller:
4 – if central control is used or
2 – without central control

+ −

STR-4P

Local control

Central control

Power supply of the motor:
A => B – UP direction
B => A – DOWN direction

Cables from the STR-4P controller to the motor: 2

| power supply | 10÷27 V DC |
|---|---|
| load capacity | 6 A |
| power consumption | |
| standby | <0.15 W |
| on | <0.6 W |
| control | triggered with 10÷27 V DC level |
| switch-on time (adjustable) | 1 s÷15 min. |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| local control terminal | 2×DY 1 mm²/ l= 10 cm |
| dimensions | 43×48×25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# STR-3D  for 230 V AC motors

L
N
PE

1 2 3
4 5 6

STR-3D

7 8 9
10 11 12

Cables from the switchgear to central control: 3

Cables from the switchgear and STR-3D controller to the roller shutter and central control at the roller shutter: 5+PE

Central control

Local control

| power supply | 100÷265 V AC |
|---|---|
| load capacity (AC-1/AC-3) | 8 A/1.5 A |
| power consumption | |
| standby | <0.15 W |
| on | <0.6 W |
| control | triggered with N level |
| switch-on time (adjustable) | 1 s÷15 min. |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# STR-4D  for 12/24 V DC motors

switchgear +
−

1 2 3
4 5 6

STR-4D

7 8 9
10 11 12

Cables from the switchgear to central control: 3

Cables from the switchgear and STR-4D controller to the roller shutter and central control at the roller shutter: 4

Central control

Power supply of the motor:
A>B – UP direction
B>A – DOWN direction

Local control

| power supply | 10÷27 V DC |
|---|---|
| load capacity | 6 A |
| power consumption | |
| standby | <0.15 W |
| on | <0.6 W |
| control | triggered with 10÷27 V DC level |
| switch-on time (adjustable) | 1 s÷15 min. |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# GS2-STR-3  230 V AC roller shutter controller

**Purpose**

GS2-STR-3 is a controller for roller shutters with 230V AC motors that is integrated with a double glass button enabling local control of the roller shutter (up and down). The controller is also equipped with central control inputs enabling the controller to be connected to group control systems along with other GS2-STR-3 or classic STR-3P or STR-3D controllers.
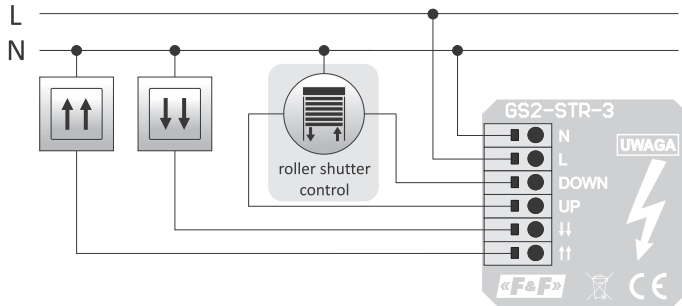


| power supply | 100÷265 V AC |
|---|---|
| load capacity (AC-1/AC-3) | 8 A/1.5 A |
| power consumption | |
| standby | <0.15 W |
| on | <0.8 W |
| control | |
| local | buttons on the glass housing |
| central | triggered with N level |
| switch-on time (adjustable) | 1 s÷15 min. |
| working temperature | -25÷50°C |
| terminal | spring terminals, cable 0.5÷2.5 mm² |
| dimensions | |
| external (glass frame) | 81×81×12 mm |
| internal (box) | ø58.5 mm, depth 15 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | |
| front | IP50 |
| back | IP20 |

**Application**

Double button, white



GS2-230-W

Double button, black
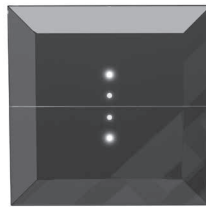


GS2-230-B

# STR-W  wind speed sensor

**Purpose**

The STR-W controller along with an external wind sensor is designed to monitor the current wind speed.
If the wind speed exceeds the preset threshold value, the internal relay will be activated.
The controller operates in two modes:
**Continuous mode** – If the wind speed exceeds the preset value, the internal relay contact closes and remains closed until the gusts of wind cease (Lockout).
**Pulse mode** – If the wind speed exceeds the preset value, the contact of the internal relay closes for approx. 1.5 seconds, transmitting a one-time shutdown command to the roller shutter controllers.  The adjustment range for both modes is the same: 20÷70 km/h.



| power supply | 100÷265 V AC |
|---|---|
| power consumption | |
| standby | <0.2 W |
| on | <0.6 W |
| working temperature | -15÷50°C |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 67×50×26 mm |
| mounting | surface |
| ingress protection | IP20 |

**wind sensor**

| dimensions | ø80, h=85 mm |
|---|---|
| cable | 2×0.25 mm², l=5 m |
| mounting | flat bar (L-profile) 150×70×3 mm |
| ingress protection | IP65 |

# STR-R  precipitation sensor (rain/snow)

## Purpose

The STR-R controller with an external precipitation sensor is designed to detect rainfall. In combination with the STR-3 or STR-4 roller shutter controllers, the STR-R controller allows building a system in which the window shutters will be closed or the awnings will be rolled up in case of rainfall. The controller operates in two modes:

**Continuous mode** – when the precipitation starts, the contact of the internal relay closes and remains closed throughout the precipitation period (Lockout).

**Pulse mode** – when the precipitation starts, the contact of the internal relay closes for approx. 1.5 seconds, transmitting a one-time shutdown command to the roller shutter controllers.



| power supply | 100÷265 V AC |
|---|---|
| power consumption | |
| standby | <0.2 W |
| on | <0.6 W |
| working temperature | -15÷50°C |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 67×50×26 mm |
| mounting | surface mounting |
| ingress protection | IP20 |

**precipitation sensor**

| dimensions | 55×50×13 mm |
|---|---|
| cable | 3×0.25 mm², l=5 m |
| mounting | screw hole ø3/adhesive tape |
| ingress protection | IP65 |

**①** green    **②** white    **③** brown

to central control

## Schematic diagram of the manual and automatic control system using system sensors and other control relays
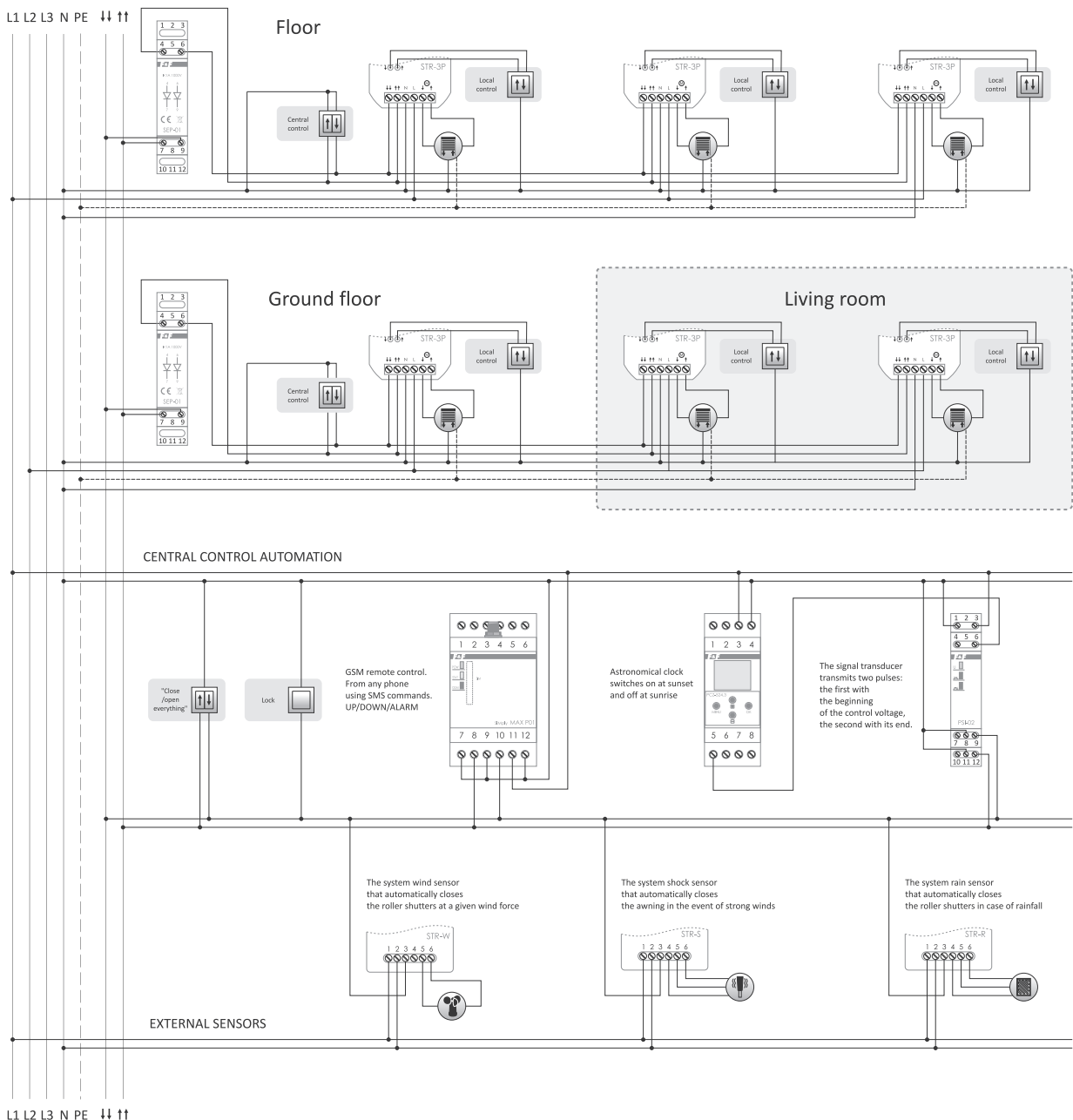
## Two-button: 2 local control buttons "Up" and "Down"



<span style="background:#7a9a3a;color:white">Functioning</span>

**• Local control**

Buttons controlling one roller shutter; ↑ – up (opening); ↓ – down (closing). Pressing the local button switches on the roller shutter for movement in a selected direction. If the roller shutter is already in motion, pressing the local control button will stop the roller blind.

**• Central control**

A group of buttons common to many controllers (at least two) controls all roller shutters in the central control system: ↑↑ – all up; ↓↓ – all down. Pressing the local button switches on the roller shutter for movement in a selected direction. If one of the roller blinds is already moving in the same direction, then the movement will be continued. If it moves in the opposite direction, the roller shutter will be stopped first and then switched on in the direction resulting from the command given to the central input.

> ⓘ The central control system allows the roller shutters to be switched on for movement only in the selected direction.
> The roller shutter will stop only after the programmed time has elapsed or after any local control button has been pressed.

# STR-1   modernization

A classic solution with a new insides. Streamlined design reduces power consumption and increases device durability.



| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | triggered with L or N level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0÷10 min. |
| power/programming indication | LED green |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| signal terminal | 4×DY 1 mm², l= 10 cm |
| supply terminal | 2×DY 1.5 mm², l= 10 cm |
| dimensions | ø55, h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# STR-21



| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | triggered with L or N level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0 s÷10 min. |
| power/programming indication | LED green |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

# STR-421



| power supply | |
|---|---|
| STR-421 230 V | 195÷253 V AC |
| STR-421 24 V | 24 V AC/DC |
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | |
| STR-421 230 V | triggered with L or N level |
| STR-421 24 V | triggered with + level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0 s÷10 min. |
| power/programming indication | LED green |
| power indication | 2×LED red |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## One-button: 1 common local control buttons "Up" and "Down"
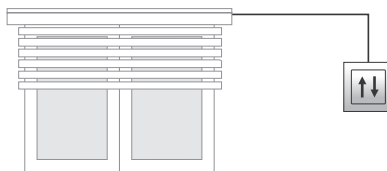


**Functioning**

- **Local control**

Button controlling one roller shutter: ↑ - up (opening); ↓ - down (closing). Pressing the local button switches on the roller blind in the direction opposite to the last one. If the roller shutter is already in motion, pressing the local control button will stop the roller blind. Press the local button again to move the roller shutter in the opposite direction.

- **Central control**

A group of buttons common to many controllers (at least two) connected to terminals 7 and 8, controlling all roller shutters in the central control system: ↑↑ - all up; ↓↓ - all down. Pressing the local button switches on the roller shutter for movement in a selected direction. If one of the roller blinds is already moving in the same direction, then the movement will be continued. If it moves in the opposite direction, the roller shutter will be stopped first and then switched on in the direction resulting from the command given to the central input.

> (!) The central control system allows the roller shutters to be switched on for movement only in the selected direction.
> The roller shutter will stop only after the programmed time has elapsed or after any local control button has been pressed.

## STR-2   modernization

A classic solution with a new insides. Streamlined design reduces power consumption and increases device durability.



| | |
|---|---|
| power supply | 195÷253 V AC |
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | triggered with L or N level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0 s÷10 min. |
| power/programming indication | LED green |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| signal terminal | 4×DY 1 mm², l= 10 cm |
| supply terminal | 2×DY 1.5 mm², l= 10 cm |
| dimensions | ø55, h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## STR-22



| | |
|---|---|
| power supply | 195÷253 V AC |
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | triggered with L or N level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0 s÷10 min. |
| power/programming indication | LED green |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

## STR-422



| | |
|---|---|
| power supply | |
| STR-422 230 V | 195÷253 V AC |
| STR-422 24 V | 24 V AC/DC |
| maximum load current (AC-1/AC-3) | 8 A/1.5 A |
| control | |
| STR-422 230 V | triggered with L or N level |
| STR-422 24 V | triggered with + level |
| control pulse current | <1 mA |
| switch-on time (adjustable) | 0 s÷10 min. |
| power/programming indication | LED green |
| power indication | 2×LED red |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Chapter 10
# Fox – Wi-Fi control system

Easy to install and rich in possibilities, wireless home automation system

## System characteristic

- Communication over home Wi-Fi network;
- Remote access to devices from anywhere in the world via the Polish F&F cloud;
- Ability to work autonomously even without a Wi-Fi connection
- Advanced programmable timers based on online calendars (such as Google, Outlook) and enhanced with astronomical functions;
- Easy to use, free mobile app for Android and iOS phones and tablets;
- Works with Google voice assistant;
- Fully Polish software focused on security and user privacy protection;
- Secured device access and sharing capabilities with a password system;
- No hidden operating costs;
- A guarantee of long-term product support backed by F&F's 30-year history;
- Ability to integrate with external IoT systems using REST APIs.

# Switch&Energy   single relay with monitoring function network parameters, Wi-R1S1-P

| power supply | 85÷265 V AC |
|---|---|
| control input | |
|   control voltage | 85÷265 V AC |
|   control pulse current | <1 mA |
| maximum load current (AC-1) | |
|   rated current | 10 A |
|   maximum current (instantaneous) | 16 A |
| power consumption | |
|   standby | <1.2 W |
|   operation (relay on) | <2 W |
| communication | |
|   radio frequency | 2.4 GHz |
|   transmission | Wi-Fi |
|   radio power | <13 dBm |
|   receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| humidity | <90% |
| (no condensation of steam and aggressive gases) | |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in ø60 flush-mounted box |
| ingress protection | IP20 |

## Functions

- 1-channel 230 V relay with 10 A rated capacity and 16 A* maximum capacity;
- Ability to connect local control buttons and set its function;
- Monitoring of network parameters: voltage, current, power (active and reactive), energy (active and reactive);
- Power limitation can be set, also in connection with time programmers;
- Built-in clock with power backup and backup copy of the work program guarantees proper operation also without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

_____

* Ability to operate above the rated load depends on the temperature and operating conditions

# Double Switch   double relay, Wi-R2S2-P

| power supply | 85÷265 V AC |
|---|---|
| control input | |
|   control voltage | 85÷265 V AC |
|   control pulse current | <1 mA |
| maximum load current (AC-1) | |
|   rated current | 2×5 A |
|   maximum current (instantaneous) | 2×8 A |
| power consumption | |
|   standby | <1.2 W |
|   operation (relay on) | <2.2 W |
| communication | |
|   radio frequency | 2.4 GHz |
|   transmission | Wi-Fi |
|   radio power | <13 dBm |
|   receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| humidity | <90% |
| (no condensation of steam and aggressive gases) | |
| dimensions | Ø54 (size 48×43 mm), h= 20 mm |
| mounting | in ø60 flush-mounted box |
| ingress protection | IP20 |

## Functions

- Two-channel 230 V relay with rated load capacity of 5 A and maximum of 8 A* per channel;
- Ability to connect local control buttons and set their function;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of a relay even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

_____

* Ability to operate above the rated load depends on the temperature and operating conditions

# Shutter 230 V roller shutter controller, Wi-STR1S2-P
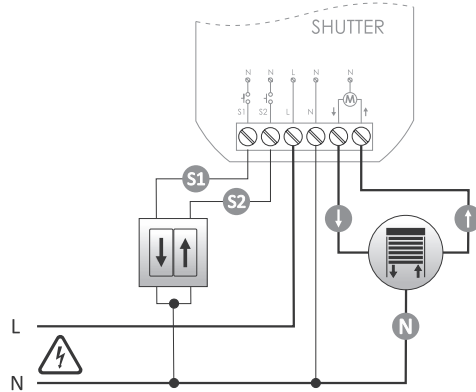


SHUTTER

| power supply | 85÷265 V AC |
| --- | --- |
| control input | |
| control voltage | 85÷265 V AC |
| control pulse current | <1 mA |
| maximum load current (AC-1) | |
| AC motor | max 320 W |
| maximum current (instantaneous) | |
| AC-1 | 6 A |
| AC-3 | 1.5 A |
| power consumption | |
| standby | <1.2 W |
| operation (relay on) | <2.2 W |
| communication | |
| radio frequency | 2.4 GHz |
| transmission | Wi-Fi |
| radio power | <13 dBm |
| receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| humidity | <90% |
| (no condensation of steam and aggressive gases) | |
| dimensions | Ø54 (size 48×43 mm), h= 25 mm |
| mounting | in ø60 flush-mounted box |
| ingress protection | IP20 |

### Functions

- Control of a single roller shutter with a 230 V motor with a load capacity of up to 320 W;
- One or two buttons for local control of the roller shutter can be connected;
- Ability to control the pitch of the slats;
- Set the desired level of roller shutter opening and slat tilt using the mobile app and time programmers;
- Electric protection of the roller shutter motor;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of a relay even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

# Gate gate controller Wi-Gate and Wi-Gate-G
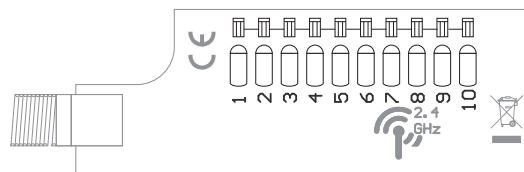


1. PWR +/-/~
2. PWR -/+/~
3. OUT 1 +
4. OUT 1 -
5. OUT 2 +
6. OUT 2 -
7. IN 1 +
8. IN 1 -
9. IN 2 +
10. IN 2 -

| power supply | 9÷30 V DC |
| --- | --- |
| control inputs | 2 |
| control voltage | 9÷30 V DC |
| control pulse current | <3 mA |
| control outputs | |
| type | open collector |
| maximum load current (AC-1) | <20 mA |
| voltage | 40 V |
| power consumption | |
| standby | <1.2 W |
| operation (output on) | <1.5 W |
| communication | |
| radio frequency | 2.4 GHz |
| transmission | Wi-Fi |
| radio power | <13 dBm |
| receiver sensitivity | -98 dBm |
| terminal | 0.14÷0.5 mm² spring terminals |
| working temperature | -20÷55°C |
| dimensions | |
| without antenna | 42×89×31 mm |
| antenna length/working part | 1 m/25 mm |
| mounting | surface |
| ingress protection | IP65 |

### Functions

- Designed for integration with any gate drive system;
- Ability to control one or two gates or a gate and a wicket;
- Local inputs for connecting gate open/close sensors or designed for local opening of the gate/wicket;
- External antenna for extended operating range;
- Hermetic housing suitable for outdoor installation;
- Available in orange (Wi-Gate) or grey (Wi-Gate-G).

# Dimmer    230 V dimmer, Wi-DIM1S1-P



| | |
|---|---|
| power supply | 85÷265 V AC |
| control input | |
|    control voltage | 85÷265 V AC |
|    control pulse current | <1 mA |
| maximum load current (AC-1) | |
|    rated current | 180 W |
|    maximum current (instantaneous) | 300 W |
| power consumption | |
|    standby | <1.2 W |
|    operation (relay on) | <1.6 W |
| communication | |
|    radio frequency | 2.4 GHz |
|    transmission | Wi-Fi |
|    radio power | <13 dBm |
|    receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| humidity | <90% |
| (no condensation of steam and aggressive gases) | |
| dimensions | ⌀54 (size 48×43 mm), h= 20 mm |
| mounting | in ⌀60 flush-mounted box |
| ingress protection | IP20 |

## Functions

- Brightness control of 230 V light sources, including dimmable LED lighting;
- Ability to connect a local button to switch the light on and off and to control the brightness;
- Setting a given brightness level using the mobile application and time programmers;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of a relay even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

# Double LED    12 V LED dimmer, Wi-LED2S2-P



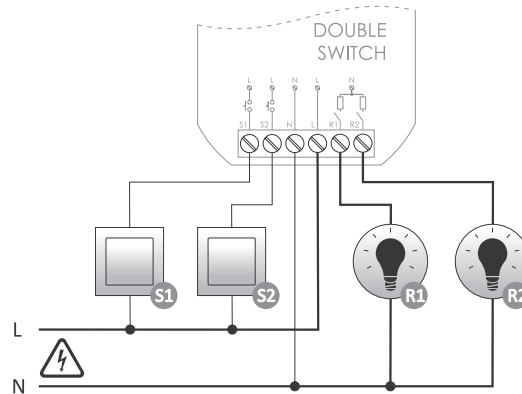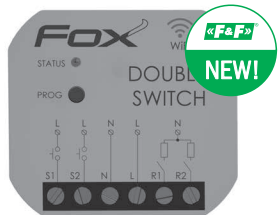| | |
|---|---|
| power supply | 9÷30 V DC |
| control input | |
|    control voltage | 9÷30 V DC |
|    control pulse current | <3 mA |
| maximum load current (AC-1) | |
|    rated current | 2×4 A |
|    maximum current (instantaneous) | 2×8 A |
| power consumption | |
|    standby | <1.2 W |
|    operation (outputs on) | <1.5 W |
| communication | |
|    radio frequency | 2.4 GHz |
|    transmission | Wi-Fi |
|    radio power | <13 dBm |
|    receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| humidity | <90% |
| (no condensation of steam and aggressive gases) | |
| dimensions | ⌀54 (size 48×43 mm), h= 20 mm |
| mounting | in ⌀60 flush-mounted box |
| ingress protection | IP20 |

## Functions

- Dual-channel 12/24 V LED lighting controller with load capacity of up to 4 A* per channel;
- Ability to connect a two local button to switch the light on and off and to control the brightness;
- Setting a given brightness level using the mobile application and time programmers;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of a relay even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

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* The load capacity can be increased using additional amplifiers LED-AMP-1P or LED-AMP-1D (see p. 49)

# Color LED color LED controller, Wi-RGBW-P
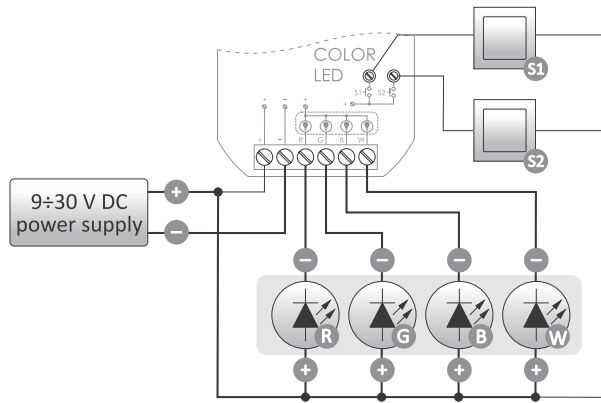


| power supply | 9÷30 V DC |
|---|---|
| control input | |
| control voltage | 9÷30 V DC |
| control pulse current | <3 mA |
| maximum load current (AC-1) | |
| rated current | 4 A/color |
| maximum current (instantaneous) | 4 A/color |
| power consumption | |
| standby | <1.2 W |
| praca (output on) | <1.5 W |
| communication | |
| radio frequency | 2,4 GHz |
| transmission | Wi-Fi |
| radio power | <13 dBm |
| receiver sensitivity | -98 dBm |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | 0÷45°C |
| dimensions | ø54 (size 48×43 mm), h = 20 mm |
| mounting | in ø60 flush-mounted box |
| ingress protection | IP20 |

**Functions**

- 12/24 V color LED RGBW lighting controller with load capacity of up to 4 A* per color;
- Operation in color or white color temperature control mode;
- Ability to connect two local buttons:
  – First to switch the light on and off and to control the brightness;
  – The second for smooth color changes and switching between preset colors.
- Setting a given brightness and level using the mobile application and time programmers;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of a relay even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in an installation box with a diameter of 60 mm.

_____

* The load capacity can be increased using additional amplifiers LED-AMP-1P or LED-AMP-1D (see p. 49)

# Chapter 11
# F&Home - smart home wired system

F&Home

## The standard of the future in your home

**Purpose**

F&Home is a system dedicated to flats, single-family houses and commercial premises.
The system provides all the basic functionalities of building automation, such as
• control of the heating, cooling, and ventilation;
• lighting control (dimmers, light scenes, RGB);
• control of roller shutters, gates, and other motor components;
• switching on/off various circuits and receivers (including sockets), outdoor lighting, sprinklers, household appliances;
• remote control through a dedicated application and GSM supervision.
By distributing the functionality into separate subsystems (modules), which individually perform particular functions, you can adjust the system to your needs and financial capabilities.

**System characteristics**

The F&Home smart home system integrates independently operating systems into standard solutions. Integration offers new possibilities and simplifies the control of an extensive installation. F&Home is a wired control system for lighting, roller shutters, heating, air conditioning and other devices powered by any voltage. The communication is carried out via UTP cables converging in switchgear (star system). Due to the specific way of control and location of the cables, the system is dedicated to newly built or thoroughly modernized buildings. An important feature of the system is the free use of accessories. You can use buttons, switches, and sockets of any manufacturer.

**Central unit**

The central element of the system is a computer with a 12" touch panel. It is mounted outside the switchboard in the wall using a steel mounting casing. The computer is powered from 230 V mains and requires a separate connection with the main switchgear. The module communicates with the system via the CAN bus. It is possible to set the color of the screen menu and upload your own favourite graphics and photos as screen savers. If the customer would like to base the control of the system only on mobile devices (tablets, phones) there is a possibility to use a central unit mounted on a DIN rail called mH-DEVELOPER. The the installation of the touch panel is not required, and the entire configuration and control of the system is carried out from mobile devices. The description of the module can be found in the section: Smart Home for developers.

**Functions**

• Pre-programming (arrangement of elements on the plan of the building);
• Programming of the dimmer settings (hysteresis);
• Setting the device programmers (in an annual cycle with 1-minute increments);
• Setting the heating and cooling programmers;
• Setting the times of motor devices (roller shutter, blinds, awnings);
• Scene definition (can include light, roller shutters, temperature, switching on of selected receivers);
• Setting the color of the interface (adjustment to individual needs);
• Uploading photos to the screen saver (electronic photo frame);
• Configuration of the GSM module;
• Software updates (using a flash drive).

Taking into account the aesthetics of the interior, the customer can choose an aluminium masking frame, lacquered in a chosen color.
Easy installation of the frame and a wide color palette guarantee that the system can be adjusted to any interior.

### Graphical interface - user menu

The clear and intuitive menu structure allows you to centrally control all devices in the entire system. An attractive visualization is an additional decorative element. It is possible to set the color of the screen menu and upload your own favourite graphics and photos as screen savers. The basic visualization of the premises in a house or apartment - based on plans provided by the client - is performed by our graphic designers.



Example of a user interface on a control panel

### GSM and Wi-Fi remote

The GSM functions allow you to remotely control the system with ease via SMS text messages. By sending a special text message we can switch on/off any receiver in the building, check if the indicated circuit is switched on, read the room temperature or run a specific scene (such as raising a room temperature, opening the door, illuminating the driveway, etc.).

Any phone or tablet with Android or iOS and F&Home Mobile application for controlling the system via Wi-Fi or the Internet can be used as a powerful home remote control. The application allows you to control devices and defined scenes.

### Switchgear, accessories and

The system operates in a star system, which means that all the control and power wires of the individual receivers converge in the switchgear. Due to a large number of cables, large switchgear (96 modules and more) or standalone switchgear cabinet must be used. It is also acceptable to use two switchgears, for example on the ground floor and on the first floor of the building.

In this case, a CAN bus line must be routed between the switchgears. The system requires a large number of cables, so the installation should be carried out before the plastering. At the installation stage, it is necessary to cooperate with plaster workers (installation of switchgears and computer housings) and plumbers (control of solenoid valves). The central point of the system is the switchgear and all wires (star system) are connected to it. The signal from the control buttons of the switch-on/off devices (lighting, sockets, and other devices) should be brought to the switchgear via UTP cable. Any type of equipment (buttons, switches, sockets) available on the market can be used to control the system.

## Installation cost and savings

Building a smart installation certainly means a higher initial cost. However, the economic effect is not only determined by the one-time cost incurred during the investment but above all by the subsequent costs of maintenance and operation. When deciding on an F&Home installation, we must be aware that it is an investment in the future. With time, we will save on the costs associated with heating, lighting, and operation of TV equipment. The highest initial cost is the purchase of system components. The cost of building a wired F&Home installation only slightly exceeds the cost of standard wiring - the work of installers/electricians is comparable to the installation of a computer system or alarm system. The total cost of the system is 2 or 3 times lower than other known systems of this type.

The integration of central heating into the F&Home system reduces heating costs by up to 30%.

This effect is achieved thanks to the ability to control the valves of central heating circuits and individual temperature control programs depending on the time of day and the presence and activity of the household members. There are also clear savings (up to 15%) achieved by controlling the lighting depending on place and time, for example by adjusting the lighting intensity to the time of day.

Additional savings can be achieved by properly controlling other receivers, such as consumer electronics, when while leaving the house we use the "Switch off all" function, which disables even the receivers already in stand-by.

## System installation

The F&Home system may only be installed by a qualified installer who has received training in the field of installation, operation, and configuration of the system.

In case of installation by an independent or unauthorized installer, the F&F company may refuse to provide free technical support and terminate the warranty conditions for the components and installation of the system.

The authorized installer holds an individual card with his name, surname and authorization number.

## System elements

| Type | Description |
|------|-------------|
| mH-IO32 | Input/output module controlling 28 on/off devices |
| mH-IO12E6 | Mixed module, controlling 12 on/off devices and 6 motorized devices |
| mH-E16 | Motor module, controlling 16 motor devices such as roller shutters, awnings, gates, roof windows |
| mH-L4 | 4-channel actuator module for dimmers (4×350 W) |
| mH-S4 | 4-channel sensor module (sensors included) |
| mH-S8 | 8-channel sensor module (sensors included) |
| mH-V4 | 4-channel valve actuator module (actuator element: semiconductor) |
| mH-V8 | 8-channel valve actuator module (actuator element: semiconductor) |
| mH-V7+ | 7-channel valve actuator module + CO pump or furnace control |
| mH-R2x16 | Relay module (2 pcs. 16 A) |
| mH-R8/2 | Relay module (8 pcs. 8 A) |
| mH-RE4 | Roller shutter relay module |
| mH-SP | Interference filter module with overvoltage protection module |
| mH-SU50 | Power supply unit |
| mH-Mrg | GSM module |
| mH-TS12 | 12" computer with touch panel |
| mH-RGB | LED RGB control module |
| mH-LED | 12 V LED lighting control module |
| mH-MS | Scene module (16 inputs). It allows you to trigger scenes using the buttons |
| mH-MK | Signal light module (16 inputs) |
| mH-SEP | CAN separator module for extended installations |

www.fhome.pl

# Chapter 12
# F&Home Radio - smart home radio system

## The standard of the future in our home

### System characteristics

The F&Home Radio system is an innovative and comprehensive solution for the designing, installation and remote management of a network of devices constituting equipment or an integral part of a building. By using universal radio-controlled actuators and sensory elements, controlling the operation of individual devices, the system provides wireless integration of previously not connected components of the installation: lighting, heating, air conditioning, ventilation, access control, monitoring, audio-video systems, and garden automation systems.

### System architecture

The F&Home Radio system is based on a central server that controls all its functions. The server is based on a Linux operating system and is characterized by high performance and reliability at a very low power consumption (max 10 W). The server communicates via radio in the 868 MHz band with sensory elements, the so-called "sensors" (such as, among other things, switches, motion detectors, temperature, humidity and other probes) and actuating elements, the so-called "actors" (relays, dimmers, LED control modules, electric motor controllers, pumps, water and heating valves, and other actuators). By using a dual radio that operates simultaneously on two independent channels, the system has a very high resistance to external interference. The range of the radio, which is typically several dozen meters, can be extended by the use of signal amplifiers (repeaters).

Both the sensors and the actors in the F&Home Radio system are universal. For example, a motion sensor can act as an alarm sensor when the household members are out of the house, and if the alarm is disarmed, it can switch on the light or change the settings of the ventilation system depending on the activity of the household members. Similarly, the power regulator can control the intensity of lighting or the thrust of a bathroom fan. Such an approach means that the available range of sensory and actuator elements does not in any way limit the functionality of the system, but on the contrary - it expands it considerably.

Processing of signals in the F&Home Radio system takes place in real-time (guaranteed response time to any events and their combinations is less than 30 ms). The F&Home Radio server works with a local network (LAN), which provides communication with a wide range of mobile devices (phones, smartphones, and tablets). With Cloud service, you can control your devices even when you're away from home. The system also has direct support for SMS-based communication via a dedicated USB modem equipped with a SIM card.

### Advantages of the wireless system

- Reduction of wired connections;
- Non-invasive installation of radio system components through the use of flush-mounted transmitter modules and controllers, alternative DIN rail modules and battery-powered sensors;
- Guaranteed simple and fast installation of systems in new buildings and modernization of existing installations, without the need for costly and time-consuming renovation work;
- Easy reconfiguration of system elements in case of extension of a house or apartment, as well as in case of increase of user requirements or change of household members' preferences;
- The ability to connect and control the operation of already installed devices without the remote control feature that make up the equipment or an integral part of the building (such as lighting elements, automation of gates and windows, shutter/blinds, radiators, solenoid valves, circulation pumps, lawn irrigation and plants watering systems, etc.);
- A much wider range of flexibility, performance, and functionality in relation to wired solutions with the ability to adapt or fully integrate them.

Internet

Router

Wi-Fi

LAN

Cloud

Wi-Fi

GPRS/3G

PC/Laptop

Tablet

Server

SMS

Smartphone

Phone

868 MHz    868 MHz

Signal amplifier

F&Home RADIO sensors and actors

F&Home RADIO sensors and actors
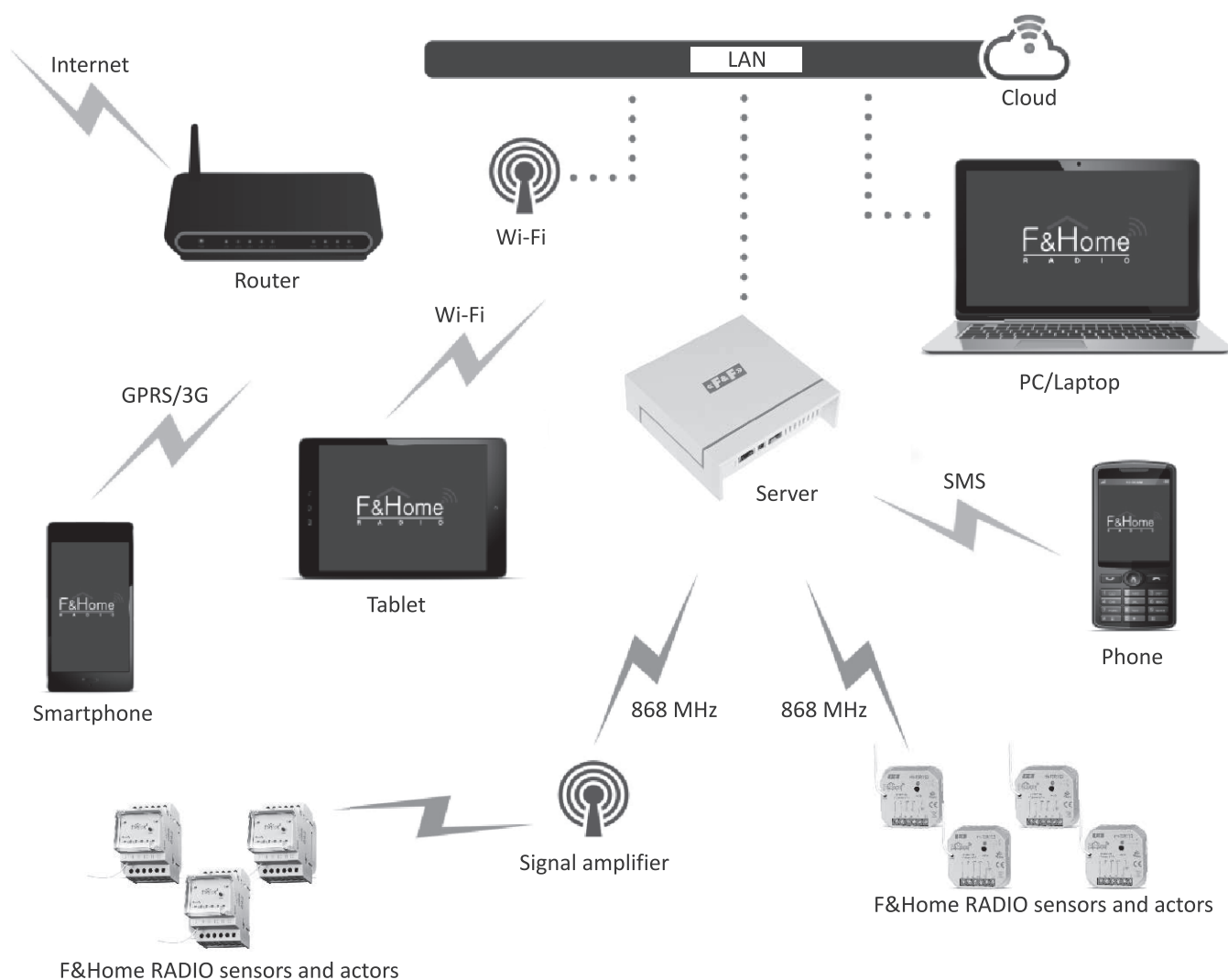
**System features**

• Server-based architecture allowing to achieve unprecedented functionality using a relatively narrow range of universal actuator and sensory elements;
• Integration of independently operating devices and installations;
• Flexible system expansion and scaling;
• The compact size of modules for easier and faster installation adapted to work with accessories from other manufacturers;
• Use of a wide range of mobile devices (phones, smartphones, and tablets) as universal remote controls, or stationary or portable control panels;
• Integration of various systems using radio communication with wired solutions (applies only to selected solutions);
• Limiting the number of installation elements by parallel use of their functionality (which reduces installation costs);
• Built-in algorithms to extend the life of system components (such as preheating for incandescent lighting);
• Use of information from Internet services to manage physical components of the system (for example, managing the operation of high inertia heating systems or plant watering systems based on weather forecasting);
• Built-in astronomical clock, which in combination with weather prediction tools allows, among other things, to fully abandon the use of twilight sensors, thus reducing installation costs;
• Unique tools for designing and configuring the installation.

## Autonomous work

The architecture and individual elements of the F&Home Radio system have been designed so as not only to allow the user to remotely control the operation of individual components, but above all, wherever possible, to relieve him from such a necessity by means of autonomous management and intelligent control of the operation of devices. Depending on the type and configuration of the installed, automated equipment of a given building, the system can control its operation after recognizing the specific activity of the household members, for example: the user sleeps, wakes up, leaves the house, stays out, returns home, enters, stays at home, goes to sleep - or other types of events such as  visit of guests, watching a movie, a party, a barbecue in the garden, etc.

Below is an example of autonomous function execution for one of the exemplary activities.

The user approaches home - the system identifies the activity (for example: the GPS location, SMS message sent by the user) and automatically:

- Adjusts temperatures (warms or cools selected rooms or zones) to the preferred values;
- Raises the roller shutters to the desired position (according to the user's settings);
- Switches on the lighting in the selected rooms or zones (such as a driveway, garden, garage) and also adjusts its intensity to external conditions (time of day, weather conditions, personal preferences);
- Ventilates the selected room (opens the windows or switches on the ventilation system), taking into account the information from the sensors (for example, the detection of precipitation, wind strength and direction);
- Starts the hot water circulation in advance of the planned return time (starts the circulation pump);
- Sets the blinds and curtains in the preferred positions, taking into account the information from the sensors (such as temperature control, angle of sunlight);
- Prepares audio-video systems for multimedia playback in selected zones or rooms;
- Starts up, controls the operation or prepares other devices for the desired work.

## Configuration tools for installers

An integral part of the F&Home Radio system is a support tool in the form of configuration software, dedicated mainly for installers, architects, developers, industry engineers, but also for hobby users. The software provides a unique solution for designing and building a smart home installation, as well as for configuring and managing building automation servers based on F&Home RADIO technology. Thanks to a virtual representation of physical sensory and actuator elements and the extensive library of software objects, realizing the logic of interaction between these elements, it is possible to freely create virtually any configuration of scenarios of operation of individual devices, installations and entire systems.

Other advantages of such a solution include:

- Faster and easier work for the installer;
- Ability to perform most of the configuration work off-site;
- Simplification and minimization of installation work at the customer's site;
- Quick copying of installation projects for a larger number of similar objects (multi-family buildings, semi-detached houses, single-family housing estates);
- Easy reconfiguration of the installation in case of system expansion or changes in user preferences.
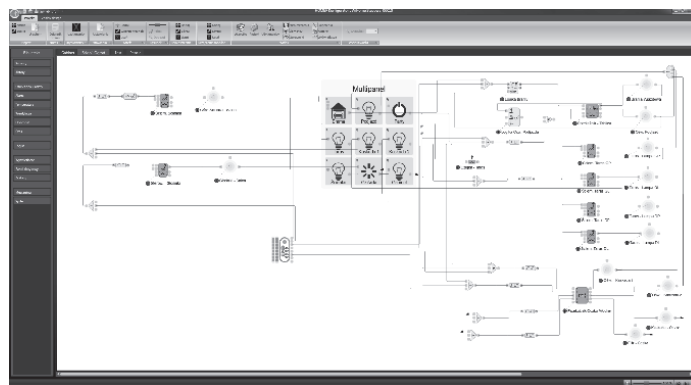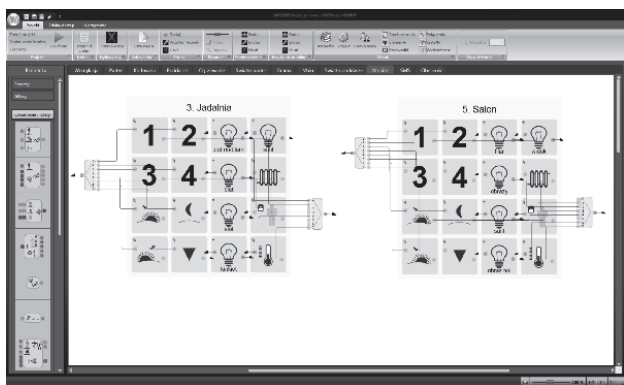


## Example of system functionality for selected installations

Lighting:

- Free configuration of light points, installation locations of physical switches, functions and the appearance of control panels of mobile applications;
- Remote control of time and intensity of illumination of individual points, separated sections, and entire circuits;
- Any color compositions for RGB LED lighting;
- Composition of different light scenes defined by the user according to his preferences;
- Sequential operation (such as the control of different light scenes using only one switch);
- Free combination of light scenes with other systems operation within defined scenarios (such as integration with audio-video systems);
- Smart operation depending on the time of day and night, presence detection, traffic intensity and other events (such as gradual illumination of rooms in night mode);
- Configuration of lighting in such a way as to simulate the presence of household members in the home during their actual absence.

Heating, air conditioning, ventilation:
- Direct or indirect control of heating system components (using furnace controllers, electric valves, circulation pumps, ventilation systems, etc.);
- The use of temperature sensors built into the system components;
- The local temperature and ventilation management in individual rooms or zones;
- Remote control of temperature and operation of ventilation devices in selected places;
- Free definition of operating mode scenarios for specific activities (such as summer mode, winter mode, holiday mode, short absence, return home, etc.);
- Configuration the operating modes to suit each user's preferences;
- Smart operation depending on the time of day and night, the activity of the household members and other events (such as adjusting the temperature to the presence and intensity of traffic in a given room);
- Synchronization of operation with Internet services;
- Control and remote control via SMS gateway (for example: remote management of the heating system in holiday homes without Ethernet network).

### Application

The F&Home RADIO 2 application allows you to control intelligent installations (even several) by switching between the servers. Control can take place locally - in the Wi-Fi network where the server is located, or remotely, from anywhere in the world via F&F's proprietary cloud.

You can download the app from the Google Play or AppStore and pair it with your F&Home RADIO smart building installation. Thanks to the customization feature, each user can configure the appearance of the application according to their preferences and the permissions granted by the administrator. This means that individual users only have access within the installation to those devices to which the administrator has granted access.

The number of icons, their location and color can be freely selected (on each device independently).

For those who want to have the same look on all mobile devices, there is an option to import/export the configuration so that you don't have to set all the parameters on each device separately.

The application allows you to control:
- lighting (including dimmable, LED and RGB);
- socket circuits and everyday appliances;
- roller blinds, shutters and awnings;
- gates, wickets, doors;
- heating (regardless of the heating source);
- air conditioning and ventilation;
- home electronics;
- watering and garden architecture equipment;
- energy consumption, flooding of premises;
- the integration of the system with other systems (for example with alarm or access control systems).
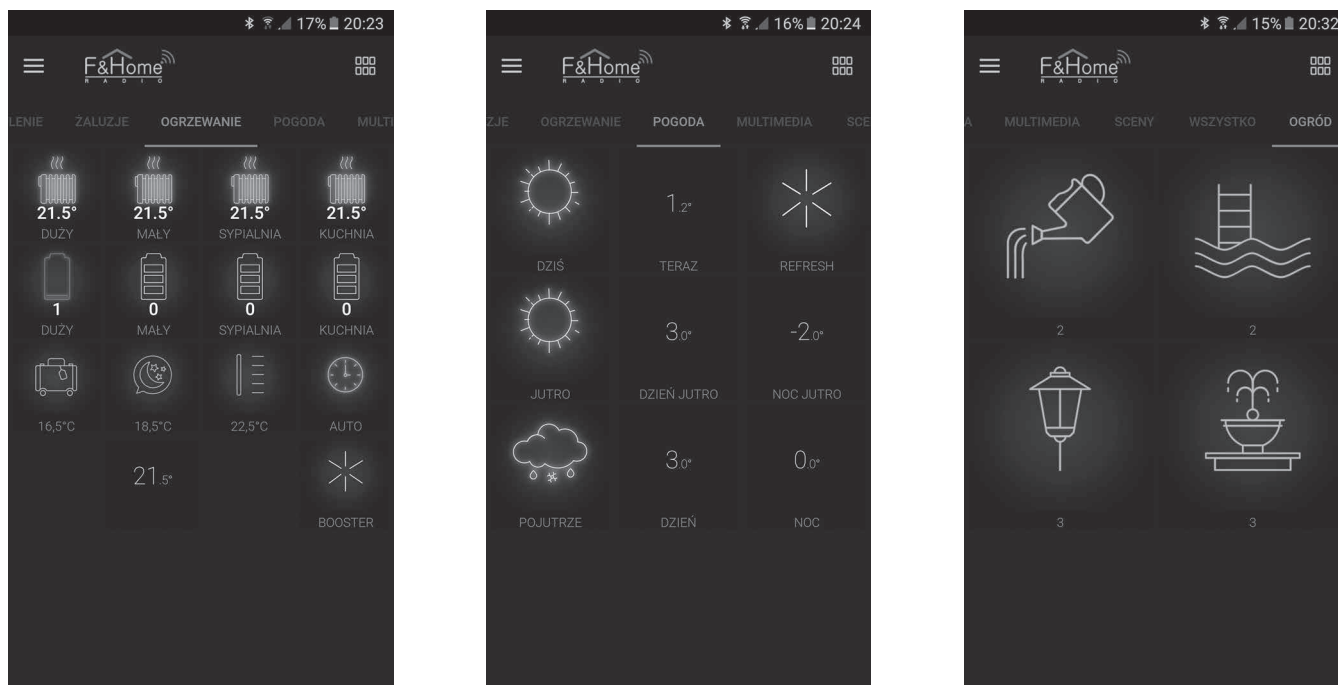


F&Home RADIO app screens

**System elements**

| Type | Description | |
|---|---|---|
| rH-D1S2 | 1-channel flush-mounted dimmer module with 2-channel transmitter | |
| rH-D2S2 | 2-channel DIN dimmer module with 2-channel transmitter | |
| rH-PWM3 | 3-channel flush-mounted module of the LED RGB low voltage PWM controller | |
| rH-PWM2S2 | 2-channel flush-mounted module of the low voltage PWM controller with 2-channel transmitter | |
| rH-TSR1S2 | 2-way flush-mounted relay module with 2-channel transmitter | |
| rH-TSR1S2 DIN | 2-way DIN relay module with 2-channel transmitter | |
| rH-R1S1 | 1-channel flush-mounted relay module with 1-channel transmitter | |
| rH-R1S1T1 | 1-channel flush-mounted relay module with 1-channel transmitter and temperature sensor | |
| rH-R2S2 | 2-channel flush-mounted relay module with 2-channel transmitter | |
| **rH-R2S2 DIN** | **2-channel DIN relay module with 2-channel transmitter** | |
| rH-R3S3 | 3-channel DIN relay module with 3-channel transmitter | |
| rH-R5 | 5-channel DIN relay module | |
| rH-S2 | 2-channel flush-mounted transmitter module | |
| rH-S4T | 4-channel flush-mounted transmitter module with temperature probe | |
| rH-S4Tes | 4-channel flush-mounted transmitter module (with external temperature probe), battery-powered | |
| rH-S4TesAC | 4-channel flush-mounted transmitter module (with external temperature probe), mains-powered | |
| rH-T1X1 | Temperature sensor and light intensity (sunlight) sensor module | |
| rH-T1X1es | Temperature sensor and light intensity (sunlight) sensor module, battery-powered | |
| rH-T1X1es AC | Temperature sensor and light intensity (sunlight) sensor module for DIN rail | |
| rH-S6 | 6-channel DIN transmitter module | |
| rH-T6 | 6-channel temperature sensor module | |
| rH-P1 | Low-current passive motion detector module | |
| rH-P1T1 | Low-current passive motion detector module with temperature probe | |
| rH-E2 | 2-channel signal amplifier module | |
| rH-IR16 | Infrared remote control module | |
| rH-RC10 | 10-button remote control (black/white) | |
| rH-AC15R4S4 | Module for cooperation with an alarm panel | |
| rH-EQ3HUB | Module for integration with thermostatic heads | |
| rH-SERWER | Control and management server of the system | |
| rH-SERWER DIN 2 | Control and management server of the system mounted on DIN rail | |
| rH-S4L4-B/W-230 | 4-channel 230 V glass connector (black/white) | |
| rH-S4L4-B/W-24 | 4-channel 24 V glass connector (black/white) | |
| **rH-WMC** | **Door/window reed relay, battery-powered** | |
| **rH-S1L1-230-W** | **Single transmitter integrated with a white glass panel, 230 V power supply** | |
| **rH-S2L2-230-W** | **Double transmitter integrated with a white glass panel, 230 V power supply** | |
| **rH-S4L4-230-W** | **Quadruple transmitter integrated with a white glass panel, 230 V power supply** | |
| **rH-S1L1-24-W** | **Single transmitter integrated with a white glass panel, 24 V power supply** | |
| **rH-S2L2-24-W** | **Double transmitter integrated with a white glass panel, 24 V power supply** | |
| **rH-S4L4-24-W** | **Quadruple transmitter integrated with a white glass panel, 24 V power supply** | |
| **rH-S1L1-230-B** | **Single transmitter integrated with a black glass panel, 230 V power supply** | |
| **rH-S2L2-230-B** | **Double transmitter integrated with a black glass panel, 230 V power supply** | |
| **rH-S4L4-230-B** | **Quadruple transmitter integrated with a black glass panel, 230 V power supply** | |
| **rH-S1L1-24-B** | **Single transmitter integrated with a black glass panel, 24 V power supply** | |
| **rH-S2L2-24-B** | **Double transmitter integrated with a black glass panel, 24 V power supply** | |
| **rH-S4L4-24-B** | **Quadruple transmitter integrated with a black glass panel, 24 V power supply** | |

# Glass touch buttons designed for the F&Home RADIO system

## rH-S4L4-24-B / rH-S4L4-230-B
touch button, black
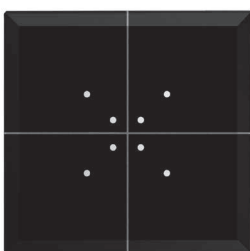
## rH-S4L4-24-W / rH-S4L4-230-W
touch button, white

| power supply | |
|---|---|
| rH-S4L4-24-B/rH-S4L4-24-B | 9÷30 V DC |
| rH-S4L4-230-B/rH-S4L4-230-W | 85÷265 V AC |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 81×81×12 mm |
| mounting | in ø60 flush-mounted box |
| ingress protection | |
| front | IP50 |
| back | IP10 |

# Chapter 13
# Smart Home for developers

**Purpose**

The mH-Developer system is designed for controlling heating, lighting and electrical sockets in the installations of houses and flats. The main module is a standalone unit that has been developed based on a detailed analysis of customer needs and in collaboration with developers. Additionally, the basic module can be extended with other functionalities (control of roller shutters, gates, RGB lighting, garden watering) by using extension modules from the F&Home system. The main module, as well as the extension elements, are mounted in the switchgear. The system does not require the installation of additional devices under the buttons - therefore it does not require the use of deepened boxes.

The whole system is characterized by simple installation, compact design and a functional mobile application that allows you to configure and control the elements of the system.
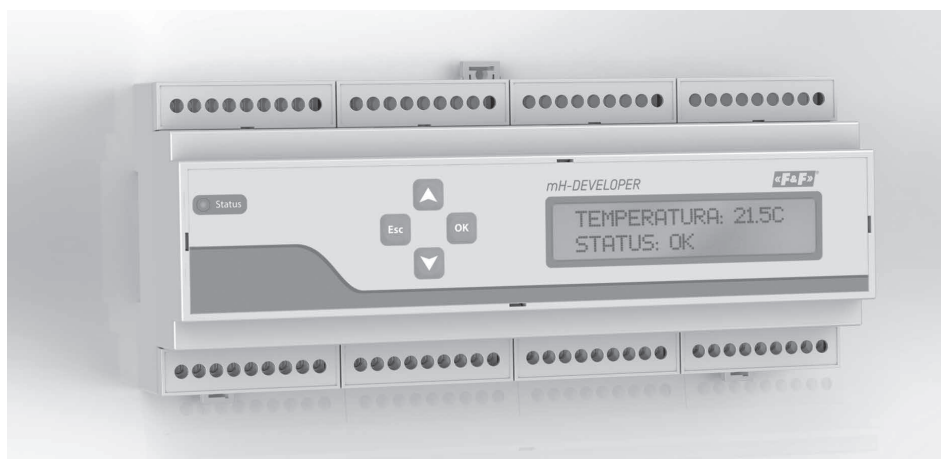


**Functions**

- Heating control (8 zones);
- An external temperature sensor can be connected;
- Control of lighting and electrical outlets (12 circuits);
- Control of water, gas and other media valves;
- Electricity meter (indicating total and instantaneous energy consumption).

**Module extensions**

- Control of dimmable light sources;
- LED and LED RGB lighting control;
- Control of roller shutters, awnings, electric curtains.

**Program functionalities**

- Configuration of individual devices;
- Scenarios (device grouping);
- Time programming of devices (programmers);
- Preview of images from IP cameras;
- Control via mobile applications for Android and iOS;
- Remote control via the cloud.

| | |
|---|---|
| power supply | 20÷26 V DC |
| maximum current consumption | 0.5 A |
| number of inputs | |
|   on/off | 12 |
|   temperature | 9 |
| number of outputs | |
|   on/off | 12 |
|   valves | 8 |
| load capacity of the on/off outputs (AC-1) | 16 A |
| load capacity of valve outputs (AC-1) | 0.5 A |
| CAN interface | YES (F&Home) |
| Modbus interface | YES (Modbus RTU) |
| LAN interface | YES (10/100 Mbps) |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 12 modules (212 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Application**

An integral part of the system is a mobile application for configuring and controlling devices connected to the mH-DEVELOPER module.

The application can be personalized - each user can have his own configuration (so that, for example, children do not need to control all of the devices).

Connection with the module is carried out automatically - when we are at home we connect locally (via WIFI) while being away from home, the application switches to cloud-based control.

It is possible to prepare an individual graphic design of the application for a specific investment. The name of the application, logo, and colors may be changed.
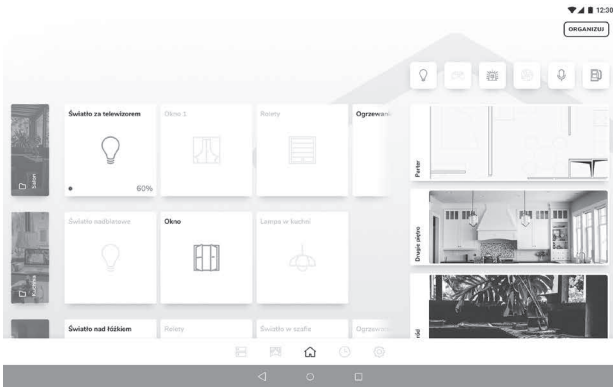


Mobile application: management of devices
in individual rooms
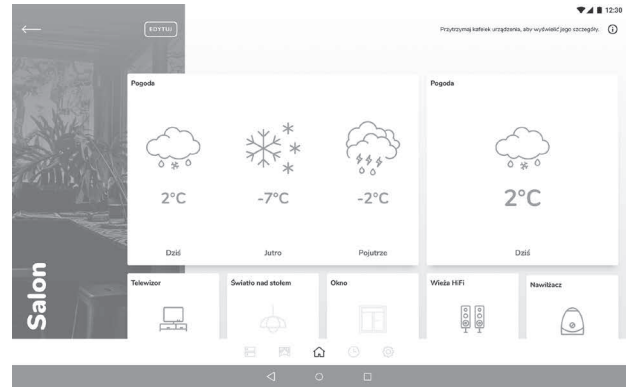


Mobile application: Weather forecast



Mobile application: heating management
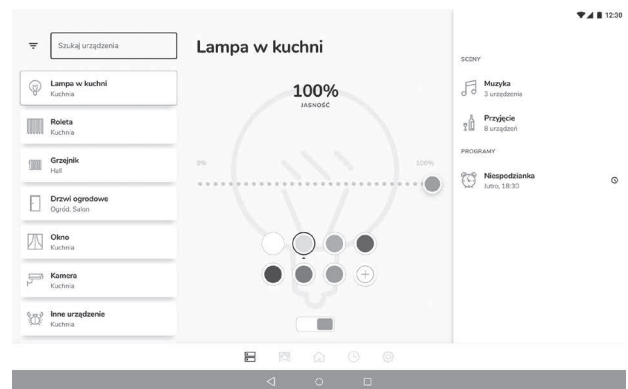


Mobile application: lighting management

# Section III

# Remote control

**Purpose**

The F&Wave wireless radio control system is designed for direct control of electrical devices in houses and flats. The system consists of dedicated transmitters and receivers. It is possible to pair multiple transmitters with a single receiver and a single transmitter with multiple receivers.

**System features**

• Control of different receivers in one system: 1- and 2-channel relays, 230 V dimmers, LED dimmers, roller shutter controllers;
• The receivers are designed to be mounted in ø60 flush-mounted box or on a DIN rail;
• Transmitters in the form of 4- and 10-button remote controls, battery wall-mounted push buttons, transmitters for installation in a ø60 flush-mounted box that can be used with any instantaneous (monostable) button and glass touch buttons;
• Central control feature, which means that multiple receivers can be activated in switch everything off/on or raise/lower everything function using just one button;
• Each receiver can be paired with 32 transmitters (multifunctional controllers) or 8 receivers (single-function controllers);
• Data retransmission by receivers - the range of operation can be increased;
• Operating range up to 100 m (in the open air with no interfering factors present). In a built-up area and if the interference sources are present (power lines, GSM transmitters, various machines, etc.), the actual range may be smaller. The range can be improved by direct retransmission of the modules in each other's range;
• Low power consumption (extends the battery life of the transmitters and reduces operating costs);
• Thermal protection of the devices increases safety and reduces failure rates in the event of overload or malfunction.
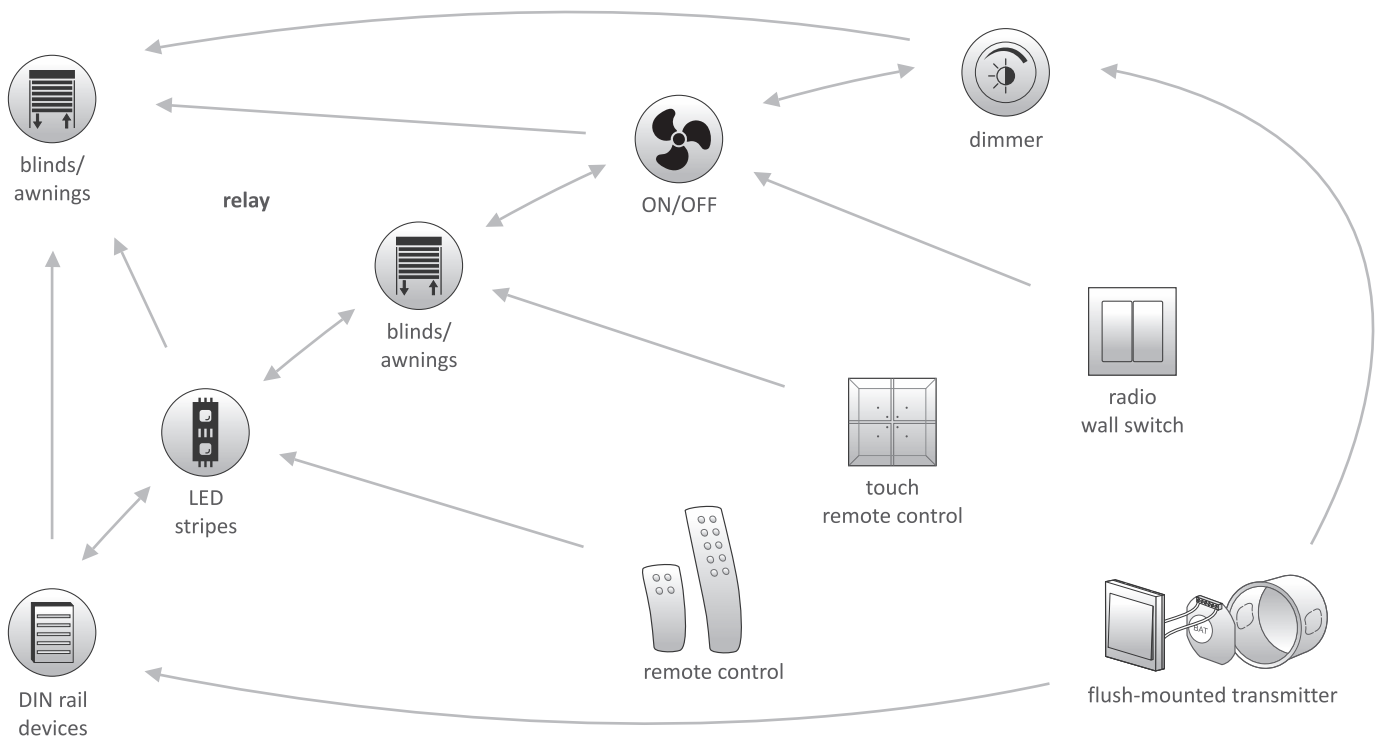
# ON/OFF relays

**Purpose**

The relay group is used for direct control of the connected receiver in the ON/OFF (switch on/off) function. Pressing a wall switch or paired radio transmitter button directly connected to the relay changes the position of the contact to the opposite one.

Central control feature, which means that multiple receivers can be switched on or off using just one button of the radio transmitter. With multifunction devices (devices with index -P) it is also possible to set the time functions, the mono/bistable operating mode and the always on/off function.

## FW-R1P  single bistable relay

- 1-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters;
- Separated output contact.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| output load (AC-1) | 8 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-R1P-P  single multifunctional relay

- 1-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters;
- Separated output contact.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| output load (AC-1) | 8 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-R1D  single bistable relay

- 1-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters;
- Separated output contact.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| output load (AC-1) | 16 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## FW-R1D-P  single multifunctional relay

- 1-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters;
- Separated output contact.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| output load (AC-1) | 16 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# FW-R2P   double bistable relay

- 2-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters.

FW-R2P

L N S1 S2 R1 R2

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on (2 relays) | 1 W |
| output load (AC-1) | 2×8 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# FW-R2P-P   double multifunctional relay

- 2-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters.

FW-R2P-P

L N S1 S2 R1 R2

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on (2 relays) | 1 W |
| output load (AC-1) | 2×8 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# FW-R2D   double bistable relay

- 2-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters;
- 2 independently separated output contacts.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on (2 relays) | 1 W |
| output load (AC-1) | 2×16 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# FW-R2D-P   double multifunctional relay

- 2-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters;
- 2 independent output contacts.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on (2 relays) | 1 W |
| output load (AC-1) | 2×16 A/250 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

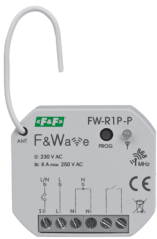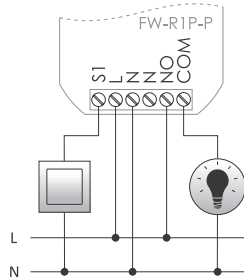# Multifunction relays without neutral wire

**Purpose**

The relay group is used for direct control of the connected receiver in the bistable (ON/OFF), monostable (pulse) or time function. Pressing a wall switch or paired radio transmitter button directly connected to the relay triggers the relay. The central control feature means that multiple receivers can be switched on or off using one radio transmitter. The NN series devices are adapted to operation in boxes without neutral cable but equipped only with the "L" wire and the wire connected to the bulb (installation with intermediate boxes).
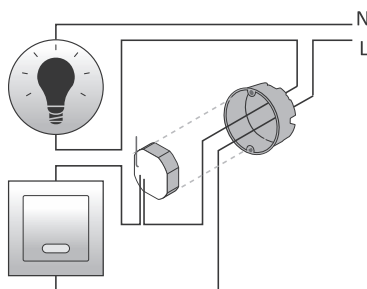


## FW-R1P-NN single multifunctional relay, suitable for operation without a neutral wire in the switch box



- The power supply in standard 2-wire installation (no neutral wire in the switch box);
- 1-channel multifunctional bistable relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters.
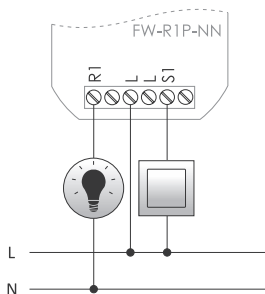


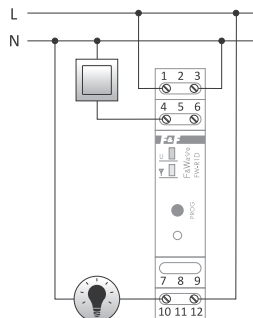| power supply | 195÷265 V AC |
|---|---|
| control | triggered with L level |
| power consumption | 0.1 W |
| output load (AC-1) | 1000 A/250 V AC |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 49×49×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-R2P-NN double multifunctional relay, suitable for operation without a neutral wire in the switch box



- The power supply in standard 2-wire installation (no neutral wire in the switch box)
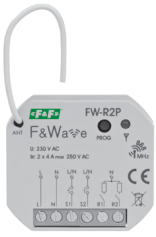- 2-channel multifunctional bistable relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
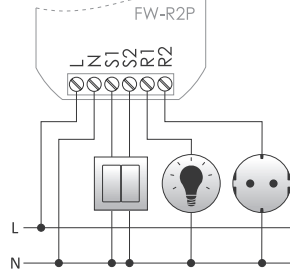- Possibility of connecting the relay with 32 transmitters.



| power supply | 195÷265 V AC |
|---|---|
| control | triggered with L level |
| power consumption | 0.1 W |
| outputs load capacity (AC-1) | |
|   single channel | 1000 W/250 V AC |
|   total (2 channels) | 1000 W/250 V AC |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 49×49×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-BYPASS-NN for use with FW-...-NN series multifunction relays

**Purpose**

The device is designed to eliminate the effect of the soft illumination of the LED bulbs when the relay is switched off. It is mounted at the light fixture parallel to the controlled bulb. It is designed to work only with FW-...-NN series devices. It is used only when working with an older type of LED lamp.



- The device allows the system to operate with older types of LED bulbs;
- Compact housing for direct mounting at the light fixture.

| power supply | 195÷265 V AC |
|---|---|
| working temperature | -25÷50°C |
| terminal | 2×LY 0.75 mm² |
| dimensions | 12×26×11.5 mm |
| ingress protection | IP20 |

# Roller shutter controllers

A group of roller shutter receivers is used for direct control of connected roller shutter drives as a function of "up/down/stop". Pressing the wall switch directly connected to the relay (local control) or the paired radio transmitter button (remote control: remote control, battery wall switch, flush-mounted transmitter or glass switch) causes the blinds to move in the desired direction. Pressing the button again while the roller shutter is moving stops it in its current position.

The central control feature means that multiple receivers can be switched on or off using one radio transmitter.

## FW-STR1P   230 V/150 W roller shutter controller

- 230 V drive controller;
- 2-button local and remote control;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- The relay can be connected with 8 transmitters.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 1 W |
| output load (AC-1/ AC-3) | 3 A/0.6 A |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-STR1P-P   230 V/150 W multifunctional roller shutter controller

- 230 V drive controller;
- Local and remote control:
  – 1-button;
  – 2-button;
  – 2-button central;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters.

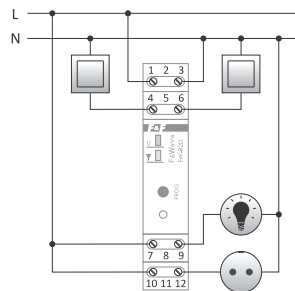| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 1 W |
| output load (AC-1/ AC-3) | 3 A/0.6 A |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## FW-STR1D   230 V/350 W roller shutter controller

- 230 V drive controller;
- 2-button local and remote control;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- The relay can be connected with 8 transmitters.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 1 W |
| output load (AC-1/ AC-3) | 8 A/1.5 A |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## FW-STR1D-P   230 V/350 W multifunctional roller shutter controller

- 230 V drive controller;
- Local and remote control:
  – 1-button;
  – 2-button;
  – 2-button central;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters.

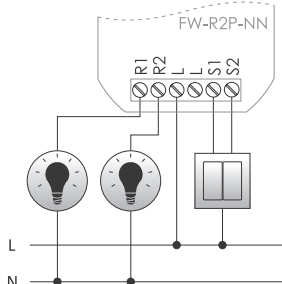| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 1 W |
| output load (AC-1/ AC-3) | 8 A/1.5 A |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Dimmers

**Purpose**

The group of dimmers is used for direct control of the connected light sources as a function of „Switch on/Switch off/Brightness level". Pressing the wall switch directly connected to the relay (local control) or the paired radio transmitter button (remote control: remote control, battery wall switch, flush-mounted transmitter or glass switch) switches the lighting on/off to the last set brightness level. A long press of the button (more than 1 second) increases/decreases the brightness level with a 10 % increment. Each subsequent brightness setting is opposite to the previous one (brighter -> darker -> brighter -> ...).
The central control feature means that multiple dimmers can be switched on or off using one transmitter button.

(!) Due to the different design solutions used in electronic light sources such as LED bulbs, ESL bulbs, transformers, there is a possibility of improper operation of the dimmer in combination with such receivers. Before the final assembly, check that the dimmer and the selected light source are working correctly.

## FW-D1P  230 V AC universal dimmer (incandescent, ELS, LED)

- 1-channel universal dimmer supports:
  – light bulbs;
  – halogen lamps;
  – ELS fluorescent lamps;
    (with dimming feature);
  – 230 V LED lamps
    (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.4 W |
| output load (load R, L, C) | 180 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 48×48×20 mm |
| mounting | in flush mounted box ⌀60 |
| ingress protection | IP20 |

## FW-D1D  230 V AC universal dimmer (incandescent, ELS, LED)

- 1-channel universal dimmer supports:
  – light bulbs;
  – halogen lamps;
  – ELS fluorescent lamps;
    (with dimming feature);
  – 230 V LED lamps
    (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.4 W |
| output load (load R, L, C) | 250 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## FW-LED2P  2-channel 12 V DC LED controller

- 2-channel 12 V LED dimmer supports:
  – 12 V LED strips (with dimming feature);
  – 12 V LED lamps (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.
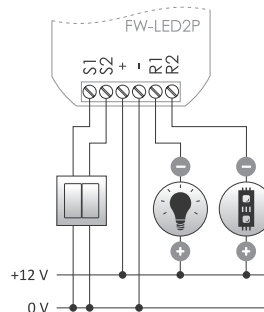
| power supply | 10÷16 V DC |
|---|---|
| power consumption | |
| standby | 0.25 W |
| on | 0.4 W |
| output load (AC-1) | 4 A/12 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ⌀60 |
| ingress protection | IP20 |

# FW-LED2D  2-channel 12 V DC LED controller



- 2-channel 12 V LED dimmer supports:
  – 12 V LED strips (with dimming feature);
  – 12 V LED lamps (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.
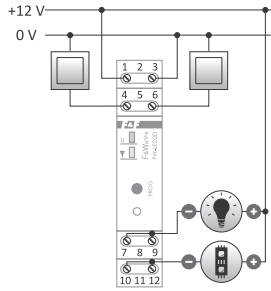


| power supply | 10÷16 V DC |
|---|---|
| power consumption | |
| standby | 0.25 W |
| on | 0.4 W |
| output load (AC-1) | 6 A/12 V |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Transmitters

## With mains power supply

# FW-GS1  1-channel 230 V or 24 V transmitter

**Purpose**

Single-channel remote control transmitter designed to work with all receivers of the F&Wave system. Available in 230 V or low 9÷30 V DC version. The mode of the button operation is selected using the knob located on the back of the device. Designed for installation in an installation box with a diameter of 60 mm.



| Mode | Button |
|---|---|
| A | ON |
| B | ON/OFF |
| C | ON/OFF |
| D | OFF |

| power supply | |
|---|---|
| FW-GS1-24-W/ FW-GS1-24-B | 9÷30 V AC/DC |
| FW-GS1-230-W/ FW-GS1-230-B | 85÷265 V AC/DC |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| glass panel | 81×81×12 mm |
| built-in | 52×57×15 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

**Variants of execution**

| Product | Button type | Panel | Description |
|---|---|---|---|
| FW-GS1-230-W | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS1-24-W | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS1-230-B | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS1-24-B | single | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |

**Glass panels**
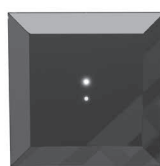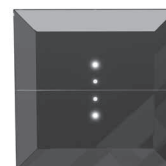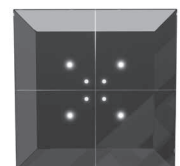


| FW-GS1-24-W | FW-GS2-24-W | FW-GS4-24-W | FW-GS1-24-B | FW-GS2-24-B | FW-GS4-24-B |
|---|---|---|---|---|---|
| FW-GS1-230-W | FW-GS2-230-W | FW-GS4-230-W | FW-GS1-230-B | FW-GS2-230-B | FW-GS4-230-B |
| rH-S1L1-24-W | rH-S2L2-24-W | rH-S4L4-24-W | rH-S1L1-24-B | rH-S2L2-24-B | rH-S4L4-24-B |
| rH-S1L1-230-W | rH-S2L2-230-W | rH-S4L4-230-W | rH-S1L1-230-B | rH-S2L2-230-B | rH-S4L4-230-B |

# FW-GS2 2-channel 230 V or 24 V transmitter

## Purpose

Dual-channel remote control transmitter designed to work with all receivers of the F&Wave system. Available in 230 V or low 9÷30 V DC version.
The mode of the button operation is selected using the knob located on the back of the device.
Designed for installation in an installation box with a diameter of 60 mm – both as an integrated standalone button and as a component of larger double (GP2) and triple (GP3) glass panels.

| Mode | Button 1 | Button 2 |
|------|----------|----------|
| A | ON/OFF | ON/OFF |
| B | ON | ON/OFF |
| C | ON/OFF | OFF |
| D | ON | OFF |

| power supply | |
|---|---|
| FW-GS2-24-W/ FW-GS2-24-B | 9÷30 V AC/DC |
| FW-GS2-230-W/ FW-GS2-230-B | 85÷265 V AC/DC |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| glass panel | 81×81×12 mm |
| built-in | 52×57×15 mm |
| mounting | in flush mounted box ∅60 |
| ingress protection | IP20 |

## Variants of execution

| Product | Button type | Panel | Description |
|---------|-------------|-------|-------------|
| FW-GS2-230-W | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS2-24-W | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS2-230-B | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS2-24-B | double | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS2-230 | double | – | Dual module for integration with GP2 (162×81 mm) or GP3 (243×81 mm) glass panels, 230 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26. |
| FW-GS2-24 | double | – | Dual module for integration with GP2 (162×81 mm) or GP3 (243×81 mm) glass panels, 24 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26 |

# FW-GS4 4-channel 230 V or 24 V transmitter

## Purpose

Four-channel remote control transmitter designed to work with all receivers of the F&Wave system. Available in 230 V or low 9÷30 V DC version.
The mode of the button operation is selected using the knob located on the back of the device.
Designed for installation in an installation box with a diameter of 60 mm – both as an integrated standalone button and as a component of larger double (GP2) and triple (GP3) glass panels.

| Mode | Button 1 | Button 2 | Button 3 | Button 4 |
|------|----------|----------|----------|----------|
| A | ON/OFF | ON/OFF | ON/OFF | ON/OFF |
| B | ON | ON/OFF | ON/OFF | ON/OFF |
| C | ON/OFF | OFF | ON/OFF | ON/OFF |
| D | ON | OFF | ON/OFF | ON/OFF |

| power supply | |
|---|---|
| FW-GS4-24-W/ FW-GS4-24-B | 9÷30 V AC/DC |
| FW-GS4-230-W/ FW-GS4-230-B | 85÷265 V AC/DC |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| glass panel | 81×81×12 mm |
| built-in | 52×57×15 mm |
| mounting | in flush mounted box ∅60 |
| ingress protection | IP20 |

## Variants of execution

| Product | Button type | Panel | Description |
|---------|-------------|-------|-------------|
| FW-GS4-230-W | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS4-24-W | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS4-230-B | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply |
| FW-GS4-24-B | quadruple | | F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply |
| FW-GS4-230 | quadruple | – | Quadruple module for integration with GP2 (162×81 mm) or GP3 (243×81 mm) glass panels, 230 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26 |
| FW-GS4-24 | quadruple | – | Quadruple module for integration with GP2 (162×81 mm) or GP3 (243×81 mm) glass panels, 24 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double buttons. The GP2 and GP3 panel configurator is shown on page 26 |

# FW-RC4-AC  network remote control transmitter for ø60 flush-mounted box, 230 V power supply with local and central ON/OFF control inputs

**Purpose**

Remote control transmitter designed to work with all receivers of the F&Wave system.
Local 230 V power supply. The connection of monostable (momentary) buttons is required.
The transmitter has 4 universal inputs, which are designed for SWITCH local control and ON/OFF central control (switch on/off and/or raise/lower the paired receivers). Input functions are assigned according to the selected operating program.

| power supply | 85÷265 V AC/DC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| power consumption | |
| standby | 0.25 W |
| on | 0.6 W |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 43×48×20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

Table showing the behavior of the individual inputs depending on the set operating mode:

| Mode | Input | | | |
|---|---|---|---|---|
| | S1 | S2 | S3 | S4 |
| A | S1 | S2 | S3 | S4 |
| B | **ON** | S2 | S3 | S4 |
| C | S1 | **OFF** | S3 | S4 |
| D | **ON** | **OFF** | S3 | S4 |

## With battery power supply

# FW-RC4  4-button remote control, black
# FW-RC4G  4-button remote control, grey

| power supply | 3 V |
|---|---|
| battery | CR2032 |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| dimensions | 32×72×30 mm |

( ! )  Very low power consumption in the standby mode extends battery life.

# FW-RC10    10-button remote control, black
# FW-RC10G   10-button remote control, grey
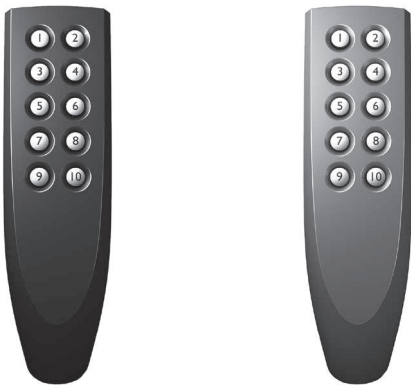
| power supply | 3 V |
|---|---|
| battery | CR2032 |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| dimensions | 44×149×44 mm |

(!) Very low power consumption in the standby mode extends battery life.

# FW-KEY    4-button remote control, keyring

| power supply | 3 V |
|---|---|
| battery | CR2032 |
| radio frequency | 868 MHz |
| power consumption | |
| standby | 0.04 μW |
| on | 50 mW |
| dimensions | 36×59 mm |

(!) Very low power consumption in the standby mode extends battery life.

# FW-RC5    battery 5-button transmitter for ø60 flush-mounted box, with 3 local and central ON/OFF control inputs

**Purpose**

Remote control transmitter designed to work with all receivers of the F&Wave system.
It does not require a 230 V power supply. Very low power consumption in the standby mode extends battery life.
The connection of monostable (momentary) buttons is required. It has 3 local control inputs for any three receivers and 2 ON/OFF central control (switch on/off and/or raise/lower the paired receivers).
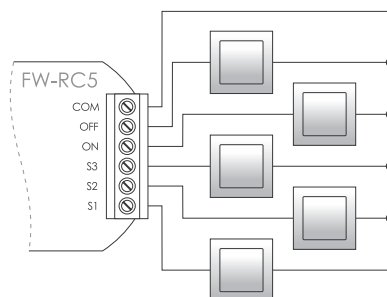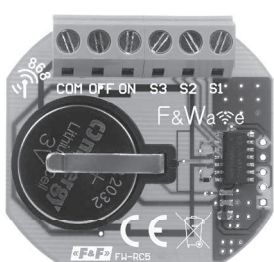
| power supply | 3 V |
|---|---|
| battery | 2032 (lithium) |
| radio frequency | 868 MHz |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 41×46×15 mm |
| mounting | in flush mounted box ø60 |

# FW-WS01 1-channel remote control transmitter (battery)
# FW-WS02 2-channel remote control transmitter (battery)

Works with the Sonata accessories family from **OSPEL** ®

## Purpose

The **FW-WSO1** is a 1-key, 1-channel transmitter and the **FW-WSO2** is a 1-key, 2-channel remote control transmitter belonging to the Sonata equipment family from Ospel and is dedicated to operating with all devices of the F&Wave system.

| power supply | 3 V |
|---|---|
| battery | 2032 (lithium) |
| voltage | 3 V DC |
| power consumption | |
| button pressed | 20 mA |
| standby | 15 nA |
| battery life | approx. 10 hours of broadcasting (pressed key on the button) |
| radio frequency | 868 MHz |
| working temperature | 5÷50°C |
| mounting | in flush mounted box ø60 |
| dimensions | 84×84×14 mm |
| ingress protection | IP20 |

# FW-WS04 4-channel remote control transmitter (battery)

Works with the Sonata accessories family from **OSPEL** ®

## Purpose

The **FW-WSO4** is a 2-key, 4-channel remote control transmitter belonging to the Sonata equipment family from Ospel and is dedicated to operating with all devices of the F&Wave system.

«F&F» NEW!

| power supply | 3 V |
|---|---|
| battery | 2032 (lithium) |
| voltage | 3 V DC |
| power consumption | |
| button pressed | 20 mA |
| standby | 15 nA |
| battery life | approx. 10 hours of broadcasting (pressed key on the button) |
| radio frequency | 868 MHz |
| working temperature | 5÷50°C |
| mounting | in flush mounted box ø60 |
| dimensions | 84×84×14 mm |
| ingress protection | IP20 |

# FW-WS1 1-button
# FW-WS2 2-button
# FW-WS3 3-button
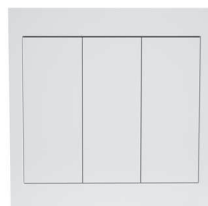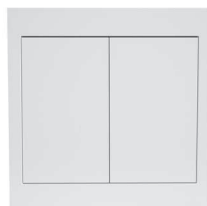
| power supply | 3 V |
|---|---|
| battery | 2032 (lithium) |
| radio frequency | 868 MHz |
| working temperature | 5÷50°C |
| dimensions | 86×86×15 mm |
| mounting | surface |

## Button functions

- SWITCH – switch on/switch off locally;
- ON – switch on/raise everything (FW-WS2 and FW-WS3);
- OFF – switch off/lower everything (FW-WS2 and FW-WS3);

## Mounting of the button

- Screw to the wall (2 mounting holes);
- Stick to the wall (for example by means of a two-sided adhesive tape);
- Free position of the button.

# FW-FS1 flood detector with F&Wave radio transmitter

## Purpose

The FW-FS1 is a wireless sensor designed to detect the presence of water and other conductive liquids. Information about the presence of water is transmitted via radio to F&Wave* receivers, through which an external alarm can be activated or the water supply shut off. The sensor is additionally equipped with an acoustic signaling device and a high capacity battery that guarantees operation without the need to worry about the power source.

## Device characteristics

The FW-FS1 sensors can be used in a "multiple sensor - single receiver" configuration where sensors located throughout the house control a single receiver responsible for shutting off the valve. They can also operate in the "one sensor - many receivers" configuration, in which the sensor sends an alarm to the receiver responsible for shutting off the water and to the second receiver responsible for reporting flooding to the control panel. It is also possible to create a "multiple sensors - multiple receivers" configuration.

The presence of water is signaled by a cyclic radio alarm and an acoustic signal emitted from the device. The built-in buzzer is also used to report low battery levels and to indicate the current status of the device. Entering the configuration mode (pairing the sensor with the receiver) as well as checking the current status is triggered by shaking the sensor - without having to disassemble the housing. One shake will signal the status of the device via the buzzer, two shakes will activate the sensor pairing mode.

* To ensure full functionality it is recommended to use multifunction receivers such as FW-R1D-P, FW-R2D-P, FW-R1P-P, FW-R2P-P, FW-R1P-NN, FW-R2P-NN.

| functioning | measurement of the electrical conductivity of liquids |
|---|---|
| radio | |
| channel quantity | 1 |
| radio frequency | 868 MHz |
| maximum power of the emitted frequency | 10 mW |
| battery | |
| type | CR123A |
| voltage | 3 V |
| capacity (typical) | 1400 mAh |
| removable | YES |
| power consumption | |
| standby | 0.005 mW |
| alarm | 50 mW |
| working temperature | 0÷40°C |
| dimensions | 82×73×31 mm |
| ingress protection | IP67 |

# Chapter 15
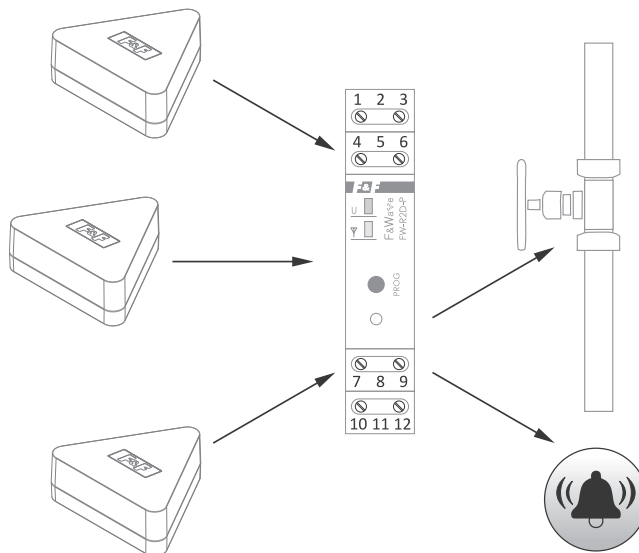
# RS – radio control system

**Purpose**

Electronic radio relays are used for remote control of the gates, roller shutters, lighting, alarm system arming, etc. The RS remote control system consisting of transmitters and receivers enables the control of gates, roller shutters, etc. Multiple transmitters can also cooperate with one receiver and a single transmitter can work with multiple receivers.

**Functioning**

The pulse triggered by pressing the transmitter button sends a coded signal to the receiver. The transmitter is protected against interruption of transmission after releasing the button. This ensures that even the shortest activation of the function results in the transmission of the full data frame. Data transmission from the transmitter is indicated by a flashing red LED.

The operating range of the system is up to 100 m. The operating range depends on a number of factors, including atmospheric conditions (humidity), terrain characteristics (reflections), receiver and transmitter placement height and all kinds of obstacles, such as walls.

## Receivers

Receivers that are suitable for installation in a flush-mounted box. Up to 32 transmitters can be stored in the non-volatile memory of each receiver. The RS-407B and RS-407M receivers work with dedicated RS-P (remote control) and RS-N (flush-mounted) transmitters.

## RS-407M   monostable



| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 5 A |
| contact | separated 1×NO |
| indication of reception/programming | red LED |
| contact status indication | green LED |
| power consumption | 0.8 W |
| terminal | 4×LY 1 mm², l= 10 cm |
| working temperature | -25÷50°C |
| dimensions | ø55, h= 21 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

① blue  ② black  ③ brown  ④ brown

(!) Pressing the transmitter button closes contact $X_1$-$X_2$ for 1÷2 seconds (pulse).
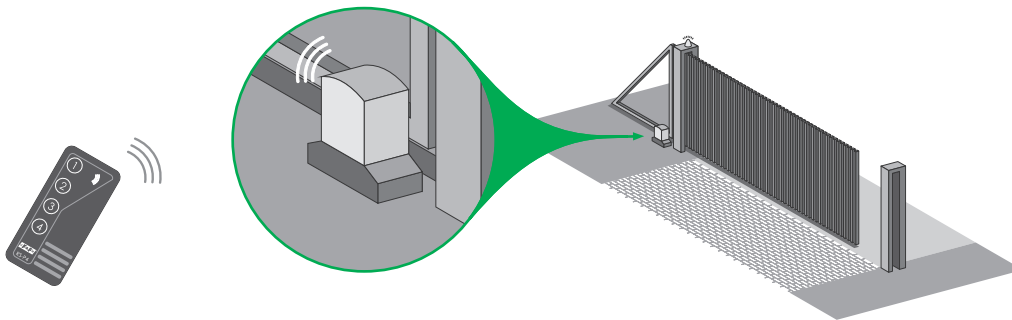


## RS-407B   bistable



| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 5 A |
| contact | separated 1×NO |
| indication of reception/programming | red LED |
| contact status indication | green LED |
| power consumption | 0.8 W |
| terminal | 4×LY 1 mm², l= 10 cm |
| working temperature | -25÷50°C |
| dimensions | ø55, h= 21 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

① blue  ② black  ③ brown  ④ brown

(!) Pressing the transmitter button changes the contact position to the opposite one (switch on/off).
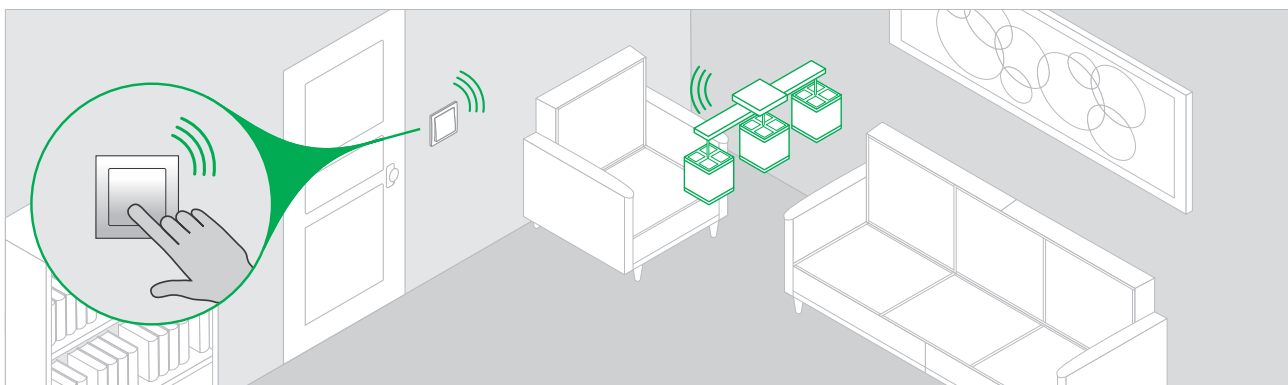
# Transmitters

**Functioning**

The pulse triggered by pressing the transmitter button sends a coded signal to the receiver. The transmitter is protected against interruption of transmission after releasing the button. This ensures that even the shortest activation of the function results in the transmission of the full data frame. Data transmission from the transmitter is indicated by a flashing red LED.

The RS-N and RS-P radio transmitters work with dedicated RS-407M and RS-407B receivers.

# RS-N... flush-mounted transmitter

**Purpose**

Transmitter for installation in a flush-mounted box. It has an autonomous battery power supply, which eliminates the need for power wires at the button mounting location. For control, we can use the monostable (momentary) buttons of any series of electrical installation equipment.
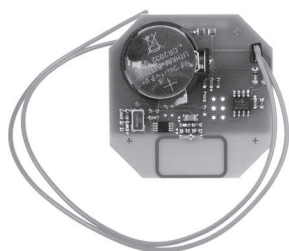


| Type | Function |
|------|----------|
| RS-N1 | 1-button |
| RS-N2 | 2-button |
| RS-N3 | 3-button |
| RS-N4 | 4-button |

| | |
|---|---|
| power supply | 3 V |
| battery | 2032 (lithium) |
| frequency | 868 MHz |
| coding | KeeLoq® |
| terminal | LGY 0.5 mm² |
| working temperature | -25÷50°C |
| dimensions | Ø52, h=11 mm |
| mounting | in flush mounted box Ø60 |
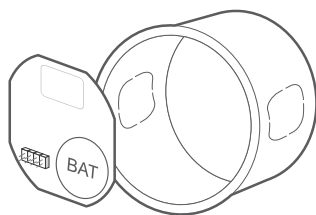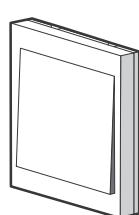


Installation in a flush mounted box
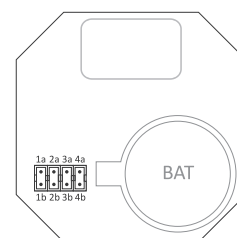


Channel terminals

# RS-P... remote control

Compact remote control in the form of a keyring.



| Type | Function |
|------|----------|
| RS-P1 | 1-button |
| RS-P2 | 2-button |
| RS-P3 | 3-button |
| RS-P4 | 4-button |

| | |
|---|---|
| power supply | 12 V |
| battery type | A23 |
| frequency | 868 MHz |
| coding | KeeLoq® |
| working temperature | -25÷50°C |
| colour | black |
| dimensions | 30×68×14 mm |

# Chapter 16
# Proxi – bluetooth smart remote control system



**Bluetooth SMART** — www.getproxi.com

## Purpose

Proxi is an innovative system for wireless control of electrical devices in homes and apartments. Control is carried out via the Bluetooth Smart communication standard. The system consists of dedicated relays and a free application for smartphones and tablets running Android or iOS (Apple). Installed relays are automatically added to the inventory of application devices and are immediately ready for control.



Garage gate

Lighting

Blinds, awnings

On/Off devices

RGBW lamps

Application available on:

Android

iOS
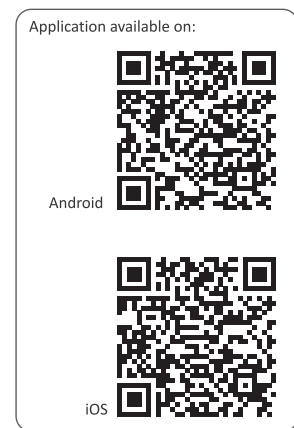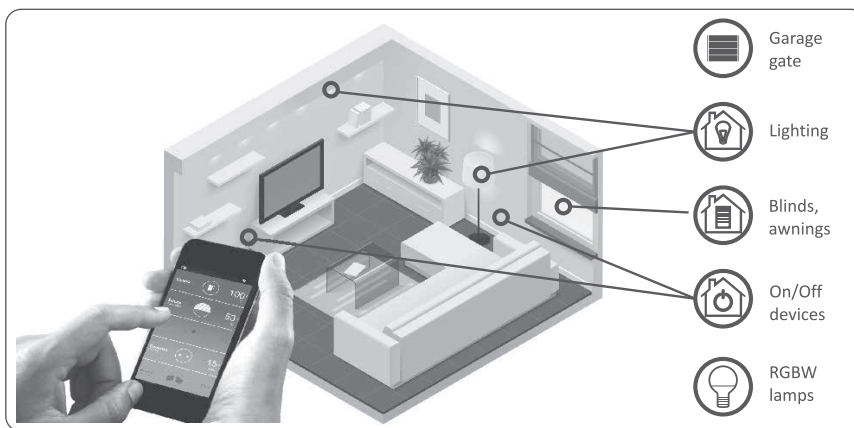
## System features

- **Remote control**
  Control of a wide range of devices without the use of central control panels, controllers, Wi-Fi routers.
- **Wireless communication**
  Two-way transmission of commands, confirmations and other information between the phone and the device.
- **Simplicity of installation**
  Easy connection to existing installations.
- **Ease of use**
  No programming, easy to use application with a friendly interface.
- **Security**
  Encrypted transmission and the ability to manage access rights to devices.
- **Notification support**
  Presentation of device operating status, activities, alerts and diagnostic information.
- **Access management**
  Configuration of devices in public and private mode, sharing devices, protecting privacy.
- **The versatility of the control devices**
  Phones and tablets running iOS version 7 or Android version 4.3 and above+.



buy  >  connect  >  download  >  control
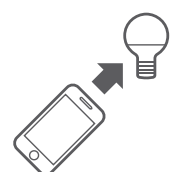
# Proxi Plug  adapter for an electrical outlet

**Purpose**

Relay module in the form of an adapter for the power supply socket, designed to control the 230 V receiver on a switch on/off basis. The plug is controlled via a mobile application and manually via a button on the housing. The LED placed in the button indicates the operating status and load (the LED color changes depending on the load value).
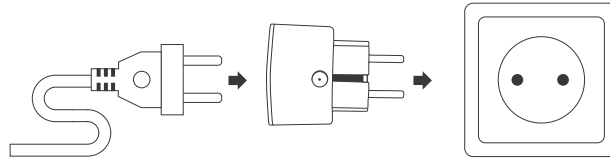
| power supply | 195÷253 V AC |
|---|---|
| output | contact 1×NO (13 A/250 V AC) |
| receiver power connected | 3000 W |
| socket type | E EEC 7/4 |
| | Schuko F EEC 7/5 |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 0.2÷ 0.8 W |
| working temperature | 0÷65°C |
| thermal protection | YES |
| dimensions | 44×44×70 mm |
| ingress protection | IP20 |

# Proxi Power  on/off relay (rB-R2S2)

**Purpose**

Relay module designed to control any two devices or electrical circuits. Simple installation in a socket box allows the module to be installed without the need for invasive and costly repair work.
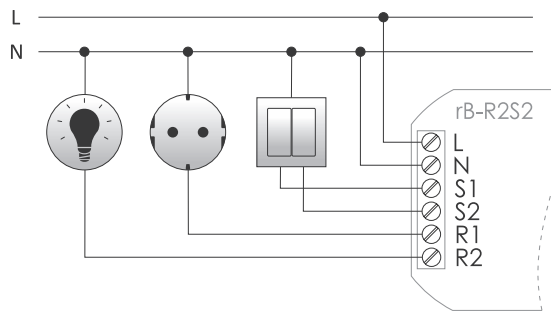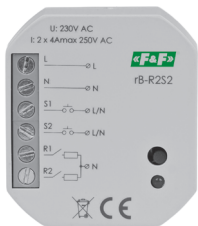
| power supply | 195÷253 V AC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| outputs | contact 2×NO (4 A/250 V AC) |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 1 W |
| working temperature | 0÷45°C |
| thermal protection | YES |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ø54 (48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# Proxi Light  lighting dimmer (rB-D1S2)

**Purpose**

The module is designed to control the operation of various light sources with smooth regulation of lighting intensity. The module can be mounted in a classic electrical box. It allows you to connect a receiver and one or two switch buttons. Remote control of lighting directly from the phone and using the buttons.
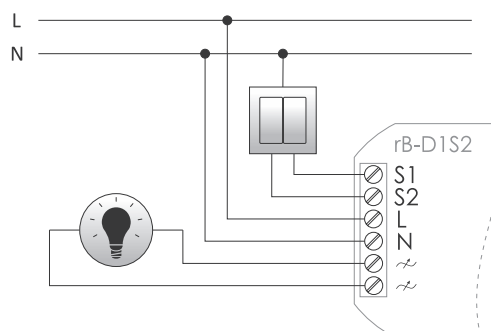
| power supply | 195÷253 V AC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| output | |
| resistive load | 150 W |
| inductive load | 100 W |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 0.4 W |
| working temperature | 0÷45°C |
| thermal protection | YES |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ø54 (48×43 mm), h= 20 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# Proxi Shade   roller shutter controller (rB-TSR1S2)

**Purpose**

Radio module designed to control drives of roller shutters, blinds, screens, awnings and curtains offered by various manufacturers. The module can be mounted in an electrical box and connected to a 2-key switch (used in traditional solutions) or installed directly at/in the device.
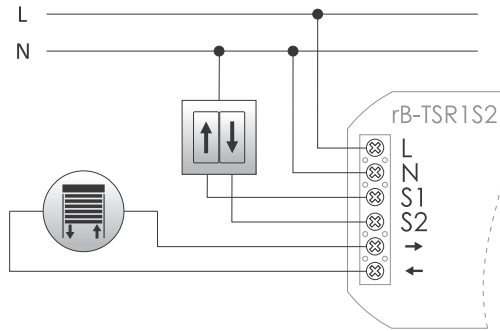


| power supply | 195÷253 V AC |
|---|---|
| control | triggered with L or N level |
| control pulse current | <1 mA |
| maximum load current (AC-1/AC-3) | 3 A/ 0.6 A |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 1 W |
| working temperature | 0÷45°C |
| thermal protection | YES |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ø54 (48×43 mm), h= 25 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# Proxi Gate   gate controller

**Purpose**

Radio module designed to control the automation of gates and garage doors from various manufacturers. The module can be installed in the gate controller along with other radio modules. This solution allows you to use all the attributes of the phone to remotely control the opening and closing of the gates. At the same time, it does not affect the possibility of using traditional remote controls.



| Terminal | Description | Function |
|---|---|---|
| 1 | PWR +/- | power supply |
| 2 | PWR +/- | power supply |
| 3 | OUT1 - | OPEN button |
| 4 | OUT1 + | OPEN button |
| 5 | OUT2 - | CLOSE button |
| 6 | OUT2 + | CLOSE button |
| 7 | IN1 | limit switches |
| 8 | IN1 | limit switches |
| 9 | IN2 | limit switches |
| 10 | IN2 | limit switches |

| power supply | 9÷30 V AC/DC |
|---|---|
| control | universal |
| control pulse current | <5 mA |
| outputs | 2×transistors (20 mA/50 V DC) |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 0.4 W |
| working temperature | -30÷55°C |
| thermal protection | YES |
| terminal | 0.5 mm² spring terminals |
| dimensions | 42×98×30 mm |
| mounting | surface mounting |
| ingress protection | IP20 |

( ! ) Connection instructions for the door controls can be downloaded from the following page www.fif.com.pl from the product subpage.

# Proxi Bulb   230 V RGBW LED lamp

**Purpose**

Proxi Bulb lamp allows you to freely change the brightness, color, and saturation of light, which brings a unique mood to your home, apartment or office. The lamp can be controlled via the free app on your smartphone or tablet, and thanks to Bluetooth Smart technology you don't need to connect to the Internet. The smart Proxi Bulb lamp is a worthwhile investment, with LED technology for up to 50,000 hours of uninterrupted operation.
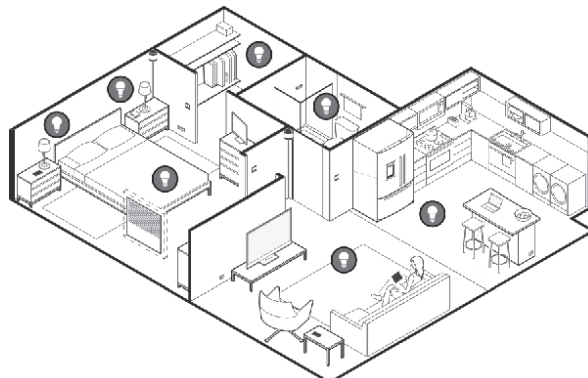


| supply voltage | 85÷265 V AC |
|---|---|
| brightness | 600 lm |
| color temperature | 3000÷6000 K |
| CRI | >80 |
| bluetooth transmission | |
| frequency | 2.4 GHz |
| signal power | 1 mW |
| transmission | two-way |
| coding | AES |
| range | 30 m |
| power consumption | 9 W |
| total system power factor | 0.95 |
| working temperature | 0÷45°C |
| dimensions | ø65×135 mm |
| mounting | E27 screw base |

# Chapter 17

# GSM remote control

## Remote controls relays

**Purpose**

Relays with built-in GSM communicator are used for remote control and control using GSM cellular network and SMS messages. Depending on the type, they can perform a simple on/off logic, open gates automatically, and control the temperature. They eliminate the traditional control with radio remote controls and the costs associated with their purchase for a large number of users.

## SIMply MAX P01/SIMply MAX P01 12 V   with on/off/alarm feature

**Functioning**

The relay works in GSM 900/1800 cellular network of any operator operating in Poland (the device is unlocked, an active SIM card is required). The relay has 2 controlled relay outputs for switching on and off the controlled receivers and 2 high voltage inputs for notifying about the activation of controlled devices. Commands and notifications are specific SMS text messages exchanged between the controller and the user's phone. User telephone numbers, temperatures, alarms and other functions are set using the configuration software for the PC.
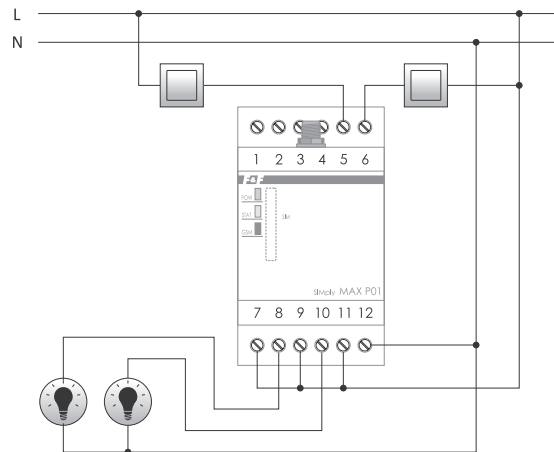
| power supply | |
|---|---|
| MAX P01 | 100÷265 V AC |
| MAX P01 12 V | 10÷16 V DC |
| control inputs | 2 |
| MAX P01 | 160÷260 V AC |
| MAX P01 12 V | 8÷16 V DC |
| voltage tolerance | 160÷260 V AC |
| relay outputs | 2 |
| type | 1×NO |
| nominal voltage | 230 V AC |
| Load capacity | <8 A |
| ports | SIM |
| power consumption | |
| standby | 1.3 W |
| GSM communication | <3 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -10÷50°C |
| dimensions | 3 modules (52 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**GSM antenna**

| SMA connector | |
|---|---|
| antenna dimensions | 20×100 mm |
| wire length | 2.5 m |
| mounting | adhesive tape |

A 4-channel version of the relay is also available: SIMply MAX P04. More information on p. 92.

**Functions**

- Switching of the ON/OFF outputs, checking the status of the inputs;
- Time switching on of the output, for example for 30 seconds (time interval 1 seconds ÷600 minutes.);
- SMS notifications to the user's phone about the status or change of the input status;
- Parallel text messages to 5 phone numbers;
- Redefinition of the input and output names, for example, IN1-> tamper detect; OUT2-> pump;
- Access password (4÷8 digits);
- Automatic response after receiving the command and its program execution (as an option);
- Automatic resetting of the outputs after the power supply is restored (output status memory);
- ADMIN administrator function - factory reset and access unlock in case of a forgotten password.

SMS
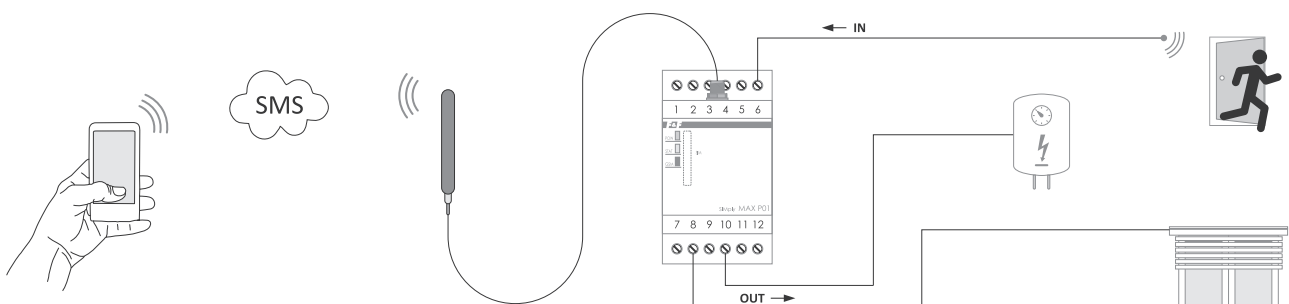
# SIMply MAX P04   with on/off/alarm feature

## Purpose

The relay works in GSM 900/1800 cellular networks of any operator operating in Poland (the device is unlocked). In order to make the calls and execute the predefined functions, the device must have an active SIM card. The relay has 4 controlled relay outputs for switching on and off the controlled receivers and 4 high voltage inputs for notifying about the activation of controlled devices. Commands and notifications are specific SMS text messages exchanged between the controller and the user's phone.



| power supply | 100÷265 V AC |
|---|---|
| inputs | 4 |
| voltage tolerance | 160÷260 V AC |
| relay outputs | 4 |
| type | 1×NO |
| nominal voltage | 230 V AC |
| load capacity | <8 A |
| ports | SIM |
| power consumption | |
| standby | 1.3 W |
| GSM communication | <3 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -10÷50°C |
| dimensions | 4 modules (70 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**GSM antenna**

| SMA connector | |
|---|---|
| antenna dimensions | 20×100 mm |
| wire length | 2.5 m |
| mounting | adhesive tape |



## Functions

- Switching of the ON/OFF outputs;
- Time switching on of the output, for example for 30 seconds (time interval 1 seconds÷600 minutes.);
- SMS notifications to the user's phone about the status or change of the input status; Parallel text messages to 5 phone numbers; Queries about the status of input or output;
- Redefinition of the input and output names, for example, IN1-> tamper detect; OUT2-> pump;
- Access password (4÷8 digits);
- Automatic response after receiving the command and its program execution (as an option);
- Automatic resetting of the outputs after the power supply is restored (output status memory);
- There is an option to configure the device with MEMORY ON command; the MEMORY OFF command disables the option;
- ADMIN administrator function - factory reset and access unlock in case of a forgotten password.
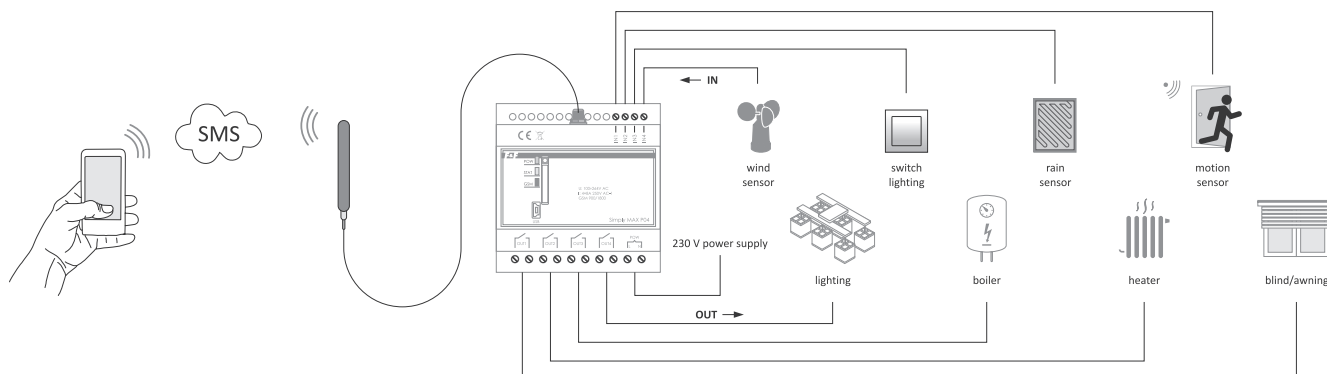
# Cost-free GSM control of the gate, gateway and barrier control

## SIMply MAX P02 with CLIP feature (dial-up access) and on/off/alarm feature

### Purpose

The MAX P02 relay with a built-in GSM communicator is used to remotely open automatic entrance gates, garage doors, barriers and gates using a mobile phone. It applies to objects with protected access and a large number of users with access rights, such as housing estates, garages, public and company car parks, etc. It eliminates traditional control with radio remote controls and the costs associated with their purchase for a large number of users.

The CLIP feature (dial-up access) allows you to control the output by calling the number of the card in the controller. Such a call is automatically rejected by the controller (no cost) and if our number is in the database of controller numbers, the output will be triggered.



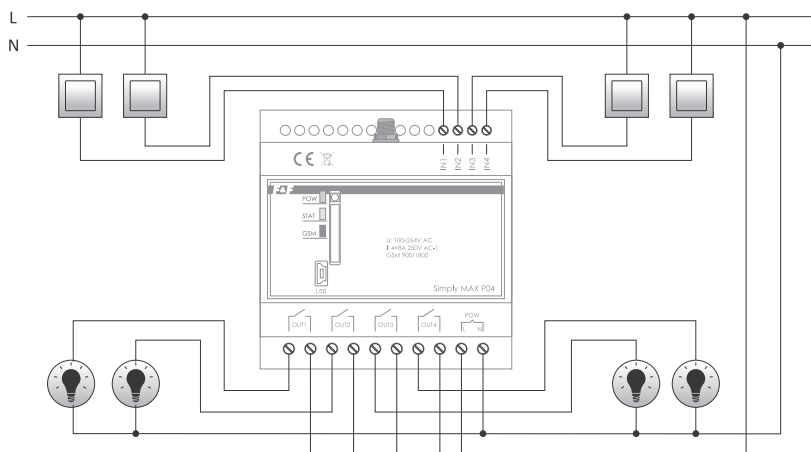| | |
|---|---|
| power supply | 100÷265 V AC |
| inputs | |
|    number | 2 |
|    voltage tolerance | 160÷260 V AC |
| relay outputs | |
|    number | 2 |
|    type | 1×NO |
|    nominal voltage | 230 V AC |
|    load capacity | 8 A |
| ports | SIM, miniUSB |
| power consumption | |
|    standby | 1.3 W |
|    GSM communication | <3 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -10÷50°C |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
| **GSM antenna** | |
|    SMA connector | |
|    antenna dimensions | 20×100 mm |
|    wire length | 2.5 m |
|    mounting | adhesive tape |

### Functioning

The relay works in GSM 900/1800 cellular networks of any operator operating in Poland (the device is unlocked). In order to make the calls and execute the predefined functions, the device must have an active SIM card. The relay has 2 independently controllable contacts and inputs with assigned functions:

**OUT1/IN1**: The output through which pulses are fed to the gate controller or gate bolt. The pulse time (contact closing) is set by the user. The control itself is cost-free. The user initiates a standard call to the relay number, which identifies the number and automatically rejects the call, while at the same time activating the outputs (CLIP dial-up access feature). Additionally, it is possible to control the output using a control button connected to IN1 input. You can select the operating mode of the relay: manual or automatic closing. In automatic mode, after activation by the user the relay activates the output again by itself after a certain time in order to close the gate.

**OUT2/IN2**: The same functions as in the MAX P01 relay.

User telephone numbers, pulse time and automatic closing time as well as OUT2/IN2 output configuration parameters are set using the configuration software on a PC or via SMS commands. Connection with the relay is carried out via USB cable.
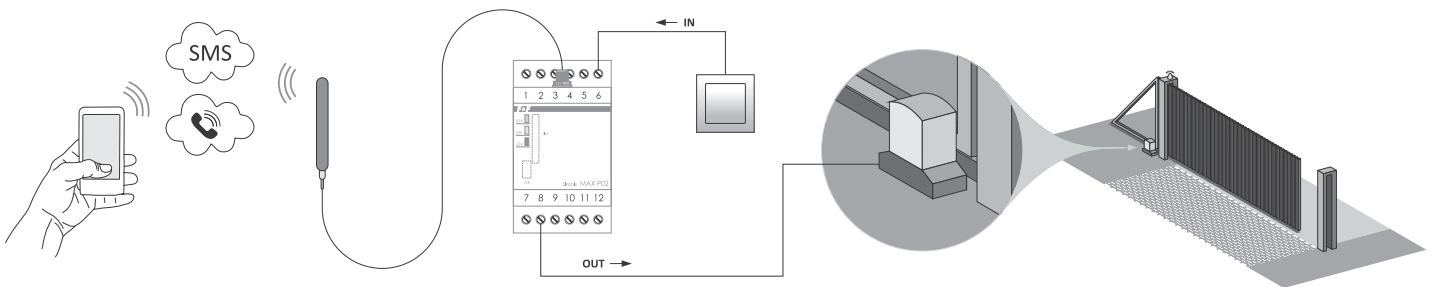


### Functions

- Cost-free control on the user side (CLIP dial-up access function);
- 2 parallel relay outputs;
- Different output activation times for each individual output can be set (for example: simultaneous control of the gate and the door);
- 2 pulse inputs for manual activation of the outputs using connected external buttons;
- Feature for automatic closing after a specified time;
- Authorization of 500 user numbers;
- PC configuration software;
- Remote setting and deletion of users via SMS commands;
- ADMIN administrator function - factory reset and access unlock in case of a forgotten password.

# SIMply MAX P03 with temperature control function + on/off/alarm feature

The MAX P03 relay with a built-in GSM communicator is used to remotely open automatic entrance gates, garage doors, barriers and gates using a mobile phone. The module implements simple functions of notifying about temperature exceeding and allows controlling the additional connected device on an ON/OFF basis. User telephone numbers, temperatures, alarms, and other functions are set using the configuration software for the PC. Connection with the relay is carried out via USB cable.
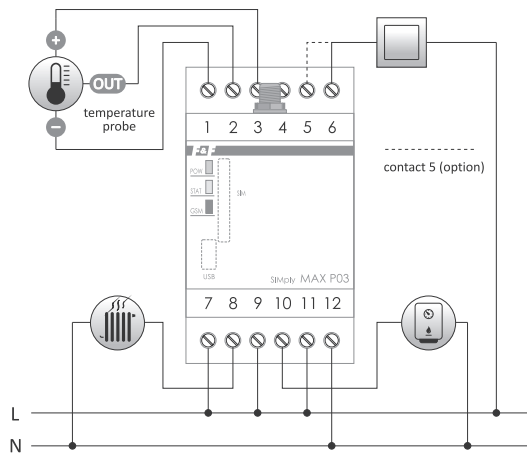


| power supply | 100÷265 V AC |
|---|---|
| inputs | |
| number | 1 |
| voltage tolerance | 160÷260 V AC |
| relay outputs | |
| number | 2 |
| type | 1×NO |
| nominal voltage | 230 V AC |
| load capacity | <8 A |
| temperature sensor type | DS1820 |
| temperature probe | RT4 |
| temperature adjustment range | +30÷65°C |
| hysteresis (adjustable) | 0÷10°C |
| setting accuracy | 0.1°C |
| measurement accuracy | 0.5°C |
| ports | SIM |
| power consumption | |
| standby | 1.3 W |
| GSM communication | <3 W |
| terminal | 1.5 mm² screw terminals |
| working temperature | -10÷50°C |
| dimensions | 3 modules (52 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**GSM antenna**

| SMA connector | 20×100 mm |
|---|---|
| wire length | 2.5 m |

## Functions

**1. System**
- Setting the access password for SMS commands;
- Output status memory;
- Readout of the current temperature;
- Checking the condition of the sensor and reporting faults;
- ADMIN administrator function - factory reset and access unlock in case of a forgotten password.

**2. Temperature control**
- Operating modes: heating or cooling;
- The regulator can be switched on/off (ON/OFF).

**3. Temperature alarm**
- Alarm for exceeding the maximum and minimum temperature;
- Notifications to 5 phone numbers;
- The alarm feature can be switched on/off (ON/OFF);
- The option of sending a second text message in case the temperature is constantly above the threshold beyond the set number of minutes.

**4. Anti-freeze temperature**
- The anti-freeze feature can be switched on/off (ON/OFF);
- The activated function works despite the inactive temperature control.

**5. Output OUT**
- Output control - 2 separate operating modes:
  SMS mode:
  – output controlled directly by SMS commands;
  – redefinition of the output name, for example: OUT1=lamp;
  – ON/OFF control and time switching on of the output;
  ALARM mode:
  – contact assigned to temperature alarms - exceeding the threshold forces the actions of the On/pulse contact;
  – option ON: contact closed above the alarm threshold, the contact opens after a drop below the hysteresis value;
  – pulse option: contact closing for a set number of seconds after exceeding the threshold;
  – ON/pulse options are set separately for minimum and maximum alarm;

**6. Input IN**
- Redefinition of the input name, for example: IN1= TUMPER DETECT;
- Select the option to trigger an SMS message: ON - signal appears; OFF - signal loss; ON/OFF - loss and appearance of the signal;
- Notifications about input activation are sent to 5 phone numbers.
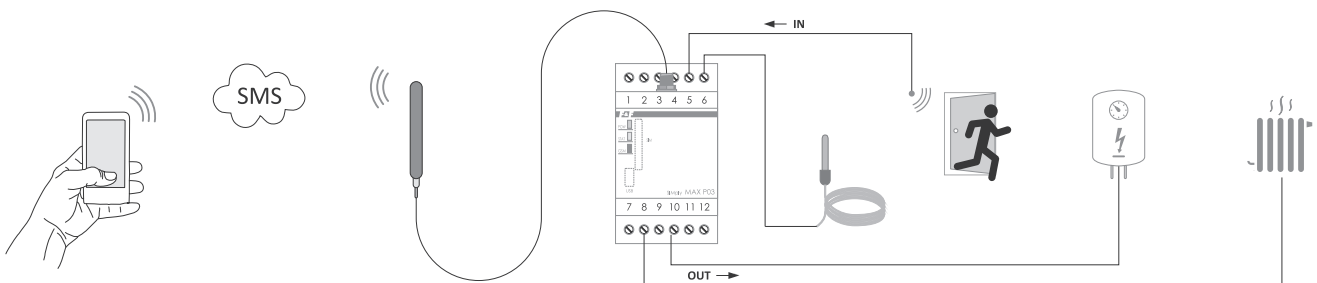
# SIMply MAX P05   pulse and operating time counter + on/off/alarm

## Purpose

The MAX P05 relay with a built-in GSM communicator is used as a pulse counter or operating time counter with the ability of remote management of the connected device by means of a mobile phone. The module implements simple functions of notifying about exceeding threshold values of a number of pulses or operating time and allows to control additional connected device on an ON/OFF basis. User telephone numbers, counting options, alarms and other functions are set using the configuration software for the PC. Connection with the relay is carried out via USB cable. Connection with the relay is carried out via USB cable.
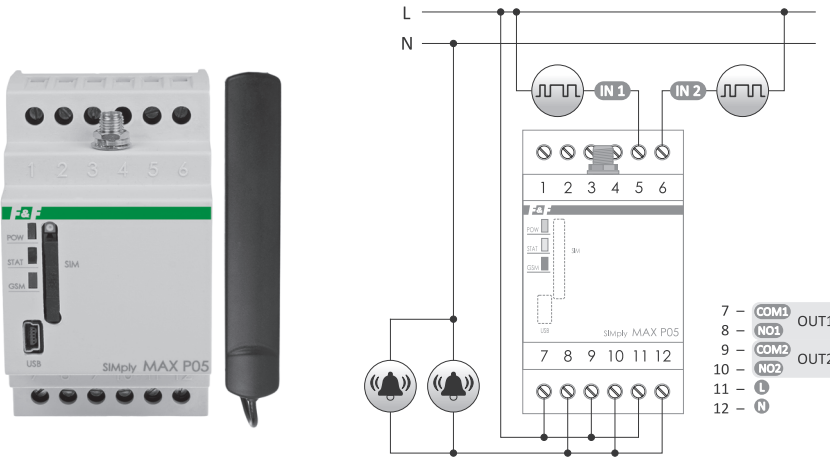
| power supply | 100÷265 V AC |
|---|---|
| inputs | |
|   number | 2 |
|   voltage tolerance | 160÷260 V AC |
|   minimum length of input pulse | 1 s |
| relay outputs | |
|   number | 2 |
|   type | 1×NO |
|   nominal voltage | 230 V AC |
|   load capacity | <8 A |
| ports | SIM, miniUSB |
| power consumption | |
|   standby | 1.3 W |
|   GSM communication | <3 W |
| terminal | 1.5 mm² screw terminals |
| working temperature | -10÷50°C |
| dimensions | 3 modules (52 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
| **GSM antenna** | |
| SMA connector | 20×100 mm |
| antenna cable length | 2.5 m |

Terminal connections:
7 – COM1 / OUT1
8 – NO1
9 – COM2 / OUT2
10 – NO2
11 – L
12 – N

## Functions

### 1. System
- Password access for SMS input commands;
- Output status memory;
- Readout of the current value of pulses and operating hours;
- ADMIN administrator function - factory reset and access unlock in case of a forgotten password.

### 2. Pulse/operating time counting
- Individual operating mode for each input: pulse counter/operating time counter;
- Counting of high voltage signals 160÷260 V AC;
- Time filters for input signals;
- SMS alerts for preset thresholds of pulses and operating time for up to 5 phone numbers.

### 3. Output OUT
- Output control - 2 separate operating modes:
  SMS mode:
  – output controlled directly by SMS commands;
  – redefinition of the output name, for example: OUT1= POMPE;
  – ON/OFF control and time switching on of the output;
  ALARM mode:
  – contact assigned to temperature alarms - exceeding the threshold forces the actions of the following contact: On/pulse;
  – option ON: contact closed above the alarm threshold, the contact opens after a drop below the hysteresis value;
  – pulse option: contact closing for a set number of seconds after exceeding the threshold;
  – ON/pulse options are set separately for minimum and maximum alarm.

### 4. Input IN
- Redefinition of the input name, for example: IN1= TUMPER DETECT;
- Select the option to trigger an SMS message: ON - signal appears; OFF - signal loss; ON/OFF - loss and appearance of the signal;
- Notifications about input activation are sent to 5 phone numbers.
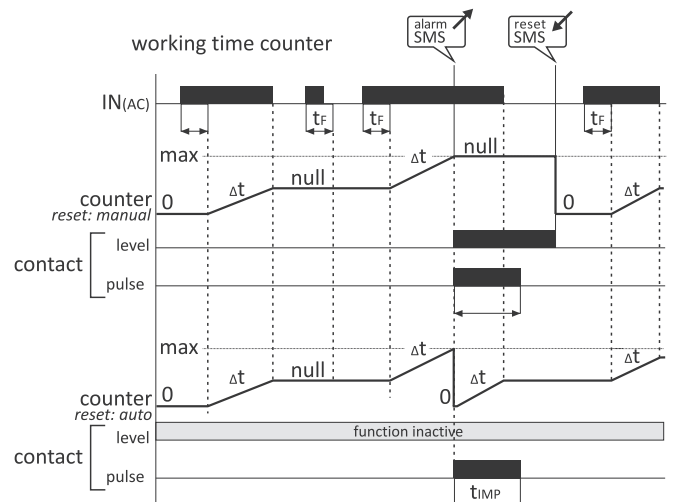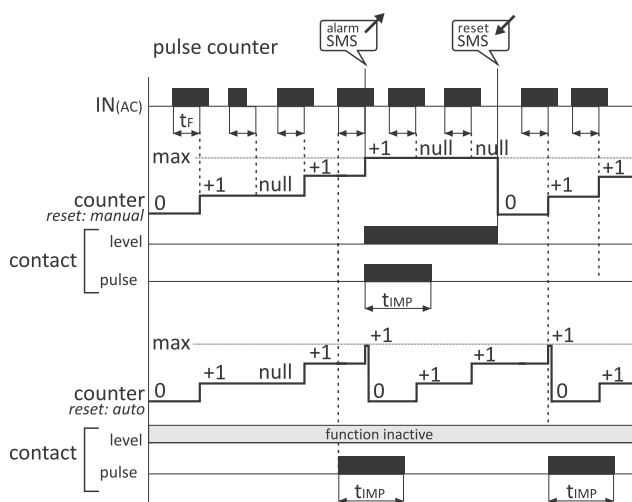
# MAX H04 programmable controller with GSM communicator

## Purpose

The MAX H04 module is one of the few controllers that allow you to connect and use it without any programming elements. With the special configuration program **H04 Config**, it can be used by anyone who does not want to learn the programming languages and complicated PLC programming procedures.

Hardware resources, which means the number of outputs/inputs and software functions allow us to connect only one controller and use all functions analogous to those of Simply MAX P-series relays. This allows you to easily control the system through one device and one phone number, and avoid the costs associated with supporting multiple SIM cards. Analog inputs in the controller allow you to connect any measuring transducer and control or monitor min/max states of any value, not only temperature but also, for example, currents, voltages, levels, pressures, etc.



| | |
|---|---|
| power supply | 9÷30 V DC |
| digital inputs | 4 (30 V; 0.2 A) |
| analog/digital input | 4 (0/4÷20 mA/0÷10 V) |
| digital output OC | 4 (50 V; 0.2 A) |
| relay outputs (symistors) | 3 (3 A; 600 V AC) |
| ports | SD, microUSB, SIM, RS-485 |
| communication protocol | Modbus RTU |
| recorder internal memory | 1.3 MB |
| terminal | 1.5 mm² screw terminals |
| working temperature | -10÷50°C |
| dimensions | 110×79×40 mm |
| mounting | screws to the ground or for TH-35 rail |
| ingress protection | IP20 |

## Functioning

The MAX H04 controller works in GSM 900/1800 cellular networks of any operator operating in Poland (the device is unlocked). One of the basic conditions for using the GSM communicator of the controller is the existence of an appropriate infrastructure. In order for the controller to make calls and perform the specified functions, it must have an active SIM card to perform communication services with the selected operator.

## Connection scheme
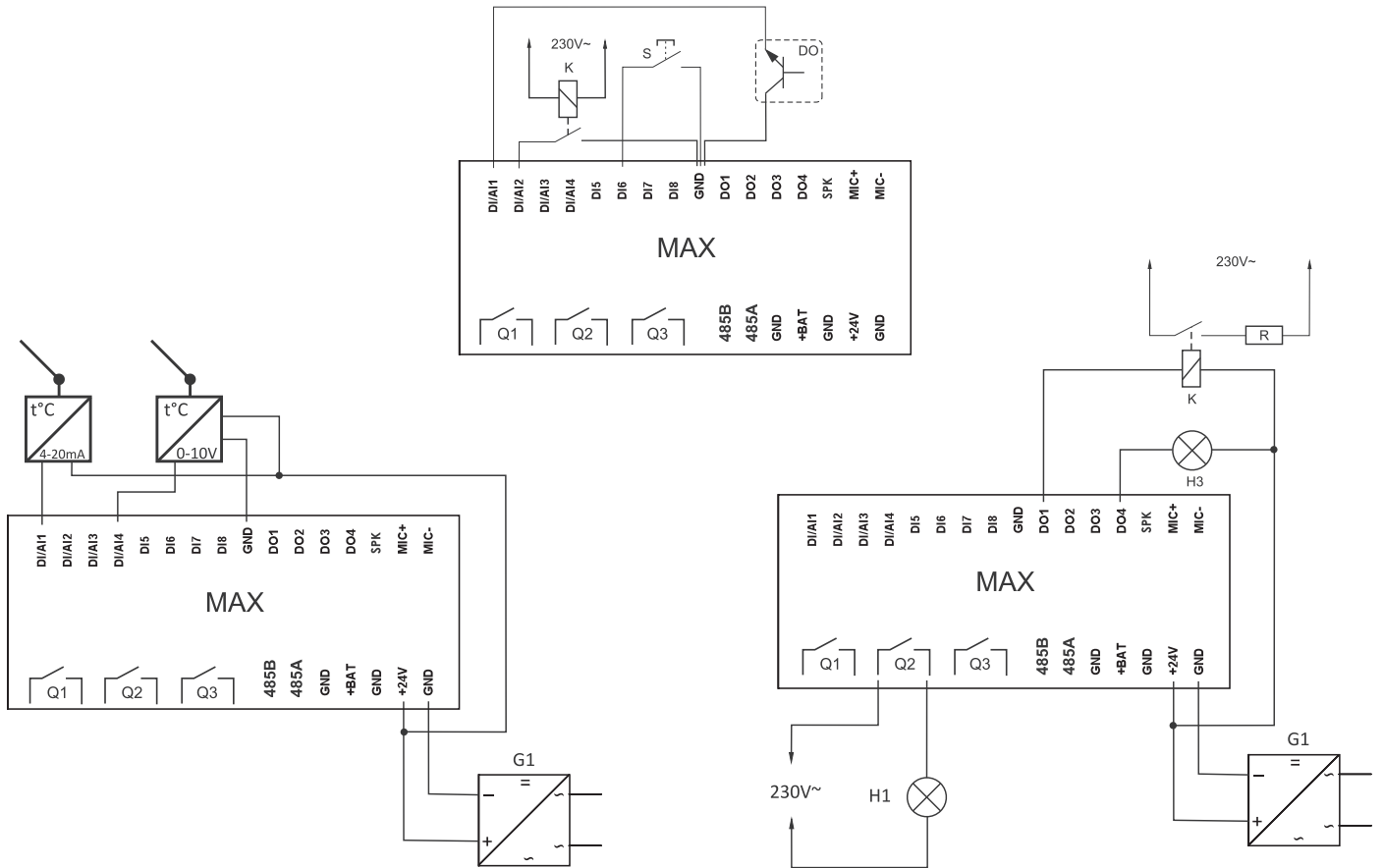
# H04 Config  PC configuration software

## Purpose

An easy and simple way to configure the controller using H04 Config.
Definition of phones, a setting of alarm thresholds, scaling of analog inputs, time synchronization, etc.

## Functions

• Control of outputs via SMS commands;
• Two-state regulation of the HEATING/COOLING type (based on the definitions of the analog input scale, threshold, and output assigned to it);
• Selection of options for actuation and alarm triggering (high state "1" or low state "0");
• Queries about the status of inputs and outputs by SMS commands;
• SMS/VOICE alerts about the activation of inputs;
• SMS/VOICE alerts about exceeding the measurement value, for example exceeding the temperature;
• Definition of the content of SMS alarms (up to 160 characters);
• The option of sending a second text message when the alarm threshold is continuously exceeded;
• Output control depending on the assigned input:
  – LEVEL option - representation of the state (IN 1 => OUT 1, IN 0 => OUT 0);
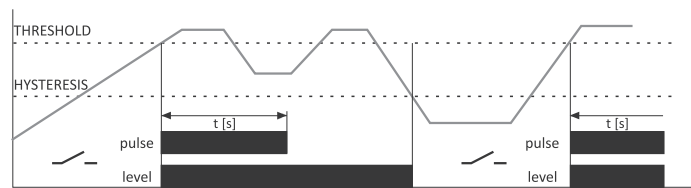


  – PULSE option - time activation of the output for a set time after the input has been activated;
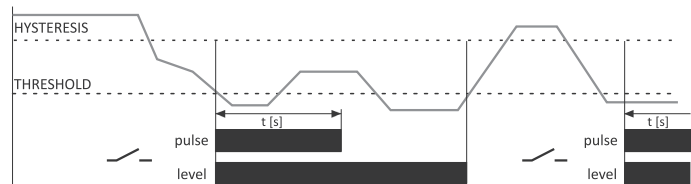


• Printing of states and values on LCD;
• User menu for settings of alarm threshold values and adjustments, telephone numbers, control options, etc.
• Control of the selected output as a function of CLIP (dial-up access) and astronomical clock.
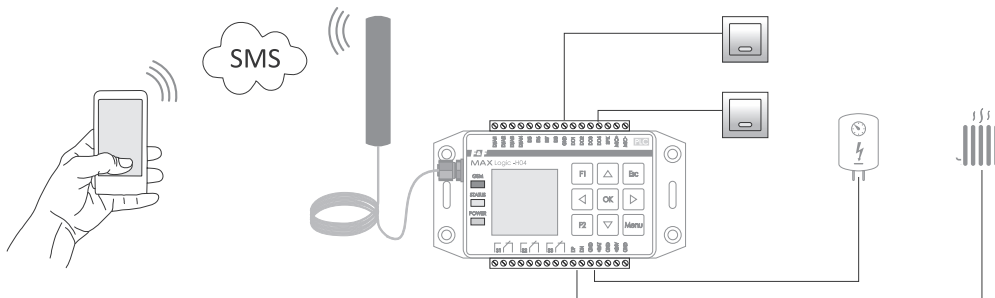


## Configuration software
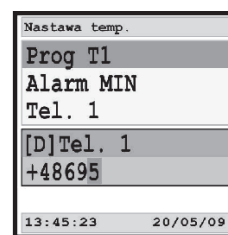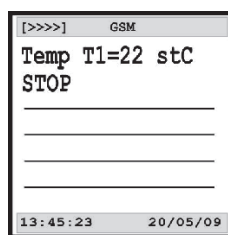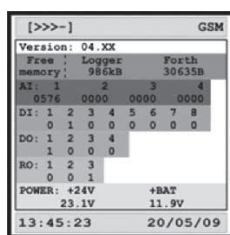
# H04 supporting applications

**Software tools**

A hardware and software system called "forth-system" is responsible for the execution of tasks and interpretation of the software written with the ForthLogic programming language. The ForthLogic underlying computational model consists of stacks, global variables, a dictionary, an input buffer, and an output buffer. The ForthLogic language allows describing parallel processes and runs in a multi-tasking environment.

The interactive programming and application development environment for MAX controllers in ForthLogic language consists of **Notepad++** text editor, **PuTTY** terminal program and **ForthLogic Programmer**, which provides two-way communication between PC and MAX controller.

This environment allows you to create scripts in the ForthLogic language, program MAX controllers and interact with the controller in terminal mode.

The **MAXLadderSOFT** software allows you to easily replace the "relay" schema with the programming language of the controller.

The program allows:

• to create and edit applications using the ladder diagram language [LAD];
• to check the correctness of the schema design;
• for direct communication between the controller and the computer;
• to upload applications to the memory of the controller.

Direct operation with the system of the controller is called **dialog mode**.

There are 2 types of dialog operation: terminal and remote.

**Terminal mode** means working with a **HyperTerminal**-type program (MAX-PC connection via USB).  The terminal mode is primarily used to learn to program, solve programming tasks or solve problems in controller operation.

**Remote mode** (only for controllers with GSM module) - the controller operates with the phone via SMS. In this mode, the phone display performs similar functions as the terminal window on the computer monitor. Remote mode is used to remotely control devices connected to the controller.

The **MAX Tool** service program allows you to set controller operating parameters, upload firmware, and Forth language applications, open Extensions and communicate directly in a simplified terminal mode.



HyperTerminal



MaxLadder Soft



Notepad++Putty+Forthlogic Programmer



Max Tool

# Section IV

## Video intercoms, door stations, mailboxes

# Chapter 18
# Video intercom monitors

| Product | Hands-free monitor | Touch panel | Backlit panel | LCD matrix | Screen diagonal | Screen resolution | Screen menu | Parameter settings (brightness, color, contrast) | 4-wire installation | Intercom | Control of electric door strike/bolt control | Control of automatic door | 14.5 V DC power supply for DIN rail (included) | Door station operation +CCTV cameras support | Taking pictures | Video recording | Panel elements made of aluminium | Panel elements made of glass | Panel elements made of plastic | Dimensions (mm) W×H×D | Additional feature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MK-12B MK-12W | ● | ● | ● | ● | 7" | 1280×600 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | ● | – | – | – | ● | 208×150×22 | expansion with 3 additional monitors or MU uniphones built-in memory for a register of 100 photos |
| MK-11B MK-11W | ● | – | – | ● | 7" | 800×600 | – | ● | ● | ● | ● | – | ● | 2+0 or 1+1 | – | – | – | – | ● | 245×159×18.5 | preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones, mechanical buttons |
| MK-10EX[1] MK-10EXH[1,2] | ● | ● | ● | ● | 7" | 720p | ● | ●[4] | ● | ● | ● | ● | ● | 2+2 or 1+3 | ● | ● | ● | ● | ● | 226×151×23 | 4 GB micro SD card, connection of alarm detectors to cameras, setting of 3 volume modes, 11 ringtone melodies/separate ringtone for every entrance, preview with starting the conversation and opening the door, expansion with 3 additional monitors, smoothly adjustable bolt opening time 1÷99 sec |
| MK-10FSD[1] MK-10FSDH[1,2] | ● | ● | ● | ● | 7" | 720p | ● | ●[4] | ● | ● | ● | ● | ● | 2+2 or 1+3 | ● | ● | ● | – | ● | 245×165×20 | 4 GB micro SD card, connection of alarm detectors to cameras, setting of 3 volume modes, 11 ringtone melodies/separate ringtone for every entrance, preview with starting the conversation and opening the door, expansion with 3 additional monitors |
| MK-10K[1] | ● | ● | ● | ● | 4" | 480×320 | ● | ●[4] | – | – | ● | – | ● | 2+2 or 1+3 | ● | ● | – | – | ● | 117×168×20 | 4 GB micro SD card, connection of alarm detectors to cameras, setting of 3 volume modes, 11 ringtone melodies/separate ringtone for every entrance, preview with starting the conversation and opening the door, expansion with 3 additional monitors, smoothly adjustable bolt opening time 1÷99 sec |
| MK-08B | ● | ● | ● | ● | 7" | 640×480 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | ● | – | – | – | ● | 241×161×23 | preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones, built-in memory for a register of 100 photos, black or white |
| MK-08F | ● | ● | – | ● | 7" | 640×480 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | ● | – | – | – | ● | 241×161×23 | preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones, built-in memory for a register of 100 photos |
| MK-06B | ●[5] | ● | ● | ● | 7" | 640×480 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | – | – | – | – | ● | 282×135×23 | preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones |
| MK-06WF | ●[5] | ● | – | ● | 7" | 640×480 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | ● | – | – | – | ● | 282×135×23 | preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones, built-in memory for a register of 100 photos |
| MK-04B MK-04W | ● | – | – | ● | 7" | 640×480 | – | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | – | – | – | – | ● | 254×160×18 | expansion with 3 additional monitors or MU uniphones, moveable buttons, black or white |
| MK-03 MK-03W | ● | ● | – | ● | 7" | 640×480 | ● | ● | ● | ● | ● | ● | ● | 2+0 or 1+1 | – | – | – | – | ● | 241×161×23 | preview with starting the conversation and opening the door, expansion with 3 additional monitors  or MU uniphones |
| MU-01[3] | – | – | – | – | – | – | – | ●[6] | 3 | ● | ● | – | – | 2+0 | – | – | – | – | ● | 100×200×45 | – |
| MU-02[3] | ● | – | – | – | – | – | – | ●[7] | 3 | – | ● | – | – | 2+0 | – | – | – | – | ● | 160×120×42 | – |

Legend:
[1] The MK-10 series does not work with other monitors
[2] Monitors read the AHD signal
[3] Uniphones work with all monitors in the list (except MK-10 series), 14.5 V DC power supply is required for proper operation of uniphones. The power supply is not included.
[4] For each camera separately
[5] With the additional handset
[6] With ringtone volume control
[7] With conversation and ringtone volume control

# MK-12B/MK-12W

- Hands-free monitor
- 7" panoramic screen TFT LCD 1280×600
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Intercom function for voice communication between internal devices
- Touch, backlit control panel (backlight color - blue)
- Electric door strike and automatic door control
- Color of the housing: black or white
- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)
- The module can be expanded by 3 selectable additional monitors or uniphones (except MK-10 series monitors)
- Preview with the ability to enable sound and open the door

- Wiring: 4+2 for bolt + 2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 208×150×22 mm

# MK-11B/MK-11W

- Hands-free monitor
- 7" panoramic color screen TFT LCD 640×480
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Electric door strike control
- Preview with the ability to enable sound and open the door
- The module can be expanded by 3 additional, randomly selected monitors or uniphones (except MK-10 series monitors)
- Adjustment of monitor parameters (volume, brightness and color)
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Color of the housing:
  MK-11B – black
  MK-11W – white

- Wiring: 4+2 for bolt
- Dimensions: 245×159×18.5 mm

# MK-10EXH[1]

- Hands-free monitor
- 7" panoramic touch screen LCD HD 1280×720
- On-screen menu in 10 languages (Polish, English, Ukrainian, Russian, French, Czech, Slovak, Spanish, Japanese, Chinese)
- Preview with the ability to start the conversation and open the door without a call from outside
- Support for 2 door stations and 2 CCTV cameras (CVBS and AHD mode selectable in the menu)
- Motion detection performed directly from cameras
- Electric door strike and automatic door control
- Photo/video recording function (micro SD card up to 16 GB not included)
- Adjustment of image parameters for each camera

- Ability to set 3 volume modes during the day
- Smoothly adjustable bolt opening time 1÷99 sec
- 12 ringtone melodies/a separate ringtone can be set for each input.
- Addressed intercom - connection to the selected monitor
- Digital frame function
- Music and movie player
- Wiring: 4+2 for bolt + 2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 226×151×23 mm
- Material: Brushed aluminum/glass/plastic
- The module can be expanded by 3 additional monitors from the same series only (MK-10)

[1] The MK-10 series does not work with other monitors
[2] Monitors read the AHD signal

# MK-10FSDH[1] [2]

- Hands-free monitor
- 7" panoramic color screen LCD HD 720p
- On-screen menu in 10 languages: Polish, English, Ukrainian, Russian, French, Czech, Slovak, Spanish, Japanese, Chinese
- Touch, backlit control panel (white light)
- Preview with the ability to start the conversation and open the door without a call from outside
- Support for 2 door stations and 2 CCTV cameras (CVBS and AHD mode selectable in the menu)
- Motion detection performed directly from cameras
- Electric door strike and automatic door control.
- Photo/video recording function (micro SD card up to 16 GB not included)
- Adjustment of image parameters for each camera
- Ability to set 3 volume modes during the day
- Smoothly adjustable bolt opening time 1÷99 sec
- 12 ringtone melodies/a separate ringtone can be set for each input
- Addressed intercom - connection to the selected monitor
- Digital frame function
- Music and movie player
- Wiring: 4+2 for bolt + 2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 245×165×20 mm
- Material: Brushed aluminum / glass / plastic
- The module can be expanded by 3 additional monitors from the same series only (MK-10)

# MK-10K[1]

- Hands-free monitor
- 4" color screen LCD (on-screen menu)
- Preview with the ability to start the conversation and open the door without a call from outside
- Support for 2 door stations and 2 CCTV cameras (analog)
- Motion detection performed directly from cameras
- Electric door strike and automatic door control
- Photo/video recording function (micro SD card up to 16 GB not included)
- Adjustment of image parameters for each camera
- Ability to set 3 volume modes during the day
- Smoothly adjustable bolt opening time 1÷99 sec
- 12 ringtone melodies/a separate ringtone can be set for each input
- Digital frame function
- Wiring: 4+2 for bolt +2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 226×151×23 mm
- Material: glass/plastic
- The module can be expanded by 3 additional monitors from the same series only (MK-10)

# MK-08B

- Hands-free monitor
- 7" panoramic color screen TFT LCD 640×480
- Built-in memory for a register of 100 photos
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Intercom function for voice communication between internal devices
- Touch, backlit control panel (backlight color - blue)
- Electric door strike and automatic door control
- Color of the housing: black
- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)
- On-screen menu in 8 languages: Polish, English, German, French, Spanish, Italian, Chinese, Russian
- The module can be expanded by 3 selectable additional monitors or uniphones (except MK-10 series monitors)
- Preview with the ability to enable sound and open the door
- Wiring: 4+2 for bolt +2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 241×161×23 mm

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[1] The MK-10 series does not work with other monitors
[2] Monitors read the AHD signal

# MK-08F

- Hands-free monitor
- 7" panoramic color screen TFT LCD 640×480
- Built-in memory for a register of 100 photos
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Intercom function for voice communication between internal devices
- Touch, backlit control panel (backlight color - blue)
- Electric door strike and automatic door control
- Color of the housing: white

- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)
- On-screen menu in 8 languages: Polish, English, German, French, Spanish, Italian, Chinese, Russian
- The module can be expanded by 3 selectable additional monitors or uniphones (except MK-10 series monitors)
- Preview with the ability to enable sound and open the door
- Wiring: 4+2 for bolt + 2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 241×161×23 mm

# MK-06B

- Hands-free monitor with additional handset
- 7" panoramic color screen TFT LCD 640×480
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Intercom function for voice communication between internal devices
- Touch, backlit control panel (backlight color - blue)
- Electric door strike and automatic door control

- Color of the housing: black
- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)
- Preview with the ability to enable sound and open the door
- Wiring: 4+2 for bolt + 2 for gate
- The module can be expanded by 3 additional monitors or uniphones (except MK-10 series monitors)
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 282×135×23 mm

# MK-06WF

- Hands-free monitor with additional handset
- 7" panoramic color screen TFT LCD 640×480
- Memory for 100 photos (on an internal flash drive)
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Intercom function for voice communication between internal devices
- Touch, backlit control panel (backlight color - blue)
- Electric door strike and automatic door control
- Color of the housing: white
- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)

- On-screen menu in 8 languages: Polish, English, German, French, Spanish, Italian, Chinese, Russian
- Preview with the ability to enable sound and open the door
- Installation: 4+2 for bolt + 2 for gate
- The module can be expanded by 3 additional monitors or uniphones (except MK-10 series monitors)
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 282×135×23 mm

# MK-04B black/MK-04W white

previously MK-01/MK-02

- Hands-free monitor
- 7" panoramic color screen TFT LCD 640×480;
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Electric door strike and automatic door control
- The module can be expanded by 3 additional, randomly selected monitors or uniphones (except MK-10 series monitors)
- Adjustment of monitor parameters (volume, brightness and color)
- Color of the housing:
  MK-04B – black
  MK-04W – white
- Movable buttons

- Wiring: 4+2 for bolt + 2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 245×160×18 mm

# MK-03 black/MK-03W white

- Hands-free monitor
- 7" panoramic color screen TFT LCD 640×480
- Touch, backlit control panel (backlight color - blue)
- Support for 2 door stations (or 1 station + 1 CCTV camera)
- Electric door strike and automatic door control;
- The module can be expanded by 3 additional, randomly selected monitors or uniphones (except MK-10 series monitors);
- Intercom and call forwarding
- Adjustment of monitor parameters (ringtone volume, talk volume, brightness, and color)
- Color of the housing:
  MK-03 – black
  MK-03W – white

- Preview with the ability to enable sound and open the door
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Installation: 4+2 for bolt + 2 for gate
- Dimensions: 241×161×23 mm

## Uniphones

## MU-01 headset

- Electric door strike control
- The module can be expanded by additional MU-01 or MU-02 uniphones or any monitors (except MK-10 series monitors)
- Intercom function
- Adapted to control a low-current 12 V DC electric door strike without the need for an additional transformer
- Installation: 3-wire + 2 for bolt (for stand-alone installation) 3 + power supply, as additional for the monitor
- Dimensions: 90×200×50 mm

## MU-02 hands-free

- Electric door strike control
- The module can be expanded by additional MU-01 or MU-02 uniphones or any monitors (except MK-10 series monitors)
- Call forwarding feature
- Adapted to control a low-current 12 V DC electric door strike without the need for an additional transformer.
- Installation: 3-wire + 2 for bolt (for stand-alone installation) 3 + power supply, as additional for the monitor
- Surface mounting
- Dimensions: 160×120×42 mm

**Application**

Uniphones work with all types of monitors.

# Door stations and accessories

| Product | "..." subscriber door station | Image sensor | Resolution (TVL) | Lens (mm) | Lens viewing angle | Lens adjustment | Lighting, number of IR LEDs (infrared) | 4-wire installation | Power supply | Flush-mounted | Surface mounting | Impact protection rating | Aluminum housing | Dimensions of door station (mm) [W×H×D] | Dimensions of a flush-mounted cassette (mm) [W×H×D] | Additional feature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KK-20DA | 1 | ⅓" | 800 | 1.8 | 110° | – | 5 | ● | ●[2] | ● | ● | ● | ● | 84×150×36 | 78×142×31 | built-in card reader and encryptor; backlit call button and keypad; relay (voltage free) output to the bolt |
| KK-50A** | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ● | ●[2] | ● | ● | ● | ● | 78×185×60 | – | RFID reader enables bolt control via proximity tags backlit signboard and call button; relay (voltage free) output to the bolt |
| KK-01 KK-01S | 1 | ⅓" | 600 | 3.6 | 87° | – | 4 | ● | ●[1] | – | ● | ● | ● | 59×135×39 | – | relay (voltage free) output to the bolt |
| KK-01FP* | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ● | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, fingerprint reader (max 900), backlit signboard and call button, relay (voltage free) output to the bolt |
| KK-02 | 2 | ⅓" | 600 | 3.6 | 87° | – | 6 | | ●[2] | – | ● | ● | ● | 97×130×43 | – | backlit signboard and call button, relay (voltage free) output to the bolt |
| KK-03 | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ● | ●[2] | – | ● | ● | ● | 78×185×60 | – | a keypad to control the lock with a PIN code, backlit buttons, output to the bolt - 12 V DC |
| KK-04 KK-04G | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 8 | ● | ●[1] | ● | – | ● | – | 150×203×55 | 130×183×50 | front panel made from brushed stainless steel, backlit call button, relay (voltage free) output to the bolt |
| KK-05 | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ● | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, a keypad to control the lock with a PIN code, backlit signboard and call button, relay (voltage free) output to the bolt |
| KK-05K | 1 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ● | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, RFID reader enables bolt control via proximity tags backlit signboard and call button, relay (voltage free) output to the bolt |
| KK-08 | 2 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ●[3] | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, a keypad to control the lock with a PIN code, backlit signboard and call button, relay (voltage free) output to the bolt |
| KK-08K | 2 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ●[3] | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, RFID reader enables bolt control via proximity tags backlit signboard and call buttons, relay (voltage free) output to the bolt |
| KK-09 | 4 | ⅓" | 600 | 3.6 | 87° | ±10° | 6 | ●[4] | ●[2] | ● | ●[5] | ● | – | 120×250×51 | 110×240×46 | front panel made from brushed stainless steel, backlit signboard and call button, relay (voltage free) output to the bolt |

Legend:
* remote control for programming included
** works only with MK-10EXH and MK10-FSDH
A – card reader
D – keypad
FP – fingerprint reader
G – graphite
H – sends the AHD signal
K – Master card for adding and removing users included
S – silver
[1] Power supply from the monitor
[2] 12÷14.5 V DC power supply
[3] 2×4 wires installation
[4] 4×4 wires installation
[5] Can be surface-mounted with additional box power supply

# KK-01 black/KK-01S silver

- 1- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Backlight: 4 IR LEDs
- Protection level: IP65
- Power supply: from the monitor
- Housing: hardened aluminum alloy
- Installation: surface-mounted
- Color of the housing: black/silver
- Dimensions: 58×135×39 mm

# KK-01FP

- 1- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Bolt control with opening time adjustment
- Backlit selection button and signboard for your name (backlight color: blue)
- Vandal-proof front panel made from stainless steel

- Flush-mounted installation or surface-mounted with a cover
- Ingress protection – IP65
- Output for the additional bolt release button
- Built-in capacitive fingerprint reader (max. 900 fingerprints)
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51 mm
- Box dimensions: 110×240×46 mm
- A remote control that is necessary for programming is included in the set.

# KK-02

- 2- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Lens: 3.6 mm
- Resolution: 600 lines
- Backlight: 6 IR LEDs
- Protection level IP65
- Power supply: from the monitor
- Housing: hardened aluminum alloy
- Installation: surface-mounted
- Backlit selection and signboard buttons (backlight color: blue)
- Dimensions: 97×130×43 mm

# KK-03

- 1- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Built-in combination lock
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Housing: hardened aluminum alloy

- Backlit keyboard
- Installation: surface-mounted
- Output for 12 V DC bolt power supply
- Electric door strike control with opening time adjustment 1÷99 s
- Dimensions: 78×185×60 mm
- An additional output switch can be connected
- Protection level IP65

# KK-04 inox/KK-04G graphite

- 1- subscriber door station with a camera
- Image sensor: 1/3" color
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 8 IR LEDs (infrared)
- Backlit selection button (backlight color: blue)

- Vandal-proof front panel made from stainless steel
- Flush-mounted installation (surface-mounting is not available)
- Power supply from the monitor
- Ingress protection: IP65
- Dimensions: 150×203×55 mm
- Box dimensions: 130×183×50 mm

# KK-05

- 1- subscriber door station
- CCD color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared) Electric door strike control with opening time adjustment 1÷99 s
- Output for the additional bolt release button
- Backlit selection button and signboard

- Vandal-proof front panel made from stainless steel
- Flush-mounted installation or surface-mounted with a cover;
- Built-in combination lock for the opening of the door using a PIN code
- Output for the additional bolt release button.
- Timer output
- Ingress protection IP65
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51 mm
- Box dimensions: 110×240×46 mm

# KK-05K

- 1- subscriber door station
- CCD color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Electric door strike control with opening time adjustment 1÷99 s
- Output for the additional bolt release button
- Backlit selection button and signboard
- Vandal-proof front panel made from stainless steel

- Flush-mounted installation or surface-mounted with a cover
- Built-in RFID reader: Unique 125 kHz
- Reader capacity: max 1000 cards
- The MASTER card is included in the set with the station, allowing you to add the cards yourself
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51 mm
- Box dimensions: 110×240×46 mm
- The remote control is used for programming (not included)

# KK-08

- 2- subscriber door station
- CCD color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Electric door strike control with opening time adjustment 1÷99 s
- Output for the additional bolt release button
- Backlit selection button and signboard

- Vandal-proof front panel made from stainless steel
- Flush-mounted installation or surface-mounted with a cover
- Built-in combination lock for the opening of the door using a PIN code
- Output for the additional bolt release button
- Timer output
- Ingress protection IP65
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51mm
- Box dimensions: 110×240×46 mm

# KK-08K inox

- 2- subscriber door station
- CCD color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Electric door strike control with opening time adjustment 1÷99 s
- Output for the additional bolt release button
- Backlit selection button and signboard
- Vandal-proof front panel made from stainless steel

- Flush-mounted installation or surface-mounted with a cover;
- Built-in RFID reader: Unique 125 kHz
- Reader capacity: max 1000 cards
- The MASTER card is included in the set with the station, allowing you to add the cards yourself
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51 mm
- Box dimensions: 110×240×46 mm
- The remote control is used for programming (not included)

# KK-09

- 4- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Backlit selection button and signboard for your name (backlight color– blue)
- Vandal-proof front panel made from stainless steel
- Flush-mounted installation or surface-mounted with a cover

- Ingress protection: IP65
- Power supply from a 12÷15 V DC external power supply
- Dimensions: 120×250×51 mm
- Box dimensions: 110×240×46 mm

# KK-01-20DA

- 1- subscriber door station
- 1/3" image sensor
- Camera resolution 800 TVL
- Lens: 1.8 mm/viewing angle 110°
- Night-time backlight - IR LED (infrared)
- Built-in combination lock: max. 200 codes
- Built-in Unique 125 kHz proximity reader: max 200 tags
- Backlit keypad and ringtone button
- Protection against unauthorized use
- Housing: brushed aluminum/ABS

- 12÷15 V DC power supply
- Operating temperature range:  -25°C÷50°C
- Power consumption:
  – standby 0.40 W
  – operation 0.95 W
- Ingress protection: IP65
- 2 contactless keychains included
- Programming with the keyboard
- Dimensions: 84×150×36 mm
- Box dimensions: 78×142×31 mm

# KK-50A

- 2- subscriber door station
- 1/3" color image sensor
- Lens viewing angle: approx. 87°
- Lens: 3.6 mm
- Resolution: 600 lines
- Backlight: 6 IR LEDs
- Lens adjustment: vertical and horizontal ±10°
- Power supply: from the monitor
- Housing: hardened aluminum alloy
- Installation: surface-mounted
- Backlit selection and signboard buttons (backlight color: blue)

- Dimensions: 97×130×43 mm
- Protection level: IP65

# Keypads

## KS-01

- Code lock with RFID proximity card reader;
- Vandal-proof metal housing;
- Built-in RFID proximity card reader;
- Support for two zones (for example door and gate);
- Doorbell function (alternatively instead of zone 2);
- Memory capacity:
  zone 1 => 1000 user codes and cards;
  zone 2 => 10 user codes and cards;
- Backlit keyboard;
- Power supply: 12÷24 V DC, 9÷18 V AC;

- Adjustable relay opening time (0÷99 s): 0 s, which means unstable mode;
- Additional switches for opening entrances can be connected;
- The input of an open door sensor, which reduces the time when the electric door strike is open to a minimum;
- Anti-tamper sensor;
- Power consumption: stand-by <40 mA, operation <70 mA;
- Operating temperature range: -20÷50°C;
- Ingress protection: IP65;
- Dimensions: 76×120×22 mm.

# Accessories

## KB-01 RFID keyring



## KB-02 RFID card



## KB-03 RFID card



## KB-04 RFID sticker

**EZ-02** low-current electric door strike

**EZ-03** low-current electric door strike with memory and switch

**EZ-04** DC electric door strike with memory without switch

**EZ-05** DC electric door strike without memory with breaker
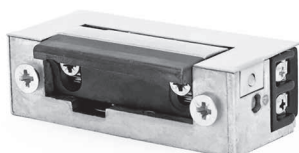


| Product | Power supply | Power consumption | Memory | Switch |
|---------|-------------|-------------------|--------|--------|
| EZ-02 | 12 V DC | 270 mA | – | – |
| EZ-03 | 12 V DC | 270 mA | ● | ● |
| EZ-04 | 230 V AC | 270 mA | ● | – |
| EZ-05 | 230 V AC | 270 mA | – | ● |

**Application**

- Installation for entrance doors;
- Compatible with all monitor power supplies.

# DSW-1 low voltage acustic signaller

**Purpose**

The relay is designed for F&F video intercoms. It activates an additional optical (using a light source) or sound (using, for example, a siren) signaling during a call from a door station. When triggered, the contact switches every 1 second. The operating time is adjustable from 5 to 30 seconds.



1. white
2. yellow
3. blue
4. red
5. black
6. red
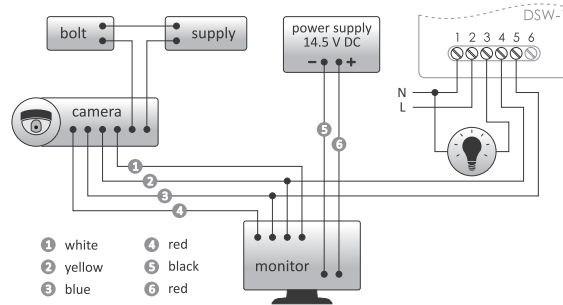
| | |
|---|---|
| power supply | 100÷265 V AC |
| maximum load current (AC-1) | 2 A |
| switch-on/activation time (adjustable) | 5÷30 s |
| switching time ON/OFF | 1 s/1 s |
| power consumption | |
| standby | 0.25 W |
| ON mode | 0.6 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -15÷50°C |
| dimensions | 51×67×26 mm |
| mounting | surface |
| protection level | IP20 |

# ZI-15 15 V/12 W pulse power supply
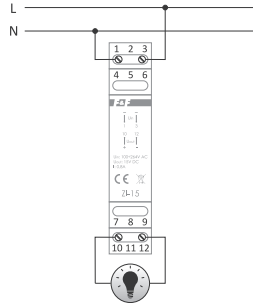


| | |
|---|---|
| input voltage | 15 V DC |
| output power | 12 W |
| current limit | Imax= 110% Iout |
| minimum load | 0% |
| keying frequency | 70 kHz |
| terminal | 2.5 mm² screw terminals |
| working temperature | -10÷40°C |
| dimensions | 1 module (18 mm) |
| wight | 80 g |
| mounting | for TH-35 rail |
| protection level | IP20 |

# Chapter 20
# Mailboxes

| Product | Analog mailbox | Digital mailbox | Resolution (TVL) | Lens viewing angle | Lens adjustment | Number of wires | Housing of stainless steel | Adjustable passage depth (mm) | Drawer width | Front panel dimensions (mm) | Back panel dimensions (mm) | Dimensions of the inlet opening (mm) | Additional feature |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SLA-KK-04-SKM | ● | – | 600 | 87° | ±10° | 4+2 | ● | 260÷410 | 250 | 285×332 | 260×110 | 241×38 | backlit call button, relay (voltage free) output to the bolt, lighting 8 IR LEDs |
| SLA-KK-04-SKP | ● | – | 600 | 87° | ±10° | 4+2 | ● | 190÷255 | 250 | 285×385 | 265×360 | 241×45 | backlit call button, relay (voltage free) output to the bolt, lighting 8 IR LEDs |
| SLA-KK-05-SKM | ● | – | 600 | 87° | ±10° | 4+2 | ● | 260÷410 | 250 | 285×385 | 260×110 | 241×38 | a keypad to control the lock with a PIN code, backlit call button and keypad, lighting 6 IR LEDs |
| SLA-KK-05-SKP | ● | – | 600 | 87° | ±10° | 4+2 | ● | 190÷255 | 250 | 285×385 | 265×360 | 241×45 | a keypad to control the lock with a PIN code, backlit call button and keypad, lighting 6 IR LEDs |
| SLC-1201A-SKM | – | ● | 2 Mpix | 170° | – | 2 | ● | 260÷410 | 270 | 290×290 | 290×150 | 230×30 | RFID reader enables bolt control via proximity tags, backlit signboard with a place for your own note, supplies 300 mA 12V voltage to the bolt, LED night-time backlight (white light) |
| SLC-1201A-SKP | – | ● | 2 Mpix | 170° | – | 2 | ● | 190÷255 | 250 | 285×385 | 265×360 | 241×45 | RFID reader enables bolt control via proximity tags, backlit signboard with a place for your own note, supplies 300 mA 12V voltage to the bolt, LED night-time backlight (white light) |
| SLC-1401D-SKM | – | ● | 2 Mpix | 170° | – | 2 | ● | 260÷410 | 250 | 285×385 | 260×110 | 241×38 | a keypad to control the lock with a PIN code, backlit keyboard, supplies 300 mA 12 V voltage to the bolt, LED night-time backlight (white light) |

Legend:
SKM – wall thickness 26÷43 mm;          SKP – wall thickness 19÷25.5 mm;          A – card reader;          D – keypad

## Analog mailboxes

# SLA-KK-04-SKM   mailbox with a video intercom



**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Material: milled stainless steel
- Number of intercom or video intercom buttons: 1
- Type of camera used: KK-04
- Drawer width: 250 mm
- Adjustment of the depth of the box: 260÷410 mm
- Front panel dimensions: 285×332 mm
- Back panel dimensions: 260×110 mm
- Throw-in slot: 241×38 mm

**KK-04 door station**
- 1- subscriber door station with a camera
- Image sensor: 1/3" color
- Lens viewing angle: approx. 87°
- Resolution: 600 lines / 3.6 mm lens
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 8 IR LEDs (infrared)
- Backlit selection button (backlight color: blue)
- Power supply from the monitor
- Ingress protection: IP65

# SLA-KK-04-SKP   mailbox with a video intercom

**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Material: milled stainless steel
- Number of intercom or video intercom buttons: 1
- Type of camera used: KK-04
- Drawer width: 265 mm
- Adjustment of the depth of the box: 190÷255 mm
- Front panel dimensions: 285×385 mm
- Throw-in slot: 241×45 mm

**KK-04 door station**
- 1- subscriber door station with a camera
- Image sensor: 1/3" color
- Lens viewing angle: approx. 87°
- Resolution: 600 lines / 3.6 mm lens
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 8 IR LEDs (infrared)
- Backlit selection button (backlight color: blue)
- Power supply: from the monitor
- Ingress protection: IP65

---

# SLA-KK-05-SKM   mailbox with a video intercom

**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Material: polished stainless steel
- Type of door station used: KK-05
- Drawer width: 250 mm
- Adjustment of the depth of the box: 260÷410 mm
- Front panel dimensions: 285×385 mm
- Back panel dimensions:  260×110 mm

- **KK-05 door station**
- 1- subscriber door station with a camera
- Image sensor: 1/3" color
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Electric door strike control with opening time adjustment 1÷99 s
- Backlit keyboard and signboards
- Opening the door with a PIN code
- Power supply from a 12÷15 V DC external power supply
- Output for the additional bolt release button
- Output for a timer that specifies temporary access

---

# SLA-KK-05-SKP   mailbox with a video intercom

**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Material: milled stainless steel
- Type of camera used: KK-05
- Drawer width: 265 mm
- Adjustment of the depth of the box: 190÷255 mm
- Front panel dimensions: 285×385 mm
- Throw-in slot: 241×45 mm

**KK-05 door station**
- 1- subscriber door station with a camera
- Image sensor: 1/3" color
- Lens viewing angle: approx. 87°
- Resolution: 600 lines
- Lens: 3.6 mm
- Lens adjustment: vertical and horizontal ±10°
- Backlight: 6 IR LEDs (infrared)
- Electric door strike control
- Backlit keyboard and signboards
- Opening the door with a PIN code
- Power supply from a 12÷15 V DC external power supply
- Output for the additional bolt release button
- Output for a timer that specifies temporary access

# Digital mailboxes

## SLC-1201A-SKM  mailbox with a video intercom

- **Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Front panel and back door material: polished stainless steel
- Drawer material: hot-dip galvanized steel
- Type of camera used
- Drawer width: 250 mm
- Adjustment of the depth of the box: 260÷410 mm
- Front panel dimensions: 285×332 mm
- Back panel dimensions: 260×110 mm

- **Door station**
- Camera 2.0 Mpix
- Lens viewing angle 170°
- Built-in RFID reader (Unique 125 kHz)
- Master keychains for programming included
- Backlit information signboard
- 1 relay output (second relay via module B5)
- 12 V output for the power supply of the electric door strike
- LED night-time backlight (white light)
- Indicator of call start and bolt opening
- It supports electric door strikes and electro-magnetic armatures
- Number of supported internal devices: 13
- It supports the addressed intercom feature

## SLC-1201A-SKP  mailbox with a video intercom

**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Front panel and back door material
- Type of camera used: no data available
- Drawer width: 265 mm
- Adjustment of the depth of the box: 190÷255 mm
- Front panel dimensions: 285×385 mm
- Throw-in slot: 241×45 mm

**Door station**
- Camera 2.0 Mpix
- Lens viewing angle 170°
- Built-in RFID reader (Unique 125 kHz)
- Master keychains for programming included
- Backlit information signboard
- 1 relay output (second relay via module B5)
- 12 V output for the power supply of the electric door strike
- LED night-time backlight (white light)
- Indicator of call start and bolt opening
- It supports electric door strikes and electro-magnetic armatures
- Number of supported internal devices: 13
- It supports the addressed intercom feature
- 2-wire connection to the entire system

## SLC-1401D-SKM  mailbox with a video intercom

**Mailbox**
- Type of the mailbox: pass-through with video intercom
- Number of throw-in slots: 1
- Front panel and back door material: polished stainless steel
- Drawer material: hot-dip galvanized steel
- Type of camera used: no data available
- Drawer width: 250 mm
- Adjustment of the depth of the box: 260÷410 mm
- Front panel dimensions: 285×350 mm
- Back panel dimensions: 260×110 mm

**Door station**
- Camera 2.0 Mpix
- Lens viewing angle 170°
- Built-in combination lock with a touch keyboard
- Backlit signboard for your name.
- Possibility to change the backlight of the keyboard and signboard
- LED night-time backlight (white light)
- Programming from the keyboard using codes
- 1 relay output (with relay via module B5)
- It supports electric door strikes and electro-magnetic armatures
- 12 V output for the power supply of the electric door strike
- The number of internal devices: 13
- It supports the addressed intercom feature
- 2-wire connection to the entire system

# Section V

# Time control

**Purpose**

Time relays are used for time control in industrial and home automation systems (such as ventilation, heating, lighting, signalling, etc.).

| Product | Voltage power supply | Actuator element | Maximum load current | Mounting | Input Start/Reset | Number of functions | Description | Page |
|---|---|---|---|---|---|---|---|---|
| PCA-512 230 V | 195÷253 V AC | relay | 8 A | for TH-35 rail | – | 1 | off delay | 117 |
| PCA-512 24 V | 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | off delay | 117 |
| PCA-512 UNI | 12÷264 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | off delay | 117 |
| PCA-514 DUO | 195÷253 V AC 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | off delay | 117 |
| PCR-513 230 V | 195÷253 V AC | relay | 8 A | for TH-35 rail | – | 1 | on delay | 117 |
| PCR-513-16 230 V | 195÷253 V AC | relay | 16 A | for TH-35 rail | – | 1 | **on delay** | 117 |
| PCR-513 24 V | 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | on delay | 117 |
| PCR-513 UNI | 12÷264 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | on delay | 117 |
| PCR-515 DUO | 195÷253 V AC 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 1 | on delay | 117 |
| PCS-506 | 195÷253 V AC | relay | 10 A | in flush mounted | ● | 8 | multifunctional | 121 |
| PCS-516 DUO | 195÷253 V AC 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-516 UNI | 12÷264 V AC/DC | relay | 8 A | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-516 AC | 85÷265 V AC | symistor | 2 A AC | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-516 DC | 9÷30 V DC | transistor | 8 A DC | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-517 | 24÷264 V AC/DC | relay | 16 A | for TH-35 rail | ● | 18 | multifunctional | 124 |
| PCS-519 12 V | 11÷14 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-519 DUO | 195÷253 V AC 21÷27 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | ● | 10 | multifunctional | 122 |
| PCS-533 | 9÷264 V AC/DC | relay | 16 A | for TH-35 rail | ● | programable | with wireless NFC communication | 125 |
| PCS-534 | 160÷260 V AC/DC | 4×relay | 4×16 A | for TH-35 rail | ● | programable | pulse-time, with USB port | 129 |
| PCU-504 UNI | 12÷264 V AC/DC | 2×relay | 2×4 A | for TH-35 rail | – | 3 | contacts status back-up after a power failure | 119 |
| PCU-507 230 V | 195÷253 V AC | 2×relay | 2×8 A | for TH-35 rail | – | 2 | cyclic operation | 120 |
| PCU-507 24 V | 21÷27 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | – | 2 | cyclic operation | 120 |
| PCU-510 DUO | 195÷253 V AC 21÷27 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | – | 4 | multifunctional | 118 |
| PCU-511 230 V | 195÷253 V AC | relay | 8 A | for TH-35 rail | – | 4 | multifunctional | 118 |
| PCU-511 DUO | 195÷253 V AC 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 4 | multifunctional | 118 |
| PCU-511 UNI | 12÷264 V AC/DC | relay | 8 A | for TH-35 rail | – | 4 | multifunctional | 118 |
| PCU-518 | 195÷253 V AC 21÷27 V AC/DC | relay | 8 A | for TH-35 rail | – | 4 | multifunctional, with external potentiometer for time settings | 119 |
| PCU-520 230 V | 195÷253 V AC | 2×relay | 2×8 A | for TH-35 rail | – | 2 | cyclic operation | 120 |
| PCU-520 24 V | 21÷27 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | – | 2 | cyclic operation | 120 |
| PCU-520 UNI | 12÷264 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | – | 2 | cyclic operation | 120 |
| PCU-530 | 100÷264 V AC/DC | 3×relay | 3×8 A | for TH-35 rail | – | 4 | multifunctional | 118 |
| PO-405 230 V | 195÷253 V AC | relay | 10 A | surface-mounted | ● | 1 | off delay | 126 |
| PO-405 24 V | 21÷27 V AC/DC | relay | 10 A | surface-mounted | ● | 1 | off delay | 126 |
| PO-406 | 195÷253 V AC | relay | 10 A | in flush mounted | ● | 1 | off delay | 126 |
| PO-415 230 V | 195÷253 V AC | relay | 10 A | for TH-35 rail | ● | 1 | off delay | 126 |
| PO-415 24 V | 21÷27 V AC/DC | relay | 10 A | for TH-35 rail | ● | 1 | off delay | 126 |
| STP-541 | 24÷264 V AC/DC | 2×relay | 2×16 A | for TH-35 rail | – | 1 | right/left operation | 127 |
| PCG-417 DUO | 195÷253 V AC 21÷27 V AC/DC | 2×relay | 2×8 A | for TH-35 rail | – | 1 | star/delta switch | 128 |

# Single-function

## With operating function: off delay

# PCA-512 / PCA-514

The contact remains in position 11-10 until the relay is switched on. After the supply voltage "U" is applied, the contact is switched to position 11-12 and the preset operating time is measured. After the set time has elapsed, the contact returns to position 11-10. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.
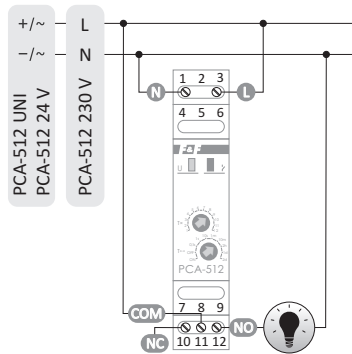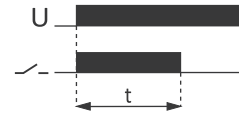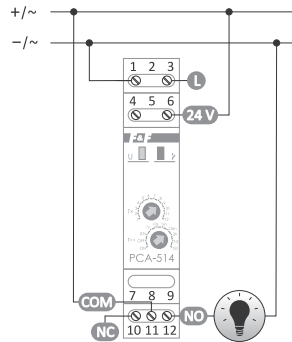


| power supply | |
|---|---|
| PCA-512 230 V | 195÷253 V AC |
| PCA-512 24 V | 21÷27 V AC/DC |
| PCA-512 UNI | 12÷264 V AC/DC |
| PCA-514 DUO | 195÷253 V AC |
| | 21÷27 V AC/DC |
| maximum load current (AC-1) | 8A |
| contact | separated 1×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| activation delay | <50 ms |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

PCA-512          PCA-514 230 V + 24 V

## With operating function: on delay

# PCR-513 / PCR-513-16 / PCR-515

After the supply voltage is applied, the contact remains in position 11-10 and the set operating time is measured. After the set time has elapsed, the contact switches to position 11-12.
To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.
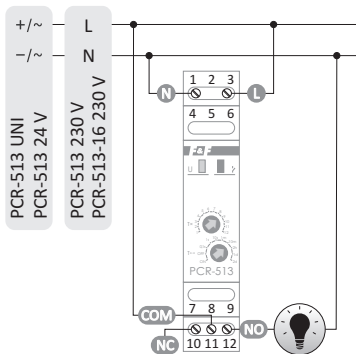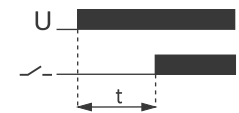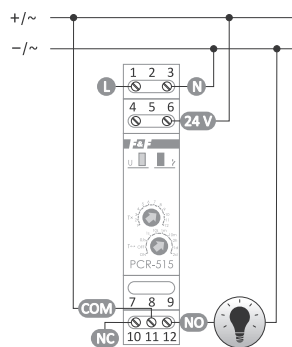


| power supply | |
|---|---|
| PCR-513 230 V | 195÷253 V AC |
| PCR-513-16 230 V | 195÷253 V AC |
| PCR-513 24 V | 21÷27 V AC/DC |
| PCR-513 UNI | 12÷264 V AC/DC |
| PCR-515 DUO | 195÷253 V AC |
| | 21÷27 V AC/DC |
| maximum load current (AC-1) | |
| PCR-513/PCR-515 | 10 A |
| PCR-513-16 | 16 A |
| contact | separated 1×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

PCR-513          PCR-515 230 V + 24 V

- Moving the rotary timer switch to position:
  – ON – permanently closes the contact if the power supply is switched on.
  – OFF – permanently opens the contact if the power supply is switched on.
- When the power supply is switched on, the system does not react to the change of time range settings.
- Operation with the newly set time range takes place after the power supply is switched off and back on.
- With the power supply switched on, it is possible to smoothly adjust the time within the preset time range.

time settings knob

time range selection knob

# Multifunctional

**Functioning**

- **Off delay (A)**
  The contacts remain in NC position until the relay is switched on. After the supply voltage is applied, the contacts are switched to NO position and the preset operating time "t" is measured. After time "t" has elapsed, the contacts return to NC position. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.
- **On delay (B)**
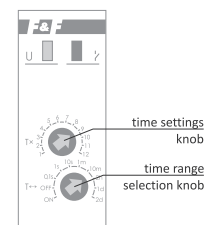  Before and after the supply voltage is applied, the contacts remain in the NC position and the preset operating time "t" is measured. After the preset time has elapsed, the contacts switch to the NO position. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.
- **Off delay - cyclic (C)**
  Off delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.
- **On delay - cyclic (D)**
  On delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

## PCU-510 DUO    2×NO/NC contact
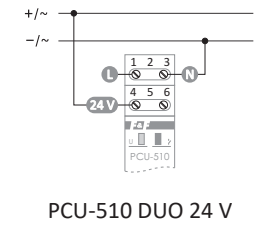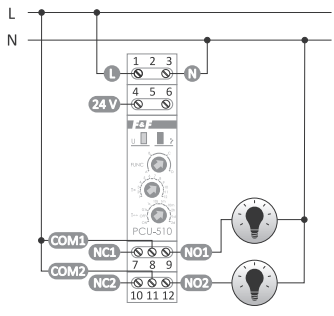
PCU-510 DUO 24 V

PCU-510 DUO
230 V power supply

| power supply | 195÷253 V AC |
| --- | --- |
| | 21÷27 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## PCU-511    1×NO/NC contact

PCU-511 24 V

PCU-511
230 V power supply

| power supply | |
| --- | --- |
| PCU-511 230 V | 195÷253 V AC |
| PCU-511 DUO | 195÷253 V AC |
| | 21÷27 V AC/DC |
| PCU-511 UNI | 12÷264 V AC/DC |
| maximum load current (AC-1) | 8 A |
| contact | separated 1×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## PCU-530    3×NO/NC contact

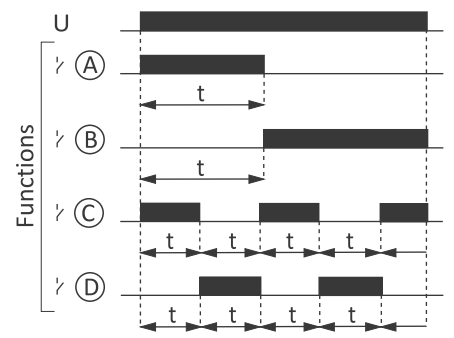| power supply | 100÷264 V AC/DC |
| --- | --- |
| maximum load current (AC-1) | 3×8 A |
| contact | separated 3×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

- Moving the rotary timer switch to position:
  – ON – permanently closes the contact if the power supply is switched on.
  – OFF – permanently opens the contact if the power supply is switched on.
- When the power supply is switched on, the system does not react to the change of time range settings.
- Operation with the newly set time range takes place after the power supply is switched off and back on.
- With the power supply switched on, it is possible to smoothly adjust the time within the preset time range.
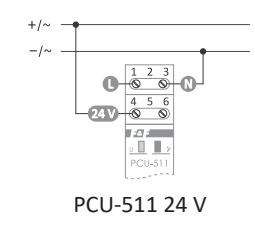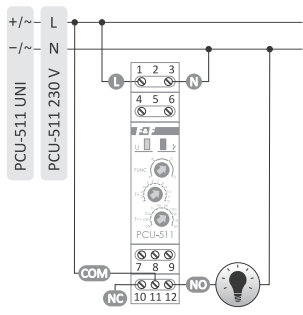
work functions
selection knob

time settings
knob

time range
selection knob
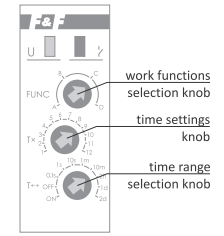
## With external potentiometer for time setting

# PCU-518 + potentiometer (ZP-18) included



| power supply | 195÷253 V AC |
| --- | --- |
| | 21÷27 V AC/DC |
| maximum load current (AC-1) | 8 A |
| contact | separated 1×NO/NC |
| working time (adjustable) | 0.1 s÷24 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
| **external potentiometer (ZP-18)** | |
| cable | 3×0.42 mm², l= 70 cm |
| box dimensions with cable gland | 83×42×30 mm |
| height/diameter of the mandrel | 30 mm/ø6 |
| mounting hole | ø10 |
| resistance | 100 kΩ |

❶ white
❷ green
❸ brown

(!) Visualization of operating modes presented on the previous page.

(!) 
• Moving the rotary timer switch to position:
  – ON permanently closes the contact if the power supply is switched on.
  – OFF permanently opens the contact if the power supply is switched on.
• When the power supply is switched on, the system does not react to the change of time range settings;
• Operation with the newly set time range takes place after the power supply is switched off and back on;
• With the power supply switched on, it is possible to smoothly adjust the time within the preset time range.

## With back-up after power failure

# PCU-504 UNI

**Functioning**

The relay has an internal capacitor system, which acts as a power supply back-up and switches the contact after a power failure.
The maximum back-up time is up to 10 minutes.

**Functions**
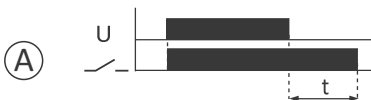


(A) Closing of the contacts after switching on the power supply voltage. After a power failure, the contacts are closed for a set period of time.
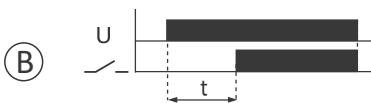
(B) On delay feature.
The back-up feature is not implemented.
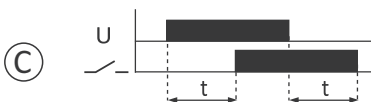
(C) After the power supply voltage is switched on, the contacts are closed after the preset time (on delay). After a power failure, the contacts are closed for a set period of time.
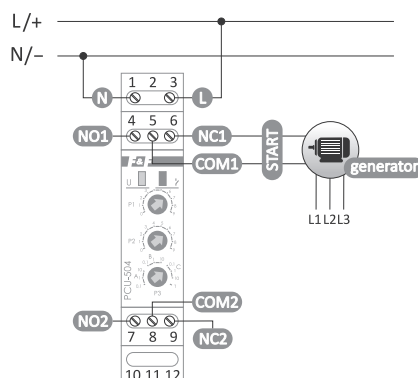


| power supply | 12÷264 V AC/DC |
| --- | --- |
| maximum load current (AC-1) | 2×4 A |
| contact | separated 2×NO/NC |
| working time (adjustable) | 0.1 s÷10 min. |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Dual-time   setting of 2 independent times: operating time ($t_1$) and break time ($t_2$)

## PCU-520   4-function
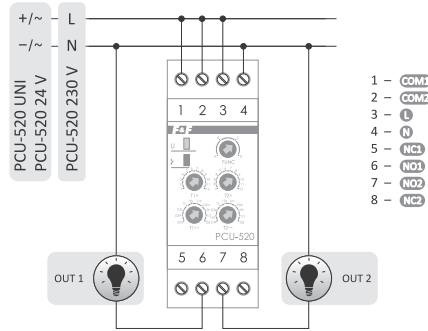


| power supply | |
|---|---|
| PCU-520 230 V | 195÷253 V AC |
| PCU-520 24 V | 21÷27 V AC/DC |
| PCU-520 UNI | 12÷264 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| break time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 1.2 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- **Off delay (A)**
  The contacts remain in positions 1-5 and 2-8 until the relay is switched on. When the power supply voltage is applied, the contacts are switched to position 1-6, 2-7 for the time $t_1$. After the time $t_1$ has elapsed, the contacts return to position 1-5, 2-8 for the duration of time $t_2$. After the time $t_2$ has elapsed, the contacts permanently return to position 1-6, 2-7. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

- **On delay (B)**
  When the power supply voltage is applied, the contacts remain in positions 1-5, 2-8 for the time $t_1$. After the time $t_1$ has elapsed, the contacts switch to position 1-6, 2-7 for a duration of time $t_2$. After the time $t_2$ has elapsed, the contacts return to position 1-5, 2-8. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

- **Off delay – cyclic (C)**
  Off delay operating mode is carried out cyclically intervals between the preset operating time and break time.

- **On delay – cyclic (D)**
  On delay operating mode is carried out cyclically at the preset intervals between the operating time and break time.
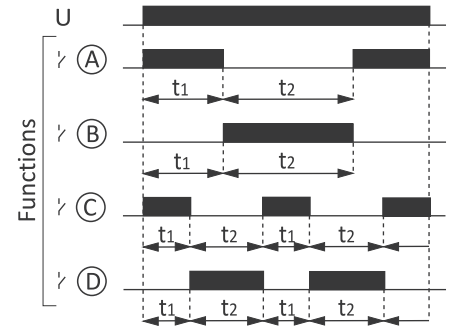


## PCU-507   2-function
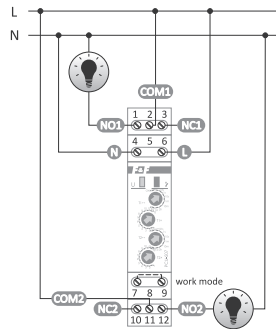


| power supply | |
|---|---|
| PCU-507 230 V | 195÷253 V AC |
| PCU-507 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO/NC |
| working time (adjustable) | 0.1 s÷576 h |
| break time (adjustable) | 0.1 s÷576 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- **Off delay – cyclic**
  The contacts remain in position 2-3 and 11-10 until the relay is switched on. When the power supply voltage is applied, the contacts are switched to position 2-1, 11-12 for the time $t_1$. After the time $t_1$ has elapsed, the contacts return to position 2-3, 11-10 for a duration of time $t_2$. The sequence of these switches is carried out cyclically.

- **On delay – cyclic**
  When the power supply voltage is applied, the contacts remain in position 2-3, 11-10 for the time $t_1$. After the time $t_1$ has elapsed, the contacts switch to position 2-1, 11-12 for a duration of time $t_2$. After the time $t_2$ has elapsed, the contacts return to position 2-3 and 11-10. The sequence of these switches is carried out cyclically. A jumper on terminals 7-9 is used to select a specific function.
  – no jumper installed – **Off delay** function;
  – jumper installed between terminals – **On delay** function.
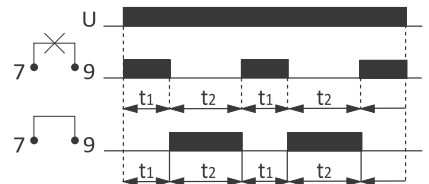


- When the power supply is switched on, setting the time range selection knob to:
  – ON – permanently closes the contacts if the power supply is switched on.
  – OFF – permanently open the contacts if the power supply is switched on.
- When the power supply is switched on, the system does not react to the change of time range and operating time settings.
- Operation with the newly set time range and operating mode takes place after the power supply is switched off and back on.
- With the power supply switched on, it is possible to smoothly adjust the time within the preset time range.

# Multifunctional

## PCS-506  8-function
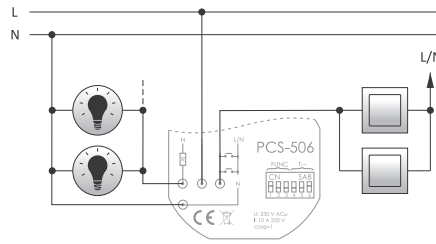


| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 10A |
| contact | 1×NO |
| control pulse current | <1 mA |
| working time (adjustable) | 0.1 s÷24 h |
| power consumption | 0.8 W |
| terminal | 4×DY1 mm², l= 10 cm |
| working temperature | -25÷50°C |
| dimensions | Ø55, h= 13 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

The selection of a specific time range and relay operation function means setting the appropriate combination of switches (the black field in the diagram indicates the position of the switch).



**A** — Presence simulator. When the START signal is given, the circuit randomly switches the relay on and off for the time from 20 s to 20 min. It starts with switching on of the relay. After the START signal is canceled, the system switches off the relay. It does not respond to time settings.
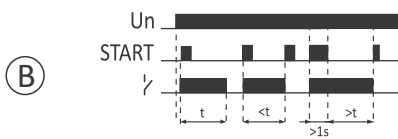
**B** — Bistable relay with automatic staircase lighting time switch. One press of the START button switches on the relay for a set time. Another START pulse during the time measurement causes the relay to be switched off. Pressing and holding the control button for more than 1 second will switch the lighting on permanently until the next pulse is given, which will switch off the relay.

**C** — Generator with a duty cycle of 50%, starting from the switch-on state.
It is active when the START voltage is applied. When the START signal is disconnected, it breaks the operation.

**D** — On delay of the relay using the START signal. When the relay is switched on, the next START pulse switches it off. The next START pulse causes the time to be measured again and the relay to be switched on. The interval between the trailing edge of the deleting signal and the rising edge of the START signal causing subsequent time measurement - minimum 0.5 sec.
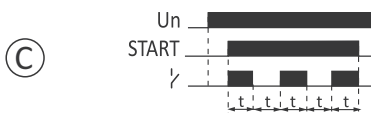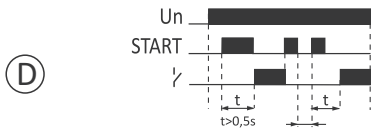
**E** — Generating a single pulse with time "t" by the rising edge of the START signal.
During the time measurement, the system does not react to START pulses.

**F** — Generating a single pulse with time "t" by the trailing edge of the START signal. During the time measurement, the system does not react to START pulses.
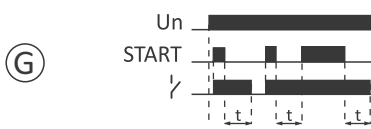
**G** — Off delay with back-up feature. The rising edge of the START signal causes the relay to be switched on, while the trailing edge causes the start of time measurement. Applying the START signal during the time measurement starts the operating cycle from the beginning.
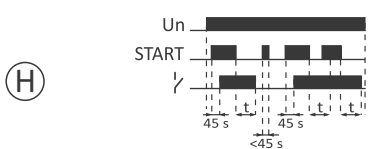
**H** — Off delay and on delay with a back-up feature. If the START voltage is shorter than 45 s, the system ignores it, if it is longer than 45 s, then after this time the relay switches on and time measurement begins with the START signal trailing edge. If during the time measurement another START pulse occurs, the trailing edge of this signal will cause the time to be measured from the beginning (for example, for ventilation: short term activation of the lighting does not switch on the fan, switching on the lighting for longer than 45 seconds switches the fan on).
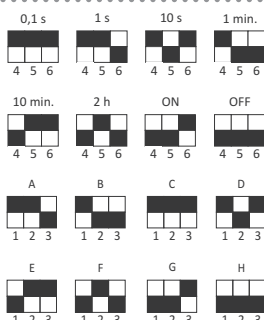


### Time ranges
Setting the time range switch to ON when the power supply is switched on causes the relay to be permanently switched on.
Setting the time range switch to OFF when the power supply is switched on causes Switch relay to be permanently switched off.

### Operating features
When the power supply is switched on, the system does not react to the change of operating mode and time range settings.
Operation with the newly set operating mode and time range takes place after the power supply is switched off and back on.

# PCS-516 / PCS-516AC / PCS-516DC / PCS-519

## 10-function, with "Start" and "Reset" control inputs
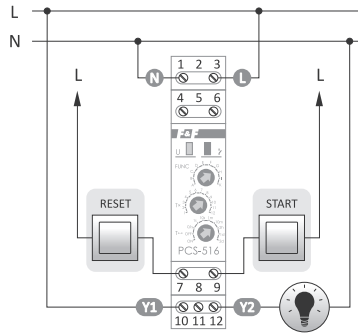
PCS-516 AC
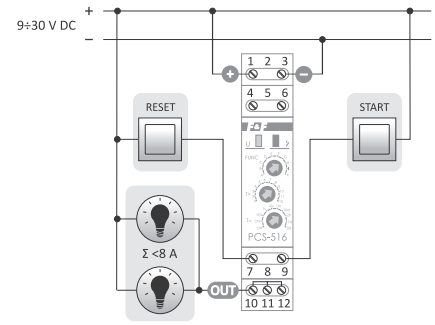
PCS-516 DC

### Features

**PCS-516 AC**:
- Semiconductor output (symistor) for controlling loads supplied with AC voltage;
- Zero voltage switching on, zero current switching off – low surge when switched on;
- No problems with wear and tear of the relay contacts – dedicated for operation with high switching frequency;
- Output separated from input – can be powered/controlled by one phase and the receiver can be connected to another phase.

**PCS-516 DC**:
- Semiconductor outputs (transistor in the open collector system – OC);
- No problems with wear and tear of the relay contacts – dedicated for operation with high switching frequency.
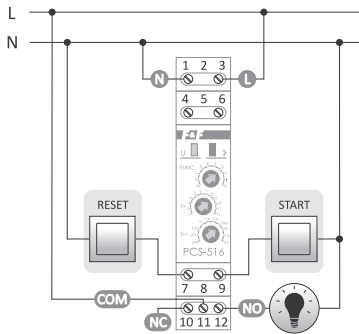
PCS-516 DUO 230 V
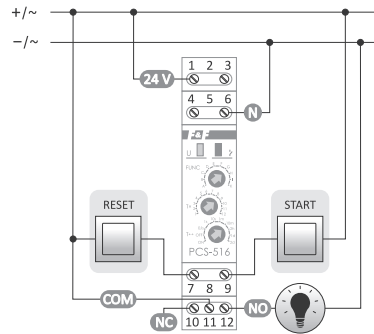
PCS-516 DUO 24 V
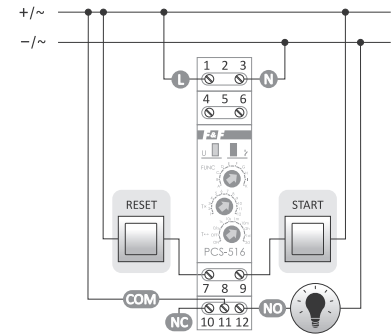
PCS-516 UNI
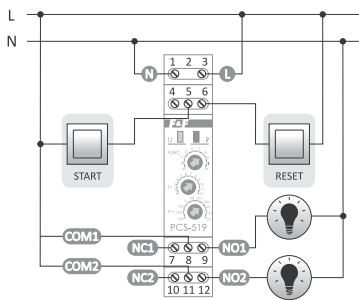
PCS-519 DUO 230 V
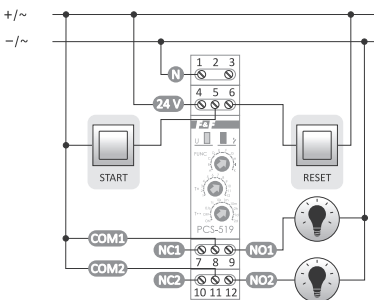
PCS-519 DUO 24 V
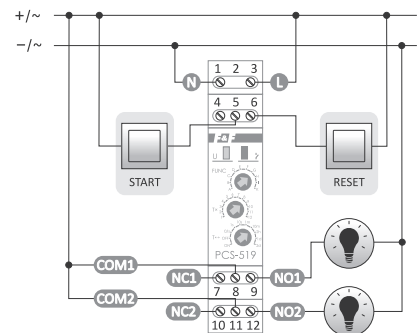
PCS-519 12 V

| | PCS-516 AC | PCS-516 DC | PCS-516 DUO | PCS-516 UNI | PCS-519 12 V | PCS-519 DUO |
|---|---|---|---|---|---|---|
| Power supply | 85÷265 V AC | 9÷30 V DC | 195÷253 V AC/21÷27 V AC/DC | 12÷264 V AC/DC | 11÷14 V AC/DC | 195÷253 V AC/21÷27 V AC/DC |
| Actuator | symistor | transistor | relay | relay | 2× relay | 2× relay |
| Number and type of output contacts | 1×NO | 1×OC | separated 1×NO/NC | separated 1×NO/NC | separated 2×NO/NC | separated 2×NO/NC |
| Maximum load | 2 A (AC-1) | 8 A | 8 A (AC-1) | 8 A (AC-1) | 2×8 A (AC-1) | 2×8 A (AC-1) |
| Time setting range | 0.1 s÷576 h | | | | | |
| Signalling activation | green LED | | | | | |
| Contact status indication | red LED | | | | | |
| Power consumption | 0.6 W | 0.6 W | 0.8 W | 0.8 W | 0.8 W | 0.8 W |
| Working temperature | -25÷50°C | | | | | |
| Terminal | 2.5 mm² screw terminals | | | | | |
| Tightening torque | 0.4 Nm | | | | | |
| Dimensions | 1 module (18 mm) | | | | | |
| Mounting | for TH-35 rail | | | | | |
| Ingress protection | IP20 | | | | | |

To select a specific time range and relay operating function, set the appropriate combination of rotary coding switches.
When RESET voltage is applied during the execution of the given function, it causes:
• for functions A, B, C, D, F: implementation of the operating mode from the beginning;
• for functions F, G, H, I: return of the relay to the initial state and waiting for the START signal;
• for function K: the relay contact to be permanently closed;
When the power supply is switched on, setting the time range rotary switch to position:
• ON – causes the contact to be permanently closed;
• OFF – causes the contact to be permanently open.

Ⓐ
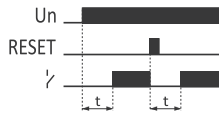
**On delay.** After the supply voltage is switched on (the green LED U is on), the contact remains in opened position [3-5] and the set operating time "t" is measured. After the preset time has elapsed, the contact switches to closed position [3-7] (the red LED R is on). To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on or apply the signal at the RESET input.

Ⓑ
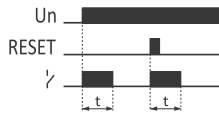
**Off delay.** The contact remains in opened position [3-5] until the relay is switched on. After the supply voltage is switched on (the green LED U is on), the contact is switched to closed position [3-7] and the set operating time "t" is measured (the red LED R is on). To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on or apply the signal at the RESET input.

Ⓒ
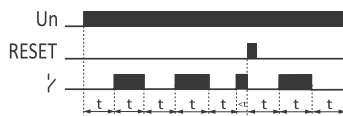
**On delay – cyclic.** On delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

Ⓓ
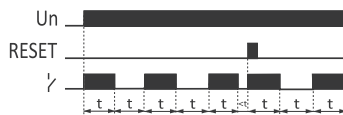
**Off delay – cyclic.** Off delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

Ⓔ
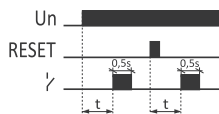
Generating pulse 0.5 s after the preset time "t".
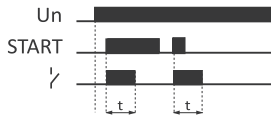
Ⓕ

Generating a single pulse with time "t" by the rising edge of the START signal. During the time measurement, the system does not react to START pulses.

Ⓖ

Generating a single pulse with time "t" by the trailing edge of the START signal. During the time measurement, the system does not react to START pulses.

Ⓗ
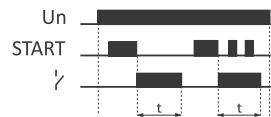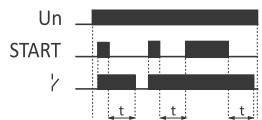
Off delay with back-up feature. The rising edge of the START signal causes the relay to be switched on, while the trailing edge causes the start of time measurement.
Applying the START signal during the time measurement causes the cycle to be extended by another time "t" by the trailing edge.

Ⓘ
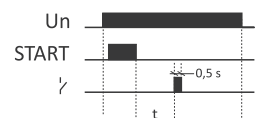
Generating a single 0.5 s pulse after time "t" by the triggered trailing edge of the START signal.

Ⓚ

The "t" break time in the closing of the contact triggered by the rising edge of the START signal.

# PCS-517 18-function
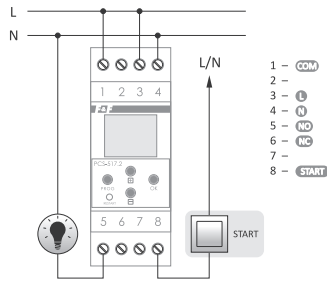


!  Time setting range (0.25 s ÷ 100 h) allows for a very precise adjusting of the contact closing, such as 2 h 13 min.  27 s.

| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16A |
| contact | separated 1×NO/NC |
| control pulse current | <1 mA |
| time setting range | 0÷100 h |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**P00**  The state of "inactivity"

**P01**  

After the supply voltage is applied, the contact remains in position 1-6 (off) and the set delay time "t" is measured. After the set time "t" has elapsed, the contact switches to position 1-5 (on). To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

**P02**  

The contact remains in position 1-6 (off) until the voltage is switched on. After the supply voltage is applied, the contact is switched to position 1-5 (on) and the set time "t" is measured. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

**P03**  

On delay operating mode is carried out cyclically at the preset intervals of the operating time "$t_1$" and break time "$t_2$" (on).

**P04**  

Off delay operating mode is carried out cyclically at the preset intervals of the operating time "$t_1$" (on) and break time "$t_2$".

**P05**  

When the power supply voltage is applied, the contact remains in position 1-6 (off) and the preset delay time "$t_1$" is measured. After the time $t_1$ has elapsed, the contacts switch to position 1-5 (on) for a duration of time "$t_2$". To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

**P06**  

After the START signal is given, the contact is switched to position 1-5 (on). After the START signal loss, the contact is backed-up for the set time "t". While measuring time "t", the relay does not react to subsequent pulses of the START signal.

**P07**  

After the START signal is given, the contact is switched to position 1-5 (on). After the START signal loss, the contact is backed-up for the set time "t". The reappearance of the START signal during the time "t" measurement interrupts its countdown and the contact remains switched on (position 1-5). The second loss of the START signal triggers the countdown of the contact back-up time "t".

**P08**  

On delay of the contact (position 1-5) after time "t" by the rising edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal. After the loss and reappearance of the START signal, the contact is disconnected (position 1-6) for the time "t".

**P09**  
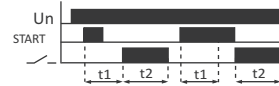
Triggering the delay time "$t_1$" (position 1-6) by the rising edge of the START signal. Triggering the time of closing "$t_2$" (position 1-5) occurs always after START signal loss, but not earlier than after time "$t_1$". After counting down the time "$t_1$", the contact is switched on (position 1-5) for the time "$t_2$".

**P10**  

$$t_A + t_B + ... + t_x = t$$

Closing of the contact (position 1-5) during the time "t" countdown from the value set to "zero" only during the START signal. The loss of the START signal stops the countdown. After the START signal appears again, the countdown of the remaining time "t" continues. Supply voltage loss "zeroes" the remaining time "t". After the power supply voltage and the START signal appear, the time "t" will be counted down again from the set value.

**P11**  
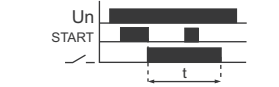
Closing of the contact (position 1-5) for a time "t" by the trailing edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal.

**P12**  
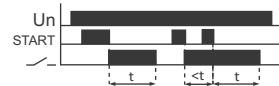
Closing of the contact (position 1-5) for a time "t" by the trailing edge of the START signal. The reappearance of the START signal and its loss during the time "t" measurement triggers the countdown of the time "t" from the beginning.

**P13**  

Closing of the contact (position 1-5) for a time "t" by the rising edge of the START signal. Reapplying of the START signal during the time "t" countdown stops it and disconnects the contact (position 1-6).

**P14**  

Closing of the contact (position 1-5) for a time "t" by the rising edge of the START signal. The reappearance of the START signal during the time "t" measurement triggers the countdown of the time "t" from the beginning.

**P15**  
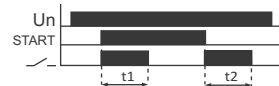
Closing of the contact (position 1-5) for a time "t" by the rising edge of the START signal and it subsequent closing for a time "$t_2$" by the trailing edge of the START signal.

**P16**  

Closing of the contact (position 1-5) for a time "$t_1$" by the rising edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal.

**P17**  

On delay of the contact (position 1-5) after time "t" by the triggered rising edge of the START signal. Another START signal opens the contact (position 1-6) for the time "t". The reappearance of the START signal during the time "t" measurement triggers the countdown of the time "t" from the beginning.
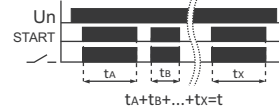
**P18**  

On delay of the contact (position 1-5) after time "t" by the triggered rising edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal. After a power failure, the contact will be open (pos. 1-6). To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

# Programmable

# PCS-533    with NFC wireless communication

**Purpose**

The PCS-533 module is a programmable time relay that enables switching on and off of the relay as well as switching the relay as a function of time and as a function of control signals set by 2 inputs.

**Functioning**

The operation of the relay is carried out in accordance with the program prepared by the user, using a dedicated, free of charge application for a smartphone with the Android system and uploaded to the controller via the NFC wireless communication system. Up to 200 consecutive operations or conditions can be defined in the program.
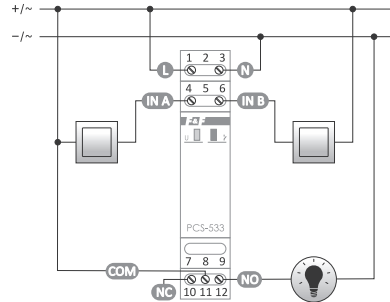


| power supply | 9÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| control pulse current | <1 mA |
| working time (adjustable) | 0.1 s÷24 h |
| power indication | green LED |
| contact status indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# PCS533 Configurator

**Functions**

- Preparing the program as a list of consecutive commands. Each command is symbolized by an icon. Pressing a tile with a command allows you to edit the details (such as operation time, expected input signal, etc.);
- Easily add, move, and delete program commands (by dragging and dropping tiles);
- A set of templates (in the form of diagrams) – ready-made programs with typical functions of the time relays;
- Write and read programs to and from a file. Programs can be shared via e-mail, Bluetooth, network drives, etc.
- Automatic program backup – each relay has its own ID. The application keeps a complete history of programs loaded into the relay;
- Mass programming mode – one program can be loaded to multiple relays (without the need to connect power supply).

**Command list**

- **Output** – setting the state of the relay (on, off, switch) for a specified time or permanently;
- **Input A/B** – waiting for a specified state to appear on the input;
- **Return to** – return to the previous command. This allows you to repeat a sequence of commands (infinitely or a given number of times);
- **Pause** – pauses the execution of the program for a specified time;
- **Stop** – stops the execution of the program (until the power supply is switched back on or reset);
- **Reset** – start the execution of the program from the beginning;
- **Special input A/B** – commands, which configure the inputs in such a way that regardless of the state of the program, the **Pause** or **Reset** command can be executed.
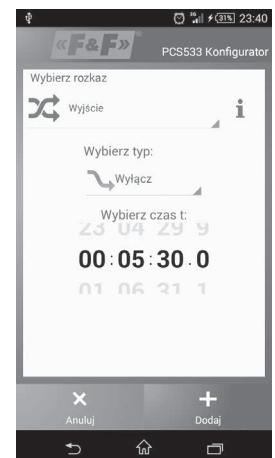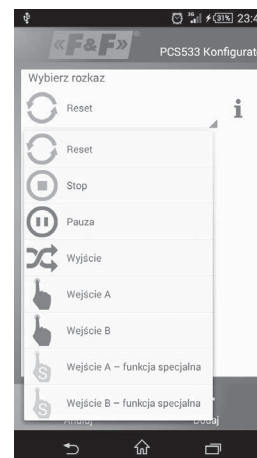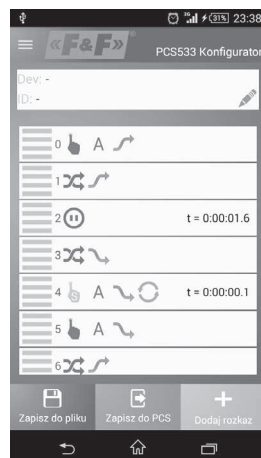


PCS Configurator app

# With off delay (fan)

Time relays with off delay are used to maintain the power supply of the controlled receiver for a specified period of time after the loss of the control voltage, for example in bathroom ventilation systems, where it is necessary to maintain the fan operation (switched on along with the lighting) for a specified period of time after said lighting has been switched off.

**Functioning**

When the control voltage "S" is applied to the relay, the relay is triggered and the voltage on the controlled receiver is switched on (such as a fan). After a loss of control voltage, the operation of the receiver is backed-up for the time "t" (set with a potentiometer). After the time "t", the relay will be switched off. If the control voltage "S" is applied again before the set time has elapsed, the relay will execute its function from the beginning.
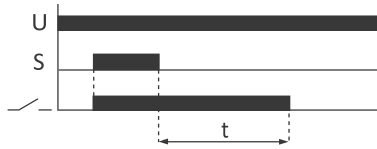


# PO-405
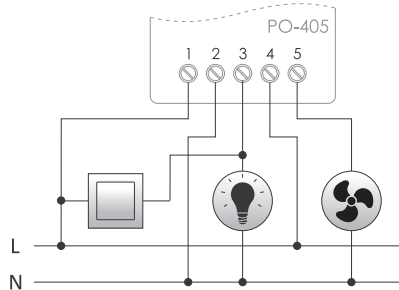


| power supply | |
|---|---|
| PO-405 230 V | 195÷253 V AC |
| PO-405 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 10 A |
| contact | 1×NO |
| backup time | 1÷15 min. |
| power indication | green LED |
| operation indication | red LED |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

# PO-406



❶ blue　❷ brown　❸ red　❹ black

| power supply | 195÷253 V AC |
|---|---|
| maximum load current (AC-1) | 10 A |
| contact | 1×NO |
| backup time | 1÷15 min. |
| power consumption | 0.56 W |
| terminal | 4×DY 1 mm², l= 10 cm |
| working temperature | -25÷50°C |
| dimensions | ø55, h= 13 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

# PO-415



Lighting + ventilation
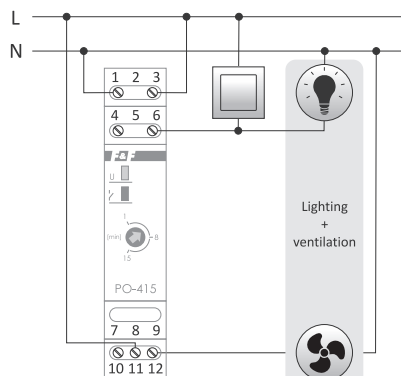
| power supply | |
|---|---|
| PO-415 230 V | 195÷253 V AC |
| PO-415 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 10 A |
| contact | separated 1×NO/NC |
| backup time | 1÷15 min. |
| power indication | green LED |
| operation indication | red LED |
| power consumption | 0.56 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Chapter 22
# Time controllers

## STP-541   time controller, type: right/left operation

### Purpose

The programmable controller is used to controlling technological processes in industrial automation systems, in which there is a need for temporary, cyclic, alternating switching of receivers with forced time breaks between successive switchings.

### Functioning

After the power supply is switched on, the controller switches to a cyclical program consisting of 4 steps. In the first step, the contact is switched to position 1-5 for the time "$t_1$". In the second step, after the time "$t_1$" the contact will return to position 1-6 for the time "$t_2$". In the third step, after the time "$t_2$", the second contact is switched to position 2-7 for the time "$t_3$". In the subsequent step, after the time "$t_3$" the contact is switched to position 2-8 for the time "$t_4$". And in the last step after the time "$t_4$", the controller will start the program cycle from the beginning (from the time "$t_1$"). The cycle will be repeated according to the programmed number of repetitions or infinitely when working in a loop. Loss of the power supply voltage for longer than 1 second will stop the controller program execution. After restarting the power supply, the controller will start the program from the beginning with the programmed number of cycle repetitions.
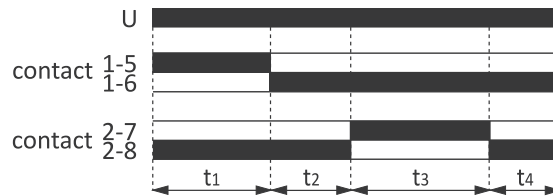


| | |
|---|---|
| power supply | 24÷264 V AC/DC |
| maximum load current (AC-1) | 2×16 A |
| contact | separated 2×NO/NC |
| time settings $t_1$, $t_2$, $t_3$, $t_4$ | 1 s÷100 h |
| time setting accuracy | 1 s |
| number of cycle repetitions | 1÷999999 |
| | or in an infinite loop |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Wiring diagram



SG – main contactor
SP – "right" system contactor
SL – "left" system contactor

Diagram of the contactor switching system of the following type: right/left operation

# "Star"/"delta" switch

# PCG-417 DU0    to control the "star"/"delta" contactor switching system

## Purpose

Motor starters with "star" to "delta" switch are used when the power supply does not allow short-term high-current loads or when the start time is long. Induction motors with a "delta" winding draw a very high current at start-up, up to 8 times the rated current. By using the "star" winding connection during startup, the current and the starting torque are reduced 3 times. Motors with lower power are switched by mechanical switches, motors with higher power require a contactor switch. Time switches are used for controlling the contactors. These are usually reversible relays (off delay) with an electromagnetic relay 1×NO/NC (change-over contact). However, they are not "safe". Quick switching does not guarantee that the contactor of the "star" system will be able to disconnect before the contactor of the "triangle" system is switched on or that the electric arcs on the contacts of the contactor of the "star" system will be extinguished. This leads to a short-circuit. To prevent this, use the PCG-417 time relay.

## Functioning

The PCG-417 relay has a special system of two electromagnetic relays, which eliminates the risk of switching on two contactors at the same time. Each relay controls the corresponding contactor. When switching from "star" to "delta", the first relay disconnects the "star" contactor, a forced time break occurs and the second relay switches on the "delta" contactor.

After the power supply is switched on, the "star" contact will be switched to position 7-9 for the preset start-up time "$t_1$". The "delta" contact remains in position 10-11. After the startup time "$t_1$" has elapsed, the "star" contact is switched to position 7-8 (the "delta" contact still remains in position 10-11) and the switching interval is interrupted at the set time "$t_2$". After the time "$t_2$" has elapsed, the "delta" contact is switched to position 10-12 and remains in this state until the supply voltage is disconnected (the "star" contact remains in position 7-8).



230 V version

24 V version
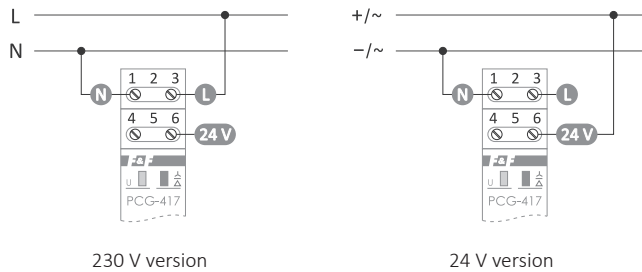
| power supply | 195÷253 V AC |
| --- | --- |
| | 21÷27 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | 2×NO |
| "star" start-up time | 1÷1000 s |
| switching time (adjustable) | 75 or 150 ms |
| power indication | green LED |
| operation indication | red LED |
| power consumption | 0.8 W |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| working temperature | -25÷50°C |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Wiring diagram
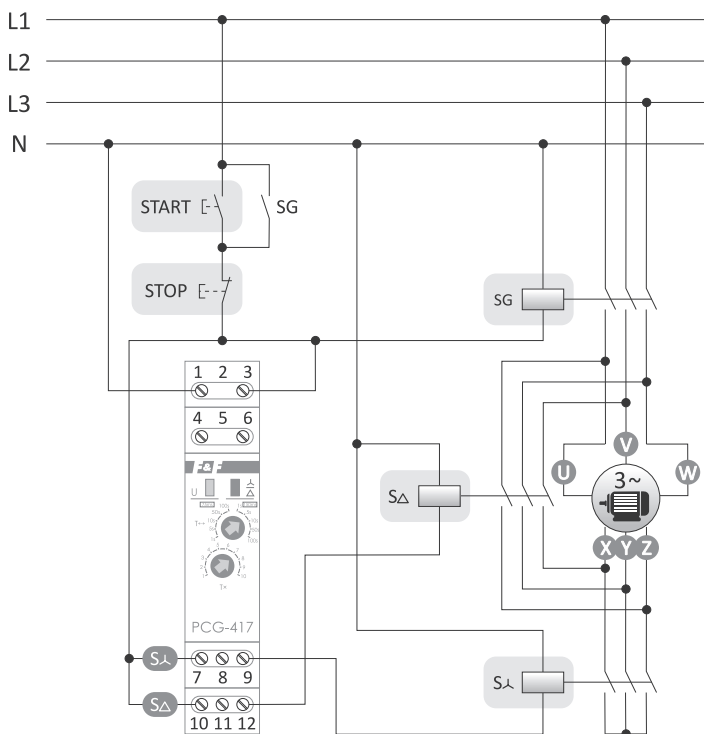


SG – main contactor
SΔ – "delta" system contactor
Sx – "star" system contactor

t2= 75 or 150 ms
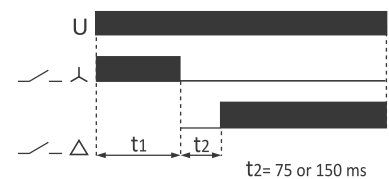
# PCS-534 4-channel, pulse-time sequential controller

## Purpose

The PCS-534 controller is designed for automation systems, in which there is a need to simultaneously control a group of receivers in an established ON/OFF combination, forced by successive pulses applied manually or automatically to the control input or according to time intervals between successive switchings.
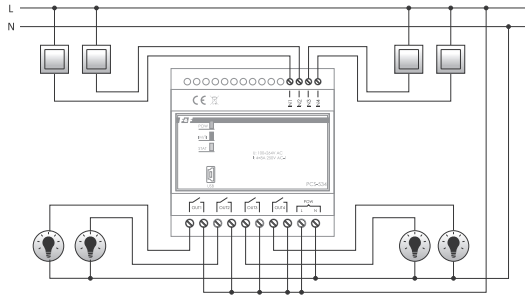


| | |
|---|---|
| power supply | 160÷260 V AC/DC |
| output load current | 4×16 A |
| contact | 4×NO |
| input voltage tolerance | 160÷260 V AC/DC |
| time settings $t_1$, $t_2$, $t_3$, $t_4$ | 1 s÷99 h 59 min. 59 s |
| time setting accuracy | 1 s |
| number of cycle repetitions | 1÷999999 |
| | or in an infinite loop |
| communication port | miniUSB |
| power consumption | 1.3 W |
| terminal | 2.5 mm² screw terminals |
| working temperature | -20÷50°C |
| dimensions | 5 modules (87.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functioning

The sequential relay has 4 separate outputs OUT1÷OUT4 and 4 independent signal inputs IN1÷IN4. The open/closed contact system is set sequentially according to the preset program. The contacts are switched to the next state after the next pulse at the control input or automatically, according to the time schedule.

The contact sequence, time schedule, and operating options are set using the configuration software on the PC. Connection to the controller via USB cable.

**Operating modes:**
- Pulse - programmed contact sequences are executed after successive pulses of control input IN1.
  The first pulse switches from sequence 0 to sequence 1 and onwards after the subsequent pulses. After executing the last sequence, the relay executes the program from sequence 0 or 1 for the "autostart" option;
- Time-controlled – contact switching is carried out automatically according to the time schedule. The pulse at the IN1 input switches from sequence 0 to sequence 1 and continues to switch automatically after the preset time. After the last sequence has been executed, the relay returns to sequence 0 and waits for a control pulse at input IN1 or continues to execute the program from sequence 1 onwards ("autostart" option).
- Sequence 0 - output state of the contacts (0000) after switching on the power supply (fixed option, unchanged by the user).

**Additional options:**
- Autostart - automatic start option. In the pulse mode, it means an automatic transition to sequence 1 after the power supply is switched on. In time mode, it means an automatic start of operation according to the time schedule.

**Input functions:**
- IN1 ("Start"):
– pulse: applying the pulse switches the contacts to the next state;
– time: applying the pulse starts the time schedule;
- IN2 ("Pause"):
– pulse: blocks switching to the next sequence despite successive pulses to IN1;
– time: stops the countdown time for switching to the next state;
- IN3 ("Continuation"):
– pulse: restores the reaction to IN1 input pulses;
– time: continuation of the countdown in the stopped sequence;
- IN4 ("Reset"):
– pulse: immediately stop the program being executed and return to sequence 0 and wait for a restart.
  In the "Autostart" option it executes the program from sequence 1;
– time: immediately stop the program being executed and return to sequence 0 and wait for a start signal at IN1.
  In the "Autostart" option it executes the program from sequence 1.
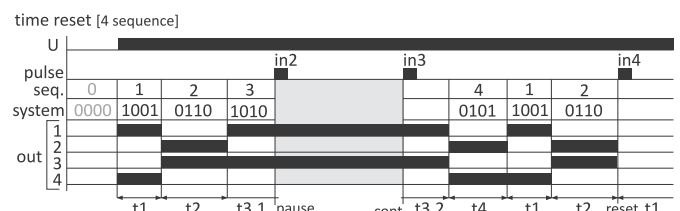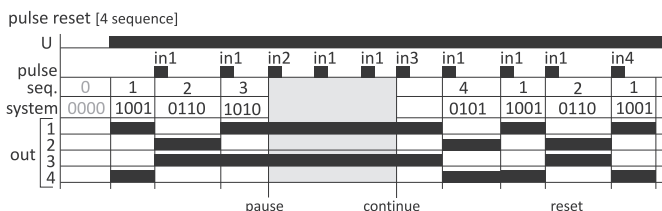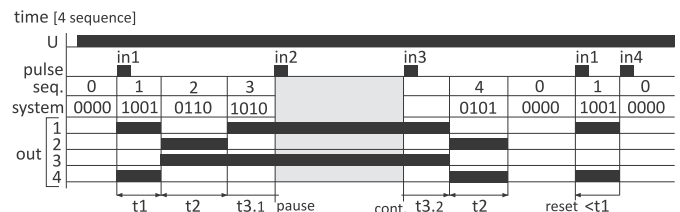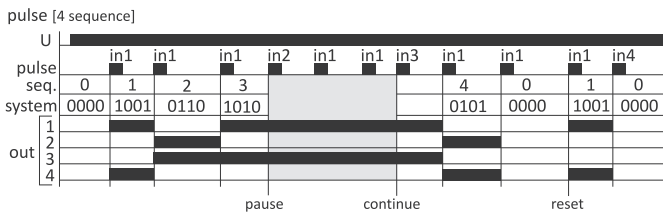
# Control timers (programmable)

## Purpose

The programmable control timer is used to time control devices in a home or industrial automation systems according to an individual time program set by the user.

| Product | Type | Number of channels | Actuator element | Page |
|---|---|---|---|---|
| PCZ-521.3 | programmable, weekly | 1 | relay | 131 |
| PCZ-521.3 PLUS | programmable, weekly | 1 | relay | 130 |
| PCZ-522.3 | programmable, weekly | 2 | relay | 131 |
| PCZ-523.2 | pulse (bell) | 1 | relay | 131 |
| PCZ-524.3 | astronomical | 1 | relay | 133 |
| PCZ-525.3 | astronomical with a night-time break | 1 | relay | 134 |
| PCZ-525.3 PLUS | astronomical with a night-time break | 1 | relay | 134 |
| PCZ-526.3 | astronomical with a night-time break | 2 | relay | 135 |
| PCZ-529.3 | yearly | 1 | relay | 132 |
| PCZ-531A10 | programmable, weekly | 1 | analog output | 48 |
| PCZ-531LED | programmable, weekly | 1 | transistor | 48 |

**Weekly programmable timer** – is used to time control devices in a home or industrial automation system according to an individual time program set by the user. In this type of timer, the minimum time of relay activation is 1 minute.
**Pulse timer (bell timer)** – used for time control of devices in a home or industrial automation systems according to an individual time program set by the user, and is programmed on the principle of setting the switch-on time and pulse duration. This type of timer allows you to program the relay to be switched-on from 1 second.
**Astronomical clock** – used to switch on and off lights or other electric appliances, according to the hours of sunset and sunrise. Switch on and switch off points are calculated on the basis of information about the current date, time and geographical coordinates of the place of the timer installation. In this type of clock, it is not possible to "manually" program the hours of switching on and off.
**Yearly timer** – used to time control devices in a home or industrial automation systems according to an individual time program set by the user in the yearly cycle. This type of timer allows you to program the relay to be switched on and off on a specific day of the year and at a specific time.

## ON/OFF type: weekly

# PCZ-521.3 PLUS   1-channel

## Functions

- 500 memory cells;
- NFC wireless communication;
- **A backlit LCD display with adjustable brightness level;**
- **An external button for manual control of the relay can be connected;**
- A memory of the relay status in manual mode;
- Free PCZ Configurator app for your smartphone (Android);

- Operating modes:
  - automatic – the switching on of the receiver is determined by the operating program of the controller;
  - semi-automatic – operation in automatic mode can be temporarily interrupted and the status of the relay can be set manually;
  - manual – the status of the relay can be set manually;
- Battery back-up of the timer operation and an indication of the battery charge status.

| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 500 |
| | (250 pairs of ON/OFF commands) |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

! PCZ-521.3 PLUS can not work with backlit buttons

# PCZ-521.3  1-channel

**Functions**

- 500 memory cells;
- Relays status memory;
- Battery charge level;

- LCD contrast setting;
- NFC wireless communication;
- PCZ Configurator app for your smartphone.



| | |
|---|---|
| power supply | 24÷264 V AC/DC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 500 |
| power consumption | 1,5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

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# PCZ-522.3  2-channel

**Functions**

- 2 independent channels, separately programmable;
- 500 memory cells + relay status memory;
- Battery charge level;

- LCD contrast setting;
- NFC wireless communication;
- PCZ Configurator app for your smartphone.



| | |
|---|---|
| power supply | 24÷264 V AC/DC |
| maximum load current (AC-1) | 2×16 A |
| contact | separated 2×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 2×250 |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

---

## ON/OFF type: pulse (bell)

# PCZ-523.2  1-channel, with 2 programmable lines

**Functions**

- The timer switches the device on at a preset time and switches it off after a preset time (pulse) in cycles: daily, weekly, working days (Mon.÷Fri.) or weekend (Sat., Sun.).
- Pulse length: 1 s÷100 min.
- The relay has 2 independently programmable, switchable program lines controlling the alternatively connected receiver.



| | |
|---|---|
| power supply | 24÷264 V AC/DC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time setting accuracy | 1 min. |
| pulse length | 1 s÷100 min. |
| program memory cells | 250 |
| | (2×60 ON/HOLD commands / program) |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

# ON/OFF type: yearly

# PCZ-529.3  1-channel

## Functioning

The timer allows you to establish overriding seasonality in the automation system. It switches devices on and off according to the programmed dates in a yearly cycle. Can be set to the switch on for only one, selected day of the year. Additionally, it is possible to set the time of switching on and off, which means providing a specific time and minute for the set date.

## Functions

- 500 memory cells;
- Relays status memory;
- Battery charge level;

- LCD contrast setting;
- NFC wireless communication;
- PCZ Configurator app for your smartphone.





| | |
|---|---|
| power supply | 24÷264 V AC/DC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| time program setting accuracy | 1 min. |
| program memory cells | 500 |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

## New features in the PCZ-xxx.3 series (PCZ-521.3, PCZ-521.3 PLUS, PCZ-522.3, PCZ-529.3)

**NFC wireless communication** – wireless reading and writing of the control timer configuration via an Android phone equipped with the NFC communication module.

**PCZ Configurator app** – free app for Android phones and tablets equipped with NFC wireless communication module.

## Functions

- Setting the timer configuration in offline mode (without the connection with the timer);
- Reading and writing the configuration to the controller;
- Quick programming of multiple controllers with one configuration;
- Reading and writing the configuration to the file;
- Configuration sharing via e-mail, Bluetooth, network drives;
- Unique identification of the connected timer and the ability to give the devices their own names;
- Automatic backup of the configuration;
- Restore previous configuration (in conjunction with the unique identifier of each timer);
- Set the time and date based on the watch on your phone.

Application is available on:



https://play.google.com/store/apps/details?id=pl.com.fif.clockprogramer

Section V.  Time control

# Astronomical

## Purpose

An astronomical clock is used to switch on and off lights or other electric appliances according to the daily hours of sunset and sunrise.

## Functioning

The astronomical clock, based on information about the current date and geographical coordinates of the place of its installation, automatically determines the daily, program points of switching the lighting on and off. The exact time of switching on and off is determined remains the calculation of the position of the sun relative to the horizon and enables the selection of one of the three control options (the moment of switching on and off of the lighting is set independently):
• Astronomical sunset and sunrise;
• Civil twilight/civil dawn;
• Adjustment – individual correction of software switch-on and switch-off points by the user: angular or time.

## Functions

• **Automatic operation** – automatic operation according to programmed switch-on and switch-off points.
• **Semi-automatic operation** – possibility to manually switch the contact state during automatic operation. The change will be effective until the next switch on/off resulting from the automatic operation cycle.
  WARNING!
  In semi-automatic mode, the contact position is opposite to the one resulting from the program cycle (for example, at night the contact is switched off, and during the day it is switched on). Semi-automatic operation only works until the end of the current automatic operation cycle, for example: entering the semi-automatic mode during the day will switch on the light until the programmed time of switching on resulting from the astronomical cycle is reached. The timer then returns to automatic operation (and the light remains on until dawn).
• **Manual operation** – permanent switching on and off of the contact.
• **Coordinate code** – assigned geographical coordinates for specified cities to facilitate location selection. Places and time zones of about 1500 places from 51 countries of the world are defined in memory.
• **Adjustment** – acceleration or delay of switching on/off times in relation to astronomical sunrise and sunset points:
  ±15° – angular correction for the moment of switching on in relation to the position of the center of the sun against the horizon;
  ±180 min. – time correction for the moment of switching on as a time shift in relation to sunrise/sunset.
• **Automatic change of time** – change of time from daylight saving time to standard time. Ability to work with or without automatic change. The controller is equipped with a time zone selection function so that the switching time is consistent with the local time.
• **Preview of date, program ON/OFF points and location** – ability to view date, the current time of contact switching and set location.
• **Time correction of the timer** – the setting of the monthly second correction of the system clock.
• **Battery charge indicator** – the controller is equipped with control of the battery status that maintains the timer operation in case of main power failure. If the battery is low, you will be notified if it needs to be replaced.
• **LCD brightness correction** – change the contrast of the display to give a clear LCD reading for different viewing angles.
• **Relays status memory** – the relay status set in manual mode is also stored in memory after a power failure.

# Without the programmable night-time break

# PCZ-524.3   1-channel

## Functions

• 1-channel;
• Relays status memory;
• Battery charge level;
• LCD contrast setting;
• NFC wireless communication;
• PCZ Configurator app for your smartphone.



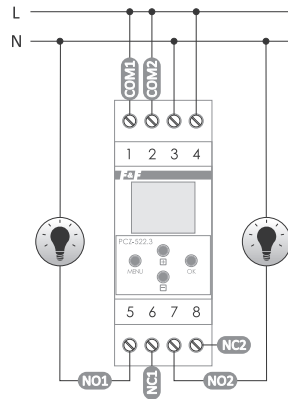| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

* battery life addicted to weather conditions and frequency of mains failure
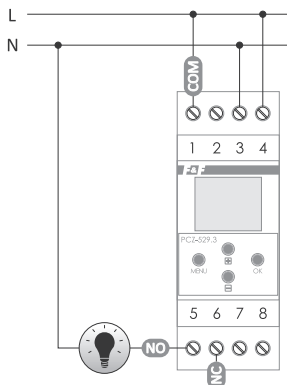
# With the programmable night-time break

The ability to set a night-time break, which means switching off the controlled receiver for a specified time "t" (for example, from 21.15 to "$t_1$", then from "$t_2$" to 04.20) between the points of program switchings.

## PCZ-525.3 PLUS   1-channel

**Functions**

- 500 memory cells;
- NFC wireless communication;
- **A backlit LCD display with adjustable brightness level;**
- **An external button for manual control of the relay can be connected;**
- **Ability to connect an external brightness sensor (probe Plus): adjustment of the switch-on/off moment to real conditions (for example: on a cloudy day the light will switch on earlier than it would based on the astronomical settings);**
- Free PCZ Configurator app for your smartphone (Android);

- A memory of the relay status in manual mode;
- Operating modes:
  – automatic – the switching on of the receiver is determined by the operating program of the controller;
  – semi-automatic – operation in automatic mode can be temporarily interrupted and the status of the relay can be set manually;
  – manual – the status of the relay can be set manually;
- Battery back-up of the timer operation and an indication of the battery charge status.



| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

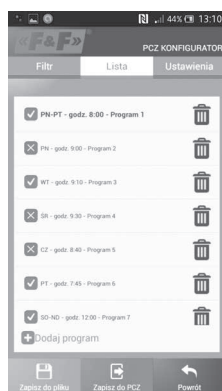\* battery life addicted to weather conditions and frequency of mains failure

(!) PCZ-525.3 PLUS can not work with backlit buttons.

## PCZ-525.3   1-channel

**Functions**

- 1-channel;
- Programmable night-time break;
- Relay status memory + battery charge level;

- LCD contrast setting;
- NFC wireless communication;
- PCZ Configurator app for your smartphone.



| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

(!) An additional option of manually setting the "fixed" switch-on time, which allows to anticipate sunset and switch on the lighting at the same time on a daily basis, regardless of the settings. Similarly, it is possible to set a "fixed" switch-off time to extend the lighting operation time after sunrise.

# PCZ-526.3 2-channel, with a night-time break programmable independently for each channel

## Functions

- 2-channel;
- A night-time break programmable separately for each channel;
- Relays status memory;
- Battery charge level;
- LCD contrast setting;
- NFC wireless communication;
- PCZ Configurator app for your smartphone.



| power supply | 24÷264 V AC/DC |
|---|---|
| maximum load current (AC-1) | 2×16 A |
| contact | separated 2×NO/NC |
| backup time clock operation | 6 years* |
| battery type | 2032 (lithium) |
| backup time display operation | no |
| accuracy of the clock | 1 s |
| time error | ±1 s/24 h |
| power consumption | 1.5 W |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| working temperature | -20÷50°C |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life addicted to weather conditions and frequency of mains failure

( ! ) An additional option of manually setting the "fixed" switch-on time, which allows to anticipate sunset and switch on the lighting at the same time on a daily basis, regardless of the settings. Similarly, it is possible to set a "fixed" switch-off time to extend the lighting operation time after sunrise.

## New features in the PCZ-xxx.3 series (PCZ-524.3, PCZ-525.3, PCZ-525.3 PLUS, PCZ-526.3)

**NFC wireless communication** – wireless reading and writing of the control timer configuration via an Android phone equipped with the NFC communication module.

**PCZ Configurator app** – free app for Android phones and tablets equipped with NFC wireless communication module.

## Functions

- Setting the timer configuration in offline mode (without the connection with the timer);
- Reading and writing the configuration to the controller;
- Quick programming of multiple controllers with one configuration;
- Reading and writing the configuration to the file;
- Configuration sharing via e-mail, Bluetooth, network drives;
- Unique identification of the connected timer and the ability to give the devices their own names;
- Automatic backup of the configuration.

Combined with the unique identifier of each timer, the previous configuration can easily be restored;

- Set the time and date based on the watch on your phone;
- Set the geographical coordinates of the place of the timer installation using the GPS function of your phone.

Application is available on:



https://play.google.com/store/apps/details?id=pl.com.fif.clockprogramer

## Related devices
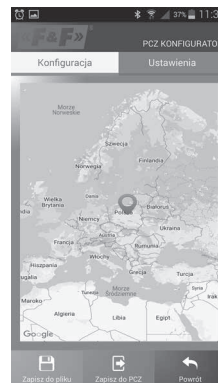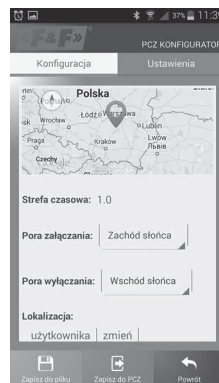
**Lighting brightness controls with weekly timer**

### PCZ-531LED
with LED 9÷30 V control output

### PCZ-531A10
with 0÷10 V analog output

Brightness controllers with weekly timer are designed for program control of brightness levels according to the individual time program set by the user.

*More information on p. 48*

# Section VI
## Programmable controllers

# FLC programmable controllers

**Purpose**

FLC is a series of compact programmable relays that can replace many individual electronic modules, which perform the functions of meters, relays and time controllers. The devices are perfectly suitable for any switchgear, supplementing or replacing specialized devices. Each central unit is equipped with an LCD display and a keypad to enable the implementation of a functional operator panel. The built-in real-time clock with battery back-up and with the calendar and astronomical functions allows you to create complex clock applications. Communication functions including Ethernet (FLC18-ETH controller) enable connection of controllers to Modbus RTU/TCP network and remote access to the controller via configurable server WWW. The capabilities of FLC18 controllers can be further extended with up to 16 I/O extension modules.

**Functions**

- Programming the controller using the function block diagram (FBD):
  - up to 1024 function blocks can be programmed (for FLC18, for FLC12 - 512 function blocks);
  - dozens of basic logic functions and function blocks;
  - you can create your own function blocks;
- Free software in Polish;
- Programming of the controller via Ethernet (FLC18-ETH) and/or FLC-USB programmer;
- Menu and controller notifications in Polish;
- Operator panel: LCD display (4×16 characters) and 6-button keypad;
- Real-time clock with battery back-up and weekly, yearly and astronomical functions;
- Support for Modbus RTU/TCP/ASCII communication protocol;
- Web server and controller programming via Ethernet (FLC18-ETH);
- Each central unit is equipped with analog inputs and fast counting inputs;
- Up to 16 extension modules can be connected (FLC18):
  - digital input and relay output modules;
  - digital input and transistor output modules;
  - analog inputs;
  - analog outputs;
  - temperature transmitters for PT100 probes;
  - RS-485 communication modules;
- Controller power supply 12÷24 V DC;
- Modular mounting on a DIN rail (35 mm).

## Hardware resource table

| Model | FLC18-ETH-12DI-6R | FLC18-12DI-6R | FLC12- 8DI-4R | FLC18E-8DI-8R | FLC18E-8DI-8TN | FLC18E-4AI-I | FLC18E-2AQ-VI | FLC18E-3PT100 | FLC18E-RS485 |
|---|---|---|---|---|---|---|---|---|---|
| Type | | Central unit | | | | Expansion module | | | |
| Function | CPU+Ethernet | CPU | CPU | Digital inputs and outputs relay | Digital inputs and outputs transistor | Inputs analog | Inputs analog | Transmitter of temperature | Module of communication |
| Power supply | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC | 12÷24 V DC |
| Digital inputs (total) | 12 | 12 | 8 | 8 | 8 | – | – | – | – |
| fast (60 kHz) | 4 | 4 | 4 | – | – | – | – | – | – |
| Analog inputs (total) | 8 | 6 | 4 | 4 | 4 | 4 | – | 3 | – |
| voltage (0÷10 V) | 8 | 6 | 4 | 4 | 4 | – | – | – | – |
| current (0÷20 mA) | 2 | – | – | – | – | 4 | – | – | – |
| PT100 probe | – | – | – | – | – | – | – | 3 | – |
| Digital outputs (total) | 6 | 6 | 6 | 8 | 8 | – | – | – | – |
| relay (10 A/250 V AC) | 6 | 6 | 4 | 8 | – | – | – | – | – |
| relay (3 A/250 V AC) | – | – | – | 4 | – | – | – | – | – |
| transistor (0.3 A/60 V DC) | – | – | – | – | 8 | – | – | – | – |
| Analog outputs (total) | – | – | – | 4 | – | – | 2 | – | – |
| voltage (0÷10 V) | – | – | – | 4 | – | – | 2 | – | – |
| current (0÷20 mA) | – | – | – | – | – | – | 2 | – | – |
| Communication ports | Ethernet RS485 RS232 (TTL) | RS232 (TTL) | RS232 (TTL) | – | – | – | – | – | RS485 |
| RTC clock | ● | ● | ● | – | – | – | – | – | – |
| LCD panel and keyboard | ● | ● | ● | – | – | – | – | – | – |
| Data recording (SD card) | ● | – | – | – | – | – | – | – | – |
| Ethernet | web server, Modbus, TCP/RTU, MQTT, Programming of the controller | – | – | – | – | – | – | – | – |
| Page | 140 | 141 | 142 | 144 | 144 | 145 | 145 | 145 | 146 |

# Software tools

The free FLCLogic Soft utility software is used to program FLC drivers.

Basic features of the application:

- create programs using the function block diagram;
- application, contextual help, and documentation for the program is available in Polish;
- simulation of the program operation without the need to connect the FLC driver;
- writing and reading the program to and from the FLC driver by means of the FLC-USB programmer or Ethernet connection (FLC18-ETH);
- advanced testing of the program running on the controller:
  - online preview of the status of inputs, outputs, and variables;
  - forcing the state of variables;
  - registration of analog and digital data.

**FLCLogic Soft application**

Registration of analogue data in FLCLogic Soft app.
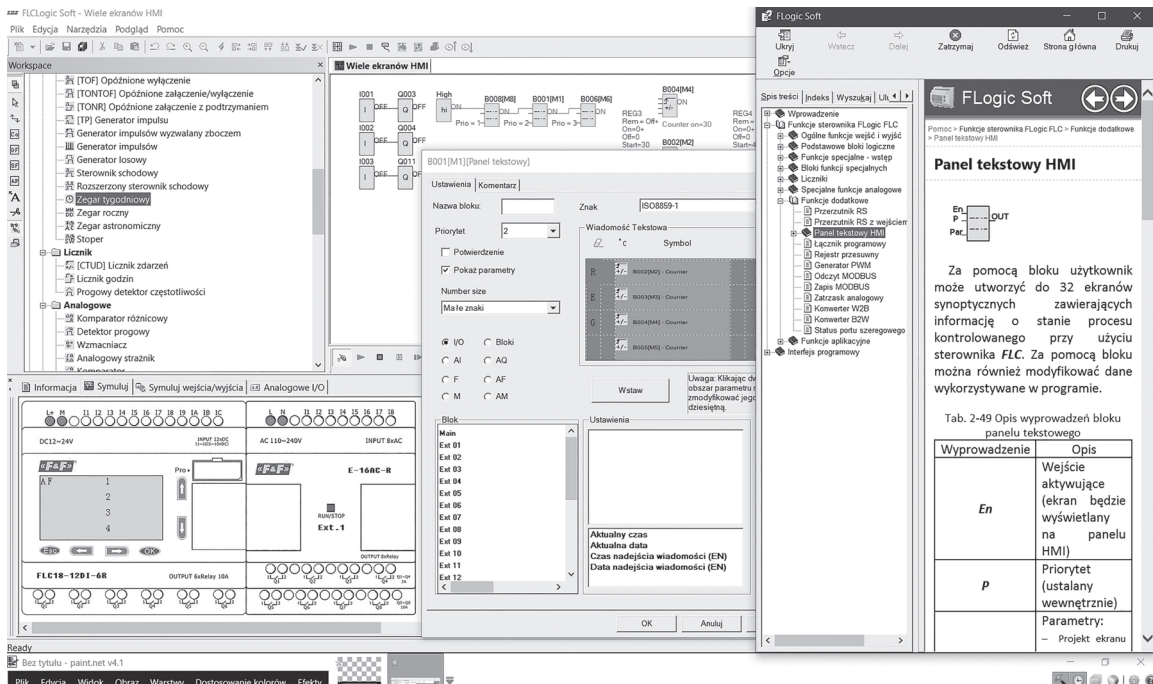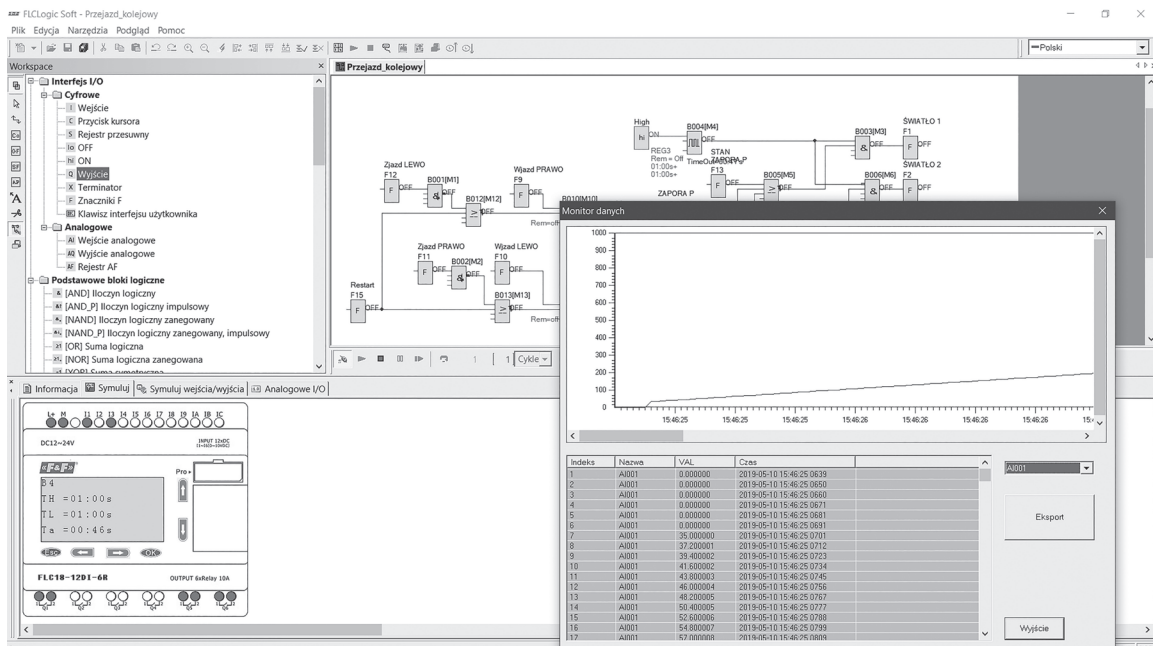
# Elements of the system

# FLC18-ETH-12DI-6R CPU central unit with Ethernet

**Purpose**

FLC18-ETH-12DI-6R is an advanced programmable relay, which integrates many solutions, thus enabling the construction of functional automatic control systems.

**Functions**

- 12 inputs and 6 relay outputs;
- Analog inputs, both voltage 0÷10 V and current 0÷20 mA, enabling direct connection of many types of measurement sensors to the relay;
- Ability to expand the driver with 16 expansion modules;
- Ethernet port for connecting the relay to the local network;
- Built-in web server and access to the controller via a web browser;
- Integration with Internet Of Things (IOT) devices provided by MQTT protocol support;
- Data can be recorded on SD card;
- Isolated RS-485 port with Modbus RTU/ASCII support;
- Programming of the controller via Ethernet or directly via the programmer;
- An LCD display and keyboard for ease of use;
- Real-time clock with calendar and battery back-up.
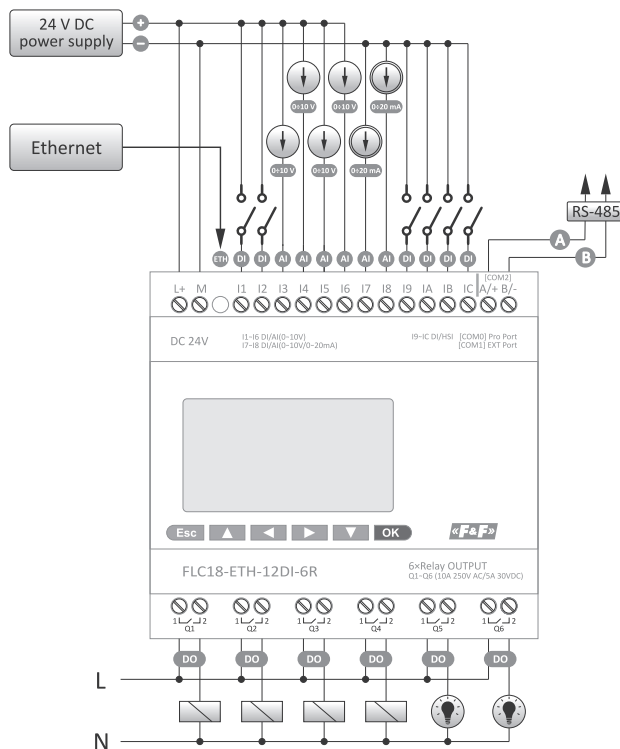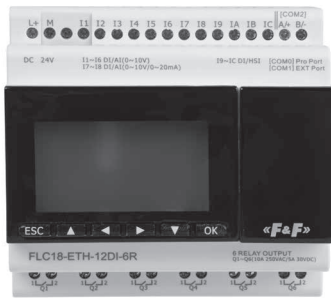
| | |
|---|---|
| programming language | FBD (64 kB) |
| number of function blocks | 1024 |
| size of the FBD program | 64 kB |
| **power supply** | |
| nominal | 24 V DC |
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 4 W |
| **inputs** | |
| total number of inputs | 12 (I1÷IC) |
| number of digital inputs | 12 (I1÷IC) |
| number of analog inputs | |
| voltage (0÷10 V DC) | 8 (I1÷I8) |
| current (0÷20 mA) | 2 (I7÷I8) |
| isolation between input and power supply | resistance |
| isolation between inputs | none |
| **digital inputs I1÷IC** | |
| regular inputs (4 Hz) | 8 (I1÷I8) |
| high-speed inputs (60 kHz) | 4 (I9÷IC) |
| range of input voltages | 0÷28.8 V DC |
| **analog voltage inputs I1÷I6** | |
| measuring range | 0÷10 V DC |
| maximum input voltage | 28.8 V DC |
| input impedance | 34÷72 kΩ |
| resolution | 10 bit |
| voltage accuracy at 25°C | 20 mV |
| voltage accuracy at 55°C | 40 mV |
| **analog current inputs I7÷I8** | |
| measuring range | 0÷20 mA |
| input impedance | |
| resolution | 10 bit |
| measurement accuracy at 25°C | 0.05 mA |
| measurement accuracy at 55°C | 0.1 mA |
| **outputs** | |
| number of outputs | 6 (Q1÷Q6) |
| type of output | relay |
| load capacity of contacts | |
| power supply AC | |
| resistive load | 10 A |
| inductive load | 2 A |
| maximum voltage | 250 V |
| power supply DC | |
| load | 5 A |
| maximum voltage | 30 V |
| electrical life, resistive load | $10^5$ cycles |
| mechanical durability | $10^7$ cycles |
| switching speed (mechanical) | 10 Hz |
| short circuit protection and surge protection | none |
| RTC accuracy | ±2 s/day |
| RTC support time | 20 days |
| program lifespan | 10 years |
| protection against the loss of data | YES |
| cycle time | 0.6÷8 ms |
| single application processing time | 100 µs |
| extension modules | 16 |
| operator panel | 4 |
| LCD display (characters) | 4×16 characters |
| keyboard | 6 buttons |
| customizable | YES |
| **communication ports** | |
| Ethernet | 1 |
| speed | 10M/100M Bps |
| purpose | Modbus TCP/RTU (Master and Slave) MQTT programming of the controller |
| RS232 (TTL) | 1 |
| purpose | programming of the controller |
| RS485 | 1 |
| speed | 4800, 9600, 19200, 38400, 57600, 115200 Bps |
| purpose | Modbus RTU/ASCII (Master and Slave) |
| web server | YES |
| program protection | YES |
| working temperature | -20÷55°C |
| dimensions | 95×90×61 mm |
| weight | 400 g |
| ingress protection | IP20 |

# FLC18-12DI-6R  CPU central unit

**Purpose**

FLC18-12DI-6R is a programmable relay dedicated for automatic control systems of medium complexity.

**Functions**

- 12 inputs and 6 relay outputs;
- Built-in voltage analog inputs and fast counting inputs;
- Ability to expand the driver with 16 expansion modules;
- An LCD display and keyboard for ease of use;
- Real-time clock with calendar and battery back-up.





| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 3.5÷4 W |
| **inputs** | |
| total number of inputs | 12 (I1÷IC) |
| number of digital inputs | 12 (I1÷IC) |
| number of digital inputs | 6 (I1÷I6) (0÷10 V DC) |
| range of input voltages | 0÷28.8 V DC |
| input type | resistive |
| isolation between input and power supply | resistance |
| isolation between inputs | none |
| **analog inputs I1÷I6** | |
| measuring range | 0÷10 V DC |
| maximum input voltage | 28.8 V DC |
| input impedance | 34÷72 kΩ |
| resolution | 10 bit |
| voltage accuracy at 25°C | 20 mV |
| voltage accuracy at 55°C | 40 mV |
| **outputs** | |
| number of outputs | 6 (Q1÷Q6) |
| type of output | relay |
| continuous current, resistive load | 10 A |
| continuous current, inductive load | 2 A |
| operating voltage (AC) | 250 V |
| operating voltage (DC) | 48 V |
| acceptable power load | 300 W |
| electrical life, resistive load | $10^5$ cycles |
| mechanical durability | $10^7$ cycles |
| switching speed (mechanical) | 10 Hz |
| short circuit protection and surge protection | none |
| **other parameters** | |
| number of function blocks | 1024 |
| number of event counters (1÷99999999) | 1024 |
| number of timers (10 ms ÷ 99 h 59 m) | 1024 |
| number of digital flags | 256 |
| number of analog registers | 256 |
| number of PI regulators | 30 |
| number of mathematical blocks | 1024 |
| number of HMI screens | 128 |
| RTC accuracy | ±2 s/day |
| RTC support time | 20 days |
| program lifespan | 10 years |
| protection against the loss of data | YES |
| cycle time | 0.6÷8 ms |
| single application processing time | 100 ms |
| extension modules | 16 |
| number of free inputs (4 Hz) | 8 |
| number of high-speed inputs (60 kHz) | 4 |
| operator panel | YES |
| RS232 | YES |
| communication protocol | Modbus RTU/ ASCII |
| HMI panel | YES |
| program protection | PIN, 4 digits |
| working temperature | -20÷55°C |
| dimensions | 95×90×61 mm |
| weight | 400 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC12-8DI-4R   CPU central unit

## Purpose

FLC12-8DI-4R is a basic programmable relay dedicated for simple control systems where no large number of inputs/outputs or additional extension modules are required.

## Functions

• 8 inputs and 4 relay outputs;
• Built-in voltage analog inputs and fast counting inputs;
• An LCD display and keyboard for ease of use;
• Real-time clock with calendar and battery back-up.





| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 3.5÷4 W |
| **inputs** | |
| total number of inputs | 8 (I1÷I8) |
| number of digital inputs | 8 (I1÷ I8) |
| number of digital inputs | 4 (I1÷I4) (0÷10 V DC) |
| range of input voltages | 0÷28.8 V DC |
| input type | resistive |
| isolation between input and power supply | resistance |
| isolation between inputs | none |
| **analog inputs I1÷I4** | |
| measuring range | 0÷10 V DC |
| maximum input voltage | 28.8 V DC |
| input impedance | 34÷72 kΩ |
| resolution | 10 bit |
| voltage accuracy at 25°C | 20 mV |
| voltage accuracy at 55°C | 40 mV |
| **outputs** | |
| number of outputs | 4 (Q1÷Q4) |
| type of output | relay |
| continuous current, resistive load | 10 A |
| continuous current, inductive load | 2 A |
| operating voltage (AC) | 250 V |
| operating voltage (DC) | 48 V |
| acceptable power load | 300 W |
| electrical life, resistive load | $10^5$ cycles |
| mechanical durability | $10^7$ cycles |
| switching speed (mechanical) | 10 Hz |
| short circuit protection and surge protection | none |
| **other parameters** | |
| number of function blocks | 512 |
| number of event counters (1÷99999999) | 512 |
| number of timers (10 ms ÷ 99 h 59 m) | 512 |
| number of digital flags | 256 |
| number of analog registers | 256 |
| number of PI regulators | 30 |
| number of mathematical blocks | 512 |
| number of HMI screens | 64 |
| RTC accuracy | ±2 s/day |
| RTC support time | 20 days |
| program lifespan | 10 years |
| protection against the loss of data | YES |
| cycle time | 0.6÷8 ms |
| single application processing time | 100 ms |
| extension modules | NO |
| number of free inputs (4 Hz) | 4 |
| number of high-speed inputs (60 kHz) | 4 |
| operator panel | YES |
| RS232 | YES |
| HMI panel | YES |
| working temperature | -20÷55°C |
| dimensions | 71.5×90×61 mm |
| weight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |
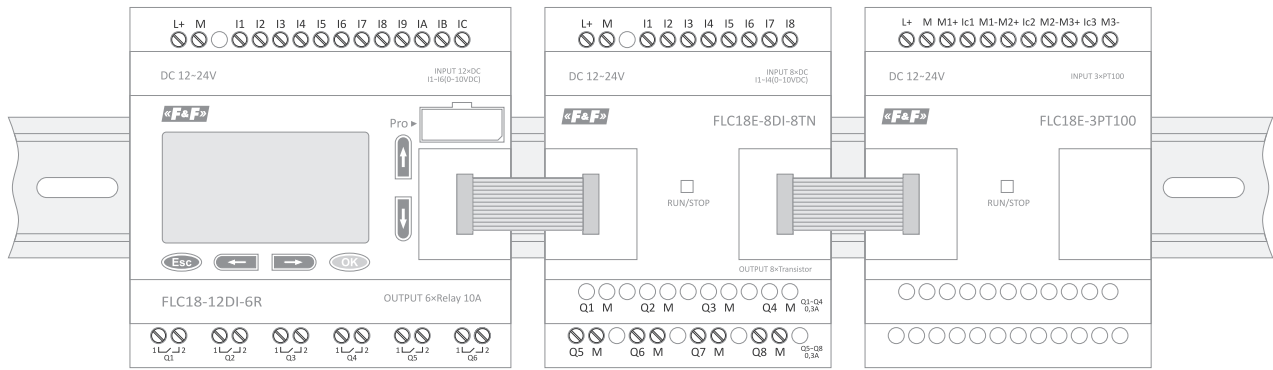
# FLC-USB (programmer)  interface for programming FLC drivers

**Purpose**

Separated interface for programming FLC and USB 2.0 drivers.



| power supply | |
|---|---|
| from the FLC controller port | 5 V DC |
| from the USB port of the computer | 5 V DC |
| separation between FLC and USB | galvanic |

# FLC18E-8DI-8TN  expansion module of the analog-to-digital inputs/outputs



| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 3.5÷4 W |
| **inputs** | |
| total number of inputs | 8 (I1÷I8) |
| number of digital inputs | 8 (I1÷IC) |
| number of digital inputs | 4 (I1÷I4) (0÷10 V DC) |
| range of input voltages | 0÷28.8 V DC |
| input type | resistive |
| isolation between input and power supply | resistance |
| isolation between inputs | none |
| **analog inputs I1÷I4** | |
| measuring range | 0÷10 V DC |
| maximum input voltage | 28.8 V DC |
| input impedance | 34÷72 kΩ |
| resolution | 9 bit |
| voltage accuracy at 25°C | 30 mV |
| voltage accuracy at 55°C | 60 mV |
| **outputs** | |
| number of outputs | 8 (Q1÷Q8) |
| type of output | PNP transistor |
| continuous current (resistive load) | 300 mA |
| critical current | 650 mA |
| maximum output voltage | 30 V |
| switching frequency (resistive load) | 10 Hz |
| switching frequency (inductive load) | 0.5 Hz |
| short circuit protection and surge protection | none |
| **other parameters** | |
| cooperation with the CPU modules | YES |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| weight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC18E-8DI-8R  expansion module  of the analog-to-digital inputs/outputs



| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 3.5÷4 W |
| **inputs** | |
| total number of inputs | 8 (I1÷I8) |
| number of digital inputs | 8 (I1÷IC) |
| number of digital inputs | 4 (I1÷I4) (0÷10 V DC) |
| range of input voltages | 0÷28.8 V DC |
| input type | resistive |
| isolation between input and power supply | resistance |
| isolation between inputs | none |
| **analog inputs I1÷I4** | |
| measuring range | 0÷10 V DC |
| maximum input voltage | 28.8 V DC |
| input impedance | 34÷72 kΩ |
| resolution | 9 bit |
| voltage accuracy at 25°C | 30 mV |
| voltage accuracy at 55°C | 60 mV |
| **outputs** | |
| number of outputs | 8 (Q1÷Q8) |
| type of output | relay |
| continuous current, resistive load (Q1÷Q4) | 3 A |
| continuous current, inductive load (Q1÷Q4) | 1 A |
| continuous current, resistive load (Q5÷Q8) | 10 A |
| continuous current, inductive load (Q5÷Q8) | 2 A |
| operating voltage (AC) | 250 V |
| operating voltage (DC) | 48 V |
| switching speed (mechanical) | 2 Hz |
| short circuit protection and surge protection | none |
| **other parameters** | |
| cooperation with the CPU modules | YES |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| weight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC18E-4AI-I   expansion module with 4 current analog inputs
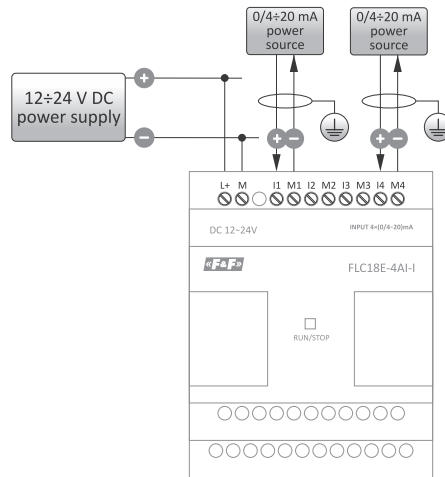


| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 1 W |
| **analog inputs** | |
| number of inputs | 4 (AI1÷AI4) |
| measuring range | 0/4÷20 mA |
| resolution | 10 bit |
| switching time | 50 ms |
| accuracy at 25°C | 50 µV |
| **other parameters** | |
| cooperation with the CPU modules | FLC18-12DI-6R |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| wight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC18E-2AQ-VI   expansion module of analog outputs (2 voltage + 2 current)
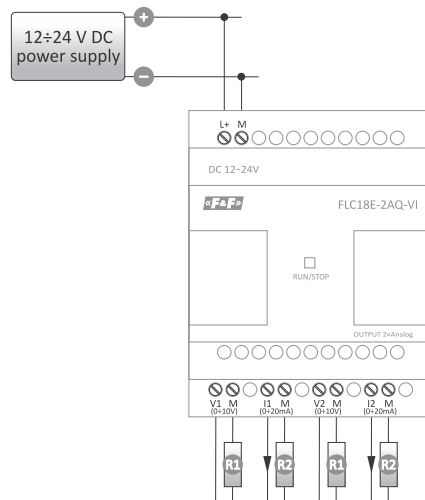


| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 1.8 W |
| **analog voltage/current output** | |
| number of analog outputs | 2 |
| range of output voltages | 0÷10 V DC |
| range of output currents | 0÷ 20 mA |
| resolution | 10 bit |
| voltage accuracy at 25°C | 20 mV |
| voltage accuracy at 25°C | 50 µA |
| **other parameters** | |
| cooperation with the CPU modules | FLC18-12DI-6R |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| wight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC18E-3PT100   expansion module for PT100 temperature sensors with 3 inputs
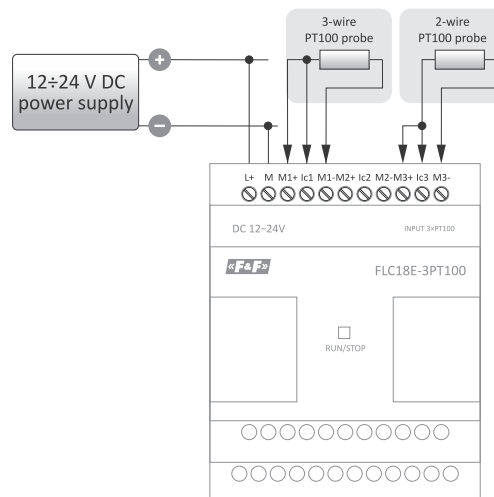


| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 1 W |
| **sensor inputs PT100** | |
| number of sensors | 3 (AI1÷AI3) |
| measuring probe | PT100 |
| probe type | 2- or 3-wire |
| resolution | 12 bit |
| measurement accuracy at 25°C | 0.3°C |
| **other parameters** | |
| cooperation with the CPU modules | FLC18-12DI-6R |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| wight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| ingress protection | IP20 |

# FLC18E-RS485 expansion module with RS-485 communication interface
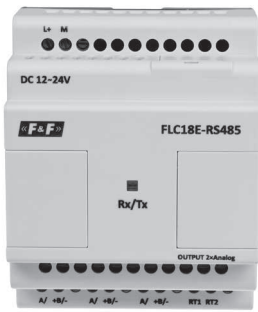


| power supply | 12÷24 V DC |
|---|---|
| resistance to temporary power failure | 5 ms |
| starting current | 250 mA |
| power | 1.8 W |
| **communication output** | |
| RS-485 | 1 |
| output separation | galvanic |
| communication interface | RS-485 |
| working mode | Master/Slave |
| communication parameters configuration | YES |
| **other parameters** | |
| cooperation with the CPU modules | FLC18-12DI-6R |
| working temperature | -25÷50°C |
| dimensions | 71.5×90×58 mm |
| wight | 300 g |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| protection level | IP20 |
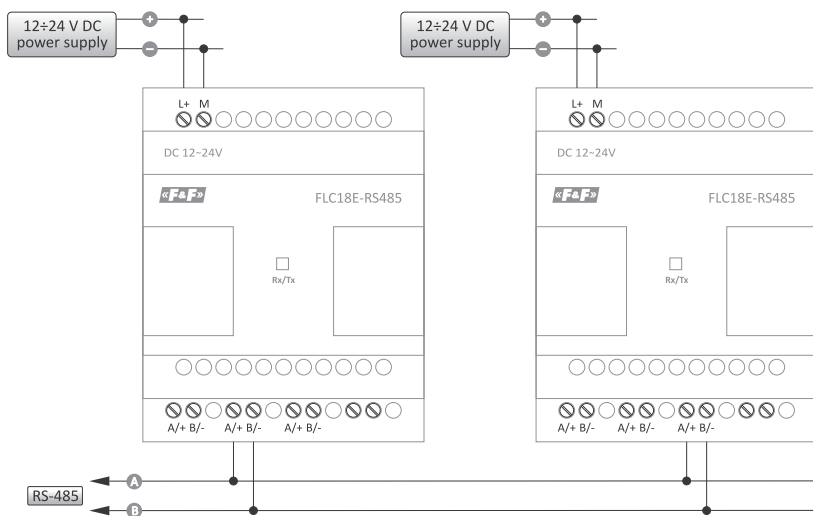
## MAX H04   with GSM communicator (SMS, VOICE, GPRS, CLIP)

**PLC MAX**

**Purpose**

MAX H04 is a freely programmable logic controller (PLC) with a built-in GSM communicator. It is designed to solve a wide range of tasks of technological process management and data exchange via GSM mobile phone network in SMS, VOICE, and CLIP connection mode. The controller is used in home automation as a control of operating states of devices and remote control and as an element of solutions for control and supervision of industrial automation devices of small and medium degree of technological advancement.

| | |
|---|---|
| controller program cycle | 10 ms |
| power supply | 9÷30 V DC |
| digital inputs | 4 (30 V; 0.2 A) |
| analog/digital input | 4 (0/4÷20 mA/0÷10 V) |
| digital output OC | 4 (50 V; 0.2 A) |
| relay outputs (symistors) | 3 (<3 A; 600 V AC) |
| ports | SD, microUSB, SIM, RS-485 |
| communication protocol | Modbus RTU |
| recorder internal memory | 1.3 MB |
| terminal | 1.5 mm² screw terminals |
| working temperature | -10÷50°C |
| dimensions | 110×79×40mm |
| installation | surface mounting or for TH-35 rail |
| protection level | IP20 |

(!) The MAX H04 module is one of the few controllers that allow you to connect and use it without any programming elements. With the special configuration program H04 Config, it can be used by anyone who does not want to learn the programming languages and complicated PLC programming procedures.

**Infrastructure**

The MAX Logic controller works in GSM 900/1800 cellular networks of any operator operating in Poland (the device is unlocked). One of the basic conditions for using the GSM communicator of the controller is the existence of an appropriate infrastructure. In order for the controller to make calls and perform the specified functions, it must have an active SIM card to perform communication services with the selected GDM operator.
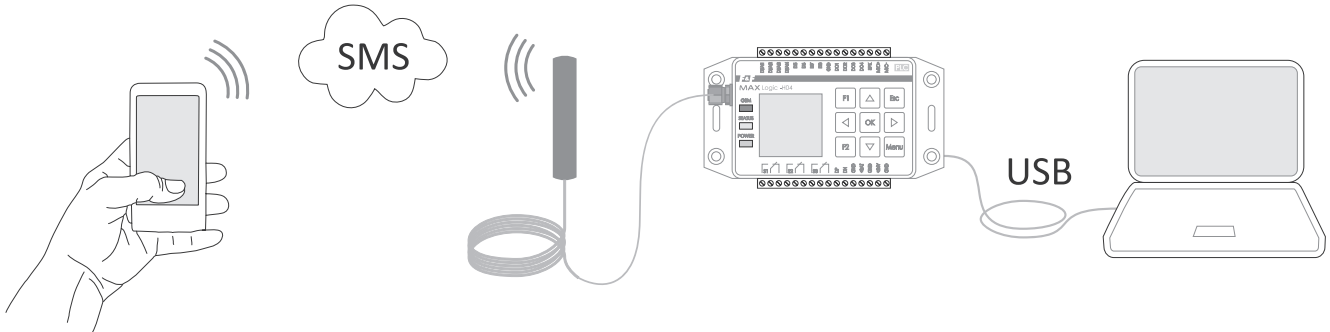


**Functions**

• **Working mode**
The controller can function as a device with a rigid operating algorithm, whose parameters and functions are set using H04 Config software, or as a freely programmable logic controller, whose operating logic is fully specified in the application (programs written using ForthLogic or MAXLadderSoft programming languages.

• **Configuration menu**
Graphical-text menu for setting controller functions, configuring input types, setting specific output functions, providing telephone numbers to which notifications are to be sent, establishing access lock and specifying performance parameters for specific tasks.

• **IVR voice menu**  (playback of *.wav sound files)
It allows you to remotely control in standard voice call mode using the DTMF functions (selecting an option by pressing the desired phone keypad button).

• **Recorder**
The stand-alone recorder stores data in one of three modes:
– interval mode – data are read at equal, preset intervals;
– event mode – data are recorded only when there are any changes in the logical state of inputs/outputs;
– user-mode – data is recorded in accordance with the user format defined in the ForthLogic language application.
The data is stored in the non-volatile internal memory or on an SD card as a text file.
The data is written in series in the form of text: 13:04:39|19/03|18.4 13.8|353 0000 0000 0000 | 01010100|0100|110

- **Remote control and notifications**
The remote control function allows you to directly manage the outputs and control the operating status of devices connected to the controller inputs via your mobile phone.
- **Voice menu**
The IVR voice menu (playback of .wav sound files) allows you to remotely control in standard voice connection mode using the DTMF functions (selecting an option by pressing the desired phone keypad button). When creating a program in ForthLogic language it is possible to create any voice menu based on the individual needs of the user such as boiler control 1, heating control 2, group control 3, and system status 4.
- **SMS commands**
SMS commands are standard ForthLogic language commands, which are known to the Forth-system word interpreter and are directly executed by the controller. Therefore, it is possible to specify any command word from the standard ForthLogic dictionary, which will be implemented directly by the controller, for example: 1 1 RO! As a parameter word, it sets the relay output 1 to the active state. After executing the command, you will receive a return message "(OK)". If the command unknown to the Forth-system word interpreter is given, the return message "ERROR - UNKNOWN WORD" will be sent.
When creating a program in the ForthLogic language according to the individual needs of the user, it is possible to create commands of any meaning, for example, START, STATE, PUMP? etc. performing actions defined by ForthLogic language words.
- **Notifications**
The notification function allows you to receive instant SMS information on the user's phone about the change in the status of digital or analog inputs, change of operating parameters of the system, etc. SMS content is standard words or system messages or specially defined phrases such as "Attention, main power failure".
- **RS-485 communication port and Modbus RTU protocol**
The controller can exchange data with external devices via the RS-485 interface using the Modbus RTU protocol.
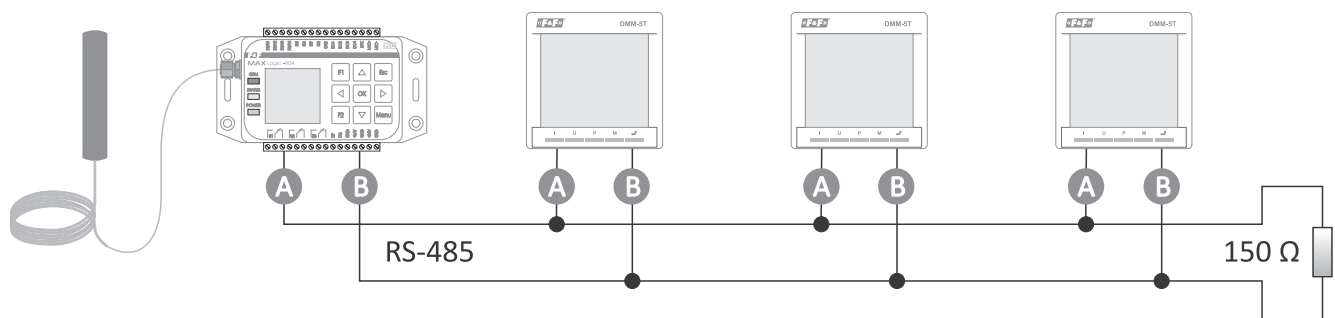


- **Internal memory**
Built-in 2 MB non-volatile memory designed to store recorded data.
- **SD card**
SD/MMC memory card reader allows you to perform service functions and record and store registration data. SD, SDHC and MMC memory cards up to 32 GB are supported.
- **RS-485 communication port and Modbus RTU protocol**
The controller can exchange data with external devices via the RS-485 interface using the Modbus RTU protocol.
- **Power supply**
The power module and built-in battery charger allow you to implement a flexible power supply scheme. For many functions of the controller, an emergency power supply (backup) in the form of an external gel battery with a nominal voltage of 12 V is required. The controller continuously monitors the state of the battery charge and charges it automatically when the main supply voltage is present.
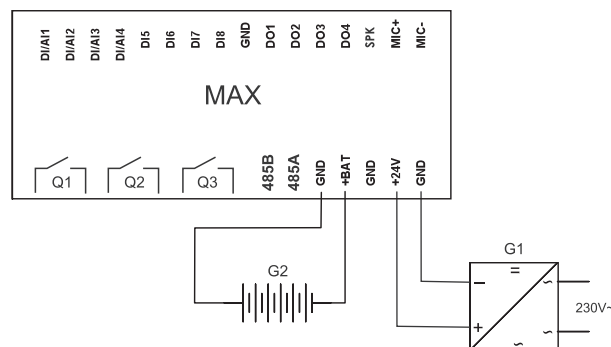


- **Clock**
The controller has the function of automatic time change from the daylight saving time to standard time with the possibility of switching it off. In order to increase the accuracy of the system clock, it is possible to set the automatic time correction in seconds using the MAX Tool program. System time is adjusted on the first day of each month at 21:00:00 by adding the preset correction value to the system time.
- **Access lock**
It is possible to set a password that protects access to the system through the terminal and SMS commands. The password is a sequence of 4÷15 digits set in the MAX Tool, H04 Config program and Forth language commands.
- **Status of IN/OUT**
The status screen of the inputs and outputs allows for an optical evaluation of the operating status of the controller, informs about the firmware version, available memory and parameters of supply voltages.

# H04 Config   configuration software

- Control of outputs via SMS commands;
- Queries about the status of inputs and outputs by SMS commands;
- SMS/VOICE alerts about the activation of inputs;
- SMS/VOICE alerts about exceeding the measurement value, for example exceeding the temperature;
- Definition of the content of SMS alarms - A(up to 160 characters);
- The option of sending a second text message when the alarm threshold is continuously exceeded;
- Output control depending on the assigned input:
  - LEVEL option – representation of the state (IN 1 -> OUT 1, IN 0 -> OUT 0);
  - PULSE option – time activation of the output for a set time after the input has been activated;
- The function of a two-state controller of the HEATING/COOLING type (based on the definitions of the analog input scale, threshold, and output assigned to it);
- Selection of options for actuation and alarm triggering (high state 1 or low state 0);
- Printing of states and values on LCD;
- User menu for settings of alarm threshold values and adjustments, telephone numbers, control options, etc.
- CLIP (dial-up) feature and an astronomical clock function.
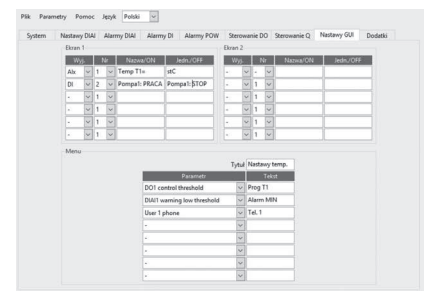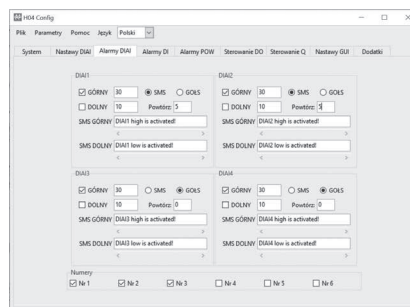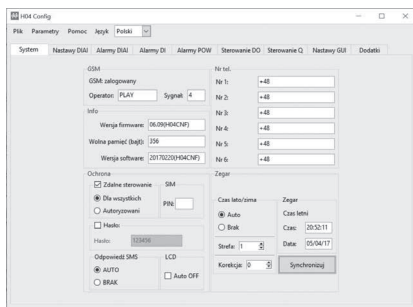


Screenshots from H04 Config program

## Software tools

A hardware and software system called "forth-system" is responsible for the execution of tasks and interpretation of the software written with the **ForthLogic** programming language. The ForthLogic underlying computational model consists of stacks, global variables, a dictionary, an input buffer, and an output buffer. The ForthLogic language allows describing parallel processes and runs in a multi-tasking environment.

The interactive programming and application development environment for MAX controllers in ForthLogic language consists of **Notepad++** text editor, **PuTTY** terminal program and **ForthLogic Programmer**, which provides two-way communication between PC and MAX controller.

This environment allows you to create scripts in the ForthLogic language, program MAX controllers and interact with the controller in terminal mode.

The **MAXLadderSOFT** software allows you to easily replace the "relay" schema with the programming language of the controller.

The program allows:
- to create and edit applications using the ladder diagram language [LAD];
- to check the correctness of the schema design;
- for direct communication between the controller and the computer;
- to upload applications to the memory of the controller.

Direct operation with the system of the controller is called **dialog mode**.

There are 2 types of dialog operation: terminal and remote.

**Terminal mode** means working with a **HyperTerminal**-type program (MAX-PC connection via USB). The terminal mode is primarily used to learn to program, solve programming tasks or solve problems in controller operation.

**Remote mode** (only for controllers with GSM module) - the controller operates with the phone via SMS. In this mode, the phone display performs similar functions as the terminal window on the computer monitor. Remote mode is used to remotely control devices connected to the controller.

The **MAX Tool** service program allows you to set controller operating parameters, upload firmware, and Forth language applications, open Extensions and communicate directly in a simplified terminal mode.



HyperTerminal



MaxLadder Soft



Notepad++Putty+Forthlogic Programmer

RS-485 communication network (Modbus RTU) based on FLC controllers

# Section VII
# Power supply control

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

### Purpose

Phase loss sensors are designed to protect an electric motor powered from a three-phase network in  following cases:
• a voltage loss in at least one phase;
• an asymmetry of the voltage between phases above the set value;
• damage to the switching contactor (for version with contact control).
Additionally for the True RMS version:
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V.

### Functioning

If the supply voltage is correct, the device indicates the correct functioning by the green LED and switches the internal contact to the active position after the set time. If any of the anomalies described in the section above occurs, the device disables the internal contact, causing the protected devices to be disconnected. The device will be switched back on automatically when voltages return to normal values.

For the contactor contacts control version, restart cannot take place until the contactor status has been checked and the unit has been reset. This prevents switching the device back on with a faulty actuator.

### True RMS series devices

True RMS series devices, thanks to the use of microprocessor for voltage measurement, allow measurements in networks with large voltage distortions and disturbances. This is especially important nowadays, when there are already many pulse devices that cause interference in the network. Such devices include: LED bulbs, pulse power supplies (such as those installed in televisions, computers, phone chargers) or photovoltaic systems.

The ever-increasing demand for electric power, which will increase even more due to the popularization of electric cars, may cause temporary voltage failures or spikes. Such interference can be misinterpreted by sensors on the standard line, which may result in their incorrect operation.

| Product | Supply voltage | Maximum load current (AC-1) | Configuration of the contacts | Contact separa-tion | Voltage asymmetry of tripping | Off delay | Cooperation with power generators | Control of phase sequence | Control of contactor contacts | Terminal | Mounting | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CZF | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | – | – | OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m | surface-mounted | 154 |
| CZF TRMS | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | – | – | OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m | surface-mounted | 154 |
| CZF-B | 3×400 V+N | 10 A | 1×NO | ● | 55 V | 4 s | – | – | – | 4.0 mm² screw terminals | for TH-35 rail | 154 |
| **CZF-B TRMS** | **3×400 V+N** | **16 A** | **1×NO** | **●** | **55 V** | **4 s** | **–** | **–** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **154** |
| CZF-BR | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | – | – | 4.0 mm² screw terminals | for TH-35 rail | 155 |
| **CZF-BR TRMS** | **3×400 V+N** | **16 A** | **1×NO/NC** | **●** | **40÷80 V** | **4 s** | **–** | **–** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **155** |
| CZF-BS | 3×400 V+N | 10 A | 1×NO/NC | ● | 55 V | 4 s | – | – | – | 4.0 mm² screw terminals | for TH-35 rail | 154 |
| **CZF-BS TRMS** | **3×400 V+N** | **16 A** | **1×NO/NC** | **●** | **55 V** | **4 s** | **–** | **–** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **154** |
| CZF-BT | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 0.5÷5 s | – | – | – | 4.0 mm² screw terminals | for TH-35 rail | 155 |
| **CZF-BT TRMS** | **3×400 V+N** | **16 A** | **1×NO/NC** | **●** | **40÷80 V** | **1÷10 s** | **–** | **–** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **155** |
| CZF-310 | 3×400 V+N | 10 A | 1×NO/NC | ● | 55 V | 4 s | – | – | – | 2.5 mm² screw terminals | for TH-35 rail | 154 |
| **CZF-310 TRMS** | **3×400 V+N** | **10 A** | **1×NO/NC** | **●** | **55 V** | **4 s** | **–** | **–** | **–** | **2.5 mm² screw terminals** | **for TH-35 rail** | **154** |
| CZF-311 | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | – | – | 2.5 mm² screw terminals | for TH-35 rail | 155 |
| **CZF-311 TRMS** | **3×400 V+N** | **10 A** | **1×NO/NC** | **●** | **40÷80 V** | **4 s** | **–** | **–** | **–** | **2.5 mm² screw terminals** | **for TH-35 rail** | **155** |
| CZF-312 | 3×400 V+N | 2×5 A | 1×NO+1×NC | ● | 40÷80 V | 0.2 s | – | – | – | 2.5 mm² screw terminals | for TH-35 rail | 155 |
| **CZF-312 TRMS** | **3×400 V+N** | **2×8 A** | **1×NO+1×NC** | **●** | **40÷80 V** | **0.5 s** | **–** | **–** | **–** | **2.5 mm² screw terminals** | **for TH-35 rail** | **155** |
| **CZF-331 TRMS** | **3×400 V+N** | **2×8 A** | **2×NO/NC** | **●** | **40÷80 V** | **4 s** | **–** | **–** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **156** |
| CZF-332 | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | – | ● | 4.0 mm² screw terminals | for TH-35 rail | 157 |
| CZF-333 | 3×400 V | 10 A | 1×NO/NC | ● | 20÷50 V | 4 s | ● | – | – | 4.0 mm² screw terminals | for TH-35 rail | 156 |
| **CZF-334 TRMS** | **3×400 V** | **2×6 A** | **2×NO/NC** | **●** | **20÷80 V** | **1÷10 s** | **●** | **–** | **–** | **2.5 mm² screw terminals** | **for TH-35 rail** | **156** |
| CZF2 | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | – | ● | 1.5 mm² screw terminals | surface-mounted | 158 |
| CZF2-B | 3×400 V+N | 10 A | 1×NO | – | 55 V | 4 s | – | – | ● | 4.0 mm² screw terminals | for TH-35 rail | 158 |
| CZF2-BR | 3×400 V+N | 10 A | 1×NO | – | 40÷80 V | 4 s | – | – | ● | 4.0 mm² screw terminals | for TH-35 rail | 158 |
| CKF | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | ● | – | OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m | surface-mounted | 160 |
| **CKF TRMS** | **3×400 V+N** | **10 A** | **1×NO** | **●** | **45 V** | **4 s** | **–** | **●** | **–** | **OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m** | **surface-mounted** | **160** |
| CKF-B | 3×400 V+N | 10 A | 1×NO | ● | 55 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 160 |
| **CKF-B TRMS** | **3×400 V+N** | **16 A** | **1×NO** | **●** | **55 V** | **4 s** | **–** | **●** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **160** |
| CKF-BR | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| **CKF-BR TRMS** | **3×400 V+N** | **16 A** | **1×NO/NC** | **●** | **40÷80 V** | **4 s** | **–** | **●** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **161** |
| CKF-BT | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 0.5÷5 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| **CKF-BT TRMS** | **3×400 V+N** | **16 A** | **1×NO/NC** | **●** | **40÷80 V** | **1÷10 s** | **–** | **●** | **–** | **4.0 mm² screw terminals** | **for TH-35 rail** | **161** |
| CKF-316 | 3×400 V+N | 10 A | 1×NO/NC | ● | 55 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 160 |
| **CKF-316 TRMS** | **3×400 V+N** | **10 A** | **1×NO/NC** | **●** | **55 V** | **4 s** | **–** | **●** | **–** | **2.5 mm² screw terminals** | **for TH-35 rail** | **160** |
| CKF-317 | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 161 |
| CKF-317 TRMS | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 161 |
| CKF-318 TRMS | 3×400 V | 2×6 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 162 |
| CKF-319 TRMS | 3×400 V+N | 2×8 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 162 |
| CKF-320 TRMS | 3×400 V+N | 2×8 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 159 |
| CKF-337 | 3×400 V | 10 A | 1×NO/NC | ● | 20÷60 V | 0.2÷5 s | ● | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 162 |

# With a constant tripping threshold of voltage asymmetry

## CZF / CZF TRMS   surface-mounted, separated 1×NO contact



**①** brown　**③** black　**⑤** yellow
**②** blue　**④** brown　**⑥** blue

| | CZF | CZF TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 180 V |
| effective voltage unbalance | 45 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal | OMY 4×1 mm²; 2×0.75 mm²; l= 0.5 m | |
| dimensions | 51×67×26 mm | |
| mounting | surface | |
| ingress protection | IP20 | |

## CZF-B / CZF-B TRMS   separated 1×NO contact
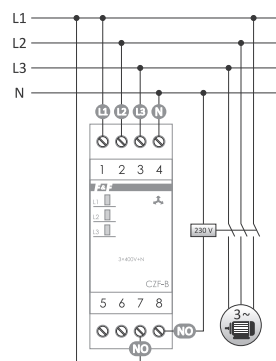


| | CZF-B | CZF-B TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 55 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CZF-BS / CZF-BS TRMS   separated 1×NO/NC contact
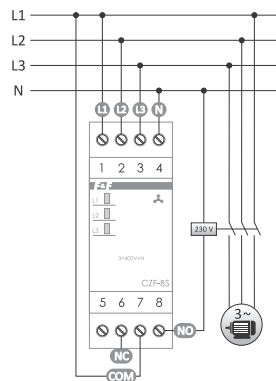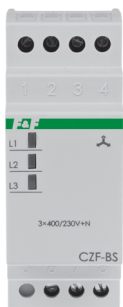


| | CZF-BS | CZF-BS TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 55 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CZF-310 / CZF-310 TRMS   separated 1×NO/NC contact
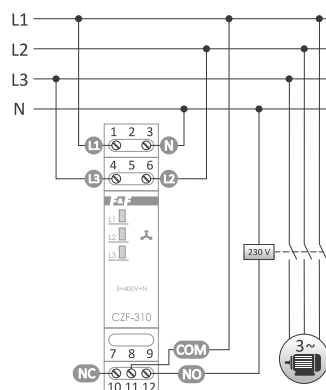


| | CZF-310 | CZF-310 TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | 150 V | |
| maximum phase voltage | 280 V | |
| effective voltage unbalance | 55 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | |
| switch-off delay on phase loss | 1 s | |
| activation delay | 4 s | |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord/wire) | |
| tightening torque | 0.4 Nm | |
| dimensions | 1 module (18 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

# With an adjustable tripping threshold of voltage asymmetry

## CZF-BR / CZF-BR TRMS    separated 1×NO/NC contact, adjustable asymmetry
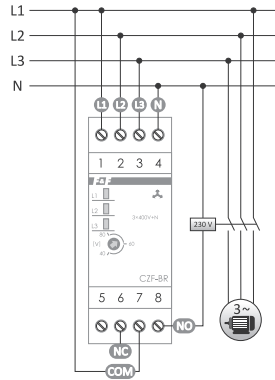


| | CZF-BR | CZF-BR TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CZF-BT / CZF-BT TRMS    separated 1×NO/NC contact, adjustable asymmetry and off delay
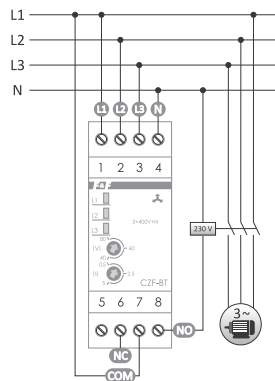


| | CZF-BT | CZF-BT TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 0.5÷5 s | 1÷10 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CZF-311 / CZF-311 TRMS    separated 1×NO/NC contact, adjustable asymmetry
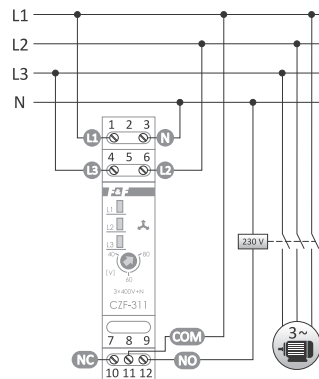


| | CZF-311 | CZF-311 TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | 150 V | |
| maximum phase voltage | 280 V | |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | |
| switch-off delay on phase loss | 1 s | |
| activation delay | 4 s | |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord/wire) | |
| tightening torque | 0.4 Nm | |
| dimensions | 1 module (18 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CZF-312 / CZF-312 TRMS    separated 1×NC and 1×NO contacts, with a tripping time of 0.5 s
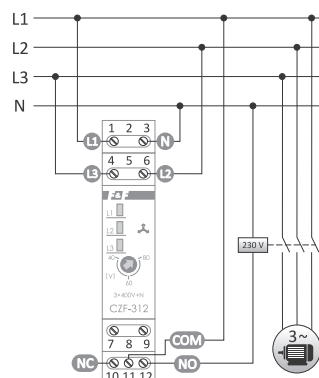


| | CZF-312 | CZF-312 TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated: 1×NC, 1×NO | |
| maximum load current (AC-1) | 2×5 A | 2×8 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 0.2 s | 0.5 s |
| switch-off delay on phase loss | 0.2 s | 0.5 s |
| activation delay | ? | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord/wire) | |
| tightening torque | 0.4 Nm | |
| dimensions | 1 module (18 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

# CZF-331 TRMS  separated 2×NO/NC contacts, adjustable asymmetry



Failure signalling

| power supply | 3×400 V+N |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 40÷80 V |
| voltage hysteresis | 5 V |
| switch-off delay on asymmetry | 4 s |
| switch-off delay on phase loss | 1 s |
| activation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Adapted to work with a power generator (without neutral wire)

# CZF-333  adjustable asymmetry, without neutral wire



| power supply | 3×400 V |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 10 A |
| indication of the correct power supply | 3×LED |
| effective voltage unbalance | 20÷50 V |
| activation interphase voltage | <320 V |
| voltage hysteresis | 5 V |
| deactivation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# CZF-334 TRMS  separated 2×NO/NC contacts, adjustable asymmetry, activation and deactivation delay, without neutral wire



Failure signalling

Contacts 10 and 12 internally connected

| power supply | 3×400 V |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×6 A |
| minimum phase voltage | 320 V |
| maximum phase voltage | 480 V |
| effective voltage unbalance | 20÷80 V |
| voltage hysteresis | 5 V |
| switch-off delay on asymmetry | 1÷10 s |
| switch-off delay on phase loss | 1 s |
| activation delay | 1÷60 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord/wire) |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# With control of the contactor contacts

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value;
• contactor contact failure.

**Functioning**

Voltage loss in at least one phase or voltage asymmetry between phases above the tripping threshold will cause the motor to shut down. The shutdown will take place with a delay of 4 seconds, which prevents the motor from switching-off when the voltage drops temporarily. Re-activation will take place automatically when the voltage increases by 5 V above the tripping voltage (by the value of voltage hysteresis). A failure of any of the contacts of the contactor that switches the motor on will cause the motor to be switched off permanently. A restart is only possible after the power supply has been completely disconnected, the contactor fault has been removed and the power supply has been switched on again. In the event of the anomalies described above, starting the motor is not possible.



# CZF-332   separated 1×NO/NC contact, adjustable asymmetry



| power supply | 3×400 V+N |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 10 A |
| indication of the correct power supply | 2×LED |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 40÷80 V |
| voltage hysteresis | 5 V |
| deactivation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# CZF2  surface-mounted, separated 1×NO contact



| power supply | 3×400 V+N |
|---|---|
| contact | separated 1×NO |
| maximum load current (AC-1) | 10 A |
| indication of the correct power supply | 2×LED |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 45 V |
| voltage hysteresis | 5 V |
| deactivation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 1.5 mm² screw terminals (cord/wire) |
| tightening torque | 0.3 Nm |
| dimensions | 95×60×25 mm |
| mounting | surface |
| ingress protection | IP20 |

# CZF2-B  mounting on a DIN rail



| power supply | 3×400 V+N |
|---|---|
| contact | 1×NO |
| maximum load current (AC-1) | 10 A |
| indication of the correct power supply | 2×LED |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 55 V |
| voltage hysteresis | 5 V |
| deactivation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) / 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# CZF2-BR  adjustable asymmetry



| power supply | 3×400 V+N |
|---|---|
| contact | 1×NO |
| maximum load current (AC-1) | 10 A |
| indication of the correct power supply | 2×LED |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 40÷80 V |
| voltage hysteresis | 5 V |
| deactivation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) / 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Chapter 27

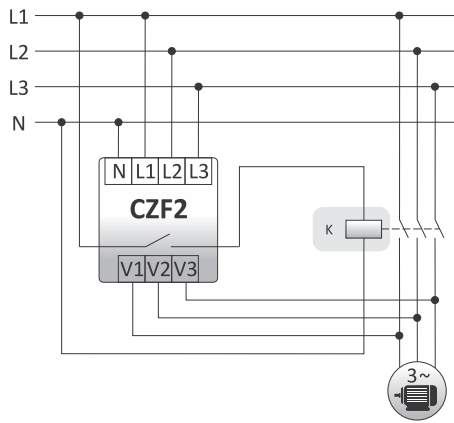# Phase sequence and phase loss sensors

**Purpose**

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
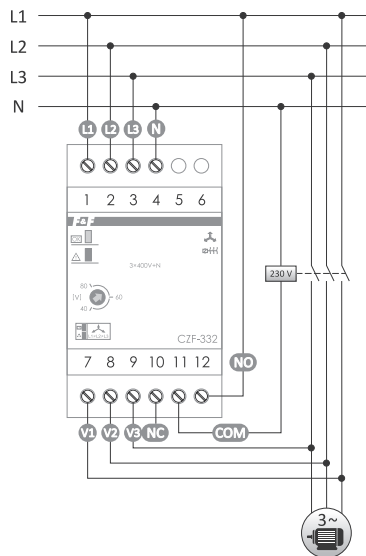• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value;
• incorrect phase sequence.

**Functioning**

Voltage loss in at least one phase or voltage asymmetry between phases above the tripping threshold will cause the motor to shut down. The shutdown will take place with a delay of 4 seconds, which prevents the motor from switching-off when the voltage drops temporarily. Re-activation will take place automatically when the voltage increases by 5 V above the tripping voltage (by the value of voltage hysteresis). In the event of the anomalies described above, starting the motor is not possible. If the phase sequence is changed before the sensor causing an unwanted change of the motor rotation direction, the sensor will not allow the motor to start. Re-activation is possible after the correct phase sequence has been restored.

| Product | Supply voltage | Maximum load current (AC-1) | Configuration of the contacts | Contact separation | Voltage asymmetry of tripping | Off delay | Cooperation with power generators | Control of phase sequence | Control of contactor contacts | Terminal | Mounting | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CKF | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | ● | – | OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m | surface | 160 |
| CKF TRMS | 3×400 V+N | 10 A | 1×NO | ● | 45 V | 4 s | – | ● | – | OMY 4×1 mm²; 2×0.75 mm², l: 0.5 m | surface | 160 |
| CKF-B | 3×400 V+N | 10 A | 1×NO | ● | 55 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 160 |
| CKF-B TRMS | 3×400 V+N | 16 A | 1×NO | ● | 55 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 160 |
| CKF-BR | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| CKF-BR TRMS | 3×400 V+N | 16 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| CKF-BT | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 0.5÷5 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| CKF-BT TRMS | 3×400 V+N | 16 A | 1×NO/NC | ● | 40÷80 V | 1÷10 s | – | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 161 |
| CKF-316 | 3×400 V+N | 10 A | 1×NO/NC | ● | 55 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 160 |
| CKF-316 TRMS | 3×400 V+N | 10 A | 1×NO/NC | ● | 55 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 160 |
| CKF-317 | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 161 |
| CKF-317 TRMS | 3×400 V+N | 10 A | 1×NO/NC | ● | 40÷80 V | 4 s | – | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 161 |
| CKF-318 TRMS | 3×400 V | 2×6 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 162 |
| CKF-319 TRMS | 3×400 V+N | 2×8 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 162 |
| CKF-320 TRMS | 3×400 V+N | 2×8 A | 2×NO/NC | ● | 20÷80 V | 1÷10 s | ● | ● | – | 2.5 mm² screw terminals | for TH-35 rail | 159 |
| CKF-337 | 3×400 V | 10 A | 1×NO/NC | ● | 20÷60 V | 0.2÷5 s | ● | ● | – | 4.0 mm² screw terminals | for TH-35 rail | 162 |

# CKF-320 TRMS   with a voltage window



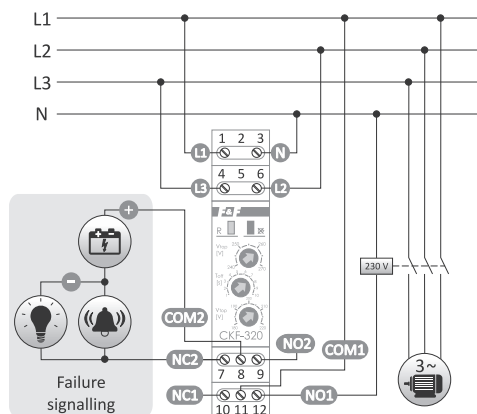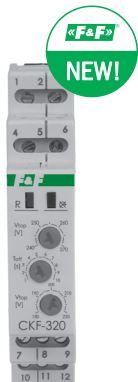| | |
|---|---|
| power supply | 3×400 V+N |
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| adjustment range | |
| lower voltage threshold | 180÷220 V |
| higher voltage threshold | 240÷280 V |
| voltage hysteresis | 5 V |
| deactivation delay | |
| on assymetry | 1÷10 s |
| when exceeding the voltage window | 1÷10 s |
| switch-off delay on phase loss | 1 s |
| activation delay | 4 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord/wire) |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

Failure signalling

# With a constant tripping threshold of voltage asymmetry

## CKF / CKF TRMS   surface-mounted, separated 1×NO contact

L1
L2
L3
N

3~

| | CKF | CKF TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 180 V |
| effective voltage unbalance | 45 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal | OMY 4×1 mm²; 2×0.75 mm²; l= 0.5 m | |
| dimensions | 51×67×26 mm | |
| mounting | surface | |
| ingress protection | IP20 | |

① brown   ③ blue   ⑤ black
② blue   ④ black   ⑥ brown

## CKF-B / CKF-B TRMS   separated 1×NO contact

L1
L2
L3
N

230 V

3~
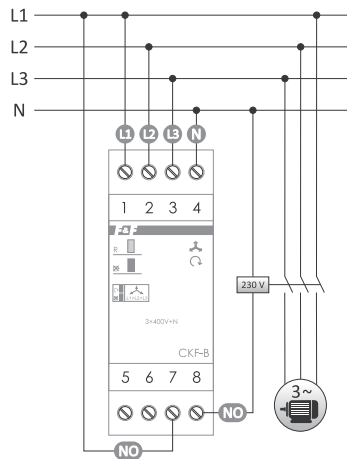
| | CKF-B | CKF-B TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 55 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CKF-316 / CKF-316 TRMS   separated 1×NO/NC contact

L1
L2
L3
N

230 V

3~
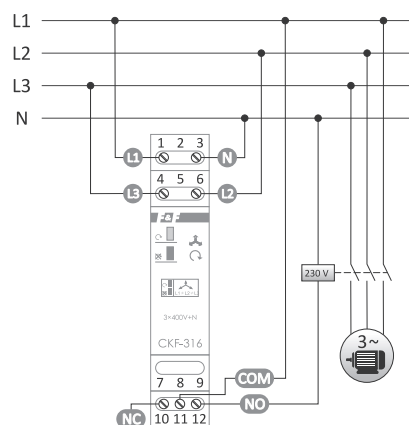
| | CKF-316 | CKF-316 TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | 150 V | |
| maximum phase voltage | 280 V | |
| effective voltage unbalance | 55 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | |
| switch-off delay on phase loss | 1 s | |
| activation delay | 4 s | |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord/wire) | |
| tightening torque | 0.4 Nm | |
| dimensions | 1 module (18 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

# With an adjustable tripping threshold of voltage asymmetry

## CKF-BR / CKF-BR TRMS    separated 1×NO/NC contact, adjustable asymmetry
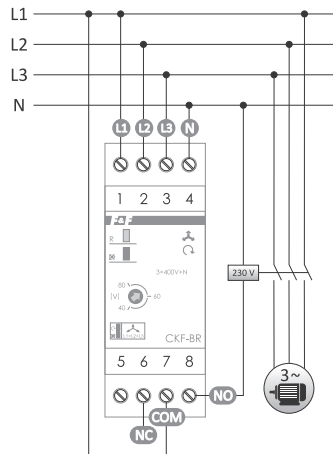


| | CKF-BR | CKF-BR TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | 4 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CKF-BT / CKF-BT TRMS    separated 1×NO/NC contact, adjustable asymmetry and off time
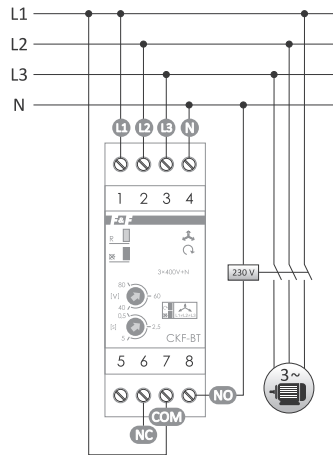


| | CKF-BT | CKF-BT TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | 16 A |
| minimum phase voltage | – | 150 V |
| maximum phase voltage | – | 280 V |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 0.5÷5 s | 1÷10 s |
| switch-off delay on phase loss | 1.5 s | 1 s |
| activation delay | 3.5 s | 4 s |
| power consumption | 0.8 W | 1.6 W |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord) 4.0 mm² (wire) | |
| tightening torque | 0.5 Nm | |
| dimensions | 2 modules (35 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

## CKF-317 / CKF-317 TRMS    separated 1×NO/NC contact, adjustable asymmetry
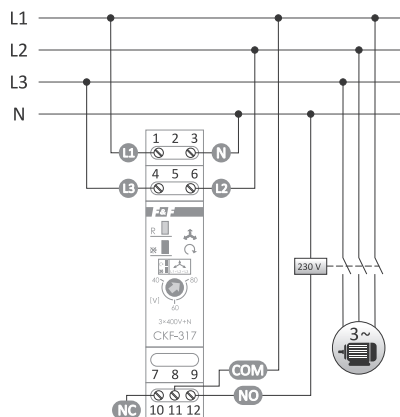


| | CKF-317 | CKF-317 TRMS |
|---|---|---|
| power supply | 3×400 V+N | |
| contact | separated 1×NO/NC | |
| maximum load current (AC-1) | 10 A | |
| minimum phase voltage | 150 V | |
| maximum phase voltage | 280 V | |
| effective voltage unbalance | 40÷80 V | |
| voltage hysteresis | 5 V | |
| switch-off delay on asymmetry | 4 s | |
| switch-off delay on phase loss | 1 s | |
| activation delay | 4 s | |
| power consumption | 1.6 W | |
| working temperature | -25÷40°C | |
| terminal, screw terminals | 2.5 mm² (cord/wire) | |
| tightening torque | 0.4 Nm | |
| dimensions | 1 module (18 mm) | |
| mounting | for TH-35 rail | |
| ingress protection | IP20 | |

# CKF-319 TRMS
1-module housing, separated 2×NO/NC contacts, adjustable asymmetry, activation and deactivation delay

| power supply | 3×400 V+N |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| minimum phase voltage | 150 V |
| maximum phase voltage | 280 V |
| effective voltage unbalance | 20÷80 V |
| voltage hysteresis | 5 V |
| switch-off delay on asymmetry | 1÷10 s |
| switch-off delay on phase loss | 1 s |
| activation delay | 1÷60 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord/wire) |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Adapted to work with a power generator (without neutral wire)

# CKF-318 TRMS
1-module housing, separated 2×NO/NC contacts, adjustable asymmetry, activation and deactivation delay, without neutral wire

| power supply | 3×400 V |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×6 A |
| minimum phase voltage | 320 V |
| maximum phase voltage | 480 V |
| effective voltage unbalance | 20÷80 V |
| voltage hysteresis | 5 V |
| switch-off delay on asymmetry | 1÷10 s |
| switch-off delay on phase loss | 1 s |
| activation delay | 1÷60 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord/wire) |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

Contacts 10 and 12 internally connected

# CKF-337
separated 1×NO contact/NC, adjustable asymmetry, deactivation delay, without neutral wire
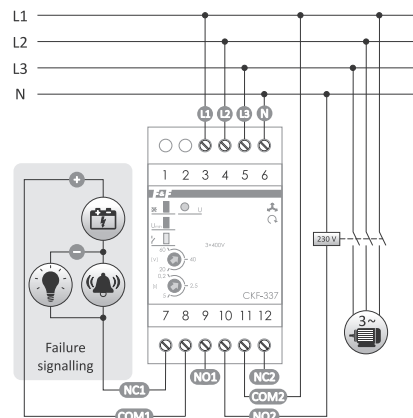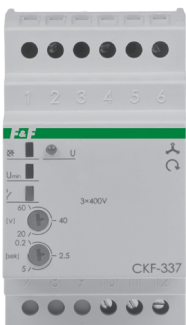
| power supply | 3×400 V |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 10 A |
| effective voltage unbalance | 20÷60 V |
| activation interphase voltage | <320 V |
| voltage hysteresis | 5 V |
| deactivation delay (adjustable) | 0.2÷5 s |
| power consumption | 1.6 W |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Voltage relays

Voltage relays are used to control the voltage of a single-phase or three-phase network and protect the receiver against the effects of voltage drop or rise beyond the set values.

(!) All types of voltage relays can be supplied with voltages up to 450 V. This allows for effective protection of the receiver even if the voltage exceeds the permissible standards. Also in cases of replacing the polarity of the power supply or disconnecting the "zero", it will not destroy (burn) the relay.

**Functioning**

The potentiometers are used to set the lower ($U_1$) and upper ($U_2$) voltage thresholds. It is the so-called "voltage window", within the limits of which there may be changes of power supply voltage that do not cause the relay activation. Changing the supply voltage above or below the set voltage thresholds will switch the contact of the relay. The relay contact will be switched back automatically when the correct voltage is restored.

## Time lock

(!) **Applies to CP-710 and CP-730:** As a result of unstable voltage in the mains and frequent changes of supply voltage beyond the set thresholds of the voltage window (minimum 10 times per 1 minute), the relay is locked for a period of 10 minutes. This prevents the connected receiver from being turned on and off too often.



## CP-709   without time lock



| | |
|---|---|
| power supply | 50÷450 V AC |
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 16 A |
| power supply control | 4×LED |
| voltage activation threshold | |
| lower $U_1$ | 150÷210 V |
| upper $U_2$ | 230÷260 V |
| voltage hysteresis | |
| for threshold $U_1$ | 5 V |
| for threshold $U_2$ | 5 V |
| activation time | |
| for threshold $U_1$ | 1.5 s |
| for threshold $U_2$ | 0.1 s |
| return time | |
| for threshold $U_1$ | 1.5 s |
| for threshold $U_2$ | 1.5 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# CP-710 1-phase, with time lock*



| power supply | 50÷450 V AC |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 16 A |
| power supply control | 4×LED |
| voltage activation threshold | |
| lower $U_1$ | 150÷210 V |
| upper $U_2$ | 230÷260 V |
| voltage hysteresis | |
| for threshold $U_1$ | 5 V |
| for threshold $U_2$ | 5 V |
| activation time | |
| for threshold $U_1$ | 1.5 s |
| for threshold $U_2$ | 0.1 s |
| return time | |
| for threshold $U_1$ | 1.5 s |
| for threshold $U_2$ | 1.5 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

* Uwaga na poprzedniej stronie

# CP-721 programmable, without time lock
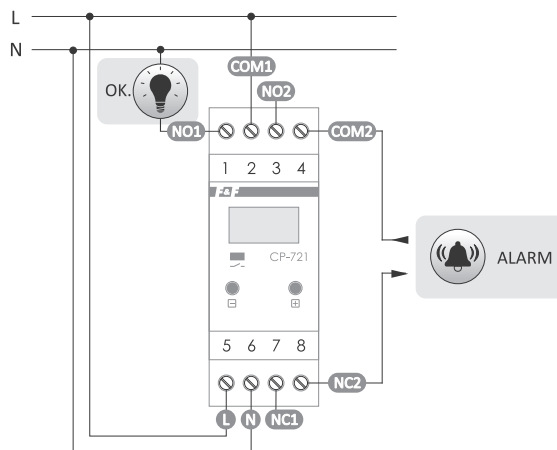


| power supply | 150÷450 V AC |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| tripping voltage thresholds/step | |
| lower UL | 150÷210 V/5 V |
| upper UH | 230÷260 V/5 V |
| voltage hysteresis | |
| for threshold UL | 5 V |
| for threshold UH | 5 V |
| activation time/step | |
| for threshold UL | 2÷10 s/1 s |
| for threshold UH | 0.1÷1 s/0.1 s |
| return time | |
| for threshold UL | 2 s÷9,5 min. |
| for threshold UH | 2 s÷9,5 min. |
| setting accuracy | 1 V |
| measurement accuracy | ±1 V |
| display | 3×segment LED 5×9 mm |
| contact signalling activation | yellow LED |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- Setting the voltage window (UL and UH thresholds);
- Separate setting of the tripping times when the UL and UH thresholds are exceeded;
- Return time setting;
- Continuous display of the mains voltage;
- Signalling of correct mains voltage and closing of the contact.

# CP-730 3-phase, with time lock*
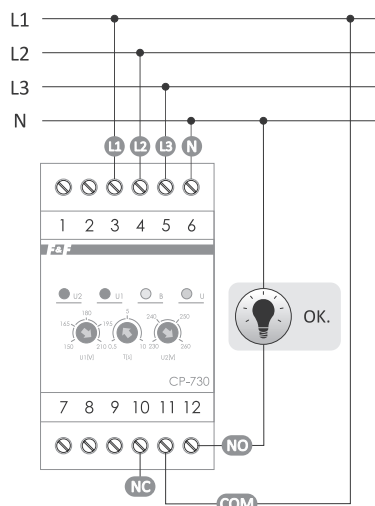


| power supply | 3×(50÷450 V)+N |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 8 A |
| power supply control | 4×LED |
| voltage activation threshold | |
| lower UL | 150÷210 V |
| upper UH | 230÷260 V |
| return voltage hysteresis | |
| for threshold UL and UH | 5 V |
| activation time | |
| for threshold UL (adjustable) | 0.5÷10 s |
| for threshold UH | 0.1 s |
| return time | |
| for threshold UL and UH | 1.5 s |
| power consumption | 1.7 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

* Uwaga na poprzedniej stronie

# Under-voltage

## CP-733   3×NC contacts

When the mains voltage is correct, the contacts remain open. Voltage loss in a phase or its drop below a set threshold of tripping voltage will cause the closing of a contact corresponding to this phase. The contact is opened automatically when the voltage in the phase returns or when the voltage increases by 5 V above the set threshold (by the value of voltage hysteresis).

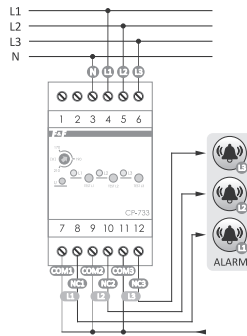| | |
|---|---|
| power supply | 3×(50÷450 V)+N |
| contact | separated 3×NC |
| maximum load current (AC-1) | 3×8 A |
| power supply control | 4×LED |
| activation voltage (adjustable) | 170÷210 V |
| voltage hysteresis | 5 V |
| activation time/return | 0.5 s/ 1.5 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## CP-734   3×NO contacts

When the mains voltage is correct, the contacts remain closed. Voltage loss in a phase or its drop below a set threshold of tripping voltage will open a contact corresponding to this phase. The contact is closed automatically when the voltage in the phase returns or when the voltage increases by 5 V above the set threshold (by the value of voltage hysteresis).
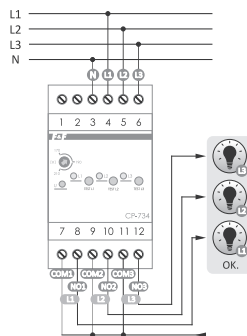
| | |
|---|---|
| power supply | 3×(50÷450 V)+N |
| contact | separated 3×NO |
| maximum load current (AC-1) | 3×8 A |
| power supply control | 4×LED |
| activation voltage (adjustable) | 170÷210 V |
| voltage hysteresis | 5 V |
| activation time/return | 0.5 s/ 1.5 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

Chapter 28

## CP-500   power supply 3×500 V, without neutral wire

When the mains voltage is correct, the contacts remain closed. Triggering any protection causes the sensor contacts to open. The contacts will be closed automatically when the correct network parameters return.
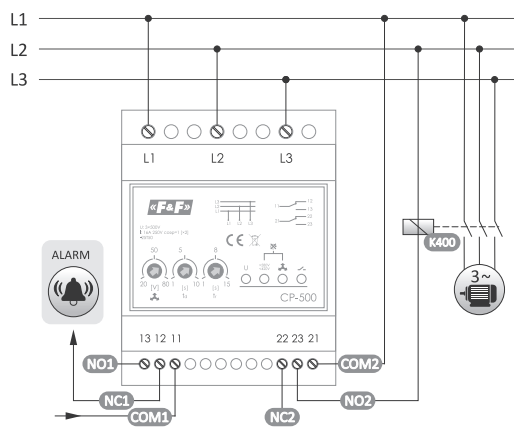
| | |
|---|---|
| power supply | 3×500 V |
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| power supply control/status indication | 4×LED |
| voltage/activation asymmetry (adjustable) | 20÷80 V |
| activation time on asymmetry (adjustable) | 1÷10 s |
| voltage threshold/activation time | |
| upper | 580 V/0.5 s |
| lower | 420 V/5 s |
| voltage hysteresis | 5 V |
| return time (adjustable) | 1÷15 s |
| power consumption | 1.4 W |
| working temperature | -25÷50°C |
| connection of contacts 1 and 2 | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| terminal L₁, L₂, L₃ | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 4 modules (70 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

• Protection against phase loss;
• Protection against phase sequence change;
• Protection against phases asymmetry;

• Protection against rising of the voltage above 580 V;
• Protection against dropping of the voltage below 420 V.

## Purpose

Automatic phase switches are designed to ensure the continuity of power supply to single-phase receivers in the event of a power phase loss or a drop in its parameters below the norm. They constitute a single-phase automatic transfer switching system. They are particularly useful in cases where a continuous supply of voltage with correct parameters is required, for example, refrigeration and air-conditioning equipment, computer and telecommunications networks, cable television, alarm systems, etc.

## PF-431/PF-431-LED with a priority phase

### Functioning

A three-phase voltage (3×400 V+N) is applied to the input of the switch. The switch output is supplied with a single-phase voltage (230 V AC), which means phase voltage of one of the phases. The electronic circuit of the switch controls the voltage values of the applied phases so that the output voltage is not less than 195 V. The phase with the correct parameters is directed to the switch output. The $L_1$ is a priority phase, which means if its parameters are correct, this phase will always be switched to the output. In case of a voltage drop in the phase $L_1$ below 190 V or its loss, the electronic circuit will switch $L_2$ phase to the output (if its parameters are correct). In the case of the simultaneous absence of correct voltages in the $L_1$ and $L_2$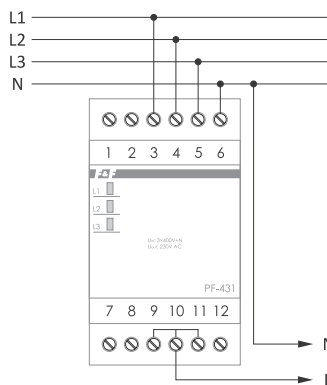 phases, the $L_3$ phase will be switched to the output. If the correct supply voltage in phase $L_1$ (above 195 V) returns, the system will switch this phase to the output.



| power supply | 3×400 V+N |
|---|---|
| output voltage | 230 V AC |
| maximum load current (AC-1)* | |
| PF-431 | <16 A |
| PF-431-LED | <16 A (120 A/20 ms) |
| activation threshold $L_1$, $L_2$ | <195 V |
| activation threshold $L_3$ | <190 V |
| voltage hysteresis | 5 V |
| voltage measurement error | ±1% |
| switching time | 0.3 s |
| input voltage signalling | 3×LED |
| power consumption | 1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

* Actual permissible load depends on the nature of the receivers. The use of the PF-441 switch with additional contactors is essential for the power supply of large household appliances, heating devices, lighting (LEDs, meta-halogens, ESL bulbs).

## PF-441 for work with contactors, with a priority phase with lower (195 V) and upper (250 V) actuation threshold

### Functioning

The switch in the direct connection is used to power a single-phase circuit whose load does not exceed 16 A. For circuits with a load of more than 16 A, we use a system of a switch and three contactors with appropriately selected load capacity.

A three-phase voltage (3×400 V+N) is applied to the input ($L_1$, $L_2$, $L_3$, N) of the switch. The switch output ($T_1$, $T_2$, $T_3$) is supplied with a single-phase voltage (230 V AC), which means phase voltage of one of the phases. The electronic circuit of the switch controls the voltage values of the supplied phases. The phase with the correct parameters is directed to the output. The $L_1$ is a priority phase, which means if its parameters are correct, this phase will always be switched to the output.

In case of a voltage drop in the phase $L_1$ or its loss, the electronic circuit will switch $L_2$ phase to the output (if its parameters are correct). In the case of the simultaneous absence of correct voltages in the $L_1$ and $L_2$ phases, the $L_3$ phase will be switched to the output.

If the correct supply voltage in phase $L_1$ returns, the system will switch this phase to the output. Switching time (the appearance of the voltage at the output) after the loss of the currently switched-on phase is between 0.5 and 0.8 seconds (during this time the receivers are not supplied with power). The "Uk" input is used to control the switched-on voltages. The system allows only one phase to be switched on. This prevents the two phases from being simultaneously fed to the output, which could cause a phase-to-phase short-circuit. In the event of a permanent short-circuit of the contactor contacts, the system will not switch to another contactor despite the incorrect voltage in this phase. After switching on the supply voltage (at least one phase) for 2 seconds, the system examines the correctness of the applied voltages and only after that time will it switch on the phase to the output.



| power supply | 3×400 V+N |
|---|---|
| output voltage | 230 V AC |
| maximum load current (AC-1) | |
| direct connection | 16 A |
| with contactors | to the load capacity of contactor contacts |
| activation threshold | |
| lower | 195 V |
| upper (adjustable) | 250 V |
| voltage hysteresis | 5 V |
| voltage measurement error | ±1% |
| switching time | 0.5÷0.8 s |
| power indication | green LED |
| indication of the selected phase | 3× yellow LED |
| power consumption | 1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 4 modules (70 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# PF-451 for work with contactors, without a priority phase
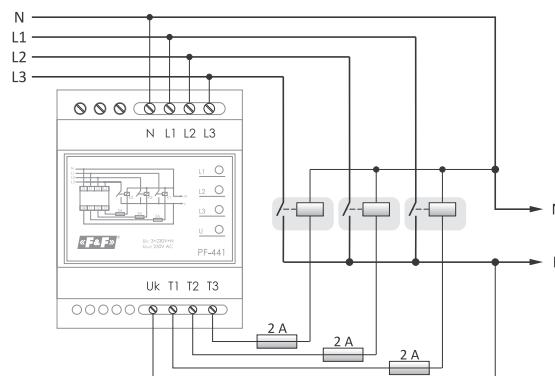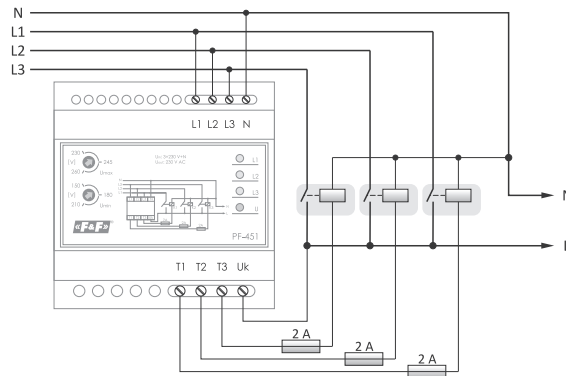with adjustable lower (150÷210 V) and upper (230÷260 V) actuation threshold

The switch in the direct connection is used to power a single-phase circuit whose load does not exceed 16 A. For circuits with a load of more than 16 A, we use a system of a switch and three contactors with appropriately selected load capacity.

A three-phase voltage (3×400 V+N) is applied to the input ($L_1$, $L_2$, $L_3$, N) of the switch. The switch output ($T_1$, $T_2$, $T_3$) is supplied with a single-phase voltage (230 V AC), which means phase voltage of one of the phases. The electronic circuit of the switch controls the voltage values of the supplied phases. The phase with the correct parameters is directed to the output. The sequence of phase switching is not specified – the phase with the best parameters is always directed to the output. The switch to the next good phase will be made only after the quality of the parameters of this phase has decreased. Switching time (the appearance of the voltage at the output) after the loss of the currently switched-on phase is between 0.5 and 0.8 seconds (during this time the receivers are not supplied with power).

The "Uk" input is used to control the switched-on voltages. The system allows only one phase to be switched on. This prevents the two phases from being simultaneously fed to the output, which could cause a phase-to-phase short-circuit. Also, in case of damage to the contactor (for example as a result of a break in the coil circuit, a suspended or burnt operating contact), the receiver will switch to another phase, despite the fact that the voltage at this phase is correct. In the event of a permanent short-circuit of the contactor contacts, the system will not switch to another contactor despite the incorrect voltage in this phase. After switching on the supply voltage (at least one phase) for 2 seconds, the system examines the correctness of the applied voltages and only after that time will it switch on the phase to the output.



| power supply | 3×400 V+N |
|---|---|
| output voltage | 230 V AC |
| maximum load current (AC-1) | |
|   direct connection | 16 A |
|   with contactors | to the load capacity of contactor contacts |
| activation threshold $L_1$, $L_2$ | <195 V |
| activation threshold $L_3$ | <190 V |
| voltage hysteresis | 5 V |
| voltage measurement error | ±1% |
| switching time | 0.3 s |
| input voltage signalling | 3×LED |
| power consumption | 1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 5 modules (85 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# PF-452 phase voltage output with adjustable lower (150÷210 V)
and upper (230÷270 V) threshold and with the actuation time (2÷10 s)

A three-phase voltage (3×400 V+N) is applied to the input ($L_1$, $L_2$, $L_3$, N) of the switch. The electronic circuit of the switch controls the voltage values of the supplied phases. Two phases with the correct parameters are directed to the outputs. The sequence of phase switching is not specified.

After a drop in the value of the parameters of one phase, the switchover to the next good phase takes place. Switching time (the appearance of the voltage at the output) after the loss of the currently switched-on phase is between 0.5 and 0.8 seconds (during this time the receivers are supplied with power). The "Uk" input is used to control the switching of the contacts and protects against simultaneous supplying of two phases to one output in case of the relay contacts are glued together.

The switch can operate in two receiving options: phase-to-phase 400 V AC voltage or 2×230 V AC phase voltages.

In the case of the remaining one correct phase, the controller operates according to the selected function:

**Function A** (no P-P jumper). A correct phase is directed to both $R_1$ and $R_2$ output. For the phase-to-phase receiving option, this means no 400 V power supply.

**Function B** (P-P jumper). A correct phase is directed only to $R_1$ output.

Application: priority controller: if it is not possible to connect all devices to one phase at the same time due to the load, then the key single-phase receivers are connected to the output $R_1$ and will be powered whenever at least one phase is good. Secondary receivers will be connected to the output $R_2$ and will only work when at least two phases of the power supply are correct. The operating option is set via a jumper at the P-P terminals.
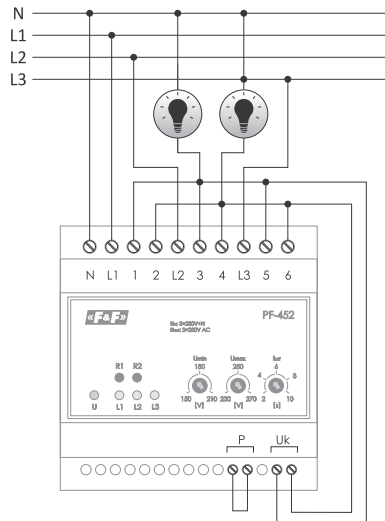


| power supply | 3×400 V+N |
|---|---|
| output voltage | |
|   A function | 400 V |
|   B function | 2×230 V |
| maximum load current (AC-1) | |
|   direct connection | 16 A |
|   with contactors | to the load capacity of contactor contacts |
| activation threshold | |
|   lower (adjustable) | 150÷210 V |
|   upper (adjustable) | 230÷270 V |
| voltage hysteresis | 5 V |
| activation time (adjustable) | 2÷10 s |
| voltage measurement error | ±1% |
| switching time | 0.5÷0.8 s |
| power indication | green LED |
| indication of the selected phase | 3× yellow LED |
| outputs indication | 2× red LED |
| power consumption | 1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 5 modules (85 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Automatic transfer switches

## Purpose

Automatic transfer switches are designed to control the parameters and correctness of power supply lines and automatic switching of power supply sources of the facility in case of a drop in power supply line parameters or a total loss of voltage in this line.

# SZR-277

## Purpose

The SZR-277 automatic transfer switch is designed for automatic switching of power sources operating in the following configuration: N1+N2 or N1+G in single-phase networks.

## Functions

- Control of supply line parameters;
- Protection of the receivers from too high or too low voltage;
- Control of the relay contacts and protection against the possibility of a short circuit between the generator and the mainline;
- Generator startup control;
- Emergency external safety switch;
- Backup power supply for the controller from the battery along with the battery charging system.

| supply voltage | |
|---|---|
| main line (terminals 1-2) | 195÷265 V/50 Hz |
| generator (terminals 1-3) | 195÷265 V/50 Hz |
| battery* (terminals 1-4) | 10÷14.5 V DC |
| maximum allowable voltage (terminals 1-2, 1-3) | 400 V |
| maximum switching current | 16 A (AC-1)/250 V |
| of internal contacts | 3 A (AC-15)/250 V |
| contact | 3×NO |
| voltage threshold** | |
| lower (adjustable) | 150÷210 V |
| upper | 270 V |
| hysteresis | 5 V |
| switch-off time | |
| for lower threshold (adjustable) | 1÷15 s |
| for upper threshold | 0.3 s |
| switching time | 0.3 s |
| time of qualifying the line as good | 10 s |
| start time of the generator | 5÷120 s |
| power consumption | 4 W |
| working temperature | 10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 3 modules (52 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* recommended battery type:  RLA, 12 V voltage, 1.2 Ah capacity;
\*\* when the voltage exceeds 300 V, the load is disconnected in no more than 0.1 seconds

## Schemat podłączenia



Connection at the current <16 A (AC-1)
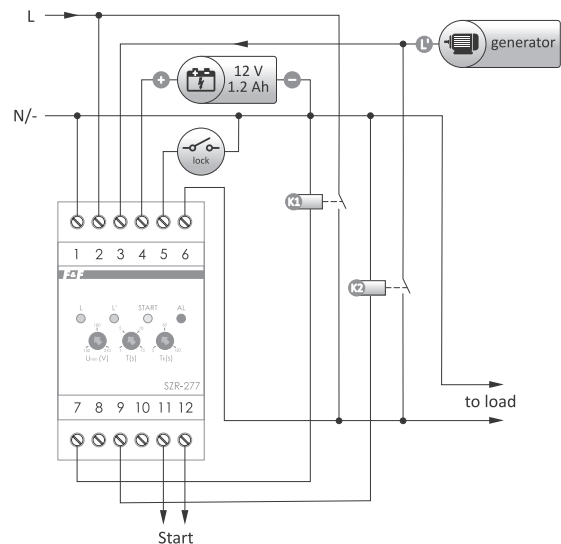


Connection (with the contactors) at the current above 16 A (AC-1)

## Work modes
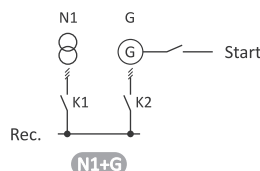
# SZR-278

**Purpose**

The SZR-278 automatic transfer switch is designed for automatic switching of power sources operating in the following configuration: N1+N2 or N1+N2+S.
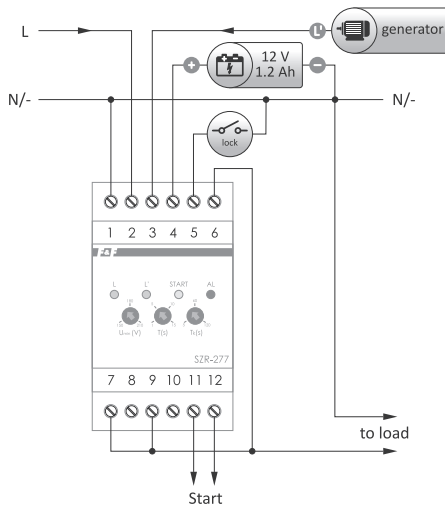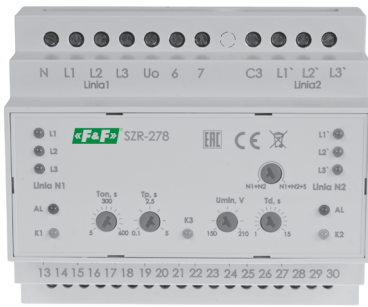
| | |
|---|---|
| controlled lines | 3×400V+N |
| supply voltage | 24÷264 V AC |
| maximum voltage | 450 V AC |
| frequency | 45÷55 Hz |
| number of controlled lines | 2 |
| number of relay outputs | 4×NO/NC |
| maximum coil current of contactor | 2 A |
| lower voltage threshold | 150÷210 V AC |
| upper voltage threshold | 270 V AC |
| lower switch-off time | 1÷15 s |
| upper switch off time | 0.3 s |
| line switching time | 0.1÷5 s |
| effective voltage unbalance | 80 V |
| switch-off time at voltage drop | 0.1 s |
| power consumption | 4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 6 modules (105 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- Phase presence check;
- Phase sequence check;
- Phase asymmetry check;
- Monitoring of minimum and maximum phase voltage;
- Control of contactors or motorized switches;
- Status of the contactors check;
- Monitoring of overcurrent circuit breakers operation;
- Can be powered from an external power source;
- Operation in the voltage range from 24 to 450 V;
- Can be used in 1-phase and 3-phase circuits;

- Automatic activation of backup power according to the specified algorithm;
- Protection of receivers against voltages above 400 V;
- Setting the operating time of the automatic transfer switch system after shutdown and restoration of the main power supply;
- Manual control of actuators;
- Indication of presence and correctness of voltages at the inputs;
- Status indicators (ON, OFF, Failure) of actuators;
- Software lock protecting against simultaneous activation of contactors;
- Common neutral wire for both lines.

**Wiring diagram**
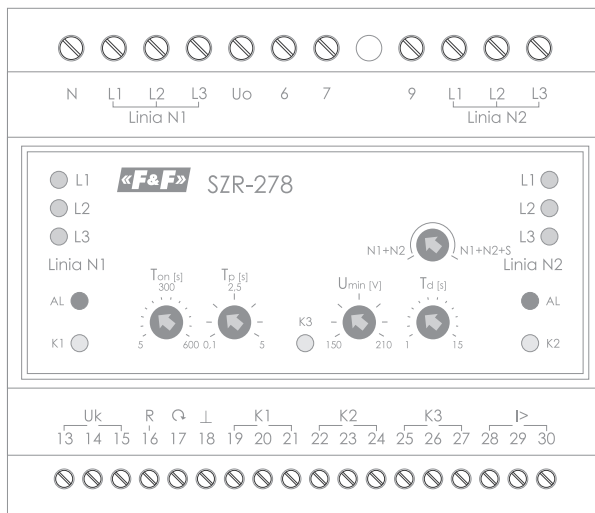


| | |
|---|---|
| 2-4 | line N1 |
| 10-12 | line N2 |
| 13-15 | voltage control |
| 16 | safety switch |
| 17 | error reset |
| 19-27 | control of output devices |
| 28-30 | auxiliary control input |

**Work modes**



N1+N2

N1+N2+S

# SZR-279

**Purpose**

The SZR-279 automatic transfer switch is designed for automatic switching of power supply sources in one or two supply lines with the possibility of additional control of an emergency generator.
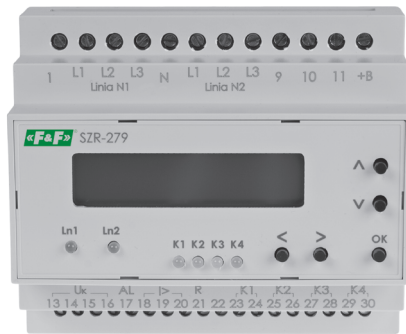
| | |
|---|---|
| controlled lines | 3×400V+N |
| supply voltage | 24÷264 V AC |
| maximum voltage | 450 V AC |
| frequency | 45÷55 Hz |
| number of controlled lines | 3 |
| number of relay outputs | 4×NO/NC, 1×NO |
| maximum coil current of contactor | 2 A |
| lower voltage threshold | 150÷210 V AC |
| upper voltage threshold | 230÷300 V AC |
| lower switch-off time | 2÷30 s |
| upper switch off time | 0.3÷10 s |
| line switching time | 0.3÷30 s |
| effective voltage unbalance | 20÷100 V |
| start-up time of the generator | 5÷100 s |
| shutdown time of the generator | 10÷200 s |
| switch-off time at voltage drop | 4 s |
| power consumption | 6 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 6 modules (105 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- Phase presence check;
- Phase sequence check;
- Phase asymmetry check;
- Monitoring of minimum and maximum phase voltage;
- Control of contactors or motorized switches;
- Status of the contactors check;
- Monitoring of overcurrent circuit breakers operation;
- Start signal of the generator;
- ALARM output;
- PIN code to block access to controller settings;
- Can be powered from an external power source;
- Operation in the voltage range from 24 to 450 V;
- Can be used in 1-phase and 3-phase circuits;

- Automatic activation of backup power according to the specified algorithm;
- Protection of receivers against voltages above 400 V;
- Setting the operating time of the automatic transfer switch system after shutdown and restoration of the main power supply;
- Manual control of actuators;
- Indication of presence and value of voltages at the inputs;
- Status indicators (ON, OFF, Failure) of actuators;
- Display of operating modes;
- Software and the electrical lock protecting against simultaneous activation of contactors;
- Separated signalling and alarm outputs;
- Monitoring of the backup line from the generator.

**Wiring diagram**
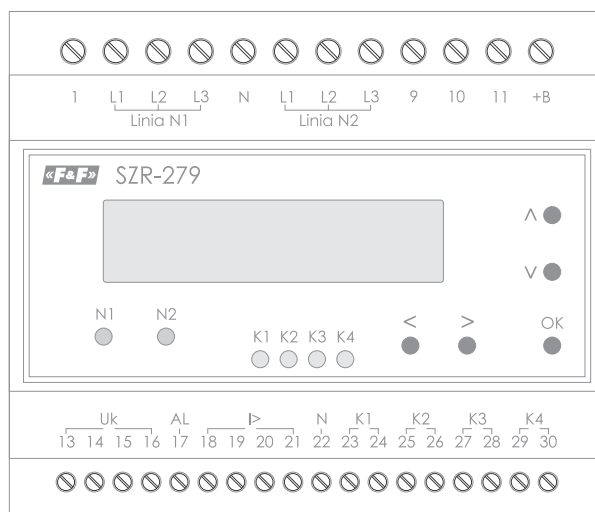


| | |
|---|---|
| 2-4line N1 | |
| 6-8 | line N2 |
| 12 | auxiliary power supply |
| 13-15 | voltage control |
| 17 | error indication |
| 18-20 | current control |
| 21 | safety switch |
| 22-28 | control of output devices |
| 29-30 | start-up of the generator |

N1    G
Start
K1    K2
Rec.
**N1+G**

N1    N2
K1    K2
Rec.
**N1+N2**

N1    N2
K1    K2
K3
Rec. 1    Rec. 2
**N1+N2+S**

N1    N2
K1    K4    K2    K3
Rec. 1    Rec. 2
**N1+N2+S1+S2**

N1    N2    G    K4
K1    K2    K3    KU
Rec.
**N1+N2+G**

N1    N2    G    K4
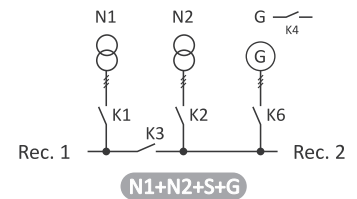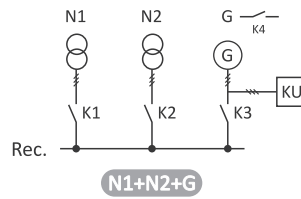K1    K2    K6
K3
Rec. 1    Rec. 2
**N1+N2+S+G**
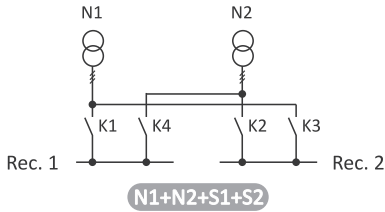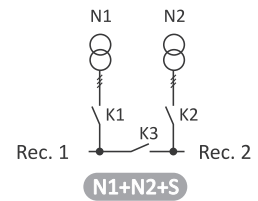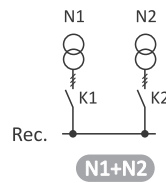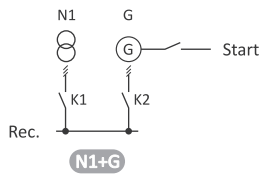
# SZR-280 / SZR-280/12

## Purpose

The SZR-280 automatic transfer switch is designed for automatic switching of power sources operating in the following configuration: N1+N2 or N1+G, with load shedding support and event recording. Configuration of the controller by means of a computer application.

| controlled lines | 2 |
|---|---|
| **controller power supply** | |
| supply voltage | |
| SZR-280 | 85÷264 V AC |
| SZR-280/12 | 11÷14 V AC/DC |
| power consumption | 4 W |
| input voltage measured | |
| rated voltage | 230 V |
| measuring range | 80÷300 V |
| frequency | 45÷55 Hz |
| accuracy | 1% of the full scale + 1 digit |
| relay outputs | |
| contacts | 5×NO |
| maximum load current (AC-1) | 5×8 A |
| status indication | 8×LED |
| working temperature | 10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| dimensions | 100×75×110 mm |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- Simultaneous control of two power lines;
- Measurement of True RMS values;
- Galvanic separation of measuring inputs of power supply lines for contactor control;
- Support for the emergency diesel generator;
- Automatic mode operation with the ability to set a priority line;
- The load shedding is carried out by dividing the receiving line into 2 parts, with the ability to freely define the load shedding cases;
- Independent setting for each line of the voltage range for which the line is qualified as good and setting of voltage hysteresis for the line qualification;
- Setting the time of qualifying the line as good and as bad;
- Accelerated qualification of a line as bad in case of a total loss of voltage on the line;
- Definition of switch-on and switch-off times of the controlled contactors;
- An external safety circuit blocking the operation of the controller can be connected;
- Configuration of the controller via a PC using a dedicated application;
- Event logging with the ability to export the log file to a PC.

*continued on next page*

<div style="text-align: right">Chapter 30</div>

| N1 | | | | |
|----|---|---|---|---|
| | L1 | | | |
| | L2 | | | |
| | L3 | | | |
| | N | | | |

PE

N1
L1
L2
L3
N

N2
L1
L2
L3
N

K1

K2

| | 1 | 3 | 5 | 7 | 9 | 11 | 13 | 15 |
|---|---|---|---|---|---|----|----|----|
| | L1 | L2 | L3 | N | L1 | L2 | L3 | N |

Linia N1        Linia N2

SZR-280

Zasilanie

| L | N | PE | | COM | K1 | K2 | K3 | K4 | K5 | | – | – | Blokada |
|---|---|----|--|-----|----|----|----|----|----|--|---|---|---------|
| 16 | 17 | 18 | | 20 | 21 | 22 | 23 | 24 | 25 | | 27 | 28 | 29 | 30 |

K1  K2    K4

Lock chain

UPS

K4
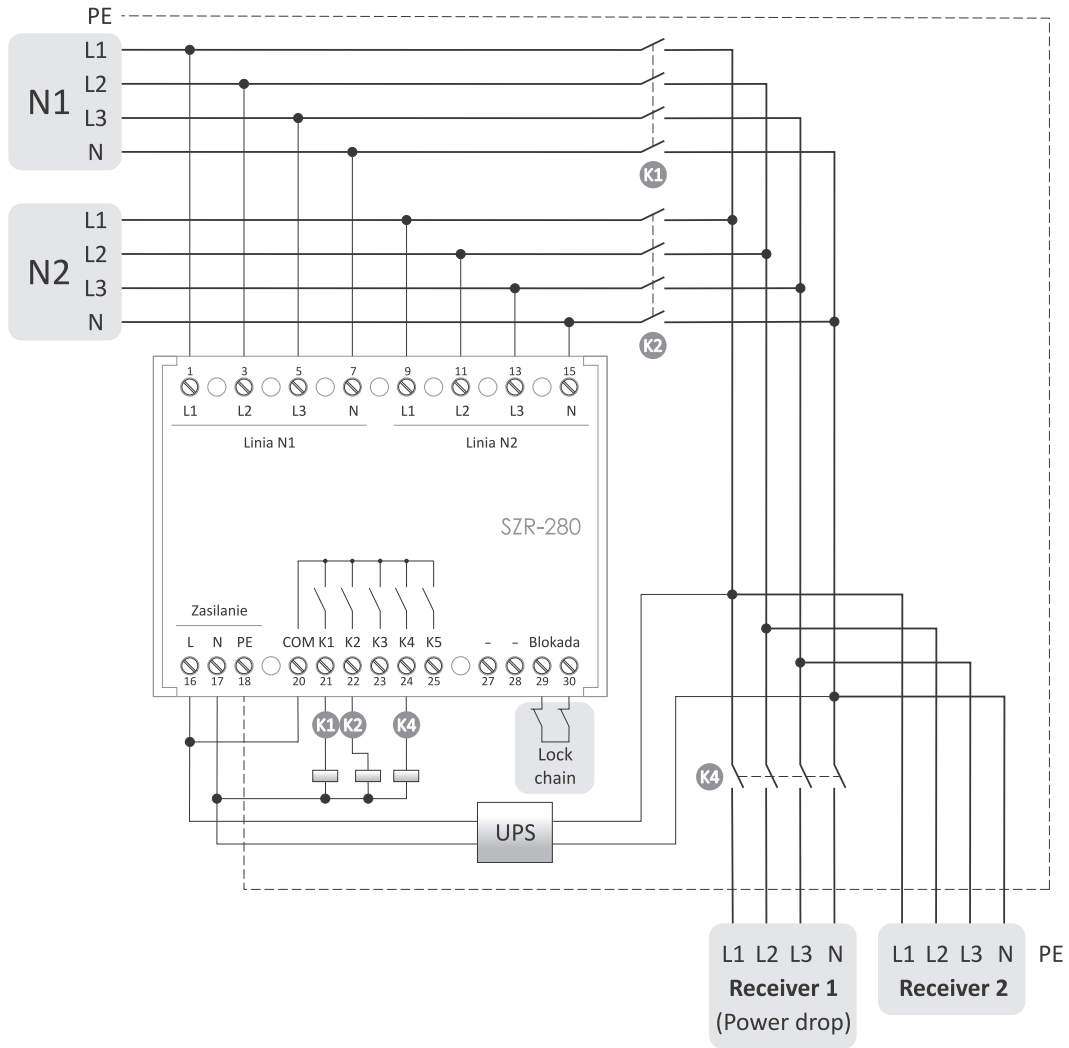
| L1 | L2 | L3 | N | | L1 | L2 | L3 | N | PE |
|----|----|----|---|--|----|----|----|---|-----|
| **Receiver 1** | | | | | **Receiver 2** | | | | |
| (Power drop) | | | | | | | | | |

| 1-7 | N1 line |
|------|------------------------|
| 9-15 | N2 line |
| 13-15 | voltage control |
| 16-18 | controller power supply |
| 20-25 | outputs control |
| 29-30 | controller lock |

N1    G

Start

K1    K2

Rec.

**N1+G**

N1    N2

K1    K2

Rec.

**N1+N2**
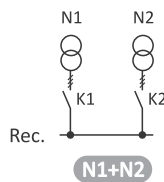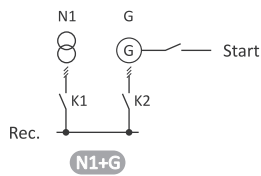
Chapter 30

# Section **VIII**

## Current protection

### Purpose

Power consumption limiters are used to disconnect the power supply of the electrical installation circuit in case of exceeding the set value of the power consumed by the receivers in this circuit. They protect against unauthorized connection and theft of electrical power.

### Functioning

The power limiter allows you to power the circuit when the total power of the receivers in the controlled circuit is lower than the set power.
Exceeding the set power consumption threshold in a controlled circuit results in the disconnection of the power supply to this circuit.
The power supply will be restored automatically after a set time.

## OM-623 with an adjustable return time, for circuits with current converters
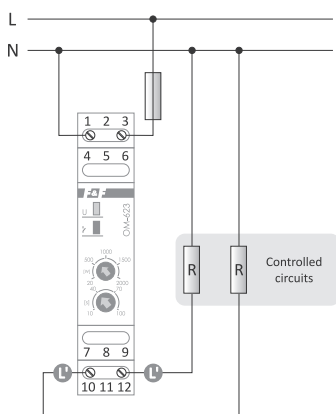
| | |
|---|---|
| power supply | 165÷265 V AC |
| maximum load current | |
| (AC-1) | 16 A |
| (AC-3) | 2 A |
| power limit (adjustable) | 20÷2000 W |
| activation delay | 2 s |
| return power supply time (adjustable) | 10÷100 s |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

## OM-1 with a fixed return time

| | |
|---|---|
| power supply | 195÷253 V AC |
| maximum load current (AC-1) | 16 A |
| power limit | 200÷2000 VA |
| activation delay | 1.5÷2 s |
| return power supply hysteresis | 2% |
| return power supply time | 30 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26mm |
| mounting | surface |
| ingress protection | IP20 |

## OM-2 with an adjustable return time

| | |
|---|---|
| power supply | 195÷253 V AC |
| maximum load current (AC-1) | 16 A |
| power limit | 200÷2000 VA |
| activation delay | 1.5÷2 s |
| return power supply hysteresis | 2% |
| return power supply time | 4÷150 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26mm |
| mounting | surface |
| ingress protection | IP20 |

# OM-631 with a fixed return time

This limiter is designed for resistive loads, such as electric heaters and classic incandescent lamps.
For other load types, the use of the OM-632 limiter is recommended.



L' – power limiter output

| | |
|---|---|
| power supply | 195÷253 V AC |
| contact | 1×NO |
| maximum load current (AC-1) | 16 A |
| power limit | 200÷1000 VA |
| activation delay | 1.5÷2 s |
| return power supply hysteresis | 2% |
| return power supply time | 30 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

# OM-632 for circuits with current converters (such as an LED) and adjustable return time

This limiter is designed to protect any electrical circuits, including those with the current converters such as compact fluorescent lamps, electronic transformers.



L' – power limiter output

| | |
|---|---|
| power supply | 195÷253 V AC |
| contact | 1×NO |
| maximum load current | |
|   AC-1 | 16 A |
|   AC-3 | 4 A |
| power limit | 200÷2000 VA |
| activation delay | 1÷2 s |
| return power supply hysteresis | 2% |
| return power supply time (adjustable) | 10÷100 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

# OM-611 for cooperation with a current transformer and with an adjustable tripping and return time

This relay is designed to cooperate with a current transformer whose primary circuit is connected to the measured circuit, and the output to the OM measurement terminals, which allows to control circuits of any load capacity and to set the actual threshold of relay activation higher than 5 A (IOM). The range of the measured current will depend on the ratio of the transformer, for example from 5 A to 50 A with a 10:1 ratio for 50/5 A transformer.
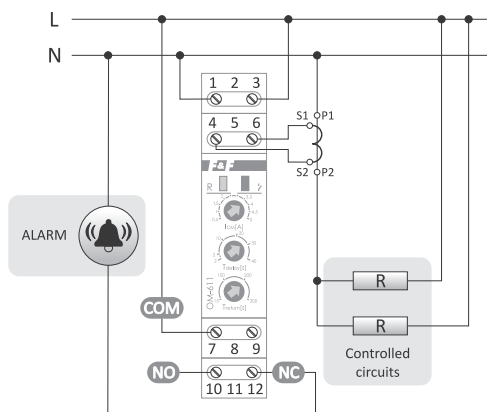


| | |
|---|---|
| power supply | 195÷253 V AC |
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 8 A |
| activation threshold (adjustable) | 0.5÷5 A |
| activation delay (adjustable) | 2÷40 s |
| return power supply hysteresis | 2% |
| return power supply time (adjustable) | 15÷300 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

# OM-616 to a flush-mounted box, with a voltage relay function

Power limiter designed for direct control of the power of plug sockets. Useful in public buildings, hotels, boarding houses, hospitals, etc. Reduces power consumption from a single outlet to low values. An additional function of a voltage relay disconnects the output when the supply voltage exceeds 270 V or drops below 150 V.



Power supply / Receiver
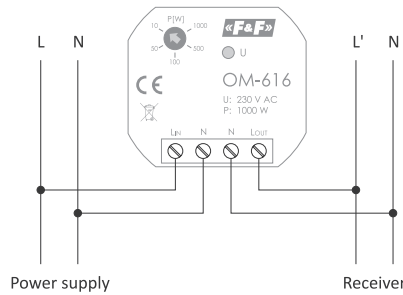
| | |
|---|---|
| power supply | 85÷265 V AC |
| contact | separated 1×NO |
| maximum load current (AC-1) | 5 A |
| power | |
| power limit (adjustable) | 10÷1000 W |
| activation time/return time | 4 s/30 s |
| voltage | |
| lower activation threshold $U_L$ | 150 V |
| upper activation threshold $U_H$ | 270 V |
| lower activation time $U_L$ | 10 s |
| upper activation time $U_H$ | 0.3 s |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | Ø54 (48×43 mm), h= 20 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

# OM-630 3-phase, direct measurement up to 50 kW



### Functions

- Measurement of the active power of a three-phase system;
- Control of asymmetry, presence, and sequence of the phases;
- Short-circuit protection;
- Priority relay function;
- The function of a three-phase voltage relay;
- Time lock for the operation of the limiter due to frequent exceeding of the setting threshold;
- Indication of exceeding the power limit value;
- Adjustment of the tripping and return times short circuit protection.

| | |
|---|---|
| power supply | 3×(50÷450 V)+N |
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| power | |
| power limit (adjustable) | 5÷50 kW |
| set-up step | 0.5 kW |
| activation time $T_{OFF}$ (adjustable) | 1÷240 s |
| return time $T_{ON}$ (adjustable) | 2÷3600 s |
| voltage | |
| lower activation threshold $U_L$ | <160 V |
| upper activation threshold $U_H$ | >260 V |
| lower activation time $U_L$ | 5 s |
| upper activation time $U_H$ | 0.1 s |
| measurement error | |
| voltage 50÷300 V | <2% |
| current 3÷100 A | <3% |
| through-hole diameter | 10 mm |
| power consumption | ≤1.5 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 6 modules (105 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |
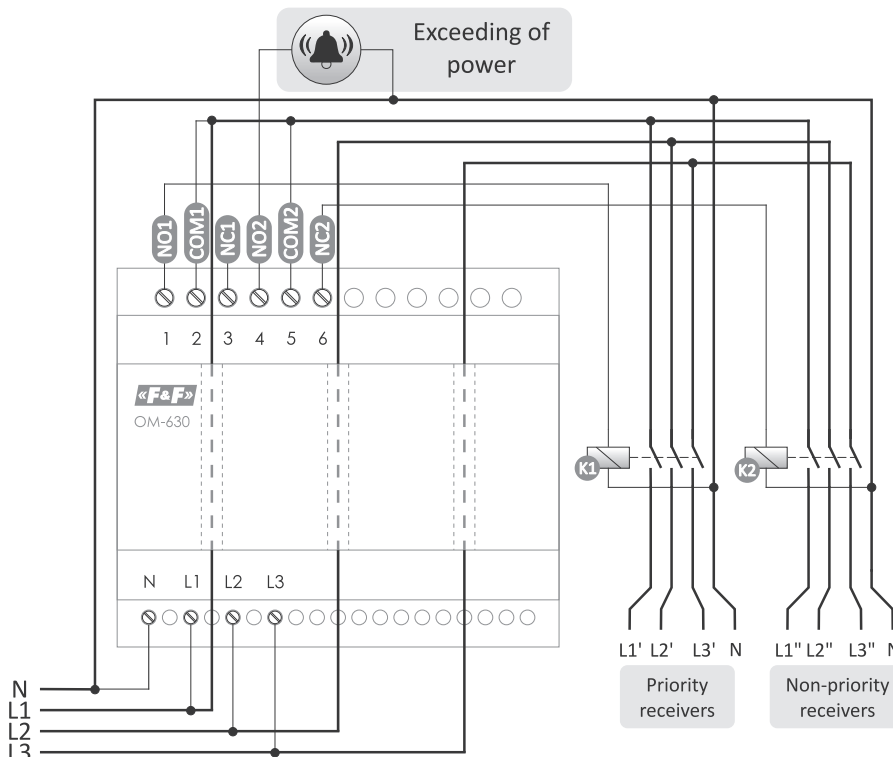
# OM-633 with power consumption indicator and voltage relay function



| power supply | 195÷253 V AC |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 16 A |
| power | |
| power limit (adjustable) | 1÷10 kW |
| activation time (adjustable) | 1÷180 s |
| return time (adjustable) | 4÷360 s |
| voltage | |
| lower activation threshold $U_L$ | 150÷210 V |
| upper activation threshold $U_H$ | 230÷260 V |
| lower activation time $U_L$ | 5 s |
| upper activation time $U_H$ | 0.3 s |
| through-hole diameter | 5 mm |
| power consumption | 2.5 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

## Functions

- An adjustable threshold of tripping power 1÷10 kW;
- Protection against the drop of $U_L$ power supply voltage (150÷210 V);
- Protection against the increase of $U_H$ power supply voltage (230÷260 V);
- Counter of relay actuations with automatic disconnection of system power supply after exceeding a set number of actuations;
- Automatic lock of the system power supply for 10 minutes in the case the power was exceeded fivefold;

- Automatic power-off when power consumption is 8 times higher than the set threshold value;
- Automatic power-off when power consumption is greater than 16 kW;
- Adjustable actuation time (1 s÷3 min.);
- Adjustable reconnection time (4 s÷6 min.);
- LED display for indicating power consumption and device configuration.

# OMS-635 with a staircase timer

## Purpose

OMS-635 is a power limiter integrated with an automatic staircase lighting time switch. It is designed to keep the lighting switched on for a preset time, for example in corridors or staircases. After the preset time has elapsed, the lighting will be automatically switched off. In addition, the integrated power limiter protects the lighting circuit from unwanted use of electricity from the lighting system. An additional output enables the connection of controlled circuits regardless of whether the lighting is switched on or off. In case the set power has been exceeded in any of the circuits, both are switched off for 30 seconds.



L' – power limiter putput
L" – output of the automatic staircase time switch
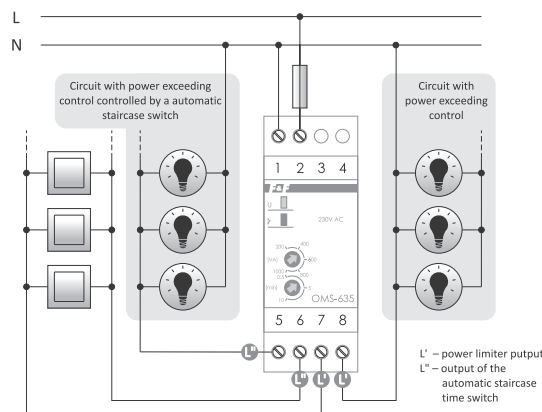
| power supply | 195÷253 V AC |
|---|---|
| contact | separated 2×NO |
| maximum load current (AC-1) | 16 A |
| power limit | 200÷1000 VA |
| activation delay | 1.5÷2 s |
| return power supply hysteresis | 2% |
| return power supply time | 30 s |
| lighting activation time (adjustable) | 0.5÷10 min. |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

# Chapter 32
# Priority relays

## Purpose

Priority relays are used, among others, when to the current circuit are connected at least 2 high-power receivers, which can work independently, and their simultaneous operation would cause the activation of current protections.

## Functioning

Using the potentiometer we can set the value of the current consumption in the priority circuit above which the relay disconnects the non-priority circuit. A drop in the current consumption in the priority circuit below the set threshold value will automatically switch on the non-priority circuit. If a priority receiver is already switched on, the relay will prevent the non-priority receiver from being switched on.
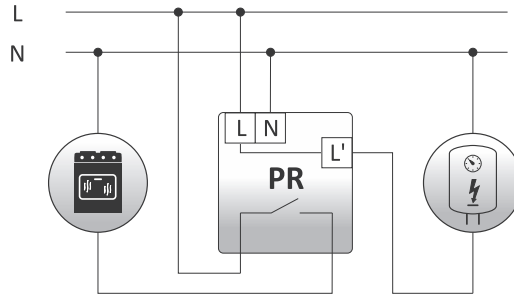


(!) For circuits with PR (priority relays), it is recommended to use overcurrent protections with longer activation time so that they do not overtake the PR reaction.

## PR-602  adjustment range: 2÷15 A



| power supply | 195÷253 V AC |
|---|---|
| maximum non-priority receivers current (AC-1)* | 16 A |
| maximum priority receivers current (AC-1) | 15 A |
| contact | separated 1×NO |
| switching current | 2÷15 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

\* a higher current requires an additional contactor

## PR-612  adjustment range: 2÷15 A



| power supply | 195÷253 V AC |
|---|---|
| maximum non-priority receivers current (AC-1)* | 16 A |
| maximum priority receivers current (AC-1) | 15 A |
| contact | separated 1×NO/NC |
| switching current | 2÷15 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

\* a higher current requires an additional contactor

## With a pass-through duct for the current cable of the receiver

**Purpose**

For priority circuits with a load capacity of more than 16 A, we use relays with a pass-through duct for the current wire of the receiver (max Ø= 4 mm), which is galvanically separated from the measuring system of the relay.

### PR-603  adjustment range: 2÷15 A





| power supply | 195÷253 V AC |
|---|---|
| maximum non-priority receivers current (AC-1)* | 16 A |
| maximum priority receivers current (AC-1) | limited by the cross-section of the cable (maximum ø4 mm) |
| contact | separated 1×NO |
| switching current | 2÷15 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 50×67×26 mm |
| mounting | surface |
| ingress protection | IP20 |

\* a higher current requires an additional contacto
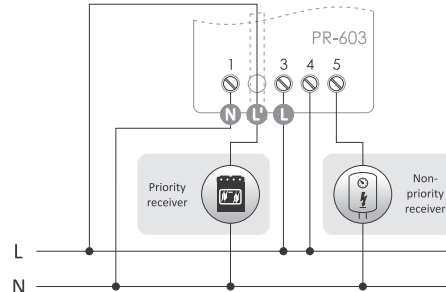
### PR-613  adjustment range: 2÷15 A





| power supply | 195÷253 V AC |
|---|---|
| maximum non-priority receivers current (AC-1)* | 16 A |
| maximum priority receivers current (AC-1) | limited by the cross-section of the cable (maximum ø4 mm) |
| contact | separated 1×NO/NC |
| switching current | 2÷15 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

\* a higher current requires an additional contactor

### PR-615  adjustment range: 4÷30 A





| power supply | 195÷253 V AC |
|---|---|
| maximum non-priority receivers current (AC-1)* | 16 A |
| maximum priority receivers current (AC-1) | limited by the cross-section of the cable (maximum ø4 mm) |
| contact | separated 1×NO/NC |
| switching current | 4÷30 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

\* a higher current requires an additional contactor

The priority receiver current can be greater than 15 A. It is limited only by the cross-section of the current cable of the receiver (separated from the measuring system), which is passed through the pass-through duct of the relay.

Chapter 32

# For use with a current transformer

# PR-614

**Purpose**

The relay is adapted to work with a current transformer with a secondary current of 5 A.

The primary circuit of the transformer is connected to the current circuit of the priority receiver and the secondary circuit to the measuring terminals of the relay.

**Example:** For a priority receiver with a maximum load of 140 A, we use a current transformer with parameters of 150/5 A. The ratio is 30.

When the scale value is set to 2 A, the relay will trip when the actual current value is 60 A (2 A × 30 = 60 A).
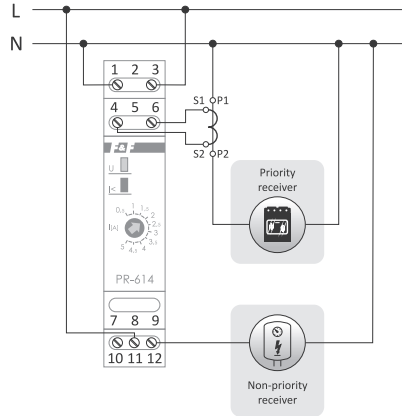
| | |
|---|---|
| power supply | 195÷253 V AC |
| maximum non-priority receivers current (AC-1)* | 16 A |
| current of the measuring input 4-6 | <5 A |
| contact | separated 1×NO/NC |
| switching current | 0.5÷5 A |
| switching delay | 0.1 s |
| return hysteresis | 10% |
| return delay | 0.1 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

\* a higher current requires an additional contactor

**Interesting and practical**
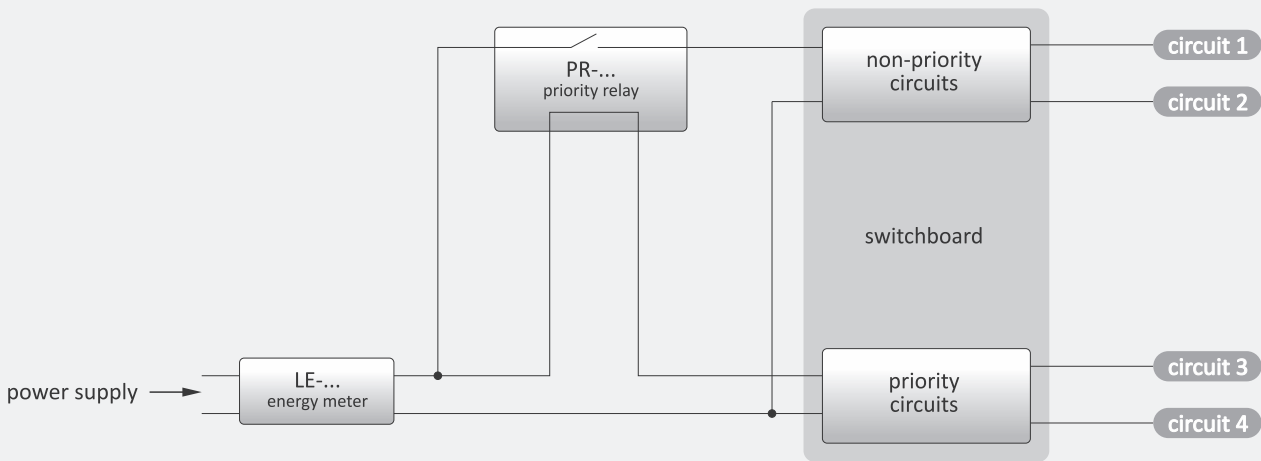


Protection against exceeding the limit of the contracted power

All PR (priority relays) can be used for three-phase networks and three-phase receivers. In the case of symmetrical receivers, it is enough to connect only 1 PR relay to any phase.

For an asymmetrical receiver, use one relay per each phase with a properly set tripping threshold depending on the load of the given phase.
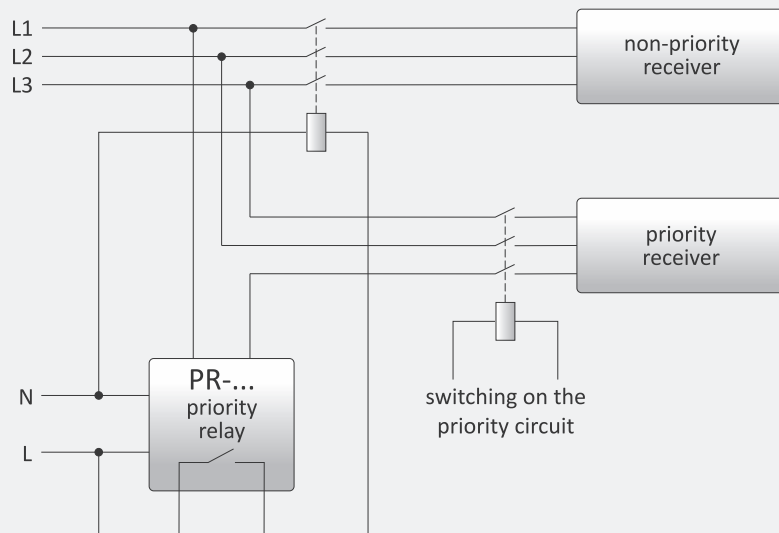


Use of the PR in the symmetrical three-phase receiver system

# Current relays

The current relays are used to control the values of the current in circuits measured with contact switching function when the current exceeds the set threshold values.

## EPP-618 with LED display and a pass-through duct for a current cable of the measured circuit

### Functioning

The EPP-618 relay enables the display of values and control of single-phase AC current flowing in the measured circuit.
The FUNC knob allows you to select one of the four operation diagrams shown in the diagrams below.

### Functions

- Direct measurement of currents up to 50 A;
- Indirect measurement up to 999 A (using an external current transformer);
- 4 operating modes:
  - indication of exceeding the preset value of current;
  - indication of the current drop below the preset value;
  - indication of exceeding the preset current with programmable hysteresis;
  - indication of the current outside the specified range.
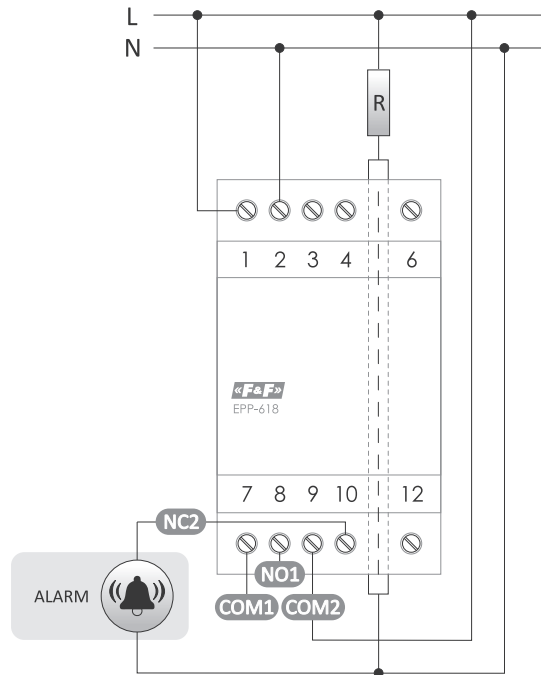


| | |
|---|---|
| power supply | 195÷253 V AC |
| contact | separated 1×NO, 1×NC |
| maximum load current (AC-1) | 2×8 A |
| adjustment range for direct measurement | 0.5÷50 A |
| ratio adjustment range | 1÷999 |
| activation time adjustment range | 0.5÷60 s |
| deactivation time adjustment range | 0.5÷60 s |
| constant hysteresis | 10% |
| measurement error | <3% |
| diameter of the pass-through duct | ø4 mm |
| power consumption | 4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 3 modules (51 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

### Work functions
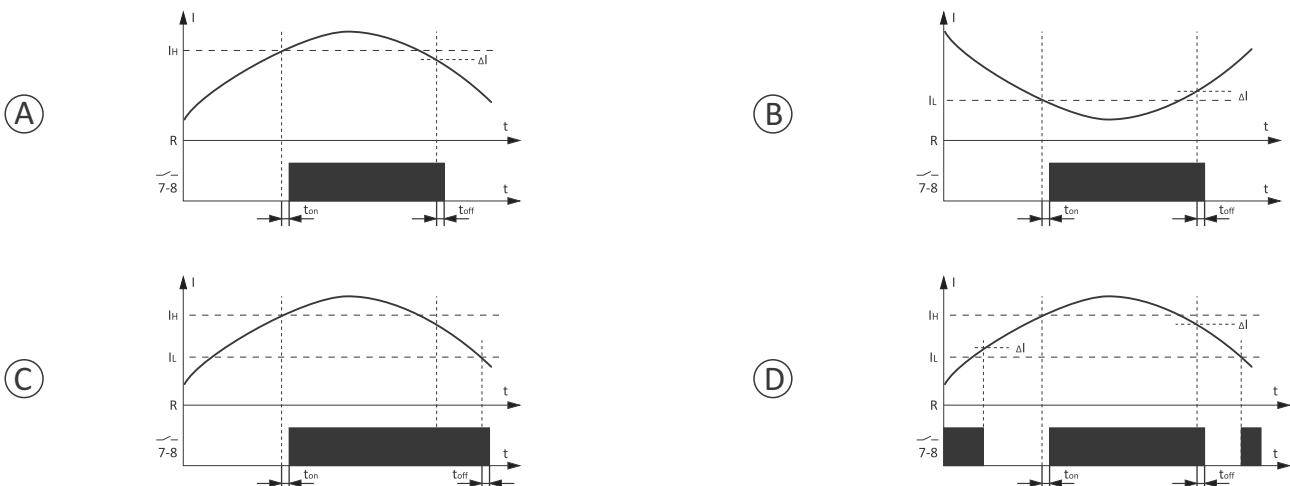
# EPP-619  with a pass-through duct for a current cable of the measured circuit

**Functioning**

The value of the measured circuit current, above which the contact will be closed (position 11-12) is set with a potentiometer.
A drop in the current below the set threshold value will automatically open the contact (position 11-10).
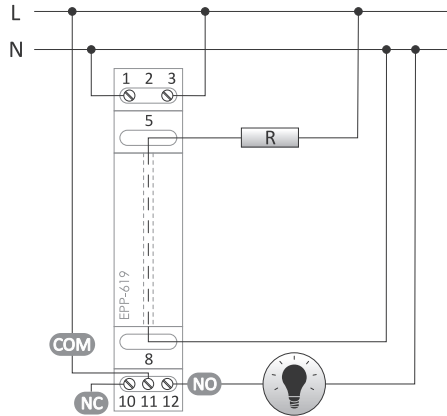


| power supply | 195÷253 V AC |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 16 A |
| current measuring circuit | limited by the cross-section of the cable |
| switching current (adjustable) | 0,6÷16 A |
| return hysteresis | 10% |
| activation delay (adjustable) | 0.5÷10 s |
| return delay | 0.5 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |
| **pass-through duct** | |
| diameter | ø4 mm |
| insulation | fibreglass impregnated with rubber |
| insulation breakdown voltage | 4 kV/mm |

# EPP-620  4-function, with adjustable lower and upper tripping threshold

**Functioning**

The relay is adapted to work with a current transformer with a secondary current of 5 A. The primary circuit of the transformer is connected to the measured current circuit and the secondary circuit to the measuring terminals of the relay.  The potentiometers are used to set the current thresholds: lower "Imin" and upper "Imax". The FUNC knob allows you to select one of the four operation diagrams shown in the diagrams below.
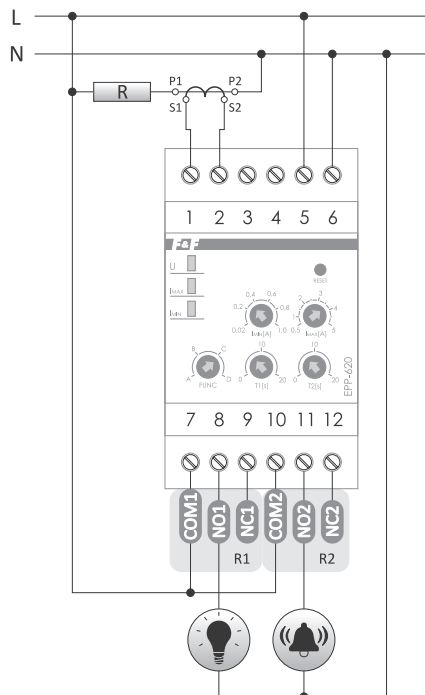


| power supply | 85÷264 V AC |
|---|---|
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×8 A |
| maximum current of the measuring input | 5 A |
| current thresholds (adjustable) | |
| Imin | 0.02÷1 A |
| Imax | 0.5÷5 A |
| activation delay (adjustable) | 0÷20 s |
| return hysteresis | 10% |
| return time | 0.5 s |
| power consumption | 0.4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

If "$I_{min}$" is exceeded, the contact $R_1$ is closed. After exceeding the "$I_{max}$" threshold, the contact $R_2$ will be closed and the contact $R_1$ will be open.
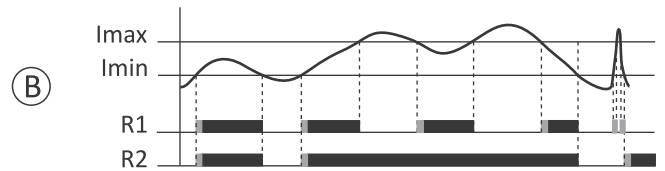


If "$I_{min}$" is exceeded, the contacts $R_1$ and $R_2$ are closed. After exceeding the "$I_{max}$" threshold, the contact $R_1$ will be open and the contact $R_2$ will be closed.
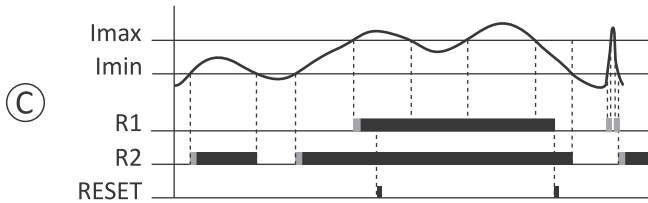


If "$I_{min}$" is exceeded, the contact $R_2$ is closed. After exceeding the "$I_{max}$" threshold, the contact $R_1$ will be closed. The $R_1$ contact is locked until the RESET button is pressed. If the value exceeds "$I_{max}$", the contact $R_1$ does not react to RESET.
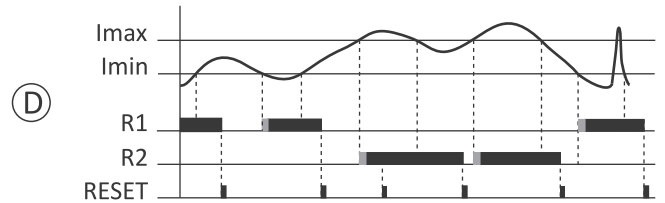


After the value drops below "$I_{min}$" the contact $R_1$ is closed. After exceeding the "$I_{max}$" threshold, the contact $R_2$ will be closed and the contact $R_1$ will be open. The $R_1$ and $R_2$ contacts are locked until the RESET button is pressed. If the value exceeds "$I_{max}$", the contact $R_2$ does not react to RESET.

# EPM-621  energy consumption direction relay (imported/exported)

**Purpose**

EPM-621 is a bidirectional relay of the direction of active electricity consumption control designed for operation in a single-phase network. It indicates if the preset level of power consumed from the network, returned to the network or both is exceeded.

**Functioning**

- The operating function and the threshold value are set using the switches.
- The relay has 4 operating modes:
  ON – test mode (switch-on of the output relay);
  EXP – control of the power exported to the network (flow in the direction "Receiver" -> "Source");
  IMP – control of power consumed from the network (flow in the direction "Source" -> "Receiver");
  I/E – power control regardless of the flow direction;
- If the set power value is exceeded, the contact is closed (position 11-12);
- The power drop below the set threshold value will automatically open the contact (position 11-10).
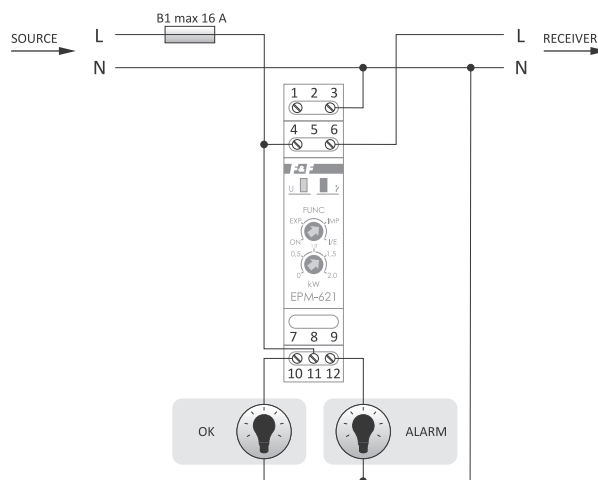


| power supply | 85÷264 V AC |
|---|---|
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 16 A |
| maximum current of the measuring circuit | 16 A |
| measuring range | 0÷2 kW |
| activation delay | 1 s |
| return hysteresis | 5% |
| return delay | 1 s |
| power consumption | 0.8 W |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

# EPS-D

## Purpose

EPS is designed to protect three-phase electric motors of any power. It effectively protects motors in expensive and important applications such as pumps, hydrophores, elevators, conveyors, fans, centrifuges, compressors, etc.

## Functioning

The relay controls the load in each phase. Based on the values of the settings entered by the user and on the actual current consumed by the motor, the microprocessor analyses the operating status of the motor. Comparing the operating status of the protected motor with the model characteristics in the memory of the processor, the EPS-D relay quickly and precisely detects any malfunctions in the operation of the motor and disconnects the motor power supply.

## Functions

- Thermal protection
- Protection against the idle run and dry run (under-current protection);
- Protection against mechanical overload;
- Protection against the stall of a rotor;

- Protection against frequent start-up;
- Protection against phase loss;
- Protection against phase sequence change;
- Protection against load asymmetry;
- Protection against ground short-circuit.

## Optional functions

- Residual current protection against electric shock (an additional Ferranti transformer connected to the device enables the protection in the range 30 mA ÷ 500 mA. Tripping time approx. 100 ms.)

## Additional functions

- Motor load preview;
- A message indicating the cause of the protection tripping;
- Heat memory of the motor.

The relay displays the current value of one selected phase of the current on the LCD display. The current can be displayed in absolute values (A) or in relative values (%) in relation to the set value of the current **In**.
In addition, it shows in real-time using the signs (I > 105% In), (I < 95% In), (95% In ÷ 105% In) the range in which the measured current falls.
The relay measures the actual value of the current up to and including the 7th harmonic. The current is measured with an accuracy of 1%.



| Execution | Setting range |
|-----------|---------------|
| 5 A* | 1÷5 A |
| 20 A | 5÷25 A |
| 100 A | 20÷100 A |

* for use with a current transformers

| | |
|---|---|
| power supply | 160÷265 V AC |
| frequency | 50 Hz |
| main circuits insulation voltage | 690 V AC |
| maximum load current (AC-15/DC-14) | 2 A |
| effective current unbalance | >30% |
| delay at phase decay and unbalance | 4 s |
| cable diameter max | ø14 |
| power consumption | 4 W |
| working temperature | 0÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| dimensions | 72×59×88 mm |
| mounting | on TH-35 rail |
| ingress protection | IP20 |
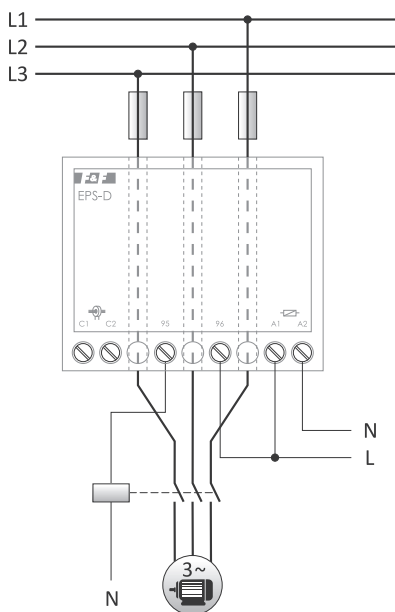


Connection scheme
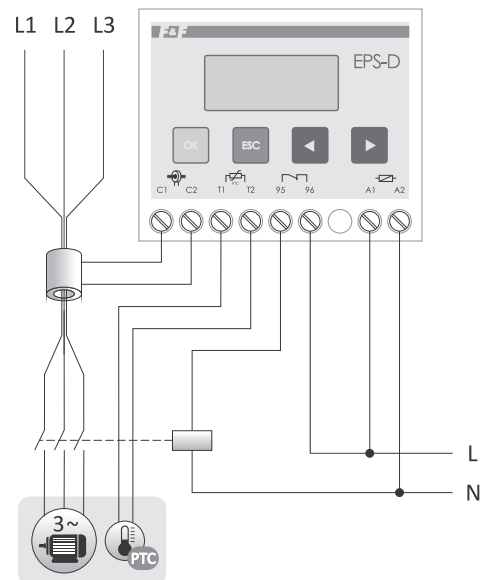


Additional residual current and temperature protection

# Fuse modules

**Purpose**

Fuse modules are used to protect electrical receivers against the effects of current rise above the nominal value of the current of the protected receiver.

**Functioning**

The fuse activation (fuse-link burnout) is indicated by the red LED.

## BZ-1  1-socket



| fuse | fuse link ø5×20 mm |
|---|---|
| maximum voltage | 250 V AC |
| maximum load current | 6.3 A |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

## BZ-2  2-socket



| fuse | fuse link ø5×20 mm |
|---|---|
| maximum voltage | 250 V AC |
| maximum load current | 6.3 A |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

## BZ-3  3-socket



| fuse | fuse link ø5×20 mm |
|---|---|
| maximum voltage | 250 V AC |
| maximum load current | 6.3 A |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

The F&F trade offer includes fast (S) and slow blow (T) fuse-links with values ranging from 0.1 A to 6.3 A.

# BZ-4  4-socket



| fuse | fuse link ø5×20 mm |
| --- | --- |
| maximum voltage | 250 V AC |
| maximum load current | 6.3 A |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | on TH-35 rail |
| ingress protection | IP20 |

## Fuse-links

The F&F trade offer includes fast (S) and slow blow (T) fuse-links with values ranging from 0.1 A to 6.3 A.

| Fast blow fuses | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | B1 | B1,25 | B1,6 | B100 | B160 | B2 | B2.5 | B200 | B250 | B3,15 | B315 | B4 | B5 | B500 | B6,3 | B630 | B800 |
| Amperage | 1 A | 1.25 A | 1.6 A | 100 mA | 160 mA | 2 A | 2.5 A | 200 mA | 250 mA | 3.15 A | 315 A | 4 A | 5 A | 500 mA | 6.3 A | 630 mA | 800 mA |

| Slow blow fuses | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Symbol | B-1 | B-1,25 | B-1,6 | B-100 | B-160 | B-2 | B-2.5 | B-200 | B-250 | B-3,15 | B-315 | B-4 | B-5 | B-500 | B-6,3 | B-630 | B-800 |
| Amperage | 1 A | 1.25 A | 1.6 A | 100 mA | 160 mA | 2 A | 2.5 A | 200 mA | 250 mA | 3.15 A | 315 A | 4 A | 5 A | 500 mA | 6.3 A | 630 mA | 800 mA |

# Section IX

## Power supply

**Functioning**

Power supplies and mains transformers are designed to safely convert 230 V AC mains voltage to low AC or DC voltages.

| Product | Type | Input voltage | Output voltage | Maximum load current (AC-1) | Power output | Size of the housing | Page |
|---|---|---|---|---|---|---|---|
| ZI-1 | pulse power supply | 85÷264 V AC | 5 V DC | 10 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-2 | pulse power supply | 85÷264 V AC | 12 V DC | 4 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-3 | pulse power supply | 85÷264 V AC | 18 V DC | 3 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-4 | pulse power supply | 85÷264 V AC | 24 V DC | 2 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-5 | pulse power supply | 85÷264 V AC | 15 V DC | 3.3 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-6 | pulse power supply | 85÷264 V AC | 48 V DC | 1 A | 50 W | 6 modules (105 mm) | 189 |
| ZI-10-12P | pulse power supply | 180÷264 V AC | 12 V DC | 0.85 A | 10 W | flush mounted box ø60 | 192 |
| ZI-20-12P | pulse power supply | 180÷264 V AC | 12 V DC | 1.7 A | 20 W | flush mounted box ø60 | 192 |
| ZI-11 | pulse stabilizer | 8÷28 V AC/ 12÷37 V DC | 5 V DC | 3 A | 15 W | 3 modules (52.5 mm) | 192 |
| ZI-12 | pulse stabilizer | 12÷28 V AC/ 16÷37 V DC | 12 V DC | 3 A | 36 W | 3 modules (52.5 mm) | 192 |
| ZI-13 | pulse stabilizer | 18÷28 V AC/ 22÷37 V DC | 18 V DC | 3 A | 54 W | 3 modules (52.5 mm) | 192 |
| ZI-14 | pulse stabilizer | 24÷28 V AC/ 28÷37 V DC | 24 V DC | 3 A | 72 W | 3 modules (52.5 mm) | 192 |
| ZI-15 | pulse power supply | 100÷264 V AC | 15 V DC | 0.8 A | 12 W | 1 module (18 mm) | 189 |
| ZI-16 | pulse power supply | 100÷264 V AC | 13.5 V DC | 0.9 A | 12 W | 1 module (18 mm) | 189 |
| ZI-17 | pulse power supply | 100÷264 V AC | 14.5 V DC | 0.8 A | 12 W | 1 module (18 mm) | 189 |
| ZI-20 | pulse power supply | 100÷264 V AC | 12 V DC | 1 A | 12 W | 1 module (18 mm) | 189 |
| ZI-21 | pulse power supply | 100÷264 V AC | 24 V DC | 0.5 A | 12 W | 1 module (18 mm) | 189 |
| ZI-22 | pulse power supply | 100÷264 V AC | 12 V DC | 2.5 A | 30 W | 3 modules (52.5 mm) | 189 |
| ZI-24 | pulse power supply | 100÷264 V AC | 24 V DC | 1.25 A | 30 W | 3 modules (52.5 mm) | 189 |
| ZI-60-24 | pulse power supply | 90÷264 V AC/ 120÷370 V DC | 24 V DC | 2.5 A | 60 W | 130×50×90 mm | 191 |
| ZI-61-12 | pulse power supply | 180÷264 V AC | 12 V DC | 5 A | 60 W | 4.5 modules (78 mm) | 190 |
| ZI-61-24 | pulse power supply | 180÷264 V AC | 24 V DC | 2.5 A | 60 W | 4.5 modules (78 mm) | 190 |
| ZI-75-12 | pulse power supply | 100÷240 V AC | 12 V DC | 6.25 A | 75 W | 130×57×115 mm | 191 |
| ZI-100-12 | pulse power supply | 180÷264 V AC | 12 V DC | 8.3 A | 100 W | 6 modules (100 mm) | 190 |
| ZI-100-24 | pulse power supply | 180÷264 V AC | 24 V DC | 4.15 A | 100 W | 6 modules (100 mm) | 190 |
| ZI-120-12 | pulse power supply | 100÷240 V AC | 12 V DC | 10 A | 120 W | 130×67×115 mm | 191 |
| ZI-120-24 | pulse power supply | 90÷264 V AC/ 120÷370 V DC | 24 V DC | 5 A | 120 W | 130×75×90 mm | 191 |
| ZI-240-12 | pulse power supply | 180÷264 V AC | 12 V DC | 20 A | 240 W | 130×127×115 mm | 191 |
| ZI-240-24 | pulse power supply | 90÷264 V AC/ 120÷370 V DC | 24 V DC | 10 A | 240 W | 130×110×90 mm | 191 |
| **ZI-USB-5** | **USB power supply** | **12÷40 V DC** | **5 V DC** | **2.1 A** | **10.5 W** | **1 module (18 mm)** | **192** |
| ZS-1 | transformer power supply | 195÷253 V AC | 5 V DC | 2 A | 12 W | 6 modules (105 mm) | 189 |
| ZS-2 | transformer power supply | 195÷253 V AC | 12 V DC | 1 A | 12 W | 6 modules (105 mm) | 189 |
| ZS-3 | transformer power supply | 195÷253 V AC | 18 V DC | 0.66 A | 12 W | 6 modules (105 mm) | 189 |
| ZS-4 | transformer power supply | 195÷253 V AC | 24 V DC | 0.5 A | 12 W | 6 modules (105 mm) | 189 |
| ZS-5 | transformer power supply | 195÷253 V AC | 15 V DC | 0.8 A | 12 W | 6 modules (105 mm) | 189 |
| ZS-6 | transformer power supply | 195÷253 V AC | 48 V DC | 0.25 A | 12 W | 6 modules (105 mm) | 189 |
| TR-08 | mains transformer | 230 V AC | 8 V AC | 1 A | 8 VA | 2 modules (35 mm) | 193 |
| TR-12 | mains transformer | 230 V AC | 12 V AC | 0.66 A | 8 VA | 3 modules (52.5 mm) | 193 |
| TR-24 | mains transformer | 230 V AC | 24 V AC | 0.5 A | 12 VA | 3 modules (52.5 mm) | 193 |

# ZS-1 / ZS-2 / ZS-3 / ZS-4 / ZS-5 / ZS-6  12 W transformer power supplies

| Type | Output voltage [V DC] | Current [A] |
|------|------|------|
| ZS-1 | 5 | 2 |
| ZS-2 | 12 | 1 |
| ZS-3 | 18 | 0.66 |
| ZS-4 | 24 | 0.5 |
| ZS-5 | 15 | 0.8 |
| ZS-6 | 48 | 0.25 |

| | |
|------|------|
| input voltage | 195÷253 V AC |
| output power | 12 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 6 modules (105 mm) |
| weight | 550 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ZI-15 / ZI-16 / ZI-17 / ZI-20 / ZI-21  12 W pulse power supplies

| Type | Output voltage [V DC] | Current [A] |
|------|------|------|
| ZI-15 | 15 | 0.8 |
| ZI-16 | 13.5 | 0.9 |
| ZI-17 | 14.5 | 0.8 |
| ZI-20 | 12 | 1.0 |
| ZI-21 | 24 | 0.5 |

| | |
|------|------|
| input voltage | 100÷264 V AC |
| output power | 12 W |
| current limit | 110% Iout |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| weight | 80 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ZI-22 / ZI-24  30 W pulse power supplies

| Type | Output voltage [V DC] | Current [A] |
|------|------|------|
| ZI-22 | 12 | 2.5 |
| ZI-24 | 24 | 1.25 |

| | |
|------|------|
| input voltage | 100÷264 V AC |
| output power | 30 W |
| current limit | |
| ZI-22 | 110% Iout |
| ZI-24 | 125% Iout |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| weight | 190 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ZI-1 / ZI-2 / ZI-3 / ZI-4 / ZI-5 / ZI-6  50 W pulse power supplies

| Type | Output voltage [V DC] | Current [A] |
|------|------|------|
| ZI-1 | 5 | 10 |
| ZI-2 | 12 | 4 |
| ZI-3 | 18 | 3 |
| ZI-4 | 24 | 2 |
| ZI-5 | 15 | 3.3 |
| ZI-6 | 48 | 1 |

| | |
|------|------|
| input voltage | 85÷264 V AC |
| output power | 50 W |
| current limit | 110% Iout |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 6 modules (105 mm) |
| weight | 190 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ZI-61-12 / ZI-61-24   60 W pulse power supplies

| | input voltage | 180÷264 V AC |
|---|---|---|
| | output power | 60 W |
| | efficiency | 87% |
| | starting current | 40 A/20ms |
| | leakage current | 1 mA |
| | the accuracy of output voltage stabilization | 1% |
| | voltage range (adjustable) | |
| | ZI-61-12 | 10.8÷13.8 V |
| | ZI-61-24 | 21.6÷28.0 V |
| | pulsation and noises | |
| | ZI-61-12 | 240 mV p-p |
| | ZI-61-24 | 360 mV p-p |
| | overload | 120÷180% Iout/10 s |
| | overvoltage protection threshold | |
| | ZI-61-12 | 18÷23 V |
| | ZI-61-24 | 36÷45 V |
| | power indication | green LED |
| | working temperature | -20÷50°C |
| | terminal | 2.5 mm² screw terminals |
| | tightening torque | 0.4 Nm |
| | dimensions | 4.5 modules (78 mm) |
| | weight | 270 g |
| | mounting | for TH-35 rail |
| | ingress protection | IP20 |

| Type | Output voltage [V DC] | Current [A] |
|---|---|---|
| ZI-61-12 | 12 | 5 |
| ZI-61-24 | 24 | 2.5 |

### Protection

- Short circuit – in case of overload or short circuit, the output voltage is automatically disconnected. The power supply unit cyclically tries to switch on the power supply and when the cause of the tripping of the protection disappears, the rated power supply voltage is restored.
- Overvoltage – a disconnection of the output voltage. Return to normal operation after the power supply is switched off and back on.
- Thermal – a disconnection of the output voltage. When the temperature drops to a safe value, the output voltage will be restored.

# ZI-100-12 / ZI-100-24   100 W pulse power supplies

| | input voltage | 180÷264 V AC |
|---|---|---|
| | output power | 100 W |
| | efficiency | 88% |
| | starting current | 40 A/20 ms |
| | leakage current | 1 mA |
| | the accuracy of output voltage stabilization | 1% |
| | voltage range (adjustable) | |
| | ZI-100-12 | 10.8÷13,8 V |
| | ZI-100-24 | 21,6÷28,0 V |
| | pulsation and noises | |
| | ZI-100-12 | 240 mV p-p |
| | ZI-100-24 | 360 mV p-p |
| | overload | 110÷160% Iout/10 s |
| | overvoltage protection threshold | |
| | ZI-100-12 | 18÷23 V |
| | ZI-100-24 | 30÷40 V |
| | thermal protection threshold | 80÷85°C |
| | power indication | green LED |
| | working temperature | -20÷50°C |
| | terminal | 2.5 mm² screw terminals |
| | tightening torque | 0.4 Nm |
| | dimensions | 6 modules (100 mm) |
| | weight | 310 g |
| | mounting | for TH-35 rail |
| | ingress protection | IP20 |

| Type | Output voltage [V DC] | Current [A] |
|---|---|---|
| ZI-100-12 | 12 | 8.3 |
| ZI-100-24 | 24 | 4.15 |

### Protection

- Short circuit – in case of overload or short circuit, the output voltage is automatically disconnected. The power supply unit cyclically tries to switch on the power supply and when the cause of the tripping of the protection disappears, the rated power supply voltage is restored.
- Overvoltage – a disconnection of the output voltage. Return to normal operation after the power supply is switched off and back on.
- Thermal – a disconnection of the output voltage. When the temperature drops to a safe value, the output voltage will be restored.

# ZI-75-12 / ZI-120-12 / ZI-240-12    12 V industrial pulse power supplies



| frequency | 50÷60 Hz |
|---|---|
| output voltage | 12 V DC |
| overload | 150%/3 min. |
| overvoltage IN -> OUT | 3 kV |
| power indication | green LED |
| working temperature | -10÷70°C |
| cooling | gravitational |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

| Type | Power [W] | Current [A] | Input voltage [V] | Dimensions [mm] | Weight [g] |
|---|---|---|---|---|---|
| ZI-75-12 | 75 | 6.25 | 100÷240 V AC | 130×57×115 | 530 |
| ZI-120-12 | 120 | 10.0 | 100÷240 V AC | 130×67×115 | 670 |
| ZI-240-12 | 240 | 20.0 | 180÷264 V AC | 130×127×115 | 960 |

## Protection

- Short circuit – in case of overload or short circuit, the output voltage is automatically disconnected. The power supply unit cyclically tries to switch on the power supply and when the cause of the tripping of the protection disappears, the rated power supply voltage is restored.
- Overvoltage – a disconnection of the output voltage. Return to normal operation after the power supply is switched off and back on.
- Thermal – a disconnection of the output voltage. When the temperature drops to a safe value, the output voltage will be restored.

# ZI-60-24 / ZI-120-24 / ZI-240-24    24 V industrial pulse power supplies



| frequency | 50÷60 Hz |
|---|---|
| output voltage | 24 V DC |
| overload | 150%/3 min. |
| overvoltage IN -> OUT | 3 kV |
| power indication | green LED |
| working temperature | -10÷70°C |
| cooling | gravitational |
| terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

| Type | Power [W] | Current [A] | Input voltage [V] | Dimensions [mm] | Weight [g] |
|---|---|---|---|---|---|
| ZI-60-24 | 60 | 2.5 | 100÷240 V AC | 130×57×115 | 530 |
| ZI-120-24 | 120 | 5,0 | 100÷240 V AC | 130×67×115 | 670 |
| ZI-240-24 | 240 | 10,0 | 100÷240 V AC | 130×127×115 | 960 |

## Protection

- Short circuit – in case of overload or short circuit, the output voltage is automatically disconnected. The power supply unit cyclically tries to switch on the power supply and when the cause of the tripping of the protection disappears, the rated power supply voltage is restored.
- Overvoltage – a disconnection of the output voltage. Return to normal operation after the power supply is switched off and back on.
- Thermal – a disconnection of the output voltage. When the temperature drops to a safe value, the output voltage will be restored.

# ZI-10-12P / ZI-20-12P   impulsowy, do puszki podtynkowej

| Type | Power [W] | Current [A] |
|---|---|---|
| ZI-10-12P | 10 | 0.85 |
| ZI-20-12P | 20 | 1.7 |

| | |
|---|---|
| input voltage | 180÷264 V AC |
| output voltage | 12 V DC |
| efficiency | 82% |
| starting current | 4 A/20 ms |
| leakage current | 1 mA |
| the accuracy of output voltage stabilization | 3% |
| overload | 140÷160%% Iout/10 s |
| thermal protection threshold | 70÷80°C |
| working temperature | -20÷35°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | Ø54 (48×43 mm), h= 25 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

**Protection**

• Overload – in case of overload or short circuit, the output voltage is automatically disconnected. The power supply unit cyclically tries to switch on the power supply and when the cause of the tripping of the protection disappears, the rated power supply voltage is restored.

• Thermal – a disconnection of the output voltage. When the temperature drops to a safe value, the output voltage will be restored.

---

# ZI-11 / ZI-12 / ZI-13 / ZI-14   pulse stabilizers

| Type | Input voltage [V AC/V DC] | Output voltage [V DC] | Current [A] |
|---|---|---|---|
| ZI-11 | 8÷28/12÷37 | 5 | 3 |
| ZI-12 | 12÷28/16÷37 | 12 | 3 |
| ZI-13 | 18÷28/22÷37 | 18 | 3 |
| ZI-14 | 24÷28/28÷37 | 24 | 3 |

| | |
|---|---|
| output current | 3 A |
| current limit | Imax= 110% Iout/10 s |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| weight | 150 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

---

# ZI-USB-5   USB power supply

**Purpose**

The ZI-USB-5 is used to power electrical and electronic devices via the standard A-type USB output.
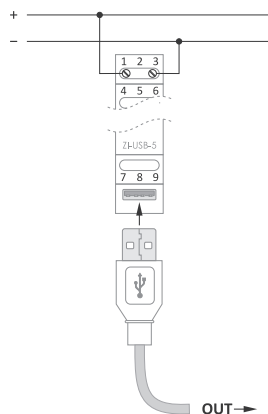
| | |
|---|---|
| input voltage | 12÷40 V DC |
| output voltage | 5 V DC |
| output current | 2.1 A |
| output power | 10.5 W |
| current limit | Imax=110% Iout |
| minimum load | 0% |
| output | USB socket |
| working temperature | 0÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ECH-06  DC power reserve module, with battery charging function (1.3÷7.2 Ah)

The ECH-06 module along with an external gel battery with a nominal voltage of 12 V constitutes a backup power supply system for receivers with a supply voltage of 9÷30 V DC.
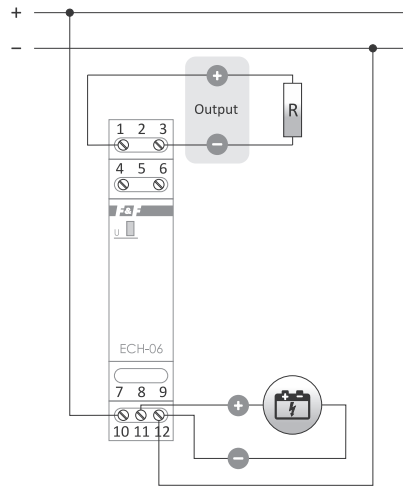
| power supply/charging voltage | 18÷30 V DC |
|---|---|
| output voltage Uout | Uin -0.5 V DC |
| | Uacu -0.5 V DC |
| current of the output load Uout | <3 A |
| supported battery capacity | 1.3÷7.2 Ah |
| maximum battery voltage | 13.8 V DC |
| charging current | <0.35 A |
| power supply cut-off threshold | <10.5 V DC |
| own power consumption | <1 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# PLD-01 350 / PLD-01 750  DC power supply (Power LED Driver)

The DC power supply is designed to supply LEDs with a forward current of 350 mA (PLD-01 350) or 750 mA (PLD-01 750).
The output voltage in this power supply is changed in such a way as to force the rated forward current of the LEDs and thus ensure their most efficient operation. The maximum power of the connected receivers depends on the value of the supply voltage and at Uin=40 V is 14 W (PLD-01 350) or 30 W (PLD-01 750). The power supply can operate autonomously in the ON/OFF mode or in combination with the SCO-803 dimmer (p. 35) as a brightness controller.
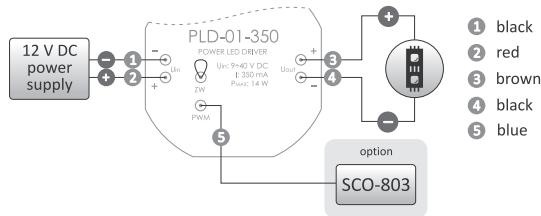
| input voltage IN | 5÷40 V DC |
|---|---|
| maximum current output stabilized | |
| PLD-01 350 for LED 1 W | 350 mA |
| PLD-01 750 for LED 3 W | 750 mA |
| LED power connected (Uin= 40 V) | |
| PLD-01 350 for LED 1 W | 14 W |
| PLD-01 750 for LED 3 W | 30 W |
| power consumption | 0.1 W |
| terminal | 5×LY 0.75 mm², l= 10 cm |
| working temperature | -20÷50°C |
| dimensions | Ø55, h= 16 mm |
| mounting | in flush mounted box Ø60 |
| ingress protection | IP20 |

1 black
2 red
3 brown
4 black
5 blue

option
SCO-803

# TR-08 / TR-12 / TR-24  mains transformers

Mains transformers are used to power electrical and electronic devices that require low, alternating voltage power supply.

| Type | Output voltage [V AC] | Current [A] | Power [VA] |
|---|---|---|---|
| TR-08 | 8 | 1 | 8 |
| TR-12 | 12 | 0.66 | 8 |
| TR-24 | 24 | 0.5 | 12 |

| input voltage | 230 V AC |
|---|---|
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | |
| TR-08 | 2 modules (35 mm) |
| TR-12/TR-24 | 3 modules (52.5 mm) |
| weight | |
| TR-08 | 271 g |
| TR-12 | 325 g |
| TR-24 | 433 g |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

! The PTC (positive-temperature-coefficient) thermistor is included in the transformer circuit as an overcurrent protection.

# Power indicators and multimeters

| Product | Mounting | Type | Indication | | | | | | | | | Power supply | Modbus | Alarm relays | Page |
|---------|----------|------|------------|--|--|--|--|--|--|--|--|--------------|--------|--------------|------|
| | | | Voltage of phase | Voltage phase-to-phase | Current | Fre-quency | Power active | Power passive | Power apparent | Energy exported to the mains | True RMS | | | | |
| DMA-1 | for TH-35 rail | ammeter 1-phase | – | – | ● | – | – | – | – | – | – | 100÷300 V AC | – | – | 197 |
| DMA-1 TrueRMS | for TH-35 rail | ammeter 1-phase | – | – | ● | – | – | – | – | – | ● | 100÷300 V AC | – | – | 197 |
| DMA-3 | for TH-35 rail | ammeter 3-phase | – | – | ● | – | – | – | – | – | – | 100÷300 V AC | – | – | 197 |
| DMA-3 TrueRMS | for TH-35 rail | ammeter 3-phase | – | – | ● | – | – | – | – | – | ● | 100÷300 V AC | – | – | 197 |
| DMA-1T | panel-mounted | ammeter 1-phase | – | – | ● | – | – | – | – | – | – | 195÷265 V AC | – | – | 198 |
| DMA-3T | panel-mounted | ammeter 3-phase | – | – | ● | – | – | – | – | – | – | 195÷265 V AC | – | – | 198 |
| DMM-1T | panel-mounted | multimeter 1-phase | ● | – | ● | ● | – | – | – | – | – | 195÷265 V AC | – | – | 198 |
| DMM-4T | panel-mounted | multimeter 3-phase | ● | ● | ● | ● | – | – | – | – | – | 195÷265 V AC | – | – | 199 |
| DMM-5T-2 | panel-mounted | analyzer 3-phase | ● | ● | ● | ● | ● | ● | ● | ● | ● | 85÷264 V AC/DC | ● | – | 200 |
| DMM-5T-3 | panel-mounted | analyzer 3-phase | ● | ● | ● | ● | ● | ● | ● | ● | ● | 85÷265 V AC/DC | ● | ● | 199 |
| DMV-1 | for TH-35 rail | voltmeter 1-phase | ● | – | – | – | – | – | – | – | – | 100÷300 V AC | – | – | 195 |
| DMV-1 TrueRMS | for TH-35 rail | voltmeter 1-phase | ● | – | – | – | – | – | – | – | ● | 100÷300 V AC | – | – | 195 |
| DMV-3 | for TH-35 rail | voltmeter 3-phase | ● | – | – | – | – | – | – | – | – | 100÷300 V AC | – | – | 195 |
| DMV-3 TrueRMS | for TH-35 rail | voltmeter 3-phase | ● | – | – | – | – | – | – | – | ● | 100÷300 V AC | – | – | 195 |
| DMV-1T | panel-mounted | voltmeter 1-phase | ● | – | – | – | – | – | – | – | – | 195÷265 V AC | – | – | 195 |
| DMV-3T | panel-mounted | voltmeter 3-phase | ● | – | – | – | – | – | – | – | – | 195÷265 V AC | – | – | 195 |
| DMV-1AC-MBT | panel-mounted | AC relay voltage | ● | – | – | – | – | – | – | – | ● | 80÷265 V AC | ● | ● | 196 |
| DMV-1DC-MBT | panel-mounted | DC relay voltage | ●* | – | – | – | – | – | – | – | – | 9÷30 V DC | ● | ● | 196 |
| WN-711 | for TH-35 rail | voltage indicator 1-phase | ● | – | – | – | – | – | – | – | – | 195÷265 V AC | – | – | 202 |
| WN-723 | for TH-35 rail | voltage indicator 3-phase | ● | – | – | – | – | – | – | – | – | 3×230 V AC | – | – | 202 |
| WNC-1 | for TH-35 rail | digital voltage indicator 1-phase | ● | – | – | – | – | – | – | – | – | 80÷500 V AC | – | – | 201 |
| WNC-3 | for TH-35 rail | digital voltage indicator 3-phase | ● | – | – | – | – | – | – | – | – | 80÷500 V AC | – | – | 201 |

* voltage measurement in the range of 0÷60 V DC

## Digital

# DMV-1 / DMV-1 True RMS    1-phase
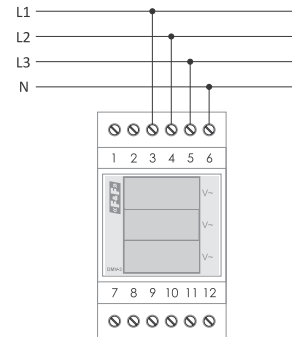# DMV-3 / DMV-3 True RMS    3-phase

| | |
|---|---|
| power supply | 100÷300 V AC |
| supply frequency | 45÷55 Hz |
| indication range | 100÷300 V |
| indication accuracy | |
| DMV-1 | 1% |
| DMV-3 | 1% |
| DMV-1 True RMS | 0.5% |
| DMV-3 True RMS | 0.5% |
| display for one phase | 3×digital LED 10×6 mm |
| power consumption | 4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions

• Measurement of phase voltages;
• The measuring circuit is also the power supply circuit of the device;
• Indicators with **True RMS** label, equipped with an RMS (Root Mean Square) transformer, indicate the correct voltage value for the distorted waveforms.
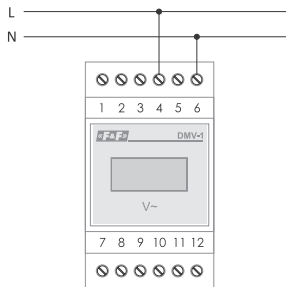


DMV-1/DMV-1 TrueRMS



DMV-3/DMV-3 TrueRMS

## Digital (panel)

# DMV-1T    1-phase
# DMV-3T    3-phase

| | |
|---|---|
| power supply | 195÷265 V AC |
| indication range | |
| DMV-1T | 12÷600 V |
| DMV-3T | 12÷400 V |
| indication accuracy | 1% |
| display | |
| DMV-1T | 3-digit LED 14×8 mm |
| DMV-3T | 3× (3-digit LED 10×6 mm) |
| power consumption | 3 VA |
| working temperature | -5÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| DMV-1T | 72×72×92 mm |
| DMV-3T | 96×96×92 mm |
| mounting hole | |
| DMV-1T | 66×66 mm |
| DMV-3T | 92×92 mm |
| ingress protection | IP20 |
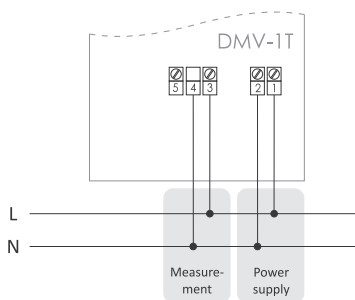






Connection scheme DMV-1T
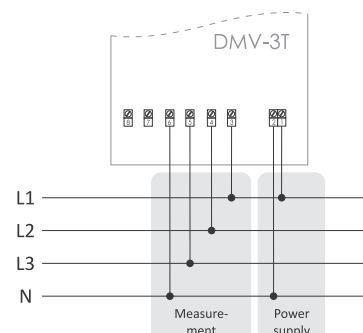


Connection scheme DMV-3T

# DMV-1AC-MBT panel-mounted AC voltage relay

DMV-1AC-MBT is a panel-mounted indicator of True RMS voltage value with the ability to set two independent alarms that control two relays. The measurement result is displayed on a 14 mm display. The device is equipped with a Modbus RTU bus which enables configuration and reading of measured parameters.

### Functions

- 2 independent alarms controlling two outputs;
- Voltage measurement 0÷400 V AC;
- Galvanic separation between the power supply and measurement chain;
- Measurement of True RMS values.
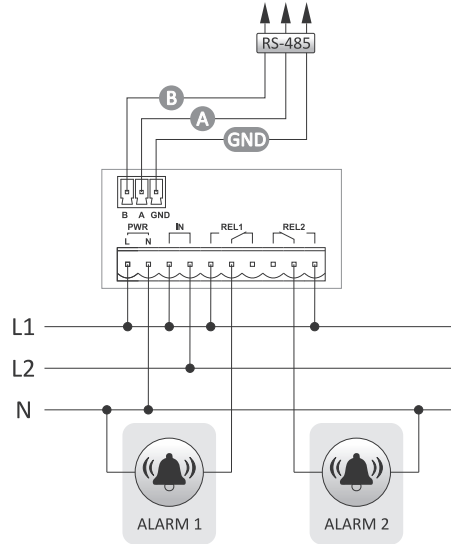
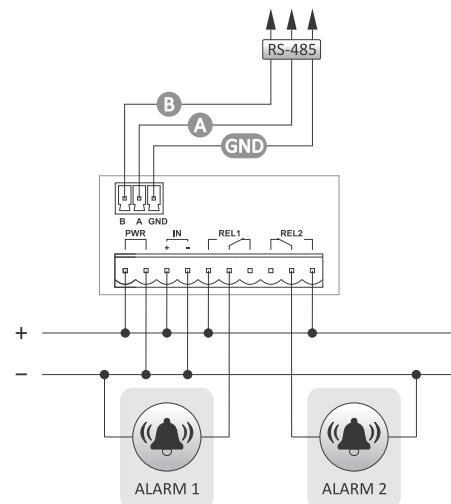| | |
|---|---|
| power supply | 80÷265 V AC |
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×6 A |
| measurement input | separated 0÷400 V AC |
| measurement accuracy | 1% |
| alarm hysteresis | 1÷150 V |
| lower alarm threshold | 10÷399 V |
| upper alarm threshold | 11÷400 V |
| alarm delay | 0÷180 s |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1 or 2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 2 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² detachable terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| housing | 72×36×72 mm |
| mounting hole | 67.5×32.5 mm |
| display height | 14 mm |
| mounting | panel |
| ingress protection | IP20 |

---

# DMV-1DC-MBT panel-mounted DC (0÷60 V) voltage relay

DMV-1DC-MBT is a panel-mounted indicator of True RMS voltage value with the ability to set two independent alarms that control two relays. The measurement result is displayed on a 14 mm display. The device is equipped with a Modbus RTU bus which enables configuration and reading of measured parameters.

### Functions

- 2 independent alarms controlling two outputs;
- Voltage measurement 0÷60 V DC;
- Galvanic separation between the power supply and measurement chain.

| | |
|---|---|
| power supply | 9÷30 V DC |
| contact | separated 2×NO/NC |
| maximum load current (AC-1) | 2×6 A |
| measurement input | 0÷60 V DC |
| measurement accuracy | 1% |
| alarm hysteresis | 1÷30 V |
| lower alarm threshold | 0÷59 V |
| upper alarm threshold | 1÷60 V |
| alarm delay | 0÷180 s |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1 or 2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 2 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² detachable terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| housing | 72×36×72 mm |
| mounting hole | 67.5×32.5 mm |
| display height | 14 mm |
| mounting | panel |
| ingress protection | IP20 |

# Current intensity indicators

The indicators are used for continuous reading of the current flowing in single-phase or three-phase network circuits.

## Digital

# DMA-1 / DMA-1 True RMS    1-phase
# DMA-3 / DMA-3 True RMS    3-phase

**Functions**

- Independent current measurement in each of the three phases;
- Indicators with **True RMS** label, equipped with an RMS (Root Mean Square) transformer, indicate the correct current value for the distorted waveforms.



| power supply | 100÷300 V AC |
|---|---|
| supply frequency | 45÷55 Hz |
| current indication range | |
|   direct measurement | 0÷20 A |
|   indirect measurement | 0÷ primary current of the transformer |
| maximum instantaneous overload | |
|   direct measurement | 40 A/1 s |
|   indirect measurement | 10 A/1 s |
| indication accuracy | |
|   DMA-1 | 1% |
|   DMA-3 | 1% |
|   DMA-1 True RMS | 0.5% |
|   DMA-3 True RMS | 0.5% |
| display | |
|   DMA-1 | 4-digit LED, digit 10×14 mm |
|   DMA-3 | 3-digit LED, digit 10×6 mm |
| power consumption | 4 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Purpose**

The DMA indicators are designed to work with current transformers with the rated secondary current of 5 A. Current range of current transformers: 25÷1000/5 A. The primary value of the transformer current determines the maximum measured current and the actual value of the current on the indicator.

DMA-1 20 A and DMA-3 20 A are designed for direct measurement (without the use of transformers) in the range of 0÷20 A.
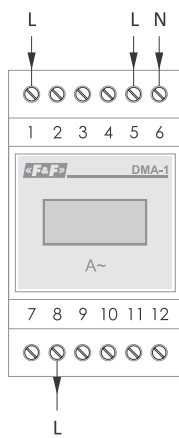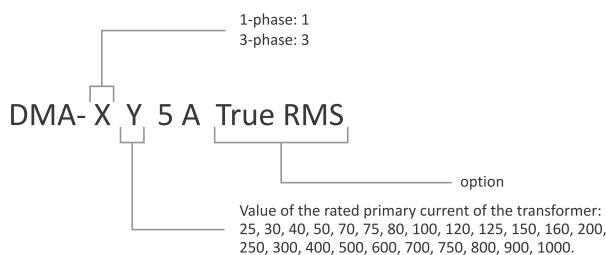


Connection scheme DMA-1
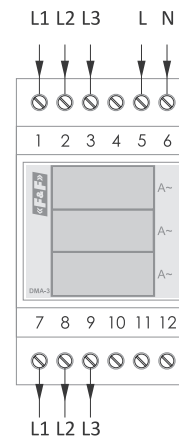


Connection scheme DMA-3

**Method of marking when placing an order**

Indirect measurement (with the use of transformers)

1-phase: 1
3-phase: 3

DMA- X Y 5 A True RMS

option

Value of the rated primary current of the transformer:
25, 30, 40, 50, 70, 75, 80, 100, 120, 125, 150, 160, 200, 250, 300, 400, 500, 600, 700, 750, 800, 900, 1000.

Example:
**DMA-1 50/5 A** – single-phase indicator for work with 50/5 A transformer, measured range 0 ÷ 50 A, without True RMS.
**DMA-3 150/5 A True RMS** – 3-phase indicator for work with 3×150/5 A transformers, measured range 3×0÷150 A, with True RMS.

Direct measurement (without the use of transformers)

1-phase: 1
3-phase: 3

DMA- X 20 A True RMS

option
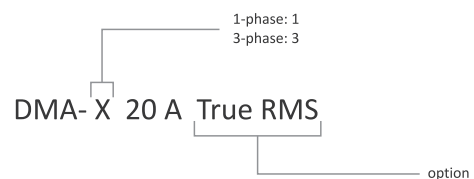
Example:
**DMA-1 20 A** – single-phase for 20 A, measured range 0 ÷ 20 A, without True RMS.
**DMA-3 20 A True RMS** – 3-phase for 20 A, measured range 3×(0 ÷ 20 A), with True RMS.
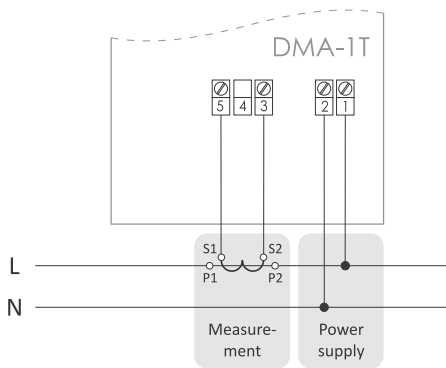
# DMA-1T  1-phase
# DMA-3T  3-phase

**Functions**

- Direct measurement in the range of 0÷5 A;
- Indirect measurement with the use of current transformers;
- Scaling the indicator to the appropriate values of the transformer by means of three buttons on the front of the indicator;
- Indirect measurement with the use of current transformers in standard current versions in the range 1÷9000/5 A.

| | |
|---|---|
| power supply | 195÷265 V AC |
| current indication range | |
| direct measurement | 0÷5 A |
| indirect measurement | 0÷ primary current of the transformer |
| indication accuracy | 1% |
| display | |
| DMA-1T | 4-digit LED 14×8 mm |
| DMA-3T | 3×(4-digit LED 10×6 mm) |
| power consumption | 3 VA |
| working temperature | -5÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | |
| DMA-1T | 72×72×92 mm |
| DMA-3T | 96×96×92 mm |
| mounting hole | |
| DMA-1T | 66×66 mm |
| DMA-3T | 92×92 mm |
| ingress protection | IP20 |



Connection scheme DMA-1T
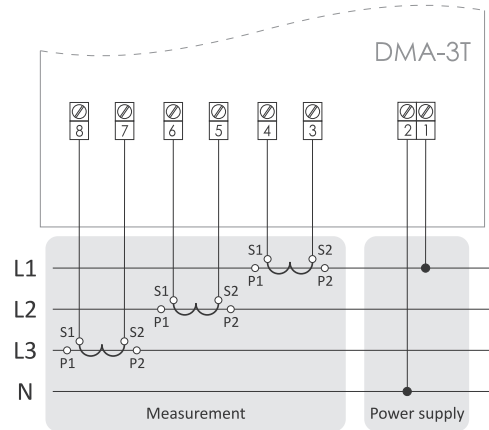


Connection scheme DMA-3T

# Multifunctional digital indicators for network parameters
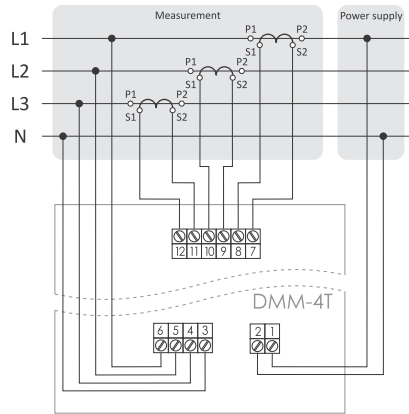
# DMM-1T  1-phase



DMM-1T



| | |
|---|---|
| power supply | 195÷265 V AC |
| current indication range | |
| direct measurement | 0÷5 A |
| indirect measurement | 0÷ primary current of the transformer |
| current ratio | 1÷9000/5 A |
| range of voltage indications | 12÷400 V AC |
| range of frequency indications | 10÷100 Hz |
| indication accuracy | 1% ±1 digit |
| display | 3×(4-digit LED 8×14 mm) |
| power consumption | 3 W |
| working temperature | -5÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 96×96×92 mm |
| mounting hole | 92×92 mm |
| ingress protection | IP20 |

**Functions**

- Direct measurement in the range of 0÷5 A;
- Indirect measurement with the use of current transformers in standard current versions in the range 1÷9000/5 A;
- Measurement of phase voltage;
- Scaling the indicator to the appropriate values of the transformer by means of three buttons on the front of the indicator;
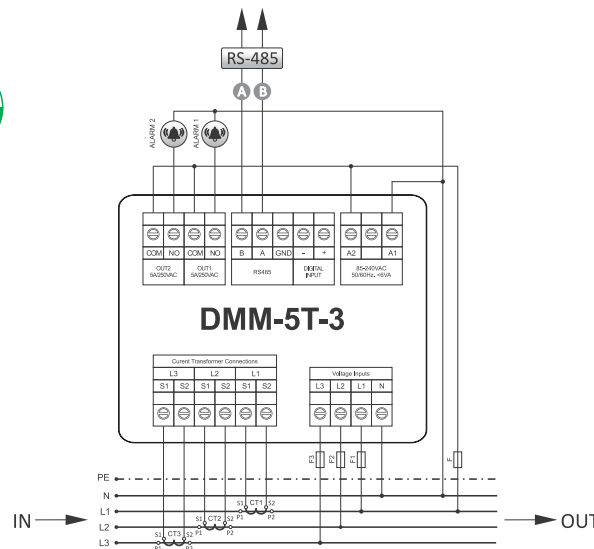- Measurement of phase frequency.

# DMM-4T   3-phase



| power supply | 195÷265 V AC |
|---|---|
| current indication range | |
|    direct measurement | 0÷5 A |
|    indirect measurement | 0÷ primary current of the transformer |
| current ratio | 1÷9000/5 A |
| range of voltage indications | 12÷400 V AC |
| range of frequency indications | 10÷100 Hz |
| indication accuracy | 1% ±1 digit |
| display | 4-digit LED 5×9 mm |
| power consumption | 3 W |
| working temperature | -5÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 96×96×92 mm |
| mounting hole | 92×92 mm |
| ingress protection | IP20 |

## Functions

- Independent current measurement in each of the three phases;
- Direct measurement in the range of 0÷5 A;
- Indirect measurement with the use of current transformers in standard current versions in the range 1÷9000/5 A;
- Scaling the indicator to the appropriate values of the transformer by means of three buttons on the front of the indicator;

- Measurement of phase voltages and phase-to-phase voltages;
- Measurement of phase frequencies;
- Selection of the indicated voltage and frequency values of one of the phases by pressing the button on the front of the indicator.

---

# DMM-5T-3   3-phase network parameter analyzer with Modbus RTU communication
4-quadrant electricity measurement



| network | 3-phase, 4-wire |
|---|---|
| power supply | 85÷265 V AC/DC |
| voltage measurement | |
|    rated voltage | 230 V AC |
|    indirect voltage measurement | 1 V÷600 kV |
|    accuracy | ±0.2 % |
|    frequency | 50÷60 Hz |
| accuracy of measurement of power and active energy | ±0.5 % |
| accuracy of measurement of power and reactive energy | ±1 % |
| measured voltage harmonics | 3÷55 |
| measured current harmonics | 3÷55 |
| accuracy of measurement of voltage harmonics | 2% |
| accuracy of measurement of current harmonics | 2% |
| current measurement | |
|    rated current In | 5 A |
|    indirect current measurement | 1 mA÷25000 A |
|    accuracy | ±0.2 % |
| relay outputs | |
|    outputs quantity | 2 |
|    function | programmable |
|    maximum load current (AC-1) | 2 A/250 V AC |
| interface | RS-485 |
| communictaion protocole | Modbus RTU |
| baud rate | 1200÷115200 bps |
| display | LCD |
|    dimensions | 71.5×61.5 mm |
|    display backlight | YES |
|    battery backup of the clock | approx. 5 years |
| power consumption | ≤10 VA |
| working temperature | -20÷55°C |
| connectors | plug-in (socket+plug) |
| mounting wires | ≤1.5 mm² |
| tightening torque | ≤0.4 Nm |
| dimensions | 98×98×58 mm |
| mounting hole | 91×91 mm |
| ingress protection | |
|    front | IP54 |
|    back | IP20 |

## Functions

- Indicator designed for measurement in semi-indirect or indirect system in 3-phase, 4-wire networks (3P4W).
- Measured parameters:
  – phase voltages and currents;
  – phase-to-phase voltage;
  – frequency;
  – reactive, active and apparent (total and per phase) power;
  – active energy (imported and exported), reactive energy (capacitive and inductive) and apparent energy (total and per phase);
  – power factor (total and for each phase);
  – measurement of total harmonic distortion of voltage and current (up to 55 harmonic);
  – display of minimum, maximum and average values for the measured parameters;
- Communication via RS-485 interface with Modbus RTU protocol support.

- Event log:
  – too high voltage;
  – too low voltage;
  – too high current flow;
  – no power;
  – exceeded voltage and current asymmetry;
  – exceeded limit of total harmonic distortion of voltage and current.
- 2 programmable relay outputs that indicates:
  – exceeding of preset voltage or current parameters;
  – exceeding of voltage and current asymmetry;
  – exceeding of acceptable of total harmonic distortion of voltage and current;
- Built-in clock with battery backup;
- Protection of meter settings by PIN code.

# DMM-5T-2

3-phase network parameter analyzer with Modbus RTU communication
4-quadrant electricity measurement, **MID certificate**

| | |
|---|---|
| according | MID Directive 2014/32/EU |
| **measuring system** | |
| network | 1P2W – 1-phase, 2-wire |
| | 3P3W – 3-phase, 3-wire |
| | 3P4W – 3-phase, 4-wire |
| **current measurement** | |
| rated current In | 0.25÷5 (6) A* |
| power consumption | 0.5 VA/phase |
| **voltage mesurement** | |
| measurement range | 58÷276 V AC (phase voltage L-N) |
| | 100÷480 V AC (interphase voltage L-L) |
| frequency | 45÷55 Hz |
| **working conditions** | |
| total power consumption | |
| typical | ≤2 VA |
| temporary | ≤15 VA |
| working temperature | -25÷55°C |
| storage temperature | -40÷70°C |
| relative humidity | 0÷95% |
| | (without condensation of |
| | steam and aggressive gases) |
| **communication protocole** | |
| pulse outputs | 2 |
| interface | RS-485 |
| protocol | Modbus RTU |
| parity | NONE/EVEN/ODD |
| baud rate | 2400/4800/9600/19200/38400 bps |
| display | monochrome LCD |
| dimensions | 96×96×62 mm |
| mounting hole | 92×92 mm |
| ingress protection | |
| front | IP54 |
| back | IP20 |

\* actual value of the measured current will depend on the size of the
current transformers used

## Selected functions

- Measured parameters:
  – phase voltages and currents;
  – interfacial tensions;
  – frequency;
  – phase sequence;
  – active power;
  – reactive power;
  – apparent power;
  – power and electricity demand;
  – power factor;
  – full, four-quadrant energy measurement (both consumed,
  and returned to the network);
  – analysis of voltage and current harmonics distribution up to
  and including the 63rd harmonic.

- Configuration of the measured network:
  – 3-phase, 4-wire;
  – 3-phase, 3-wire;
  – 1-phase, 2-wire.
- Measuring system:
  – directly (up to 5 A);
  – semi-indirect with the use of current transformers;
  – indirect with the use of voltage and current transformers;
- Communication:
  – RS-485 interface and support for Modbus RTU protocol.
  – 2 pulse outputs;
- LCD display:
  – illuminated multifunction LCD display;
  – power factor indicator;
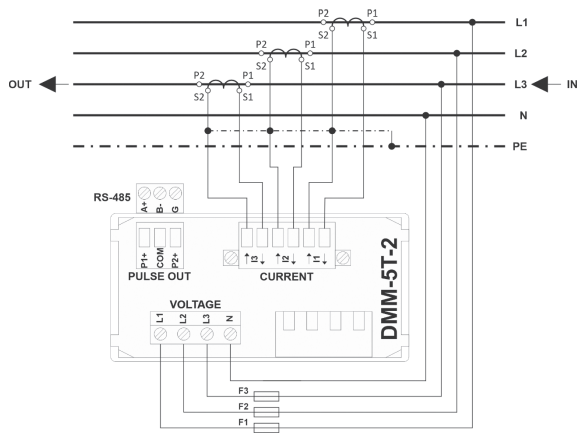  – bargraph for clear visualization of the load level.

## Wiring diagrams
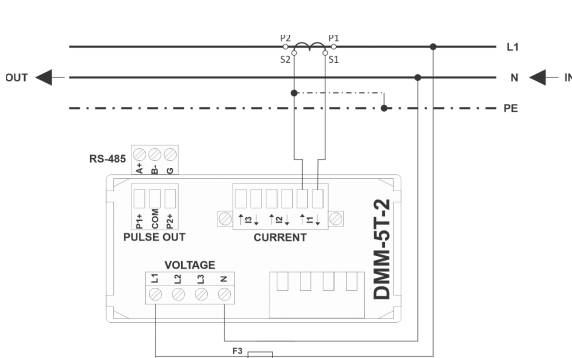


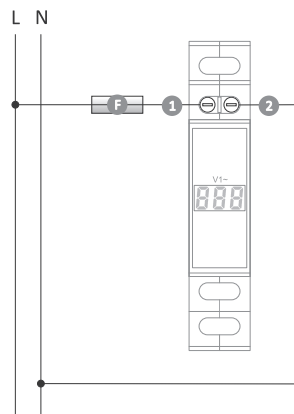1-phase, 2-wire network (1P2W)
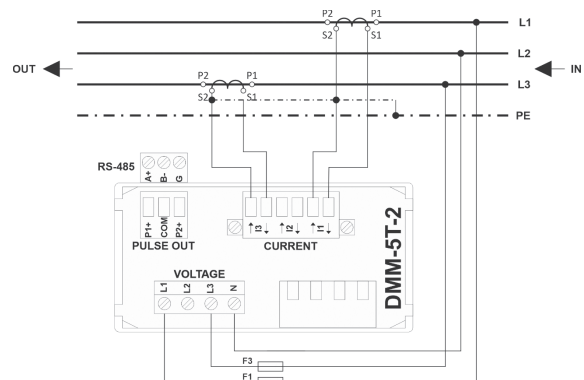


3-phase, 3-wire network (3P3W)

3-phase, 4-network (3P4W)

# Digital power supply indicators

# WNC-1  1-phase

**Purpose**

Indicator is designed to measure and indicate the value of 1-phase alternating voltage in the range of 80 ÷ 500 V AC.
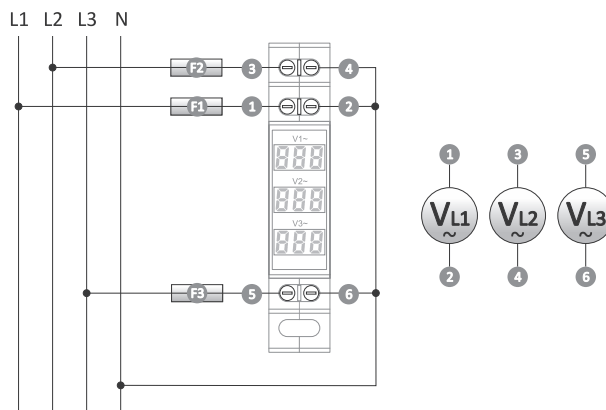


| | |
|---|---|
| power supply | 80÷500 V AC |
| frequency | 50÷60 Hz |
| voltage indicator | 3-digit, 7-segment LED |
| digit height | 7 mm |
| measurement resolution | 1 V |
| measurement accuracy | 1% (±1 digit) |
| power consumption | <5 VA, <1 W |
| working temperature | -5÷40°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# WNC-3  3-phase

**Purpose**

Indicator is designed to measure and indicate the value of 3-phase alternating voltage in the range of 80÷500 V AC.



| | |
|---|---|
| power supply | 80÷500 V AC |
| frequency | 50÷60 Hz |
| voltage indicator | 3× (3-digit, 7-segment LED) |
| digit height | 7 mm |
| measurement resolution | 1 V |
| measurement accuracy | 1% (±1 digit) |
| power consumption | <5 VA, <1 W |
| working temperature | -5÷40°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Analog power supply indicators

## WN-711 1-phase, bar

**Purpose**

Voltage indicators WN-711 are designed for continuous reading of voltage values in a 1-phase network.
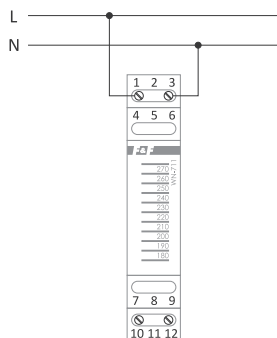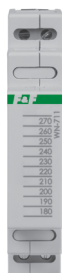
| | |
|---|---|
| power supply | 195÷265 V AC |
| voltage indicator | 11×LED |
| indication range | 205÷245 V |
| scale | 5 V |
| reading accuracy | 2.5 V |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## WN-723 3-phase, bar

**Purpose**

Voltage indicators WN-723 are designed for continuous reading of voltage values in a 3-phase network.
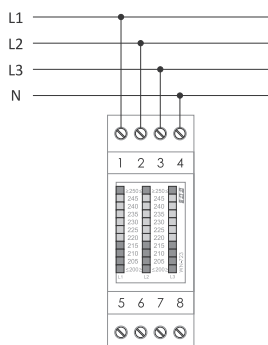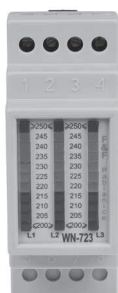
| | |
|---|---|
| power supply | 3×230 V+N |
| voltage indicator | 3×(11×LED) |
| indication range | 205÷245 V |
| scale | 5 V |
| reading accuracy | 2.5 V |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Signal lights

## LK-BZ-3 G / LK-BZ-3 K
for the optical indication of voltage in individual phases of a 3-phase network

**Purpose**

The LK-BZ-3 control light is designed for the optical indication of voltage in individual phases of a three-phase network. The control lights are protected by fuses connected in series, which allows to avoid the use of an additional module with protections and, as a result, saves space in the switchgear. The other end of the fuse is led out to the connector of the device housing, which makes it possible to use it also to protect other parts of the circuit.
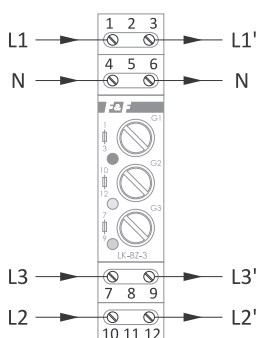
| | |
|---|---|
| power supply | 3×230 V +N |
| rated current (the signal light is on) | 1.7 mA/phase |
| power consumption (the signal light is on) | 0.2 W/phase |
| indication of voltage | 3×LED Ø3 mm |
| fuse | fuse link ø5 mm×20 mm |
| maximum disconnection voltage | 250 V AC |
| maximum fuse current | 6.3 A |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

| Type | LED color |
|---|---|
| LK-BZ-3 G | 3×green |
| LK-BZ-3 K | red-yellow-green |

# LK-712  1-phase

The LK-712 control lamp is designed for the optical indication of the presence of voltage in an electrical circuit.
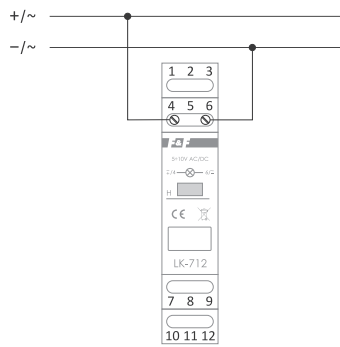
| | |
|---|---|
| power supply (implementation only in one range) | 5÷10 V AC/DC |
| | 10÷30 V AC/DC |
| | 30÷130 V AC/DC |
| | 130÷260 V AC/DC |
| power indication | 1×LED ø5 |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

| Type | LED color |
|---|---|
| LK-712 G | 1×green |
| LK-712 Y | 1×yellow |
| LK-712 R | 1×red |
| LK-712 B | 1×blue |

Example of marking when placing an order:  LK-712  B  30÷130 V — supply voltage    color

# LK-713  3-phase

It is designed for the optical indication of the presence of voltage in individual phases of a 3-phase network.
The presence of voltage in the phase is indicated by the corresponding green LED incorporated in the circuit of this phase.
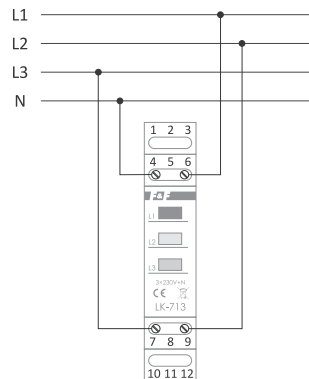
| | |
|---|---|
| power supply | 3×230 V +N |
| rated current | 1.7 mA |
| voltage indication | 3×LED ø5 |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

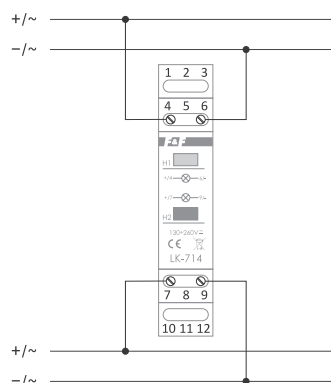| Type | LED color |
|---|---|
| LK-713 G | 3×green |
| LK-713 Y | 3×yellow |
| LK-713 R | 3×red |
| LK-713 K | red-yellow-green |

Example of marking when placing an order:  LK-713  K — color

# LK-714  2-state

It is designed for the optical indication of the operating statuses of the receiver, such as on/pause, open/closed, etc.
It has 2 separate signalling circuits: green LED and red LED.

| | |
|---|---|
| power supply (implementation only in one range) | 5÷10 V AC/DC |
| | 10÷30 V AC/DC |
| | 30÷130 V AC/DC |
| | 130÷260 V AC/DC |
| state control | 1×green LED ø5 |
| | 1×red LED ø5 |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

Example of marking when placing an order:  LK-714  130÷260 V — supply voltage

### Purpose

FPV3 three-phase photovoltaic inverters suitable for on-grid operation use modern transformerless technology for power generation and conversion. Two independent solar panel line inputs equipped with MPPT power point tracking systems allow you to flexibly adapt them to the shape and orientation of the panels. Designed and manufactured in accordance with international safety standards. The components of leading global manufacturers used in the production of the inverter guarantee a long-lasting and failure-free operation. Wi-Fi communication module integrated with Polish software and registering data from energy production on Polish servers provides full safety of the network operation. Modern design and intuitive operation additionally contribute to high comfort of use.

# FPV3 series

### Features

• Transformerless topology;
• Efficiency up to 98,2%;
• 2× MPPT inputs with a wide input voltage range;
• Silicon Carbide Components (SCC [EN]/SIC [PL]) for maximum resistance of power components;
• Zero leakage current.

### Application

• Three-phase photovoltaic installations from 4 to 10 kW;
• For indoor and outdoor mounting (IP65);
• Easy to install and maintain;
• Several inverters can be connected in parallel.

### Reliability

• Multiple safety features;
• 10 year warranty;
• The highest quality of components used to minimize the risk of damage.

### Certificates

FPV3 inverters comply with the requirements of EN 50549-1:2019 and the network code described in Commission Regulation (EU) 2016/631 (NC RfG).

### Communication

• Wi-Fi communication module as standard;
• Easy to use, free mobile app for Android and iOS phones and tablets;
• Integration with home automation software – Fox;
• Data registration on servers located in Poland;
• Ability to integrate with external IoT systems using REST APIs.

### Internal diagram of the inverter
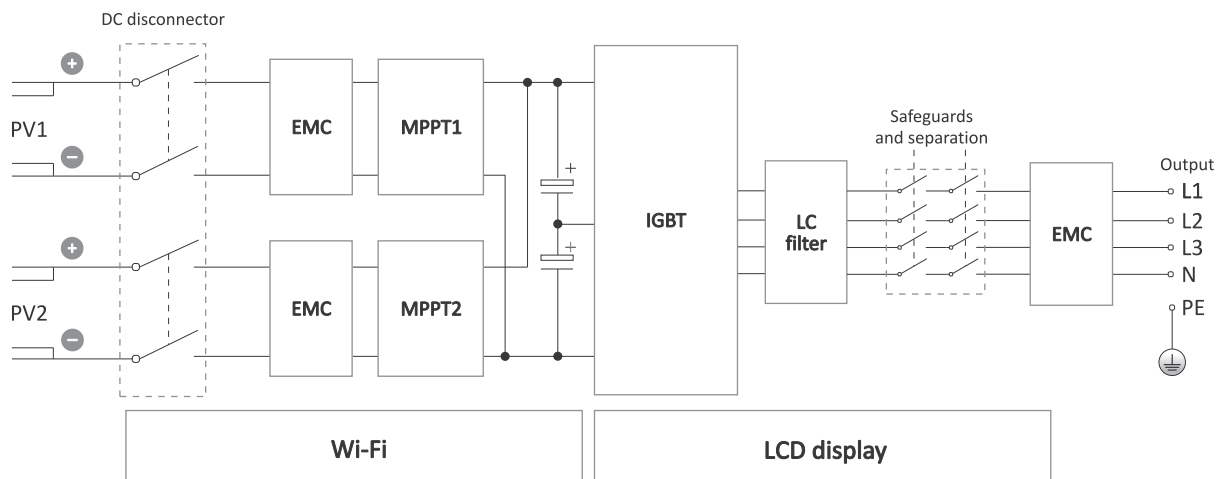
| Model | FPV3-4K | FPV3-6K | FPV3-8K | FPV3-10K |
|---|---|---|---|---|
| **Input (DC)** | | | | |
| Maximum DC power | 5500 W | 7500 W | 9500 W | 11500 W |
| Maximum DC voltage | 1000 V DC | | | |
| Minimum operating voltage | 250 V DC | | | |
| MPPT operating voltage range | 250÷850 V DC | | | |
| Maximum single output current | 17 A (17 A × 2) | | | |
| Number of MPPT controllers | 2 | | | |
| Number of DC inputs | 2 (1 input per MPPT channel) | | | |
| **Output (AC)** | | | | |
| Nominal AC power | 4000 W | 6000 W | 8000 W | 10000 W |
| Maximum apparent power | 5000 VA | 7000 VA | 8800 VA | 11000 VA |
| Maximum output current | 8 A | 12 A | 15 A | 17 A |
| Rated output voltage | 400 V AC / 50 Hz | | | |
| Range of output voltages | 280÷490 V AC / 45÷55 Hz | | | |
| Power factor | 0.8 (capacitive) ÷ 0.8 (inductive) | | | |
| Harmonic | <1,5 % | | | |
| Type of network | 3L + N + PE | | | |
| Network connection required | yes  (on-grid) | | | |
| **Efficiency** | | | | |
| Maximum | 98.2% | 98.2% | 98.2% | 98.2% |
| European weighted efficiency | 97.7% | 97.7% | 97.7% | 97.7% |
| MPPT | 99.9% | 99.9% | 99.9% | 99.9% |
| **Protection** | | | | |
| Reverse DC polarity | yes | | | |
| DC disconnector | yes | | | |
| DC/AC overvoltage protection | yes | | | |
| Protection against leakage current | yes | | | |
| DC insulation measurement | yes | | | |
| Differential current measurement | yes | | | |
| **Other** | | | | |
| Inverter topology | transformerless | | | |
| Power consumption in night mode | <1 W | | | |
| Dimensions (W×H×D) | 480×400×180 mm | | | |
| Weight | 22 kg | | | |
| Operating temperature range | -25÷60°C | | | |
| Humidity range | 0÷95 % (without condensation) | | | |
| Ingress protection | IP65 | | | |
| Cooling | natural convection | | | |
| Display | LCD | | | |
| **Communication** | | | | |
| RS-485 | option | | | |
| Wi-Fi | yes | | | |
| **Warranty** | | | | |
| 10 years | yes | | | |

# Inverters and soft starters

**Purpose**

The inverters belong to the group of electronic frequency converters and are designed for smooth control of the rotational speed of the asynchronous three-phase motors.
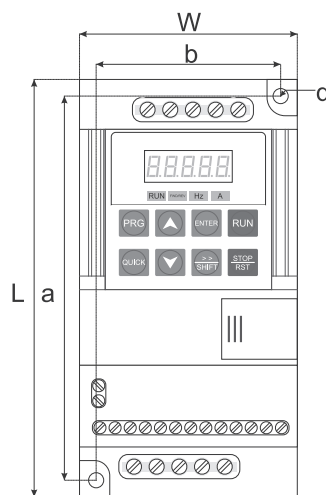
# FA-1LS / FA-3HS

**The most important functions**

- Miniature size, weight and DIN rail mounting capability;
- Sensorless motor vector control and control based on freely programmable V/F characteristic;
- Overload capacity up to 150% for a period of one minute;
- PLC mode with up to 16 programmable steps (speed, acceleration and deceleration time, duration) executed once or cyclically by the inverter;
- The built-in RS-485 communication module with support for the Modbus RTU protocol allows you to connect the inverter to the industrial network and to control, monitor and configure the operation of the inverter remotely;
- Built-in PID controller;
- High programming freedom for inverter inputs and outputs;
- Possibility of limiting access to settings and securing with a PIN number.

**Types of devices**

| Type of inverter | Voltage input [V] | Current input [A] | Voltage output [V] | Current output [A] | Maximum motor power [kW] | Width (W) [mm] | Length (L) [mm] | Height (H) [mm] |
|---|---|---|---|---|---|---|---|---|
| FA-1LS-004 | 1×230 | 5.4 | 3×230 | 2.5 | 0.4 | | | |
| FA-1LS-007 | 1×230 | 8.2 | 3×230 | 4.0 | 0.7 | | 138 | 123.5 |
| FA-1LS-015 | 1×230 | 14.0 | 3×230 | 7.0 | 1.5 | | | |
| FA-1LS-022 | 1×230 | 23.0 | 3×230 | 10.0 | 2.2 | | 185 | 134 |
| FA-3HS-007 | 3×400 | 4.3 | 3×400 | 2.5 | 0.7 | 72 | | |
| FA-3HS-015 | 3×400 | 5.0 | 3×400 | 3.8 | 1.5 | | 138 | 123.5 |
| FA-3HS-022 | 3×400 | 5.8 | 3×400 | 5.1 | 2.2 | | | |
| FA-3HS-040 | 3×400 | 10.5 | 3×400 | 9.0 | 4.0 | | 185 | 134 |
| FA-3HS-055 | 3×400 | 14.6 | 3×400 | 13.0 | 5.5 | | | |

The dimensions of the inverter and the location of the measuring holes

PE

Braking resistor (option)

P+    RB

L1    R

L2    S

L3    T

PE

POWER SUPPLY

U

V

W

PE

MOTOR

M
3~

(F1.00)    DI1

(F1.01)    DI2

(F1.02)    DI3

(F1.03)    DI4

(F1.04)    DI5

GND

+24 V

DIGITAL INPUTS

<JP1>
(F2.07)

DA1

GND

ANALOG OUTPUT

TA    (F2.02)

TC

RELAY OUTPUT

<JP3>
(F0.20)

+10 V

AI1

GND

ANALOG INPUT

<JP2>
(F9.xx)

A

B

GND

RS-485

Potentiometer
1 - 5 kΩ

External
panel
operator

JP1    1 2 3    DA1    1-2) 0 - 20 mA
                      2-3) 0 - 10 V

JP2    1 2 3    RS485 Terminator    1-2) OFF
                                    2-3) ON

JP3    1 2 3    AI1    1-2) 0 - 10 V
                      2-3) 0 - 20 mA

Configuration jumpers

- Shielded cable

- Cable wires twisted in pairs

(....)    - Parameter responsible for setting

<....>    - Configuration jumper associated with a setting

Chapter 39

| Functions | | Technical data |
|---|---|---|
| **Power supply** | **FA-1LS** | 1-phase |
| | Voltage and frequency | 1×220÷240 V, |
| | Output voltage | 3×220÷240 V (for 230 V power supply) |
| | **FA-3HS** | 3-phase |
| | Voltage and frequency | 3×380÷415 V, 50/60 Hz |
| | Output voltage | 3×380÷400 V (for 400 V power supply) |
| | Output frequency | 0,00÷3200 Hz (U/F control)<br>0,00÷300,0 Hz (vector control) |
| | V/F control characteristics | 1) Constant torque characteristics<br>2) Characteristics with reduced torque<br>3) Torque characteristics set by the user<br>4) Vector control (sensor and sensorless) |
| | Initial torque | 150.0% for 0.50 Hz |
| | Dynamics of speed control | 1:100 (in vector control mode) |
| | Output speed stability | ±0.5% (in vector control mode) |
| | Driving torque boost | In V/F control mode, automatic or user-defined |
| | Accelerating/braking | Linear or programmable S-curve characteristics.<br>Maximum acceleration and braking time - 6500 s. |
| | Frequency setting accuracy | Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz);<br>Analog accuracy setting: 1% of maximum frequency |
| | Overload | 1) 150% of the rated current for 1 minute<br>2) 180% of the rated current for 2 seconds |
| | Motor slip compensation | In V/F control mode, the automatic slip compensation is available |
| **Protection** | Inverter protection | 1) Against too high and too low power supply voltage<br>2) Against exceeding the maximum current<br>3) Against too high load<br>4) Against the loss of speed loss and stall of a motor<br>5) Against the current leakage to mass<br>6) Against overheating of the inverter<br>7) In addition, the inverter is protected against communication errors or incorrect<br> feedback signals |
| | Safety switch | The input or a button can be programmed as a safety switch<br>to immediately remove the voltage from the inverter outputs. |
| | Settings protection | Settings of the inverter can be protected with a PIN number |
| | Error reset | Both automatic and manual error reset can be set |
| **Braking** | | DC injection braking and braking using the external braking resistor |
| **I/O** | 5 digital inputs | 1) Triggering inputs both with low (COM) and high (+24 V) level.<br>2) Freely programmed functions, such as forward and reverse run, forward and reverse<br> test run, reset, multi-stage speed control, motor potentiometer, acceleration and<br> braking time change, pulse input, and others. |
| | 1 analog input | 1) They can operate as both voltage outputs (0÷10 V) and current outputs (0÷20 mA).<br> The range of 4÷20 mA can also be set.<br>2) The analog inputs can be used, among other things, for setting the frequency and<br> torque and for cooperation with the PID controller. |
| | 1 analog output | 1) They can operate as both voltage outputs (0÷10 V) and current outputs (0÷20 mA).<br>2) The analog outputs can be programmed for signaling of the following values:<br> a) preset and present frequency;<br> b) rotation speed;<br> c) output current voltage;<br> d) voltage in the DC circuit;<br> e) setpoint monitoring;<br> f) power and output torque;<br> g) motor rotation speed;<br> h) driving torque. |

| Functions | | Technical data |
|---|---|---|
| **I/O** | 1 relay output | 1) Contact load capacity 5 A/250 V AC or 5 A/30 V DC<br>2) Highly programmable output functions (the indication of 40 different states of the inverter):<br>  a) work;<br>  b) ready to work;<br>  c) failure;<br>  d) overload;<br>  e) reaching the set frequency. |
| **Adjustment of the speed** | | 1) Wide range of speed setting options, including various combinations including digital inputs, analog inputs, remote control via RS-485 and control panel buttons.<br>2) Multistage speed - 16 different speeds and 8 acceleration/braking times can be entered.<br>3) PLC mode - up to 8 steps can be programmed that are executed once or cyclically by the inverter.<br>  For each step, you can specify the speed of the motor, acceleration/braking time and duration.<br>  You can also specify whether the sequence will be executed only once or repeated in a loop. |
| **PID** | | The built-in PID controller enhances the ability to adjust the drive operation to the requirements of the technological process. Both the setpoint and the feedback signal can be entered from one of the following sources:<br>1) Control panel;<br>2) Analog inputs;<br>3) Digital inputs;<br>4) Pulse input. |
| **Environmental conditions** | Working temperature | -10°C ÷ 40°C. If the temperature exceeds 40 °C, the maximum output current is reduced by 1% with each additional °C |
| | Storage | -20÷65°C |
| | Humidity | Below 90%, no moisture condensation |
| | Height | 0÷1000 m |
| | Installation | Vertical installation inside a control cabinet with good ventilation on a mounting plate made of non-combustible material. The installation method must also ensure that the inverter is protected against direct sunlight, dust, moisture, and aggressive or explosive gases. |
| | Ventilation | Cooling by natural and forced air circulation |

# FA-1LX / FA-3HX

- The inverter design is based on a powerful 32-bit DSP processor thus providing a fast and efficient implementation of advanced asynchronous three-phase motor control algorithms.
- It can operate in speed control mode or torque control mode.
- Control of the motor is based on vector control (both sensorless and with speed feedback loop) and on a control with freely programmable V/F characteristics.
- Automatic slip compensation function and high initial torque (up to 180% at the frequency of 0.25 Hz).
- Multifunctional control panel connected to the inverter on a hot-plug basis with the ability to store up to four sets of parameter settings at the same time and easily transferring settings from one inverter to another.
- PLC mode - up to 7 steps can be programmed that are executed once or cyclically by the inverter. For each step, you can specify the speed, acceleration time and duration.
- Great freedom in programming the inputs and outputs of the inverter, both analog and digital.
- The built-in RS-485 communication module (with support for the Modbus RTU protocol) allows you to connect the inverter to the industrial network and to control, monitor and configure the operation of the inverter remotely.

## Types of devices

| Type of inverter | Voltage input [V] | Current input [A] | Voltage output [V] | Current output [A] | Maximum motor power [kW] | Width (W) [mm] | Length (L) [mm] | Height (H) [mm] |
|---|---|---|---|---|---|---|---|---|
| FA-1LX007 | 1×230 | 8.2 | 3×230 | 4 | 0.75 | 120 | 185 | 165 |
| FA-1LX015 | 1×230 | 14.0 | 3×230 | 7 | 1.5 | 120 | 185 | 165 |
| FA-1LX022 | 1×230 | 23.0 | 3×230 | 10 | 2.2 | 150 | 220 | 182 |
| FA-1LX040 | 1×230 | 35.0 | 3×230 | 16 | 4.0 | 180 | 285 | 200 |
| FA-3HX007 | 3×400 | 4.3 | 3×400 | 2.5 | 0.75 | 120 | 185 | 165 |
| FA-3HX015 | 3×400 | 5.0 | 3×400 | 3.8 | 1.45 | 120 | 185 | 165 |
| FA-3HX022 | 3×400 | 5.8 | 3×400 | 5.1 | 2.2 | 120 | 185 | 165 |
| FA-3HX040 | 3×400 | 10.5 | 3×400 | 9.0 | 4.0 | 150 | 220 | 182 |
| FA-3HX055 | 3×400 | 14.6 | 3×400 | 13 | 5.5 | 150 | 220 | 185 |
| FA-3HX075 | 3×400 | 20.5 | 3×400 | 17 | 7.5 | 180 | 285 | 200 |

Chapter 39

| Functions | | Technical data |
|---|---|---|
| | **FA-1LX** | 1-phase |
| | Voltage and frequency | 1×230 V (±10%), 50/60 Hz (±5%) |
| | Output voltage | 3×230 V (for 230 V power supply) |
| | **FA-3LX** | 3-phase |
| | Voltage and frequency | 3×400 V (±10%), 50/60 Hz (±5%) |
| | Output voltage | 3×400 V (for 400 V power supply) |
| | Output frequency | 0.00÷3200 Hz (U/F control)<br>0.00÷300.0 Hz (vector control) |
| Power supply | V/F control characteristics | 1) Constant torque characteristics<br>2) Characteristics with reduced torque<br>3) Torque characteristics set by the user<br>4) Vector control (sensor and sensorless) |
| | Initial torque | 18.0% for 0.50 Hz |
| | Dynamics of speed control | 1:100 |
| | Output speed stability | ±0.5% |
| | Driving torque boost | In V/F control mode, automatic or user-defined |
| | Accelerating/braking | Linear or programmable S-curve characteristics.<br>Maximum acceleration and braking time - 6500 s. |
| | Frequency setting accuracy | Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz);<br> Analog accuracy setting: 1% of maximum frequency |
| | Overload | 1) 150% of the rated current for 1 minute<br>2) 200% of the rated current for 0.1 second |
| | Motor slip compensation | In V/F control mode, the automatic slip compensation is available |
| Protection | Inverter protection | 1) Against too high and too low power supply voltage<br>2) Against exceeding the maximum current<br>3) Against too high load<br>4) Against the loss of speed loss and stall of a motor<br>5) Against the current leakage to mass<br>6) Against overheating of the inverter<br>7) In addition, the inverter is protected against communication errors or incorrect<br>    feedback signals |
| | Safety switch | The input or a button can be programmed as a safety switch<br>to immediately remove the voltage from the inverter outputs. |
| | Settings protection | Settings of the inverter can be protected with a PIN number |
| | Error reset | Both automatic and manual error reset can be set |
| Braking | | DC injection braking and braking using the external braking resistor |
| I/O | 6 digital inputs | 1) Triggering inputs both with low (COM) and high (+24 V) level.<br>2) Freely programmed functions, such as forward and reverse run, forward and reverse<br>    test run, reset, multi-stage speed control, motor potentiometer, acceleration and<br>    braking time change, pulse input, and others. |
| | 2 analog inputs | 1) They can operate as both voltage outputs (0÷10 V) and current outputs (0÷20 mA).<br>    The range of 4÷20 mA can also be set.<br>2) The analog inputs can be used, among other things, for setting the frequency and<br>    torque and for cooperation with the PID controller. |
| | 2 analog outputs | 1) They can operate as both voltage outputs (0÷10 V) and current outputs (0÷20 mA).<br>2) The analog outputs can be programmed for signaling of the following values:<br>    a) preset frequency;<br>    b) output current voltage;<br>    c) voltage in the DC circuit;<br>    d) temperature of the IGBT power output stage;<br>    e) output power;<br>    f) motor speed;<br>    g) driving torque. |

| Functions | Technical data |
|---|---|
| **I/O** | |
| 2 transistor outputs | 1) High-speed pulse outputs (max. frequency 100 kHz). Available indication: a) preset frequency; b) current frequency; c) value of the current; d) output voltage; e) voltage in the DC circuit; f) temperature of the power output stage; g) output power; h) motor speed; i) output torque; 2) Transistor load - max. 20 mA/27 V |
| 1 relay output | 1) Contact load capacity 5 A/250 V AC or 5 A/30 V DC 2) Highly programmable output functions (the indication of 34 different states of the inverter) |
| **Adjustment of the speed** | 1) Wide range of speed setting options, including various combinations including digital inputs, analog inputs, potentiometer and control panel buttons, pulse inputs and motor potentiometer. 2) Multistage speed - 16 different speeds and 8 acceleration/braking times can be entered. 3) PLC mode - up to 8 steps can be programmed that are executed once or cyclically by the inverter. For each step, you can specify the speed of the motor, acceleration/braking time and duration. You can also specify whether the sequence will be executed only once or repeated in a loop. |
| **PID** | The built-in PID controller enhances the ability to adjust the drive operation to the requirements of the technological process. Both the setpoint and the feedback signal can be entered from one of the following sources: 1) Control panel (buttons or potentiometer); 2) Analog inputs; 3) Digital inputs; 4) Pulse input. |
| **Environmental conditions** | |
| Working temperature | -10°C ÷ 40°C. If the temperature exceeds 40 °C, the maximum output current is reduced by 1% with each additional °C |
| Storage | -20÷65°C |
| Humidity | Below 90%, no moisture condensation |
| Height | 0÷1000 m |
| Installation | Vertical installation inside a control cabinet with good ventilation on a mounting plate made of non-combustible material. The installation method must also ensure that the inverter is protected against direct sunlight, dust, moisture, and aggressive or explosive gases. |
| Ventilation | Cooling by natural and forced air circulation |

# FA-3X

- The inverter design is based on a powerful 32-bit DSP processor thus providing a fast and effi-
  cient implementation of advanced asynchronous three-phase motor control algorithms;
- It can operate in speed control mode or torque control;
- Motor control based on a sensorless vector control and freely programmable V/F characteristics;
- Automatic slip compensation function and high initial torque (up to 180% at the frequency of
  0.5 Hz).
- PLC mode - up to 16 steps can be programmed that are executed once or cyclically by the inver-
  ter. For each step, you can specify the speed, acceleration time and duration.
- Great freedom in programming the inputs and outputs of the inverter, both analog and digital.

## Types of devices

| Type of inverter | Voltage input [V] | Current input [A] | Voltage output [V] | Current output [A] | Maximum motor power [kW] | Width (W) [mm] | Height (L) [mm] | Depth (H) [mm] |
|---|---|---|---|---|---|---|---|---|
| FA-3X110 | 3×400 | 26 | 3×400 | 25 | 11 | 220 | 360 | 210 |
| FA-3X150 | 3×400 | 35 | 3×400 | 32 | 15 | 220 | 360 | 210 |
| FA-3X220 | 3×400 | 47 | 3×400 | 45 | 22 | 225 | 435 | 242 |



## Control panel

The control panel can be detached from the main body of the inverter. This allows for external mounting on the switchgear door for quick access to the settings and control of the inverter parameters.

**Optional elements**

DC
gland

Braking
resistor

Power supply
3×400 V

L1
L2
L3

R (L1)
S (L2)
T (L3)

**Power circuit**

P      P+      RB

U (T1)
V (T2)
W (T3)

3 ~

**Control circuit**

Digital inputs
DI 1÷DI 4
(programmable)

DI 1
DI 2
DI 3
DI 4

J6
3 +24 V      DI 1÷DI 4 triggering:
2 DCOM      J6 (3-2) – COM level (default)
1 COM       J6 (1-2) – +24 V level

COM
+24 V

J13

Expansion slot
(encoder card)

J12

Expansion slot
(RS-485 card)

DA 1

GND

Digital inputs
DI 5÷DI 8
(programmable)

DI 5
DI 6
DI 7
DI 8

J5
3 +24 V      DI 5÷DI 8 triggering:
2 DCOM      J5 (3-2) – COM level (default)
1 COM       J5 (1-2) – +24 V level

Analog inputs DA 1 and DA 2
(programmable)
0÷10 V DC, max 5 mA
0÷20 mA DC, max 250 Ω

DA 2

GND

+24 V
PLC
COM

J2
3 0÷10 V DC
2
1 0÷20 mA DC

COM
PLC
+24 V

J1
3 0÷10 V DC
2
1 0÷20 mA DC

SPA

COM

SPB

COM

Transistor outputs SPA and SPB
(programmable)
max 24 V DC/50 mA

Analog inputs
AI 1÷AI 2
(programmable)

VR
1 K
2 W

+10 V
AI 1
GND

J3
3 Voltage 0÷10 V DC
2
1 Current 0÷20 mA DC

VR
1 K
2 W

+10 V
AI 2
GND

J4
3 Voltage 0÷10 V DC
2
1 Current 0÷20 mA DC

TA
TB1
TC1

TA2
TB2
TC2

Relay outputs T1 and T2
(programmable)
max 250 V AC/5 A
or 24 V DC/5A

Chapter 39

| Functions | | Technical data |
|---|---|---|
| **Power supply** | Voltage and frequency | 3× 380÷415 V (±10%), 50/60 Hz (±5%) |
| | Output voltage | 3× 380÷400 V (for 400 V power supply) |
| | Output frequency | 0.00÷3200 Hz (U/F control)<br>0.00÷300 Hz (vector control) |
| | V/F control characteristics | 1) Constant torque characteristics<br>2) Characteristics with reduced torque<br>3) Torque characteristics set by the user<br>4) Vector control (sensor and sensorless) |
| | Initial torque | 180% for 0.50 Hz |
| | Dynamics of speed control | 1:100 |
| | Output speed stability | ±0.5% |
| | Driving torque boost | In V/F control mode, automatic or user– defined |
| | Accelerating/braking | Linear or programmable S-curve characteristics.<br>Maximum acceleration and braking time: 6500 s. |
| | Frequency setting accuracy | Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz);<br>Analog accuracy setting: 1% of maximum frequency |
| | Overload | 1) 150% of the rated current for 1 minute<br>2) 200% of the rated current for 0.1 second |
| | Motor slip compensation | In V/F control mode, the automatic slip compensation is available |
| **Protection** | Inverter protection | 1) Against too high and too low power supply voltage<br>2) Against exceeding the maximum current<br>3) Against too high load<br>4) Against the loss of speed loss and stall of a motor<br>5) Against the current leakage to mass<br>6) Against overheating of the inverter<br>7) In addition, the inverter is protected against communication errors or incorrect feedback signals |
| | Safety switch | The input or a button can be programmed as a safety switch that immediately removes the voltage from the inverter outputs |
| | Settings protection | Settings of the inverter can be protected with a PIN number |
| | Error reset | Both automatic and manual error reset can be set |
| **Braking** | | DC injection braking and braking using the external braking resistor |
| **I/O** | 8 digital inputs | 1) Triggering inputs both with low (COM) and high (+24V) level.<br>2) Great freedom of function programming, for example: forward and reverse run, test run, safety switch, reset, multi-stage speed control, motor potentiometer, change of acceleration and braking times, impulse input and others |
| | 3 analog inputs | 1) They can operate as both voltage inputs (0÷10V) and current inputs (0÷20 mA), the range of 4÷20 mA can also be set.<br>2) The analog inputs can be used, among other things, for setting the frequency and torque and for cooperation with the PID controller. |
| | 2 analog outputs | 1) They can operate as both voltage outputs (0÷10 V) and current outputs (0÷20 mA).<br>2) The analog outputs can be programmed for signaling of the following values:<br>   a) preset and current frequency<br>   b) output current voltage<br>   c) voltage in the DC circuit<br>   d) temperature of the IGBT power output stage<br>   e) output power<br>   f) motor speed<br>   g) driving torque |

| Functions | Technical data |
|---|---|
| **I/O** |  |
| 2 transistor outputs | 1) High-speed pulse outputs (max. frequency 100 kHz). Available indication: a) preset frequency; b) current frequency; c) value of the current; d) output voltage; e) voltage in the DC circuit; f) temperature of the power output stage; g) output power; h) motor speed; i) output torque; 2) Transistor load - max. 20 mA/27 V |
| 1 relay output | 1) Contact load capacity 5 A/250 V AC or 5 A/30 V DC 2) Highly programmable output functions (the indication of 34 different states of the inverter) |
| **Adjustment of the speed** | 1) Wide range of speed setting options, including various combinations including digital inputs, analog inputs, potentiometer and control panel buttons, pulse inputs and motor potentiometer. 2) Multistage speed - 16 different speeds and 8 acceleration/braking times can be entered. 3) PLC mode - up to 8 steps can be programmed that are executed once or cyclically by the inverter. For each step, you can specify the speed of the motor, acceleration/braking time and duration. You can also specify whether the sequence will be executed only once or repeated in a loop. |
| **PID** | The built-in PID controller enhances the ability to adjust the drive operation to the requirements of the technological process. Both the setpoint and the feedback signal can be entered from one of the following sources: 1) Control panel (buttons or potentiometer); 2) Analog inputs; 3) Digital inputs; 4) Pulse input. |
| **Environmental conditions** |  |
| Working temperature | -10°C ÷ 40°C. If the temperature exceeds 40 °C, the maximum output current is reduced by 1% with each additional °C |
| Storage | -20÷65°C |
| Humidity | Below 90%, no moisture condensation |
| Height | 0÷1000 m |
| Installation | Vertical installation inside a control cabinet with good ventilation on a mounting plate made of non-combustible material. The installation method must also ensure that the inverter is protected against direct sunlight, dust, moisture, and aggressive or explosive gases. |
| Ventilation | Cooling by natural and forced air circulation |

# FA-1F for control of the single-phase motors

FA-1F series inverters are designed to control single-phase AC motors with an auxiliary starting capacitor.

The most important functions

• The ability to change the direction of rotation of the motor;
• The ability to adjust the rotation speed in the range from 0 to 400 Hz;
• High driving torque at low rotation speed;
• Great freedom of programming digital and analog inputs and outputs;
• PLC mode - up to 7 steps can be programmed that are executed once or cyclically by the inverter. For each step, you can specify the speed, acceleration/braking time and duration;
• A multi-function control panel that can be dismantled and connected on the outside of the inverter.

(!) Before connecting a single-phase motor, it is necessary to change its internal connections in order to eliminate the startup capacitor.
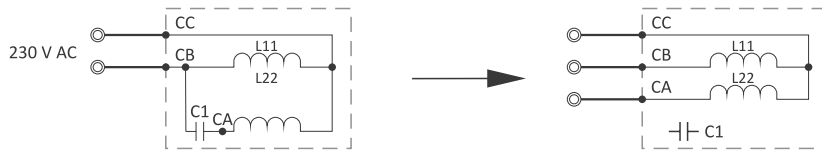


Typical single-phase motor diagram with starting capacitor

A modified system of the motor connections

## Types of devices

| Type of inverter | Voltage Input [V] | Power Input [kVA] | Voltage Output [V] | Current Output [A] | Maximum motor power [kW] | Width (W) [mm] | Height (H) [mm] | Depth (D) [mm] |
|---|---|---|---|---|---|---|---|---|
| FA-1F004 | 1×230 | 1.1 | 1×230 | 3 | 0.4 | 89 | 149 | 113 |
| FA-1F007 | 1×230 | 1.8 | 1×230 | 4.7 | 0.7 | 89 | 149 | 113 |
| FA-1F015 | 1×230 | 2.8 | 1×230 | 7.5 | 1.5 | 89 | 149 | 113 |
| FA-1F022 | 1×230 | 3.8 | 1×230 | 10 | 2.2 | 155 | 230 | 155 |
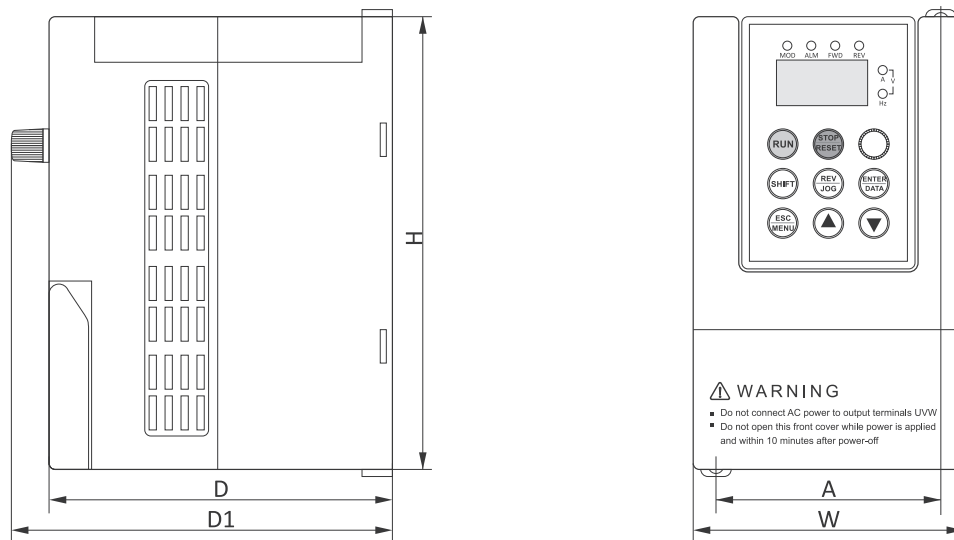


FA-1F004 FA-1F004, FA-1F007, FA-1F015 inverters

## Control panel

The control panel can be detached from the main body of the inverter. This allows for external mounting on the switchgear door for quick access to the settings and control of the inverter parameters.
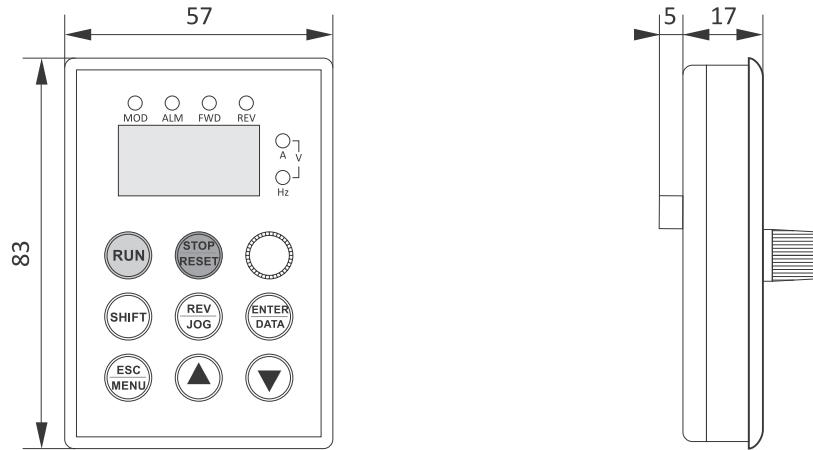


## Description of inputs and outputs

| Functions | | Technical data |
|---|---|---|
| **Power supply** | Voltage and frequency | 1×230 V (±10%), 50/60 Hz (±5%) |
| | Output voltage | 230 V |
| | Output frequency | 0.00÷400 Hz |
| | V/F control characteristics | 1) Constant torque characteristics<br>2) Characteristics with reduced torque<br>3) SVPWM vector control |
| | Initial torque | 100% for 0.50 Hz |
| | Dynamics of speed control | 1:100 |
| | Output speed stability | ±0.5% |
| | Driving torque boost | Automatic or user-defined (0.1÷20%) |
| | Accelerating/braking | Linear or S-curve characteristics |
| | Frequency setting accuracy | Digital accuracy setting: 0.01 Hz<br>Analog accuracy setting: 1% of maximum frequency |
| | Overload | 1) 150% of the rated current for 1 minute<br>2) 200% of the rated current for 0.5 second |
| | Motor slip compensation | In V/F control mode, the automatic slip compensation is available |
| **Protection** | Inverter protection | 1) Against too high and too low power supply voltage<br>2) Against exceeding the maximum current<br>3) Against too high load<br>4) Against overheating of the inverter |
| | Safety switch | The input or a button can be programmed as a safety switch that immediately removes the voltage from the inverter outputs |
| | Settings protection | Settings of the inverter can be protected with a PIN number |
| | Error reset | Both automatic and manual error reset can be set |
| **Braking** | DC injection braking and braking using the external braking resistor | |
| **I/O** | 2 digital inputs: FWD and REV | Two digital inputs to which forward (FWD) and reverse (REV) run commands are permanently assigned |
| | 5 digital inputs | 1) Universal, programmable digital inputs - digital inputs can be assigned, with up to 40 different functions for each input.<br>2) The X5 input can be configured to operate as a high-speed pulse input. |
| | 1 analog input | 1) It can operate as both voltage inputs (0÷10 V) and current inputs (4÷20 mA). Selection is made using the switch on the inverter mainboard.<br>2) The analog input can be used to set the motor rotation speed. |
| | 1 analog output | 1) It can operate as both voltage output (0÷10 V) and current output (4÷20 mA). Selection is made using the switch on the inverter mainboard.<br>2) Selection is made using the switch on the inverter mainboard.<br>   a) preset and current frequency<br>   b) output current voltage<br>   c) voltage in the DC circuit<br>   d) temperature of the IGBT power output stage<br>   e) set value of the PID controller<br>   f) PID controller feedback value |
| | 1 high-speed transistor output | 1) High-speed pulse outputs (max. frequency 20 kHz).<br>  Available indication:<br>   a) preset and current frequency<br>   b) value of output current and voltage<br>   c) voltage in the DC circuit<br>   d) temperature of the IGBT power output stage<br>   e) set value of the PID controller<br>   f) PID controller feedback value<br>2) Transistor load - max. 20 mA/27 V |

| Functions | | Technical data |
|---|---|---|
| **I/O** | 2 relay outputs 5 A | 1) Relay output intended to indicate the error of the inverter.<br>2) Contact load capacity 5A/250 V AC or 5A/30 V DC. |
| | 2 relay outputs | 1) Universal programmable relay output for signalling of, among others:<br>  a) drive operation;<br>  b) drive readiness for operation;<br>  c) reaching the set frequency;<br>  d) inverter error;<br>  e) external error report;<br>  f) operation in PLC mode;<br>  g) other:<br>    – contact load capacity T - 5 A/250 V AC<br>    – contact load capacity T - 0.5 A/250 V AC |
| **Adjustment of the speed** | | 1) Wide range of speed setting options, including various combinations including digital inputs, analog inputs, potentiometer and control panel buttons, pulse inputs and motor potentiometer.<br>2) Multistage speed - 16 different speeds and 8 acceleration/braking times can be entered.<br>3) PLC mode - up to 7 steps can be programmed that are executed once or cyclically by the inverter.<br>  For each step, you can specify the speed of the motor, acceleration/braking time and duration.<br>  You can also specify whether the sequence will be executed only once or repeated in a loop. |
| **PID** | | The built-in PID controller enhances the ability to adjust the drive operation to the requirements of the technological process. Both the setpoint and the feedback signal can be entered from one of the following sources:<br>1) Control panel (buttons or potentiometer);<br>2) Analog input;<br>3) Digital input;<br>4) Pulse input. |
| **Environmental conditions** | Working temperature | -10°C ÷ 40°C. If the temperature exceeds 40 °C, the maximum output current is reduced by 1% with each additional °C |
| | Storage | -20÷65°C |
| | Humidity | Below 90%, no moisture condensation |
| | Height | 0÷1000 m |
| | Installation | Vertical installation inside a control cabinet with good ventilation on a mounting plate made of non-combustible material. The installation method must also ensure that the inverter is protected against direct sunlight, dust, moisture, and aggressive or explosive gases. |
| | Ventilation | Cooling by natural and forced air circulation |

## Soft starters

**Purpose**

Soft starters are used to safely start asynchronous 3-phase squirrel-cage motors.
The use of a soft starter eliminates star/delta systems, and at the same time radically reduces the current surge occurring during the start-up of even the most heavily loaded drives (such as mills and crushers).

# SF-110÷SF-550



**DIGITAL OPERATOR**

| READY | PASS | ERROR |

○ A
○ %
○ S

SET ▲ PRG ▶▶

RUN ▼ STOP RESET
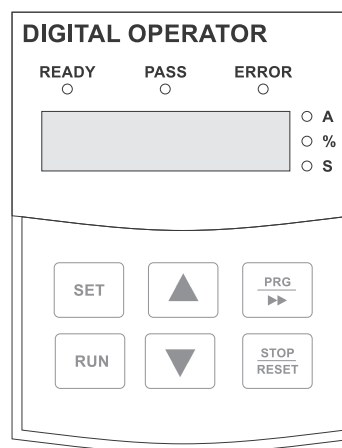
**Functioning**

The motor start-up is carried out on all three phases of the power supply, which prevents the asymmetry of the mains load and uneven load of motor windings. In addition, the advanced safety functions implemented in the soft starter protect the engine during start-up, operation, and braking.

**Selected functions**

- Full three-phase control;
- Six types of start-up characteristics;
- Control of torque, current, and power during both start-up and operation;
- Electronic protection against motor overload;
- Protection against underload of the motor;

- Over-voltage and under-voltage protection;
- Control panel with keypad and LED display;
- An analogue output of current control;
- Programmable relay outputs;
- Error memory;
- A motor can start automatically.

**Types of devices**

| Type | Input voltage [V] | Input current [A] | Maximum motor power [kW] |
|------|-------------------|-------------------|--------------------------|
| SF-110 | 3×400 | 22 | 11 |
| SF-150 | 3×400 | 30 | 15 |
| SF-180 | 3×400 | 37 | 18 |
| SF-220 | 3×400 | 44 | 22 |
| SF-300 | 3×400 | 60 | 30 |
| SF-370 | 3×400 | 74 | 37 |
| SF-450 | 3×400 | 90 | 45 |
| SF-550 | 3×400 | 110 | 55 |

(!) The control panel can be detached from the main body of the inverter.
This allows for external mounting on the switchgear door for quick access to the settings and control of the soft starter parameters.

## Connection scheme

L1
L2
L3
N

**FR1**

**KM1**

**KM2**

**KM2**

R  S  T  O1 O2  O3 O4  O5 O6

**Power circuit**

**Control circuit**

U L1  V L2  W L3  O7  O8  O9  O10  O11  O12

**PE**

1  2  3  4

3 ~

Analog output of
the current control

1  LOCK

2  STOP button

3  START button

4  COM

## Dimensions

146

R  S  T

DIGITAL OPERATOR
READY  PASS  ERROR

SET  ▲  RUN  ▼

CAUTION

288

U  V  W

159

270

115

| Functions | Technical data |
|---|---|
| Power supply | Three-phase, 3× 400 V (±15%), frequency 50 Hz |
| Motor | Asynchronous motor, three-phase (400 V windings) |
| Motor control | Start-up and braking - control of all three output phases<br>Operation - external bypass contactor required |
| Start-up | 1) With the maximum current limitation<br>2) Linear voltage increase<br>3) Rapid start and then with maximum current limitation<br>4) Rapid start and then with linear voltage increase<br>5) Linear current increase<br>6) Double control of voltage and current |
| Braking | 1) Soft braking<br>2) Coasting |
| Protection | 1) Temperature soft start<br>2) Supply voltage loss<br>3) Thermal protection of the motor<br>4) Over-voltage and under-voltage protection<br>5) Short-circuit protection<br>6) Protection against too low load |
| Additional functions | 1) Automatic motor start-up<br>2) Automatic restart in case of an error<br>3) Automatic multiple start-ups |
| Inputs | Potential-free control, relative to the COM level<br>1) Start<br>2) Stop<br>3) Lock |
| Relay outputs | 1) Power supply for bypass-free contactor<br>2) Error indication<br>3) Programming - available functions:<br>  a) operation readiness<br>  b) motor start<br>  c) switching on the bypass contactor<br>  d) beginning of the braking<br>  e) motor stop<br>  f) error - drive lock<br>  g) operation |
| Analog output | Current signal (0÷20 mA) proportional to the actual value of the motor current |
| Control panel | 1) Four-digit LCD display and LED control lights for:<br>  a) soft start programming<br>  b) signaling of the operating status<br>  c) displaying of current, power and motor overload information<br>  d) displaying error messages<br>2) Keypad for controlling the motor and configuring the soft starter<br>3) Ability to block or limit the change of settings |
| Operating conditions | **Operating environment** – free from dust and dirt (especially conductive)<br>– ensuring proper ventilation of the device<br>– protected against unauthorized access<br><br>**Temperature** -25÷40˚C<br><br>**Humidity** below 90% (no moisture condensation)<br><br>**Vibrations** below 0.5 G<br><br>**Operating altitude** below 3 000 m a.s.l. |

# Section X

Electricity
consumption meters

# Electricity consumption meters

## Purpose

Electricity consumption meters are static (electronic), calibrated measuring devices, used as sub-meters to indicate the consumed electric energy of active/reactive one-phase and three-phase alternating current.

## Functioning

A special electronic system, under the influence of the current flowing through it and the applied voltage, generates impulses in the amount proportional to the electric energy consumed. The number of pulses is converted into energy consumed and its value is indicated on the display. The meters are equipped with a pulse output SO+ SO- or communication ports with communication protocols. Input and output terminal covers of the meters can be sealed.

| Product | Type | MID | Cooperation with current transformers | Two-way | Measurement of additional parameters | | | | | | | | | | | Communication | | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Active imported energy | Active exported energy | Reactive energy | Reactive induction energy | Reactive capacitive energy | Apparent power active, reactive | Power demand | Voltage | Current | Frequency | Power factor | Modbus | M-Bus | |
| LE-01 | meter of 1-phase | – | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 227 |
| LE-01d | meter of 1-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 227 |
| LE-01M | meter of 1-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | • | – | 232 |
| LE-01MB | meter of 1-phase | • | – | • | • | – | – | • | • | • | • | • | • | • | • | – | • | 240 |
| LE-01MQ | meter of 1-phase | • | – | • | • | • | – | • | • | • | • | • | • | • | • | • | – | 238 |
| LE-01MR | meter of 1-phase | • | – | • | • | – | • | – | – | • | – | • | • | • | • | • | – | 234 |
| LE-01MW | meter of 1-phase | • | – | • | • | • | • | – | – | • | – | • | • | • | • | • | – | 235 |
| LE-02d | meter of 3-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 228 |
| LE-02d CT | meter of 3-phase | – | • | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 230 |
| LE-03 | meter of 3-phase | – | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 228 |
| LE-03d | meter of 3-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 229 |
| LE-03d CT200 | meter of 3-phase | – | • | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 230 |
| LE-03d CT400 | meter of 3-phase | – | • | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 230 |
| LE-03M | meter of 3-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | • | – | 233 |
| LE-03M CT | meter of 3-phase | – | • | – | • | – | – | – | – | – | – | – | – | – | – | • | – | 233 |
| LE-03MB | meter of 3-phase | • | – | • | • | • | – | • | • | • | • | • | • | • | • | – | • | 240 |
| LE-03MB CT | meter of 3-phase | – | • | • | • | • | – | • | • | • | • | • | • | • | • | – | • | 241 |
| LE-03MP | meter of 3-phase | – | • | • | • | • | – | • | – | • | • | • | • | • | • | • | – | 234 |
| LE-03MQ | meter of 3-phase | • | – | • | • | • | – | • | • | • | • | • | • | • | • | • | – | 238 |
| LE-03MQ CT | meter of 3-phase | • | • | • | • | • | – | • | • | • | • | • | • | • | • | • | – | 239 |
| LE-03MW | meter of 3-phase | • | – | • | • | • | • | • | • | • | • | • | • | • | • | • | – | 236 |
| LE-03MW CT | meter of 3-phase | – | • | • | • | • | • | • | • | • | • | • | • | • | • | • | – | 237 |
| LE-04d | meter of 3-phase | – | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 231 |
| LE-05d | meter of 3-phase | – | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 231 |
| WZE-1 | meter of 1-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 229 |
| WZE-3 | meter of 3-phase | • | – | – | • | – | – | – | – | – | – | – | – | – | – | – | – | 229 |

**Base current** – metrological term: the value of the current for which the essential characteristics of the meter are determined, such as accuracy of the measurement.
**Maximum current** – the maximum current which the electricity meter can be constantly loaded with.
**Minimum current** – metrological term: the lowest value of current for which the accuracy class is maintained.
**Minimum detection current** – the lowest value of current whose flow will be recorded by the meter.
**Example of marking on the device:** 0.25÷5(50)A

0.25 A – minimum current
5 A – base current
50 A – maximum current

## For direct measurement

# LE-01   1-phase, with a mechanical drum counter



| | |
|---|---|
| reference voltage | 230 V |
| base current | 5 A |
| maximum current | 45 A |
| minimum detection current | 0.02 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <8 VA; <0.4 W |
| indication range | 0÷99999.9 kWh |
| meter constant | 1000 pulses/kWh |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 1000 pulses/kWh |
|    pulse duration | 70 ms |
| working temperature | -25÷55°C |
| terminal | 6 mm² screw terminals |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 1-phase;
- Direct measurement 45 A;
- LVD compliance;
- Mechanical drum counter;
- SO pulse output.

# LE-01d   1-phase, with LCD display, **MID certificate**
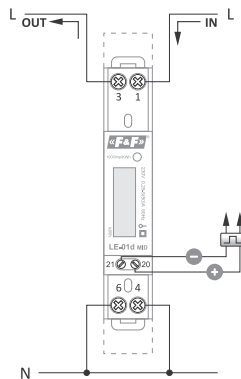


| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 230 V |
| base current | 0.25÷5 A |
| maximum current | 50 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <8 VA; <0.4 W |
| indication range | 0÷99999.9 kWh |
| meter constant | 1000 pulses/kWh |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 1000 pulses/kWh |
|    pulse duration | 90 ms |
| working temperature | -25÷55 °C |
| terminal | 6 mm² screw terminals |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 1-phase;
- Direct measurement 50 A;
- MID compliance;
- LCD display;
- SO pulse output.

## Power supply system of the pulse output with the external meter connected

In order to connect an external counting device to the electric energy indicator, connect a 12÷24 V DC power supply to the system in parallel through a current-limiting resistor 3.6÷8.2 kΩ/0.5 W. The maximum load on the counting circuit is 27 mA.
Changing the power polarity may damage the pulse output of the indicator.
If no external counting device is connected, do not connect the power supply to the pulse output.



12÷24 V DC

# LE-02d  3-phase, with LCD display, **MID certificate**



| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×5 A |
| maximum current | 3×80 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.99 kWh |
| meter constant | 800 pulses/kWh |
| current conumption indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   pulse constant | 800 pulses/kWh |
|   pulse duration | 35 ms |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 4.5 modules (75 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- 3-phase;
- Direct measurement 3×80 A;
- MID compliance;
- LCD display;
- SO pulse output.

---

# LE-03  3-phase, with a mechanical drum counter



| reference voltage | 3×230/400 V |
|---|---|
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.9 kWh |
| meter constant | 800 pulses/kWh |
| current conumption indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   pulse constant | 800 pulses/kWh |
|   pulse duration | 34÷80 ms |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- 3-phase;
- Direct measurement 3×100 A;
- LVD compliance;
- Mechanical drum counter;
- SO pulse output.

# LE-03d   3-phase, with LCD display, **MID certificate**



| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 3×230/400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.9 kWh |
| meter constant | 1000 pulses/kWh |
| current consumption A, B, C phases indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   pulse constant | 1000 pulses/kWh |
|   pulse duration | 34÷80 ms |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions
- 3-phase;
- Direct measurement 3×100 A;
- MID compliance;
- LCD display;
- SO pulse output.

---

# WZE-1   1-phase, with LCD display, **MID certificate**



| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 230 V AC |
| base current | 5 A |
| maximum current | 45 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <8 VA; <0.4 W |
| indication range | 0÷99999.99 kWh |
| meter constant | 1000 pulses/kWh |
| read-out indication | red LED |
| pulse output | |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   pulse constant | 1000 pulses/kWh |
|   pulse duration | 90 ms |
| working temperature | -25÷55°C |
| terminal | zaciski śrubowe 6 mm² |
| dimensions | 1 moduł (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions
- 1-phase;
- Direct measurement 45 A;
- MID compliance;
- LCD display;
- SO pulse output.

---

# WZE-3   3-phase, with LCD display, **MID certificate**



| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 3×230/400 V |
| base current | 3×5 A |
| maximum current | 3×80 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.99 kWh |
| meter constant | 1000 pulses/kWh |
| current consumption A, B, C phases indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   pulse constant | 1000 pulses/kWh |
|   pulse duration | 35 ms |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 4.5 modules (75 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions
- 3-phase;
- Direct measurement 3×80 A;
- MID compliance;
- LCD display;
- SO pulse output.

## For semi-indirect measurement

The indicators are designed to work with current transformers with a secondary current of 5 A.
The maximum measured current of the system is determined by the value of the primary current of the current transformer used. (more on p. 277)

# LE-02d CT  3-phase, for use with current transformers

**Functioning**

The indicator memory stores the values of the primary currents of the transformers that can be used. The selection of the appropriate value, consistent with the values of the connected transformers, automatically sets the appropriate factor, according to which the actual value of the consumed electrical energy of the system is calculated. The LCD display shows the actual value of the consumed energy in the format depending on the selected ratio. The ratio can be programmed using the button located under the cover of counter clamps.
Values of transformer currents stored in the memory of the indicator:
5, 25, 40, 50, 60, 75, 80, 100, 120, 150, 200, 250, 300, 400, 500, 600, 800, 1000, 1200, 1500, 1600, 2000, 2500, 3000, 4000, 5000, 6000.
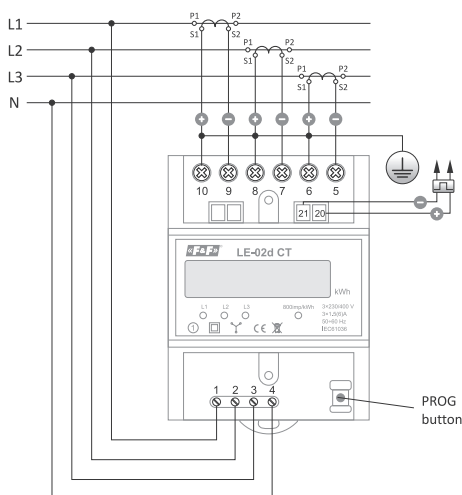


| reference voltage | 3×230/400 V |
|---|---|
| base current | 3×1.5 A |
| maximum current | 3×6 A |
| transformer secondary current | 5 A |
| minimum detection current | 0.04 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| number of the counter digits | 8 |
| indication range | depend on the ratio |
| meter constant | depend on the ratio |
| current conumption indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| pulse constant | depend on the ratio |
| pulse duration | 35 ms |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 4.5 modules (75 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Semi-indirect measurement 3×6 A;
- Transformers 5÷6000/5 A;
- The ratio is set once by pressing the button;
- LVD compliance;
- SO pulse output.

# LE-03d CT200 / LE-03d CT400 for dedicated current transformers

**Functioning**

When using transformers with dedicated parameters, the indicator shows the actual value of electricity consumed by the system.
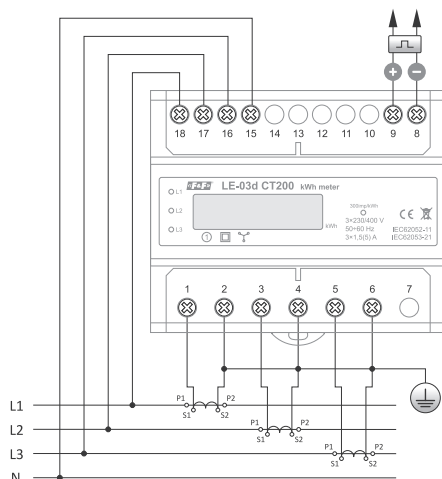


| transformer type | |
|---|---|
| LE-03d CT200 | 200/5 A |
| LE-03d CT400 | 400/5 A |
| reference voltage | 3×230/400 V |
| base current | 3×1.5 A |
| maximum current | 3×5 A |
| minimum detection current | 0.04 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| number of the counter digits | 8 |
| indication range | 0÷9999999 kWh |
| meter constant | 300 pulses/kWh |
| current conumption indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| pulse constant | 300 pulses/kWh |
| pulse duration | 35 ms |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Semi-indirect measurement 3×5 A;
- Transformers 200/5A and 400/5 A;
- Factory set ratio;
- LVD compliance;
- SO pulse output.

Chapter 40

# LE-04d  3-phase, 2-tariff

The indicator is adapted to the measurement of electricity in the double tariff system. Separate displays $T_0$ and $T_1$ are used to indicate the value of energy consumption in a given tariff.

**Functioning**

Switching between tariffs takes place when the control voltage is applied to the D input of the meter. An external control timer can be used for this purpose. The meter $T_0$ reads the value of energy consumption with no control voltage at the D input. The meter $T_1$ reads the value of energy consumption from the appearance of the control voltage at the input D until its loss. The operation of a given meter is indicated by the corresponding LED.

| | |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.99 kWh |
| meter constant | 800 pulses/kWh |
| current conumption indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| pulse constant | 800 pulses/kWh |
| pulse duration | 35 ms |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Direct measurement 3×100 A;
- 2 tariffs;
- Works with an external control timer;
- LVD compliance;
- SO pulse output.

# LE-05d  3-phase, without neutral wire

**Functioning**

An electronic system, under the influence of the current flowing through it and the applied voltage, generates impulses in the amount proportional to the electric energy consumed. Energy is measured in the Aron circuit. The indicator has a SO+ – SO- pulse output. The meter has the option of sealing the input and output terminals, preventing the meter from being bypassed.
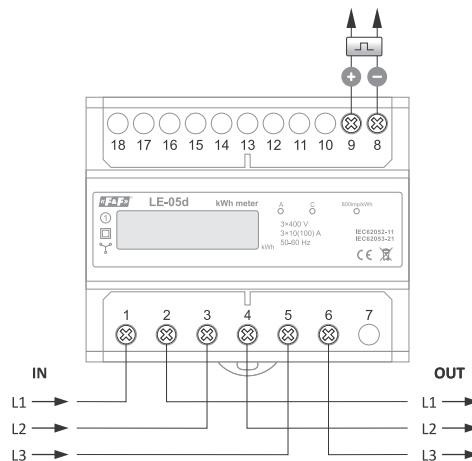
| | |
|---|---|
| reference voltage | 3×400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.9 kWh |
| meter constant | 800 pulses/kWh |
| current conumption indication | 2× red LED |
| read-out indication | red LED |
| pulse output | |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| pulse constant | 800 pulses/kWh |
| pulse duration | 34÷80 ms |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Reference voltage 3×400 V;
- Direct measurement 3×100 A;
- Measurement in the Aron circuit;
- LVD compliance;
- SO pulse output.

# Remote reading meters

**Purpose**

Remote reading meters are used to indicate the consumed electricity and power supply network parameters with the ability of remote reading, archiving data or indications in financial and billing systems, BMS, SCADA, etc.
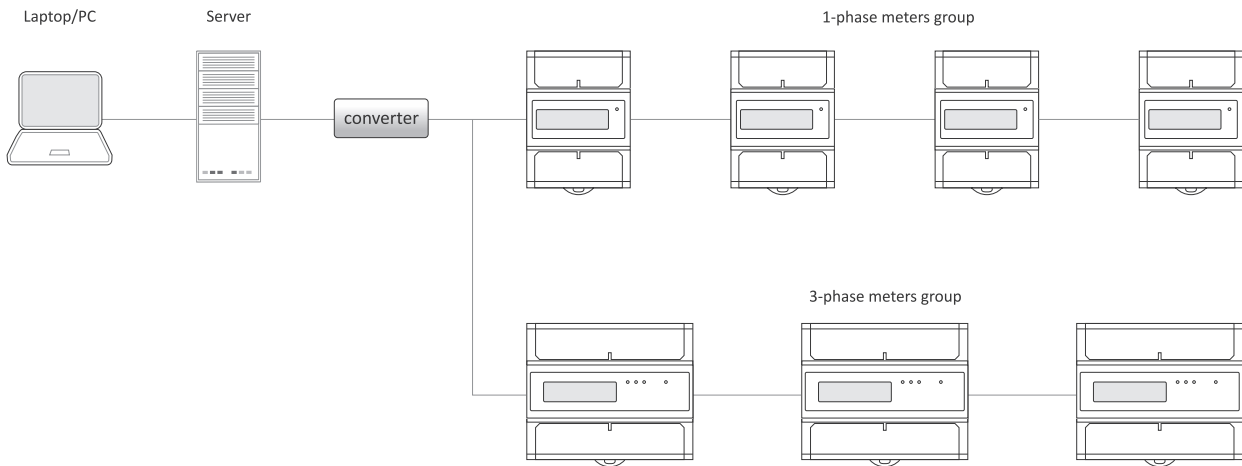


**Functioning**

The group of meters together along with the network communication devices (converters, concentrators, controllers), is managed by a special software allowing to record energy consumption and network parameters. The read and recorded values are consistent with the indications on display of the device. Communication with the meters is carried out in accordance with the established communication protocol through the communication port. Each of the meters is identified by a unique address given by the user.

## Active energy meters with Modbus RTU communication

# LE-01M   1-phase, **MID certificate**
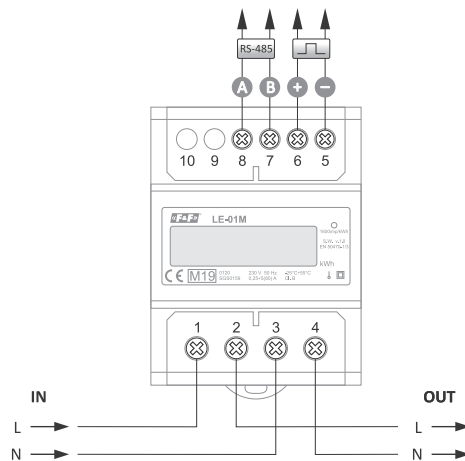


| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 230 V |
| base current | 5 A |
| maximum current | 80 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷99999.99 kWh |
| meter constant | 1600 pulses/kWh |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 1600 pulses/kWh |
|    pulse duration | 34÷80 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4.5 modules (75 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 1-phase;
- Direct measurement 100 A;
- kWh indication;
- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

# LE-03M  3-phase
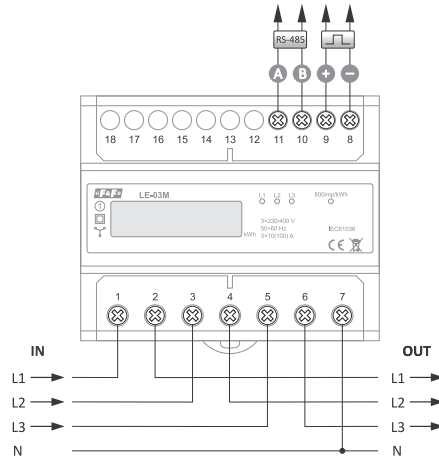


| | |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| class accuracy (IEC61036) | 1 |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷99999.99 kWh |
| meter constant | 800 pulses/kWh |
| current consumption A, B, C phases indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 800 pulses/kWh |
|    pulse duration | 34÷80 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Direct measurement 3×100 A;
- kWh indication;

- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

# LE-03M CT  3-phase, for use with current transformers

**Functioning**

The ratio is programmable according to the programming functions of the Modbus RTU protocol.
Programmable current values of the transformers: 5, 20, 30, 40, 50, 60, 75, 80, 100, 120, 125, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1250, 1500, 2000, 2500, 3000, 4000, 5000, 6000.
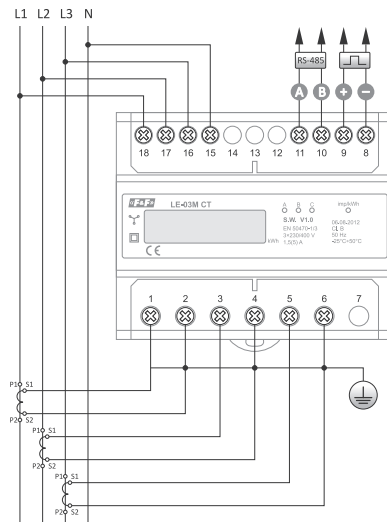


| | |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×1.5 A |
| maximum current | 3×5 A |
| minimum detection current | 0.04 A |
| accuracy class (IEC61036) | 1 |
| own power consumption | <10 VA; <2 W |
| number of the counter digits | 7 |
| indication range | depend on the ratio |
| meter constant | depend on the ratio |
| current consumption A, B, C phases indication | 3× red LED |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | depend on the ratio |
|    pulse duration | 35 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 3-phase;
- Semi-indirect measurement 3×5 A;
- Transformers 5÷6000/5 A;
- Ratio set according to Modbus RTU;

- kWh indication;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

# Active/reactive energy meters with network parameters measurement

The meters are used to indicate and record the consumed electricity and the parameters of the power supply network. The network parameters measured by the indicator are displayed cyclically on the LCD display. Remote reading of all indications is possible via the RS-485 standard wired communication network.

## LE-01MR  1-phase, MID certificate



| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 230 V |
| base current | 5 A |
| maximum current | 100 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <8 VA; <0.4 W |
| indication range | 0÷99999.99 kWh |
| meter constant | 1000 pulses/kWh |
| read-out indication | red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 1000 pulses/kWh |
|    pulse duration | 35 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions

- 1-phase;
- Direct measurement 100 A;
- kWh/kvar indication + network parameters;
- MID compliance;

- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

## LE-03MP  3-phase
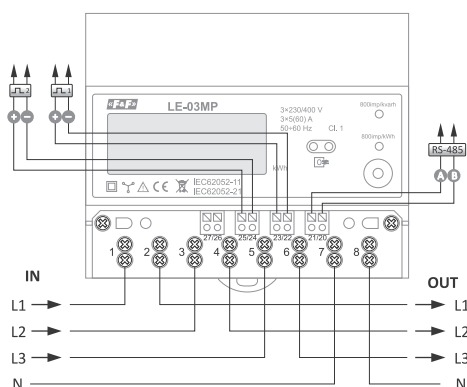


| reference voltage | 3×230/400 V |
|---|---|
| base current | 3×5 A |
| maximum current | 3×60 A |
| minimum detection current | 0.02 A |
| measurement accuracy (IEC61036) | 1st class |
| own power consumption | <10 VA; <1.5 W |
| indication range | 0÷999999.99 kWh |
| meter constant (kWh) | 800 pulses/kWh |
| meter constant (kvarh) | 800 pulses/kvarh |
| read-out indication | 2× red LED |
| pulse output | |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant | 800 pulses/kWh |
| | or 800 pulses/kvarh |
|    pulse duration | 10 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 7 modules (122 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions

- 3-phase;
- Direct measurement 3×60 A;
- kWh/kvar indication + network parameters;
- Prepaid;

- LVD compliance;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

### Additional functions

- Internal relay for switching on of phase circuits L1, L2, L3;
- Manual control of the relay;
- Overcurrent protection - the setting of the load limit value;
- Prepaid energy – the value of active energy at which the meter disconnects the internal relay;
- Automatic operation – activating automatic relay shutdown after exceeding the set excess current and activating the prepaid function;
- Status – current status of the relay [ON/OFF].

# Multi-tariff

# LE-01MW  1-phase, 2-way, 4-tariff electricity meter, **MID certificate**

LE-01MW is an electronic, compliant with the MID Directive single-phase electricity meter, designed for measurement in a direct 2-wire system. The built-in real-time clock allows the measurement of energy consumption divided into different tariff zones.
The meter is equipped with an RS-485 communication interface with Modbus RTU protocol, which enables remote reading and configuration of the meter.
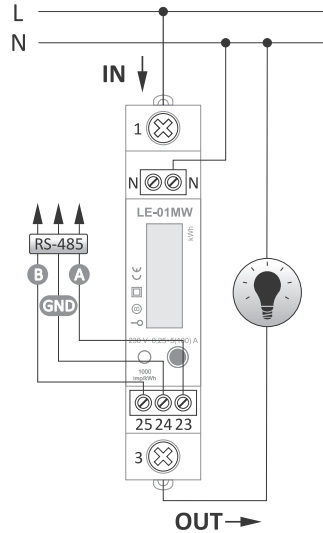


| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 230 V |
| base current | 5 A |
| maximum current | 100 A |
| minimum detection current | 0.02 A |
| voltage measuring range | 100÷289 V AC |
| rated frequency | 50 Hz |
| measurement accuracy | B class |
| installation | 1-phase, 2-wire |
| overload | 30×Imax/10 ms |
| isolation | 4 kV/1 min.; 6 kV/1 µs |
| own power consumption | <8 VA; <0.4 W |
| indication range | 6 digits |
| meter constant | 100; 1000; 2000 pulses/(kWh/kvarh) |
| communication | |
|    port | RS-485 |
|    communication protocol | Modbus RTU |
|    transmission rate | 1200, 2400, 4800, 9600 bps |
|    parity | NONE, EVEN, ODD |
|    parity bits | 2 |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

**Functions**

- 1-phase electricity meter;
- Direct measurement up to 100 A;
- Installation on DIN rail (1 module);
- Operation in one of two measurement modes:
  – measurement of active and reactive energy,
  – measurement of active energy imported from and exported to the grid
- Energy measurement in four tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- MID compliance;
- RS-485 port;
- Modbus RTU protocol;
- Backlit LCD display;
- Energy consumption indication can be read locally even if the meter is not powered.

# LE-03MW   3-phase, 4-tariff, 2-way electricity meter, **MID certificate**

**Purpose**

LE-03MW is an electronic, compliant with the MID Directive, 2-way, 4-tariff three-phase electricity meter, designed for measurement in a direct system. The built-in real-time clock allows the measurement of energy consumption divided into different tariff zones. It is equipped with communication interfaces: RS-485 with Modbus RTU protocol and optical port according to EN62056 (IEC1107) which allows remote reading and configuration of the meter.
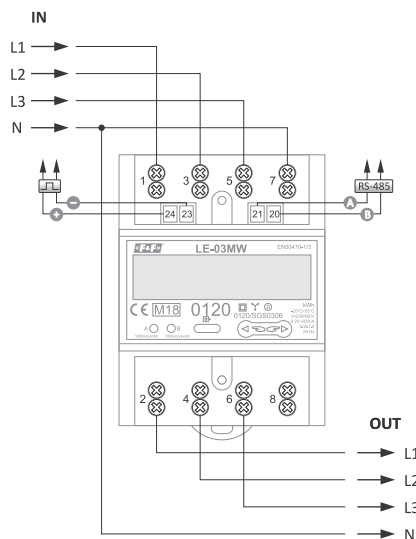


| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 3×230/400 V |
| base current | 3×5 A |
| maximum current | 3×80 A |
| minimum detection current | 0.04 A |
| measured voltage | |
|    L-N | 100÷289 V AC |
|    L-L | 173÷500 V AC |
| measurement accuracy | B class |
| own power consumption | <10 VA; <1.5 W |
| indication range | 0÷999999.99 kWh |
| meter constant (kWh) | 800 pulses/kWh |
| meter constant (kvarh) | 800 pulses/kvarh |
| read-out indication | 2× red LED |
| pulse outputs | |
|    outputs number | 2 |
|    type | OC (open collector) |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    pulse constant output 1 | 1, 10,100, 1000 pulses/kWh |
|    pulse constant output 2 | 1000 pulses/kvar |
|    pulse duration | 10 ms |
| communication | |
|    port | RS-485 |
|    communication protocol | Modbus RTU |
|    transmission rate | 1200, 2400, 4800, 9600 bps |
|    parity | EVEN |
|    parity bits | 1 |
| optical port | according to EN62056 (IEC1107) |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4.5 modules (76 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

**Functions**

- 4-tariff;
- 2-way (import/export);
- Direct measurement up to 80 A;
- Energy measurement in 4 tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- Total and tariff-divided consumption registration:
  - total active and reactive energy;
  - active and reactive energy divided into individual quadrants;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand for individual tariffs;
- Additional, resettable energy consumption meter;
- MID compliance;
- RS-485 port;
- Modbus RTU protocol;
- Optical communication port in accordance with EN62056 (IEC1107);
- 2× SO pulse outputs with a programmable number of pulses per kWh/kvarh;
- Multifunctional LCD display.

# LE-03MW CT  3-phase, 4-tariff, 2-way electricity meter

LE-03MW CT is an electronic, 4-tariff, 2-way three-phase electricity meter, designed for measurement in a semi-indirect system. The built-in real-
-time clock allows the measurement of energy consumption divided into different tariff zones. It is equipped with communication interfaces: RS-485
with Modbus RTU protocol and optical port according to EN62056 (IEC1107) which allows remote reading and configuration of the meter.
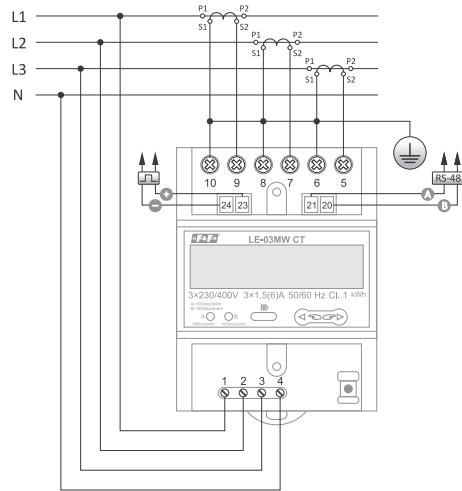


| reference voltage | | 3×230/400 V |
|---|---|---|
| base current | | 3×1.5 A |
| maximum current | | 3×6 A |
| minimum detection current | | 0.02 A |
| measured voltage | | |
| | L-N | 100÷289 V AC |
| | L-L | 173÷500 V AC |
| measurement accuracy (IEC61036) | | 1st class |
| own power consumption | | <10 VA; <1.5 W |
| indication range | | 0÷999999.99 kWh |
| meter constant (kWh) | | 12000 pulses/kWh |
| meter constant (kvarh) | | 12000 pulses/kvarh |
| read-out indication | | 2× red LED |
| pulse outputs | | |
| | outputs number | 2 |
| | type | OC (open collector) |
| | maximum voltage | 27 V DC |
| | maximum current | 27 mA |
| | pulse constant output 1 | 12000, 1200, 120, 12 pulses/kWh |
| | pulse constant output 2 | 12000 pulses/kvar |
| | pulse duration | 10 ms |
| communication | | |
| | port | RS-485 |
| | communication protocol | Modbus RTU |
| | transmission rate | 1200, 2400, 4800, 9600 bps |
| | parity | EVEN |
| | parity bits | 1 |
| optical port | | according to EN62056 (IEC1107) |
| working temperature | | -25÷55°C |
| terminal | | 25 mm² screw terminals |
| dimensions | | 4.5 modules (76 mm) |
| mounting | | for TH-35 rail |
| ingress protection | | IP51 |

## Functions

- 4-tariff;
- 2-way (import/export);
- Semi-indirect energy measurement using 5 A secondary current transformers;
- Energy measurement in 4 tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- Total and tariff-divided consumption registration:
  – total active and reactive energy;
  – active and reactive energy divided into individual quadrants;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand for individual tariffs;
- Additional, resettable energy consumption meter;
- RS-485 port;
- Modbus RTU protocol;
- Optical communication port in accordance with EN62056 (IEC1107);
- 2× SO pulse outputs with a programmable number of pulses per kWh/kvarh;
- Multifunctional LCD display.

# Active/reactive imported/exported energy meters, bi-directional with network parameters measurement

## With RS-485 port and Modbus RTU protocol

## LE-01MQ  1-phase, 2-way, 4-quadrant electricity meter, for photovoltaic systems, MID certificate



| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 230 V AC |
| base current | 5 A |
| maximum current | 100 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷99999.99 kWh |
| meter constant (kWh) | 1, 10, 100, 1000 pulses/kWh |
| meter constant (kvarh) | 1, 10, 100, 1000 pulses/kvarh |
| read-out indication | 2×LED |
| pulse outputs | 2 |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   output 1 (set up) | 1, 10, 100, 1000 pulses [kWh/kvarh] |
|   pulse duration (set up) | 60, 100, 200 ms |
|   output | 3200 pulses/kvarh |
|   pulse duration | 200 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

### Functions

- 1-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- MID compliance;

- Modbus RTU protocol;
- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

## LE-03MQ  3-phase, 2-way, 4-quadrant electricity meter, MID certificate



| compliance | MID Directive 2014/32/EU |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.99 kWh |
| meter constant (kWh) | 0.01; 0.1; 1; 10; 100 pulses/kWh |
| meter constant (kvarh) | 0.01; 0.1; 1; 10; 100 pulses/kvarh |
| read-out indication | 2×LED |
| pulse outputs | 2 |
|   type | open collector |
|   maximum voltage | 27 V DC |
|   maximum current | 27 mA |
|   output 1 (set up) | 0.01; 0.1; 1, 10, 100, 1000 pulses [kWh/kvarh] |
|   pulse duration (set up) | 60, 100, 200 ms |
|   output 2 | 3200 pulses/kvarh |
|   pulse duration | 200 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4.5 modules (76 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

### Functions

- 3-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- MID compliance;
- Modbus RTU protocol;

- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MQ meter can be found on page 242.

# LE-03MQ CT   3-phase, 2-way, 4-quadrant electricity meter, **MID certificate**

| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 3×230/400 V |
| base current | 3×5 A |
| maximum current | 3×6 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| number of reading fields | 8 digits |
| indication range | depend on the ratio |
| meter constant (kWh) | 0.01; 0.1; 1; 10; 100 pulses/kWh |
| meter constant (kvarh) | 0.01; 0.1; 1; 10; 100 pulses/kvarh |
| read-out indication | 1×LED |
| pulse outputs | 2 |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| output 1 (set up) | 0.01; 0.1; 1, 10, 100, 1000 pulses [kWh/kvarh] |
| pulse duration (set up) | 60, 100, 200 ms |
| output 2 | 3200 pulses/kvarh |
| pulse duration | 200 ms |
| port | RS-485 |
| communication protocol | Modbus RTU |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4 modules (72 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

## Functions

- 3-phase;
- 2-way (4-quadrant);
- 1 A or 5 A transformers;
- Current ratio 1÷9999;
- Adjustable measuring voltage 100÷500 V;
- Voltage ratio 1÷9999;
- Ratio set according to Modbus RTU;
- Indications of kWh/kvar (imported/exported);

- Indication of network parameters;
- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MQ CT meter can be found on page 242.

## MeternetPRO network parameter recording system
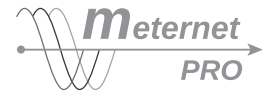
### Purpose

The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or LAN networks. The program along with its database is installed on a special MT-CPU-1 server, which operates in the LAN network. The software user interface is a Web application (website). The program is accessible through any web browser. In the case of a LAN with a public IP address, you can configure the program to operate and read data over the Internet.



**More information on p. 243**

# LE-01MB   1-phase, 2-way, 4-quadrant electricity meter, MID certificate



| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 230 V |
| base current | 5 A |
| maximum current | 100 A |
| minimum detection current | 0.02 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷99999.99 kWh |
| meter constant (kWh) | 1, 10, 100, 1000 pulses/kWh |
| meter constant (kvarh) | 1, 10, 100, 1000 pulses/kvarh |
| read-out indication | 2×LED |
| pulse outputs | 2 |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    output 1 (set up) | 1, 10, 100, 1000 pulses [kWh/kvarh] |
|    pulse duration (set up) | 60, 100, 200 ms |
|    output 2 | 3200 pulses/kvarh |
|    pulse duration | 200 ms |
| communication protocol | M-Bus |
| working temperature | -25÷55°C |
| terminal | 16 mm² screw terminals |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

### Functions

- 1-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;

- MID compliance;
- M-Bus protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

# LE-03MB   3-phase, 2-way, 4-quadrant electricity meter, MID certificate



| | |
|---|---|
| compliance | MID Directive 2014/32/EU |
| reference voltage | 3×230/400 V |
| base current | 3×10 A |
| maximum current | 3×100 A |
| minimum detection current | 0.04 A |
| measurement accuracy | B class |
| own power consumption | <10 VA; <2 W |
| indication range | 0÷999999.99 kWh |
| meter constant (kWh) | 0.01; 0.1; 1; 10; 100 pulses/kWh |
| meter constant (kvarh) | 0.01; 0.1; 1; 10; 100 pulses/kvarh |
| read-out indication | 2×LED |
| pulse outputs | 2 |
|    type | open collector |
|    maximum voltage | 27 V DC |
|    maximum current | 27 mA |
|    output 1 (set up) | 0.01; 0.1; 1, 10, 100 pulses [kWh/kvarh] |
|    pulse duration (set up) | 60, 100, 200 ms |
|    output 2 | 3200 pulses/kvarh |
|    pulse duration | 200 ms |
| communication protocol | M-Bus |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4.5 modules (76 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

### Functions

- 3-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (energy imported/exported);
- Indication of network parameters;

- MID compliance;
- M-Bus port and protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MB meter can be found on page 241.

# LE-03MB CT  3-phase, 2-way, 4-quadrant electricity meter
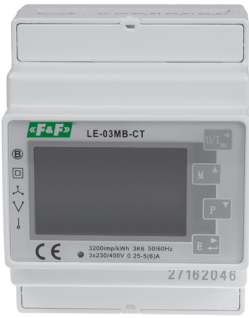
| | |
|---|---|
| reference voltage | 3×230/400 V |
| base current | 3×5 A |
| maximum current | 3×6 A |
| minimum detection current | 0.02 A |
| accuracy class (IEC61036) | 1st class |
| own power consumption | <10 VA; <2 W |
| number of reading fields | 8 digits |
| indication range | depend on the ratio |
| meter constant (kWh) | 0.01; 0.1; 1; 10; 100 pulses/kWh |
| meter constant (kvarh) | 0.01; 0.1; 1; 10; 100 pulses/kvarh |
| read-out indication | 2×LED |
| pulse outputs | 2 |
| type | open collector |
| maximum voltage | 27 V DC |
| maximum current | 27 mA |
| output 1 (set up) | 0.01; 0.1; 1, 10, 100, 1000 pulses [kWh/kvarh] |
| pulse duration (set up) | 60, 100, 200 ms |
| output 2 | 3200 pulses/kvarh |
| pulse duration | 200 ms |
| communication protocol | M-Bus |
| working temperature | -25÷55°C |
| terminal | 25 mm² screw terminals |
| dimensions | 4 modules (72 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP51 |

## Functions

- 3-phase;
- 2-way (4-quadrant);
- 1 A or 5 A transformers;
- Current ratio 1÷9999;
- Adjustable measuring voltage 100÷500 V;
- Voltage ratio 1÷9999;
- Ratio set according to Modbus RTU;

- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- M-Bus port/protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

## Measuring systems for meters: LE-03MB, LE-03MB CT, LE-03MQ, LE-03MQ CT

## LE-03MB
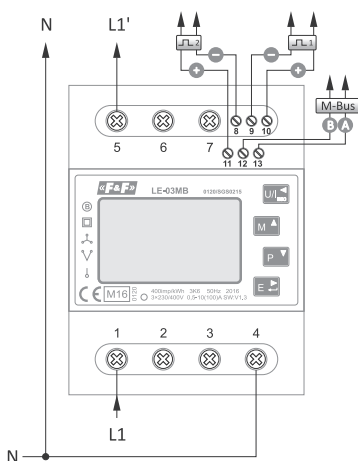


230 V AC
1-phase 2-wire installation
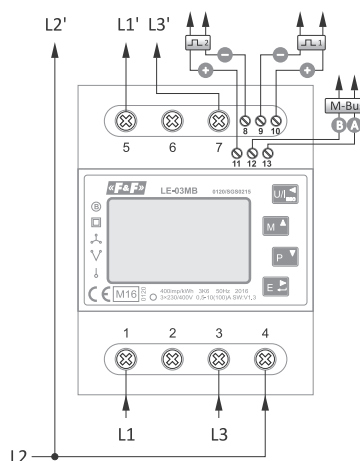
3×400 V
3-phase 3-wire installation
(without neutral wire)
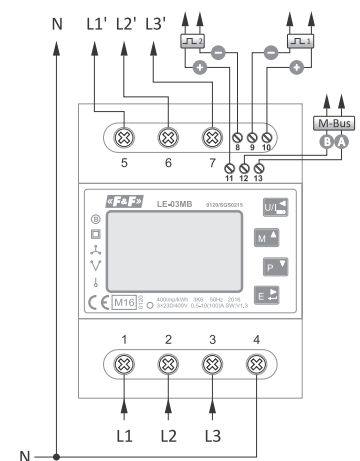
3×400 V
3-phase 3-wire installation
(without neutral wire)

*continued on next page*

# LE-03MB CT   3-phase, 2-way, 4-quadrant electricity meter
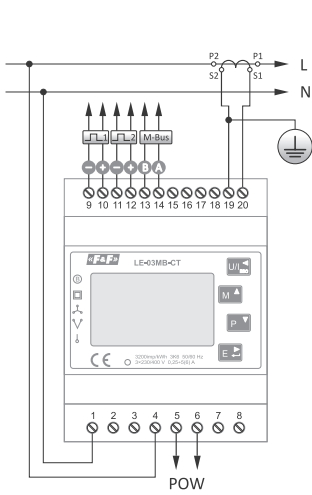


230 V AC
1-phase 2-wire installation
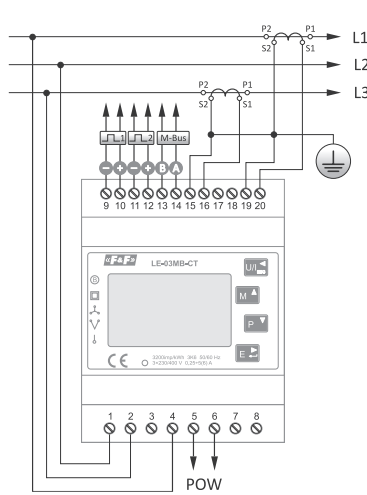
3×400 V
3-phase 3-wire inst. (without neutral wire)
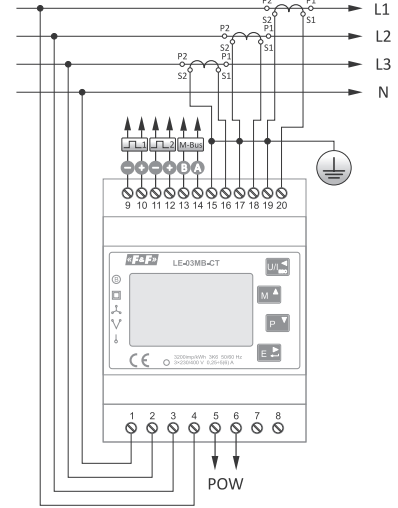
3×230 V+N
3-phase 4-wire installation

# LE-03MQ   3-phase, 2-way, 4-quadrant electricity meter, **MID certificate**
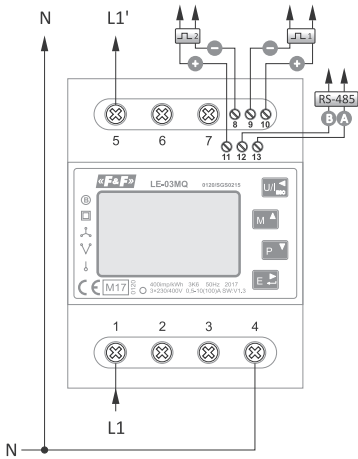


230 V AC
1-phase 2-wire installation
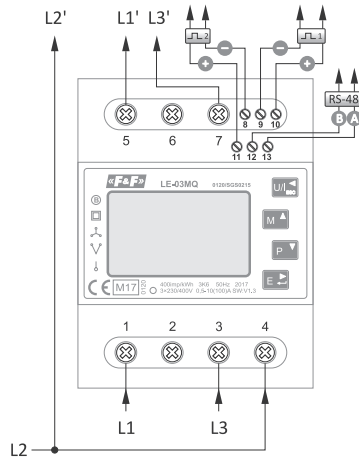
3×400 V
3-phase 3-wire inst. (without neutral wire)
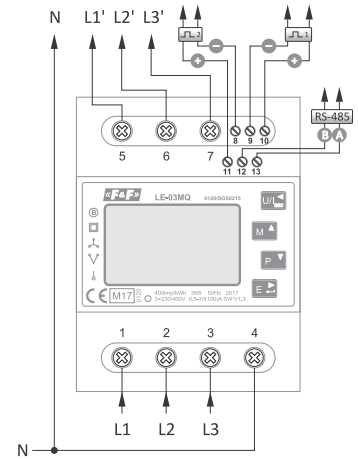
3×230 V+N
3-phase 4-wire installation

# LE-03MQ CT   3-phase, 2-way, 4-quadrant electricity meter, **MID certificate**



230 V AC
1-phase 2-wire installation

3×400 V
3-phase 3-wire inst. (without neutral wire)

3×230 V+N
3-phase 4-wire installation

# Remote reading and recording system

# MeternetPRO

The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or LAN networks. The program along with its database is installed on a special MT-CPU-1 server, which operates in the LAN network. The software user interface is a Web application (website). The program is accessible through any web browser. In the case of a LAN with a public IP address, you can configure the program to operate and read data over the Internet.



## Areas of application

- Large factories;
- Small production facilities;
- Office buildings;
- Apartment buildings;
- Apartment blocks;
- Shopping malls;
- Markets;
- Public buildings;
- Single-family housing estates;
- Campings;
- Plot gardens.

## Frequent applications

- Measurements for energy audit;
- Reports on the consumption of electricity, water, gas, etc.
- Subtenant billings;
- Analysis of production and operating costs;
- Power/current/voltage charts;
- On-line parameter monitoring;
- Supervision of power limits (power guard);
- Adjusting electricity tariff.

## Functions

- The system does not require the installation of any programs on the user's hardware;
- Local and remote access through any web browser;
- No workstation licenses - an unlimited number of users;
- The MT-CPU-1 server is a stand-alone unit that manages devices and the archive;
- Supported protocols: Modbus RTU, Modbus TCP, M-Bus, DLMS;
- Supported ports: Ethernet RJ-45, RS-485, USB ×4;
- Status – preview panel of performance and correctness of system operation;
- Reports – a preview of current and archival recorded values (results table, graphs), report filters, time ranges, subscription billing of energy consumption, etc.
- Dashboard – a window of graphic indicators, visualization, and control panels (webscada);
- Widgets – graphical indicators assigned to the recorded values (hints, bar graphs, trends, thermal maps, etc.);

- Configuration – simple system settings without programming skills, the definition of device names, system settings;
- Data acquisition – direct writing to .csv file, transfer over LAN, import of data in the form of .csv and .xls file to user's computer, external SQL databases;
- "Mathematics" software module – for algebraic transformations of read values;
- SMS/e-mail alerts;
- Manual and automatic control (threshold/hysteresis double state control, power guard);
- The differential function allows you to convert the electricity consumption [kWh] into instantaneous power [kW]. The result is a graphical profile of power consumption that allows you to track trends and find the peak power consumption.
- Integration with external devices such as water meters, gas meters, etc.

# MT-CPU-1   hardware server

## Purpose

Central unit for managing the system. The computer queries the devices, archives the data, manages the communication and distribution of data.
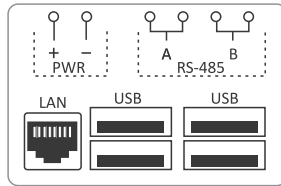


| | |
|---|---|
| supply voltage | 9÷30 V DC |
| ports | |
|    LAN | RJ-45 |
|    USB | 2.0 |
|    RS-485 | Modbus RTU |
| working status indication | 5×LED |
| RTC clock | YES |
| system memory | 8 GB |
| battery type | 2032 (lithium) |
| battery life | 6 years* |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.3 Nm |
| dimensions | 6 modules (105 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life depends on weather conditions

## Archives and data

Data archiving is carried out in a designated memory space:
- storage drives: HDDs and SSDs with USB 3.0/2.0 connection;
- flash memory (pendrive);

- storage available in the LAN (FTP, SQL, etc.);
- cloud storage (hosting), accessible via the Internet.
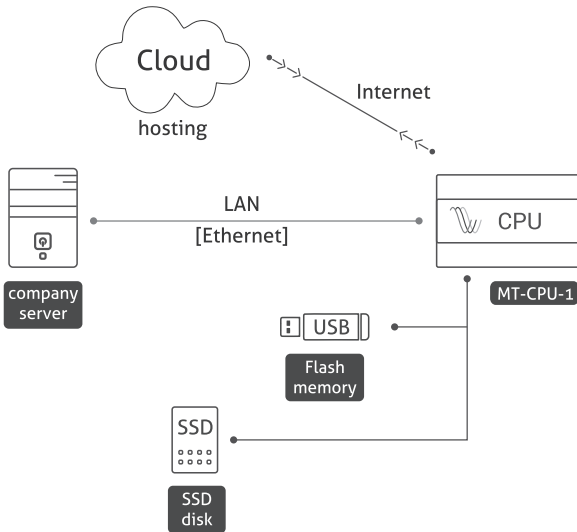


Supported archive types:



Internal database    *.csv file

Postgre SQL database    MS SQL database    Oracle database

---

# Pendrive64   flash memory USB 64 GB

## Purpose

External memory for operation with MT-CPU-1 hardware server for the MeternetPRO system archive.



| | |
|---|---|
| memory | flash |
| interface | USB 3.1 |
| read speed | 220 MB/s |
| write speed | 120 MB/s |
| power consumption | 0.35 W |
| mounting | USB port |

---

# SSD275 disk   flash memory USB 275 GB

## Purpose

External memory for operation with MT-CPU-1 hardware server for the MeternetPRO system archive.



| | |
|---|---|
| memory | SSD |
| interface | SATA M.2 2280SS |
| read speed | 530 MB/s |
| write speed | 500 MB/s |
| power consumption | |
|    standby | 0.35 W |
|    on | 1.1 W |
| terminal | USB Micro-B |
| mounting | for TH-35 rail |

# MeternetPRO   system app

The system application, together with the MT-CPU-1 server is the central unit of the system. For measuring devices, it acts as a Master.

Data exchange between devices is carried out via RS-485 port, built into MT-CPU-1 server, standard RS-485 or M-Bus to USB converters or LAN converters (Ethernet/TCP-IP).

The system does not require the installation of any programs on the user's hardware. The server is a LAN device and serves as a Web server. The application is available through a web browser for every computer operating in the same subnet. To access the system, use the login panel. In the case of LAN with a router (with a public IP address), it is possible to read data over the Internet. The read data are archived on external memory (HDD/SDD, Flash) connected to the server or sent to an external database (hosting). Data can be freely shaped according to software functions or imported to the user's computer in the form of .csv files (opened in Excel or any other database program).

**Software interface**



Screenshot from the "Reading" section - results table



Screenshot from the "Dashboard" section - time course



Screenshot from the "Dashboard" section - graphic indicators



Screenshot from the "Configuration" section

Chapter 40

- **LIC-MT-B** basic license:
  - registration of all selected parameters to the system database;
  - the operating status of the system;
  - ten tokens;
  - table of current readings;
  - reports: tabular, historical for a given time point, historical graph for one parameter for a selected time period; export of generated reports to a .csv file (opened in Excel or any other database program) and a dump of generated graphs to a .jpg file;
  - dashboard: 1 dashboard + 3 indicators (widgets).
- **LIC-MT-D** – device license (token)
  Tokens are so-called system points. Each device added to the system or a specific software license takes an appropriate number of tokens. Within the purchased number of tokens, the user can freely match different devices in the system, for example, having a license for 8 tokens, we can assemble four LE-03M meters in the system or only one LE-03MP meter. The number of tokens for a given device or software licenses is presented by the current inventory and price list available on the website: www.meternetpro.pl. Adding of purchased tokens to the system is done using the sent license code.
- **LIC-MT-R** – extension license – "reports" module
  This version with an active license allows you to create multiple parallel incremental reports. It is used as a module of subscription billing of electricity consumption (or other recorded incremental values, such as consumption of water, heat, etc.). It allows you to calculate increments in the determined settlement periods. Cycles: monthly, weekly, daily, hourly. Additionally, the license activates the ability to create historical graphs for 10 parameters on a one-time axis (such as dependence of consumed power on temperature).
- **LIC-MT-P** –extension license – "dashboard" module
  A panel of graphical indicators of current indications of selected parameters. The version with an active "dashboard" license allows you to create an unlimited number of dashboards and indicators (widgets).
- **LIC-MT-L** – software module – "control and alarm" module
  Module for assigning event logic depending on the input parameter value:
  - e-mail notifications;
  - SMS notifications;
  - manual ON/OFF control of the MR-RO-1 and MR-RO-4 output modules;
  - automatic ON/OFF control of the MR-RO-1 and MR-RO-4 output modules on a bi-state adjustment basis;
  - manual control of the output analog voltage signal of the MR-AO-1 module;
  - automatic control of the output analog voltage signal of the MR-AO-1 module;
- **LIC-MT-M** – extension license – "math" module
  This module enables algebraic transformations (calculations) of registered values (sum, difference, multiplying, division, differential, average, min., max., etc.). The result is recorded as a virtual device parameter and is subject to all software rules as any real device result.
- **LIC-MT-K** –extension license – "camping" module
  This module allows you to calculate the consumption of electricity or other utilities (water, gas, etc.) in a given time by means of the manual START/STOP control and to settle the user's account with the due amount in accordance with the set rate. Each billing report starts and ends with printing to a PDF file. The billing archive is saved in a special file in the Files tab and can be exported to a CSV file.
- **LIC-MT-Z** –extension license - "prepaid" module
  Module allowing for prepayment management of electricity or other utilities (water, gas, etc.) consumption. It allows you to automatically disconnect the power source when the set threshold is exceeded or to manually control on an ON/OFF basis.
- **LIC-MT-I** – extension license - external implementation
  Software complementation of the system library with a foreign device, not produced by the F&F. Service available at the request of the client. It allows you to integrate other Modbus RTU-compatible devices. Each device will have an individual number of tokens assigned to it.

## Subscriber electricity consumption settlements

**LIC-MT-R** – software extension license - "reports" module

The module of subscription settlements of electricity consumption (or other recorded incremental values, such as consumption of water, heat, etc.). It allows you to calculate increments in the determined billing periods. Cycles: monthly, weekly, daily, hourly. This version with an active license allows you to create multiple parallel reports.

## Server location

Install the server in a separate distribution box. Avoid installation in switchgear with high load devices and devices producing strong electromagnetic fields. In case of strong interference caused by high loads, operation of induction machines (motors), operation of inverters and a large number of capacitive load receivers (LEDs), it is recommended to install the server in a metal box with grounding.



## Power supply

The use of the backup power supply is recommended.

System restart can take up to 5÷7 minutes.

During that time, no data from the system will be recorded. Also, in case of sudden voltage loss, there is a risk of damage to the data recorded in external memory. Use a UPS or backup power supply system based on the ECH-06 module.
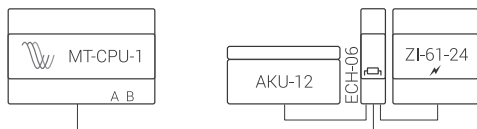


| Types of devices | Description of the device | Page |
|---|---|---|
| ECH-06 | Backup power supply module | 193 |
| AKU-12 | 12 V 1.3 Ah gel battery | – |
| ZI-24 | 24 V 30 W stabilized power supply | 189 |

The ECH-06 module constantly monitors the state of charge of the battery and charges it automatically when the main power supply voltage is present. In case of main voltage loss or drop of its value below the voltage on the battery, the receiver is powered from the battery.

# Devices associated with MeternetPRO

## Converters

# MAX-CN-USB-485   RS-485 <-> USB converter

The converter enables access to the RS-485 port from any PC or other Master-type device equipped with a USB interface.
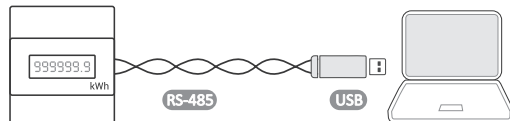


| | |
|---|---|
| wire length | 1.8 m |
| terminal RS-485 | 2×0.34 mm² |

# MAX-CN-ETH-485   RS-485 <-> TCP/IP converter

The converter enables access to the RS-485 serial port from any computer in the local network, and, using an IP address, from any computer in the world connected to the Internet. The communication takes place via TCP, UDP, DHCP and other protocols.



| | |
|---|---|
| power | 9÷24 V DC |
| power supply (included) | 9 V DC |
| RS-485 connector | 1.0 mm² |
| TCP connector | RJ-45 socket |
| dimensions | 86×100×26 mm |
| mounting | surface |
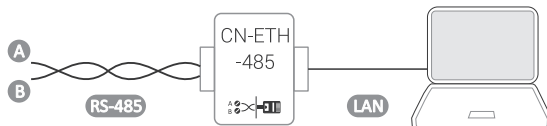
# MAX-CN-GPRS-485   RS-485 <-> GSM/GPRS network converter

The CN-GPRS-485 converter is used for bidirectional, transparent data transmission from the RS-485 serial port to the network.
The converter supports the Identity and Heartbeat packet mechanisms and socket connections.



NEW!

| | |
|---|---|
| power | 9÷24 V DC |
| power supply (included) | 9 V DC |
| RS-485 connector | 1.0 mm² |
| TCP connector | RJ-45 socket |
| dimensions | 86×100×26 mm |
| mounting | surface |

Chapter 40

| Types of devices | Description of the device | Page |
|---|---|---|
| DMM-5T-2 | Multimeter, indirect 4-quadrant measurement 5÷9000 A, measurement of U, I, F, AE, RE, P, Q, cos | 199 |
| DMM-5T-3 | Multimeter, indirect 4-quadrant measurement 1 mA÷25000 A, measurement of U, I, F, AE, RE, P, Q, cos | 200 |
| LE-01M | 1-phase direct energy meter 100 A | 232 |
| LE-03M | 3-phase direct energy meter 100 A | 233 |
| LE-03M CT | 3-phase direct energy meter 5÷6000 A | 233 |
| LE-01MR | Energy meter, direct 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, T | 234 |
| LE-03MP | Energy meter, direct 3-phase 60 A, measurement of U, I, F, AE, RE, P, Q, cos, T, Prepaid | 234 |
| LE-01MQ | Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos | 238 |
| LE-03MQ | Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos | 238 |
| LE-03MQ CT | Energy meter, semi-indirect 2-way 1-phase 5 A, measurement of U, I, F, AE, RE, P, Q, cos | 239 |
| LE-01MB | Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus | 240 |
| LE-03MB | Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus | 240 |
| LE-03MB CT | Energy meter, semi-indirect 2-way 3-phase 5 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus | 241 |
| LE-03MW | Energy meter, direct 2-way 3-phase measurement up to 80 A, measurement of U, I, F, AE, RE, P, Q, cos; Modbus | 236 |
| LE-03MW CT | Energy meter, semi-indirect 2-way 3-phase 5A, measurement of U, I, F, AE, RE, P, Q, cos; Modbus | 237 |
| MB-1U-1 | 1-phase measuring transducer for AC/DC voltage | 285 |
| MB-3U-1 | 3-phase measuring transducer for AC/DC voltage | 285 |
| MB-1I-1 | 1-phase measuring transducer for AC/DC intensity | 285 |
| MB-3I-1 | 3-phase measuring transducer for AC/DC intensity | 285 |
| MB-AHT-1 | Humidity and temperature transducer | 290 |
| MB-DS-2 | Temperature measuring transmitter, DS sensor (×2), range -50÷130°C | 287 |
| MB-PT-100 | Temperature measuring transducer, PT-100 sensor, range -100÷400°C | 288 |
| MB-TC-1 | Temperature transducer for use with thermocouples | 288 |
| MB-LI-4 | 4-channel pulse counter | 289 |
| MB-LG-4 | 4-channel operating time counter | 289 |
| MR-DIO-1 | Digital I/O expansion module (×6) | 291 |
| MR-DI-4 | Digital I/O expansion module (×4) | 291 |
| MR-RO-1 | 16 A relay output expansion module (×1) | 292 |
| MR-RO-4 | 16 A relay output expansion module (×4) | 292 |
| MR-AI-1 | Analog input expansion module 4÷20 mA/0÷10 V (×4) | 293 |
| MR-AO-1 | 0÷10 V relay output expansion module (×4) | 293 |

ⓘ It is possible to read the registers of devices outside the F&F offer.
This requires an individual configuration of the program according to the user's requirements.

**Interesting and practical**
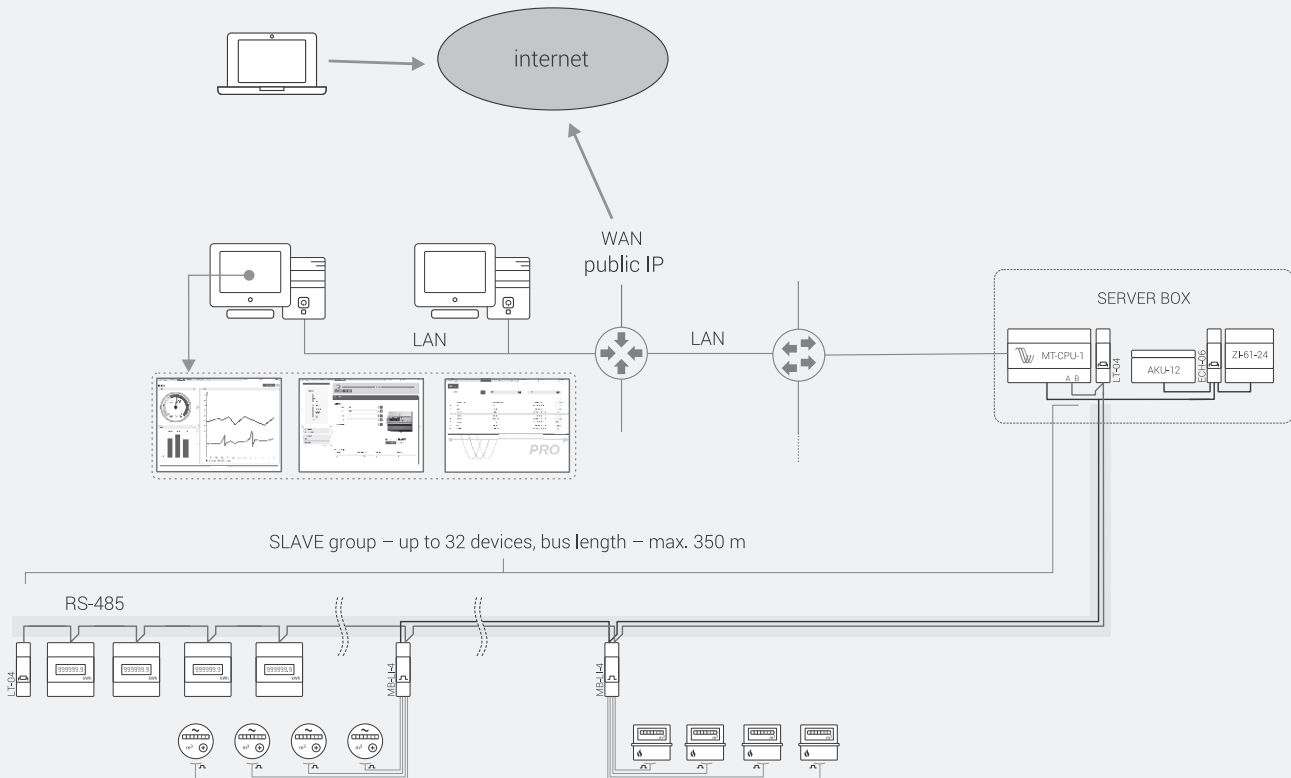


Example application of an integration system for electricity, water, and gas consumption readings

# Section **XI**

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## Status monitoring,
## measurement and regulation

# Pulse and operating time meters

| Product | Type | Programming | Multiplier/ divider | Installation | Display | Number of characters | Modbus | Reset | Voltage of counting input | Power supply | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CLI-01 | pulse meter | ● (menu) | – | for TH-35 rail | ● | 8 | – | ● | 10÷264 V AC/DC | 24÷264 V AC/DC | 251 |
| CLI-02 | pulse meter | ● (menu) | ● | for TH-35 rail | ● | 8 | – | ●● | 10÷264 V AC/DC | 24÷264 V AC/DC | 252 |
| CLI-11T 24 V | pulse meter | – | – | panel-mounted | ● | 8 | – | ● | 4÷30 V DC | internal battery | 251 |
| CLI-11T 230 V | pulse meter | – | – | panel-mounted | ● | 8 | – | ● | 110÷240 V AC/DC | internal battery | 251 |
| CLG-03 | operating time meter | ● (menu) | not applicable | for TH-35 rail | ● | 6+1 | – | ● | 10÷264 V AC/DC | 24÷264 V AC/DC | 254 |
| CLG-04 | operating time meter | – | not applicable | for TH-35 rail | ● | 6+2 | – | – | 100÷240 V AC/DC | internal battery | 254 |
| CLG-13T 24 V | operating time meter | – | not applicable | panel-mounted | ● | 5+1 | – | ●* | 4÷30 V DC | internal battery | 253 |
| CLG-13T 230 V | operating time meter | – | not applicable | panel-mounted | ● | 5+1 | – | ●* | 110÷240 V AC/DC | internal battery | 253 |
| CLG-14T | operating time meter | – | not applicable | panel-mounted | ● | 6+2 | – | ● | 110÷240 V AC/DC | internal battery | 253 |
| CLG-15T | electromechanical operating time meter | – | not applicable | panel-mounted | – | 5+2 | – | – | 230 V AC/DC | 230 V AC/DC | 253 |
| MB-LI-4 Lo | 4-channel pulse meter | ● | ● | for TH-35 rail | – | not applicable | ● | – | 6÷30 V AC/DC | 9÷30 V DC | 252 |
| MB-LI-4 Hi | 4-channel pulse meter | ● | ● | for TH-35 rail | – | not applicable | ● | – | 160÷265 V AC/DC | 9÷30 V DC | 252 |
| MB-LG-4 Lo | 4-channel operating time meter | ● | not applicable | for TH-35 rail | – | not applicable | ● | – | 6÷30 V AC/DC | 9÷30 V DC | 289 |
| MB-LG-4 Hi | 4-channel operating time meter | ● | not applicable | for TH-35 rail | – | not applicable | ● | – | 160÷265 V AC/DC | 9÷30 V DC | 289 |

* The reset of indications is done by holding the button on the front of the device

# Pulse meters

Pulse meters are used to count AC/DC voltage signals generated by additional external devices in order to determine the number of work cycles performed in automation systems, for example, to control the number of press strokes, the number of rotations of the rotational device, the number of elements coming off the production line, etc.

## CLI-11T   panel-mounted

**Functioning**

The CLI-11T meter is a one-way meter for counting pulses in the range from 0 to 99999999 (8 digits).
It has a RESET resetting input to connect an external push-button for resetting the meter status.



230 V version

24 V version
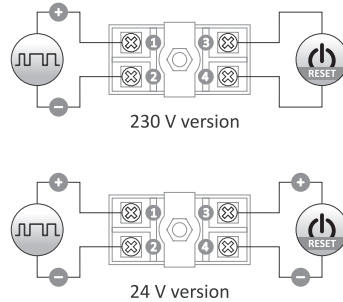
| | |
|---|---|
| power supply | internal battery |
| battery life | 10 years* |
| counting input voltage | |
|   CLI-11T 230 V | 110÷240 V AC/DC |
|   CLI-11T 24 V | 4÷30 V DC |
| maximum counting frequency | 200 Hz |
| display | 8 characters/h= 6.7 mm |
| indication accuracy | 1%±1 digit |
| working temperature | -10÷40°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | 48×24×52 mm |
| mounting hole | 45×23 mm |
| ingress protection | IP20 |

* battery life depends on weather conditions

## CLI-01   programmable

**Functioning**

The CLI-01 meter is a programmable, multifunctional electronic meter for counting external pulses in the range from 0 to 99 999 999 999. The pulses are counted according to an individual program set by the user. When the threshold value is reached, the meter will perform an action configured according to the individual needs of the user.



| | |
|---|---|
| supply voltage | 24÷264 V AC/DC |
| counting input | |
|   voltage: low state | 0÷5 V AC/DC |
|   voltage: high state | 10÷264 V AC/DC |
|   frequency for DC signal | <5 kHz |
|   frequency for AC signal | <50 Hz |
| resetting input | |
|   voltage | 24÷264 V AC/DC |
|   contact | separated 1×NO/NC |
| maximum load current (AC-1) | 8 A |
| power consumption | 1.5 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- A control panel that allows you to program and monitor the operation of the device;
- The input of the meter is designed to work with AC/DC signals with amplitude from 10 V to 264 V, the frequency up to 50 Hz for AC signals and 5 kHz for DC signals;
- The THRH parameter, adjustable from 1 to 99 999 999 999, which determines the limit number of pulses to be counted in each cycle of operation;
- External RESET resetting input;
- Relay output, which signals that the preset state of the meter has been reached (contact 1×NO/NC 8 A);

- Local meter, reset by external reset input or by the RESET button;
- Global meter (TOTAL), counting all pulses (loop operation 0→ 99 999 999→0→ ... or reset from the configuration menu of the meter);
- Digital filter, which allows limiting the maximum frequency of the counted pulses (to eliminate interference at the input of the meter);
- The memory of local and global status of the meter after a power outage;
- Program menu in one of 3 languages: Polish, English or Russian.

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# CLI-02 programmable

The CLI-02 meter is a programmable, multifunctional electronic meter for counting external pulses in the range from 0 to 99 999 999 999. The pulses are counted according to an individual program set by the user. When the threshold value is reached, the meter will perform an action configured according to the individual needs of the user.

| | |
|---|---|
| supply voltage | 24÷264 V AC/DC |
| counting input | |
| voltage: low state | 0÷5 V AC/DC |
| voltage: high state | 10÷264 V AC/DC |
| frequency for DC signal | <5 kHz |
| frequency for AC signal | <50 Hz |
| resetting input | |
| voltage | 24÷264 V AC/DC |
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 8 A |
| power consumption | 1.5 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- A control panel that allows you to program and monitor the operation of the device;
- The input of the meter is designed to work with AC/DC signals with amplitude from 10 to 264 V, the frequency up to 50 Hz for AC signals and 5 kHz for DC signals;
- The THRESHOLD parameter, adjustable from 1 to 99 999 999 999, which determines the limit number of pulses to be counted in each cycle of operation;
- External RESET resetting input;
- Relay output, which signals that the preset state of the meter has been reached (contact 1×NO/NC 8 A);
- Local meter, reset by external reset input or by the RESET button;
- Global meter (TOTAL), counting all pulses (loop operation 0→ 99 999 999→0→. or reset from the configuration menu of the meter);
- Digital filter, which allows limiting the maximum frequency of the counted pulses (to eliminate interference at the input of the meter);
- The memory of local and global status of the meter after a power outage;
- Program menu in one of 3 languages: Polish, English or Russian;
- Countdown mode "backwards" from the preset value, with an indication of reaching zero (for example 9999→0);
- Selection of the edge of the input pulse (rising edge or trailing edge) to which the meter will respond;
- The local meter can be reset automatically (loop operation) with the ability to set the selected relay action;
- Selection of relay action: a pulse of a set length of time; change of state ON → OFF or OFF → ON;
- Scaling of the values of the read pulses according to a preset multiplier or divider;
- Blocking access to the programming menu with a PIN code;
- Defining of the display backlight mode.

# MB-LI-4 Lo / MB-LI-4 Hi   4-channel pulse meters with Modbus RTU output
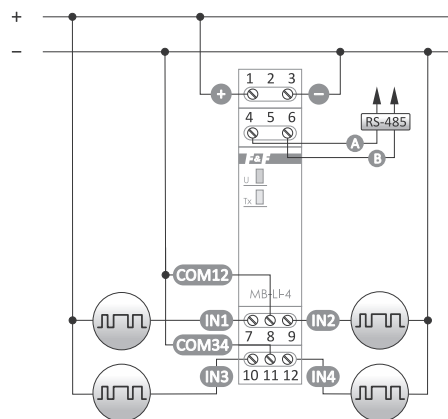
| | |
|---|---|
| supply voltage | 9÷30 V DC |
| number of counting inputs | 4 |
| counting input voltage | |
| low voltage version lo | 6÷30 V AC/DC |
| high voltage version Hi | 160÷265 V AC/DC |
| maximum counting frequency | 100 Hz |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- 2 versions of the device:
  – Lo for counting low-voltage signals;
  – Hi for signals with 230 V mains voltage;
- 4 independent counters;
- Counter input suitable for AC/DC signals;
- Factor setting (floating-point value);
- Scaled value (number of pulses × factor);

- Selection of the state trigger option 1: high or low voltage level;
- Selection of the input pulse edge (rising or trailing);
- Frequency filter, which allows limiting the maximum frequency of the counted pulses (to eliminate interference at the input of the counter);
- The memory of the meter status after a power failure;
- Digital input function.

# Operating time meters

Operating time meters are used to count the number of working hours in automatic production processes or the number of working hours of equipment which, due to safety requirements and efficiency of operation, has a certain service life, that is, an operating capacity which must not be exceeded (for example advanced propulsion units, specialized radioactive lamps, etc.).

## CLG-13T   panel-mounted, with the RESET button on the housing

**Functioning**

The CLG-13T meter is an electronic one-way meter designed for counting the hours of operation in the range from 0 to 99999.9 (5 digits + 1 after the decimal point indicating the decimal parts of the unit). The time is counted when the control voltage is applied to terminals 1-2. The battery power supply allows you to read the meter status regardless of the presence of control voltage. It has a RESET resetting input for connecting an external push-button and a RESET button on the front of the device (with locking capabilities) to reset the meter status at any read value.

230 V version

24 V version
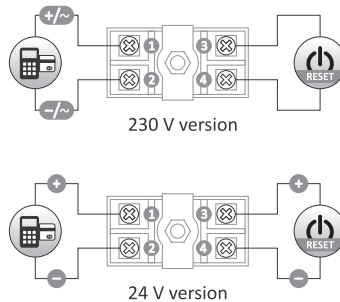
| power supply | internal battery |
|---|---|
| battery life | 10 years* |
| counting input voltage | |
| CLG-13T 230 V | 110÷240 V AC/DC |
| CLG-13T 24 V | 4÷30 V DC |
| display | 6 characters/h= 6.7 mm |
| indication accuracy | 0.1 h (6 min.) |
| working temperature | -10÷40°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | 48×24×52 mm |
| mounting hole | 45×23 mm |
| ingress protection | IP20 |

\* battery life depends on weather conditions

## CLG-14T   panel-mounted, with the RESET button on the housing

**Functioning**

The CLG-14T meter is an electronic one-way meter designed for counting the hours of operation in the range from 0 to 999999.59 (6 digits + 2 after the decimal point indicating the decimal parts of the unit). The time is counted when the control voltage is applied to terminals 1-2. The battery power supply allows you to read the meter status regardless of the presence of control voltage. It has a RESET resetting input to connect an external push-button to reset the meter status at any read value.

230 V version

24 V version
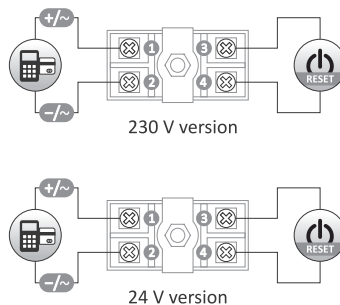
| power supply | internal battery |
|---|---|
| battery life | 10 years* |
| counting input voltage | |
| CLG-14T 230 V | 110÷240 V AC/DC |
| CLG-14T 24 V | 5÷60 V AC/DC |
| display | 8 characters/h= 6.7 mm |
| indication accuracy | 1 min. |
| working temperature | -10÷40°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | 48×24×52 mm |
| mounting hole | 45×23 mm |
| ingress protection | IP20 |

\* battery life depends on weather conditions

## CLG-15T   electromechanical

**Functioning**

The CLG-15T meter is an electric meter with a barrel meter, designed for counting the hours of operation in the range from 0 to 99999.99 (5 digits + 2 after the decimal point indicating the decimal parts of the unit) (0.01 = 36 sec). The time is counted when the motor is powered on. After reaching the maximum result, the counter starts counting from 0.

L

N
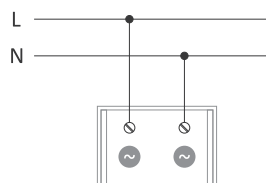
| power supply | 230 V AC |
|---|---|
| voltage tolerance | |
| indication accuracy | 0.01 h (36 s) |
| working temperature | -25÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | 48×24×60 mm |
| mounting hole | 32×22 mm |
| ingress protection | IP20 |

# CLG-03 programmable

## Functioning

The CLG-03 is a programmable, multifunctional electronic meter that can count the operating hours of connected devices or systems in the range from 1 to 999 999 999, which corresponds to a maximum operating period of more than 114 years. The operating time is counted after the control voltage is applied to terminals 7-8, according to the operating program set by the user. When the threshold value is reached, the meter will perform an action configured according to the individual needs of the user.



| power supply | 24÷264 V AC/DC |
|---|---|
| counting input | |
|   voltage: low state | 0÷5 V AC/DC |
|   voltage: high state | 10÷264 V AC/DC |
|   frequency for DC signal | <5 kHz |
|   frequency for AC signal | <50 Hz |
| resetting input | |
|   voltage | 24÷264 V AC/DC |
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 8 A |
| power consumption | 1.5 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- A control panel that allows you to program and monitor the operation of the device;
- Counting input for DC signal and AC signal (50 Hz);
- Counting up the time without a preset threshold value;
- The THRH parameter, adjustable from 1 to 99 999 999 999, which determines the limit number of operating hours to be counted in each cycle of operation;
- Countdown mode "backwards" from the preset value, with an indication of reaching zero (for example 9999→0);
- Counting the operating time with a high state (continuous voltage) at the counting input;
- Counting the operating time between two pulses applied to the counting input;
- Counting the time forwards up to a preset threshold value;
- External RESET resetting input;
- The local meter can be reset automatically (loop operation) with the ability to set the selected relay action;
- Relay output, which signals that the preset state of the meter has been reached (contact 1×NO/NC 8 A);
- Selection of a relay action: a pulse of a set length of time;
- Change of state ON → OFF or OFF → ON;
- The memory of the meter status after a power failure;
- Defining of the display backlight mode.
- Program menu in one of 3 languages: Polish, English or Russian.

# CLG-04 operating time meter

## Purpose

The CLG-04 meter is an electronic operating time meter that allows counting up to 999999.59 hours in 1 min steps. (hours: 6 digits, minutes: 2 digits). The time is counted when the control voltage is applied to terminals 5-6. The battery power supply allows you to read the meter status regardless of the presence of control voltage. The meter is designed for mounting on a DIN rail. No RESET function to reset the meter indication.
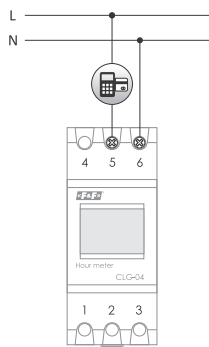


| power supply | internal battery (CR14335 soldered) |
|---|---|
| battery life | 5 years (depending on the operating conditions) |
| voltage of counting input | 100÷ 240 V AC/DC |
| display | 6+2 characters (backlit during time counting) |
| indication accuracy | 1 min. |
| power consumption | 1.5 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 2 modules (36 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Liquid level control relays

Liquid level control relays are used to detect the presence of electrically conductive liquids at the level of installed flood probes.

| Product | Number of levels | Number of probes | Contact configuration | Contact separation | Sensitivity adjustment | Page |
|---------|------------------|------------------|-----------------------|--------------------|------------------------|------|
| PZ-828 | 1 | 1 | 1×NO/NC | ● | – | 255 |
| PZ-828 RC | 1 | 1 | 1×NO/NC | ● | ● | 255 |
| PZ-829 | 2 | 3 | 2×NO/NC | ● | – | 256 |
| PZ-829 RC | 2 | 3 | 2×NO/NC | ● | ● | 256 |
| PZ-831 RC | 3 | 4 | 3×NO | ● | ● | 258 |
| PZ-832 RC | 4 (2+2 alarm) | 5 | 4×NO/NC | ● | ● | 257 |

## Single-state

# PZ-828  +1 PZ probe /PZ-828 RC  with sensitivity adjustment + 1 PZ probe

The PZ-828 is a liquid level control relay that operates on the principle of detecting the presence or absence of conductive liquid.
The relay can operate in two modes:
- emptying the tank (diagram 1): the pump is switched on when the sensor is flooded with liquid and switched off when the sensor loses contact with the liquid;
- filling the tank (diagram 2): the pump is switched on when the sensor loses contact with the liquid and switched off when the sensor is flooded with liquid;

PZ-828 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table on page 257.
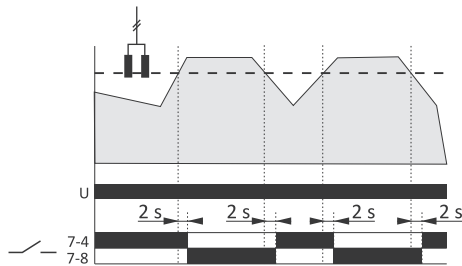


| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| sensitivity (adjustable for PZ-828 RC) | 1÷100 kΩ |
| output voltage measurement | <6 V |
| power indication | green LED |
| work status indication | red LED |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| flooding probe type | 1×PZ |
| separation of the measuring probe | galvanic (transformer) |
| ingress protection | IP20 |
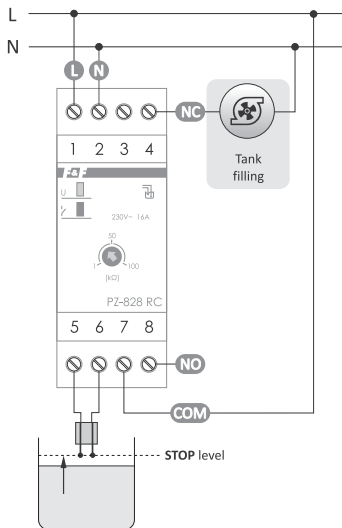


Tank filling
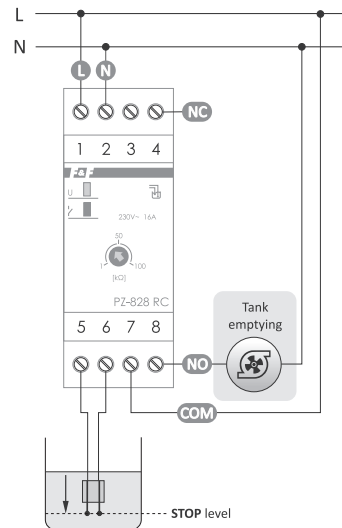


Tank emptying

# Bi-state

# PZ-829  + 3 PZ2 probes/PZ-829 RC  with sensitivity adjustment + 3 PZ2 probes

**Functioning**

The PZ-829 is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value.

The relay can operate in two modes:
- emptying the tank (diagram 1).  As soon as the liquid level reaches the set MAX level, the pump is switched on and it will continue to operate until the liquid level falls below MIN.
- filling the tank (diagram 2). As soon as the liquid level falls below the preset MIN level, the pump is switched on and it will continue to operate until the liquid level reaches the MAX value.

PZ-829 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.
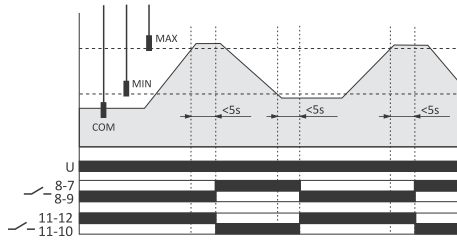
| power supply | 230 V AC |
|---|---|
| maximum load current (AC-1) | 2×16 A |
| contact | separated 2×NO/NC |
| sensitivity (adjustable for PZ-829 RC) | 1÷100 kΩ |
| contacts switching delay | |
| for MIN point | 1÷2 s |
| for MAX point | <5 s |
| output voltage measurement | <6 V |
| power indication | green LED |
| work status indication | 2× red LED |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| flooding probe type | 3×PZ2 |
| separation of the measuring probes | galvanic (transformer) |
| ingress protection | IP20 |
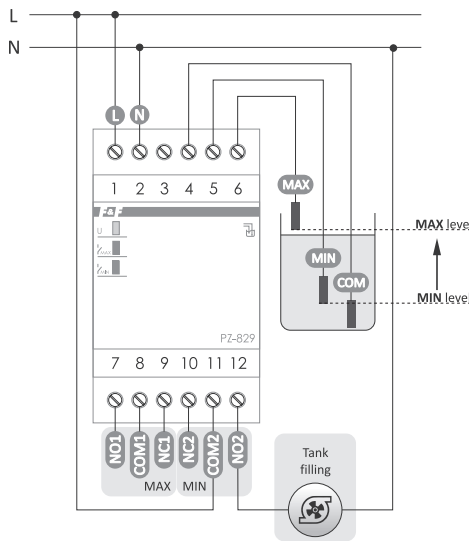
Tank filling
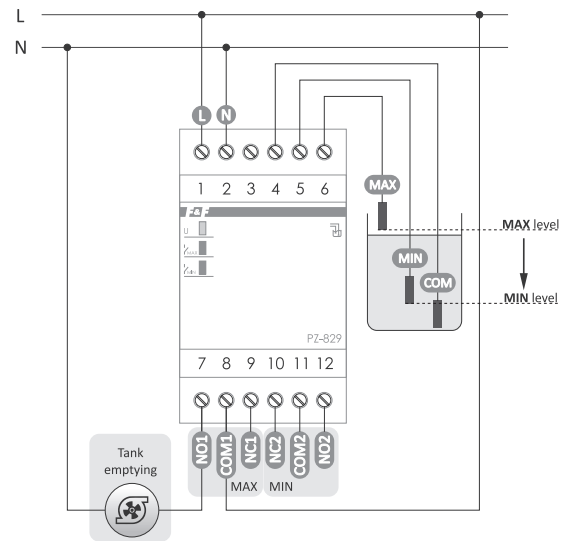
Tank emptying

## Liquid resistance table

| Type of liquid | Specific resistance |
|---|---|
| Drinking water | 5÷10 kΩ |
| Well water | 2÷5 kΩ |
| River water | 2÷15 kΩ |
| Rainwater | 15÷25 kΩ |
| Sewage water | 0.5÷2 kΩ |
| Sea water | 0.03 kΩ |
| Natural hardness water | 5 kΩ |
| Chlorinated water | 5 kΩ |
| Distilled water | no detection |

# Bi-state (with MIN and MAX alarm states)

# PZ-832 RC  + 5 PZ2 probes

The PZ-832 is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value.

The relay can operate in two modes:

• emptying the tank (diagram 1). As soon as the liquid level reaches the set MAX level, the pump is switched on and it will continue to operate until the liquid level falls below MIN.

• filling the tank (diagram 2). As soon as the liquid level falls below the preset MIN level, the pump is switched on and it will continue to operate until the liquid level reaches the MAX value.

The PZ-832 RC relay is additionally equipped with 2 alarm low and alarm high-level probes. This doubles the protection for minimum and maximum levels and protects the installation from dry-running or overfilling.

The PZ-832 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.
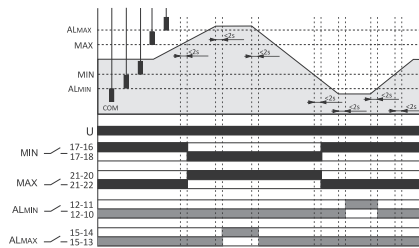
| | |
|---|---|
| power supply | 230 V AC |
| contact | separated 4×NO/NC |
| maximum load current (AC-1) | |
| MIN and MAX contacts | 16 A |
| ALMIN and ALMAX contacts | 8 A |
| sensitivity (adjustable) | 1÷100 kΩ |
| activation delay | 1÷2 s |
| output voltage measurement | <6 V |
| power indication | green LED |
| working indication | yellow LED |
| status indication MIN and MAX | 2× green LED |
| alarm state indication | 2× red LED |
| power consumption | 1.1 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 5 modules (85 mm) |
| mounting | for TH-35 rail |
| flooding probe type | 5×PZ2 |
| separation of the measuring probes | galvanic (transformer) |
| ingress protection | IP20 |
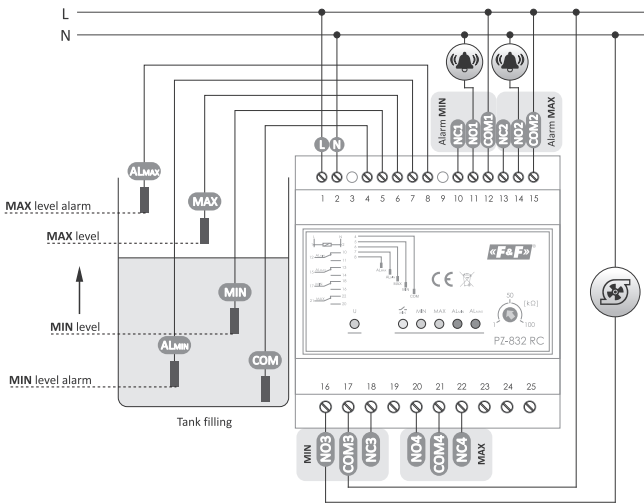
Tank filling
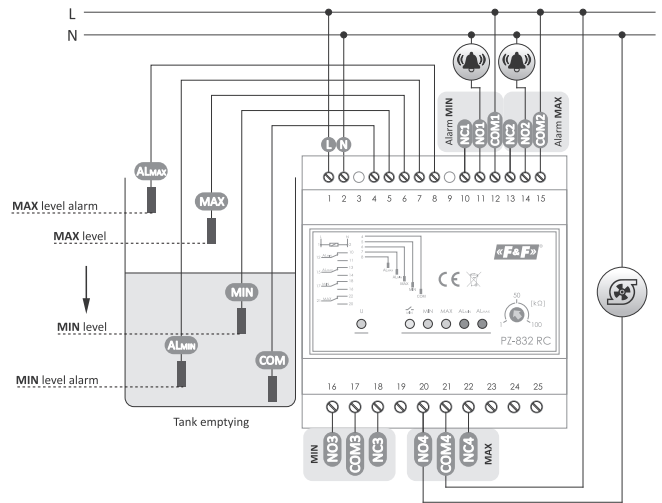
Tank emptying

## Liquid resistance table

| Type of liquid | Specific resistance |
|---|---|
| Drinking water | 5÷10 kΩ |
| Well water | 2÷5 kΩ |
| River water | 2÷15 kΩ |
| Rainwater | 15÷25 kΩ |
| Sewage water | 0.5÷2 kΩ |
| Sea water | 0.03 kΩ |
| Natural hardness water | 5 kΩ |
| Chlorinated water | 5 kΩ |
| Distilled water | no detection |

# Tri-state

# PZ-831 RC   + 4 PZ2 probes

PZ-831 RC is a liquid level control relay, which, thanks to being equipped with 4 PZ2-type flooding probes, enables the detection and independent monitoring of reaching 3 preset liquid levels. The relay can also be used in a cascade pump switching system, where exceeding the next liquid level indicates the need to switch on an additional pump.

PZ-831 RC enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.
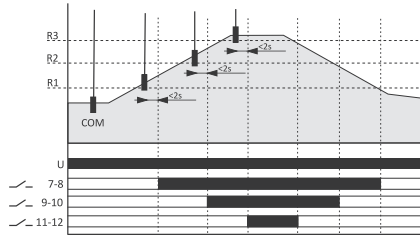
| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 3×8 A |
| contact | separated 3×NO |
| sensitivity (adjustable) | 1÷180 kΩ |
| contacts switching delay | 2 s |
| output voltage measurement | <6 V |
| power indication | green LED |
| work status indication | 3× red LED |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| flooding probe type | 4×PZ2 |
| separation of the measuring probes | galvanic (transformer) |
| ingress protection | IP20 |
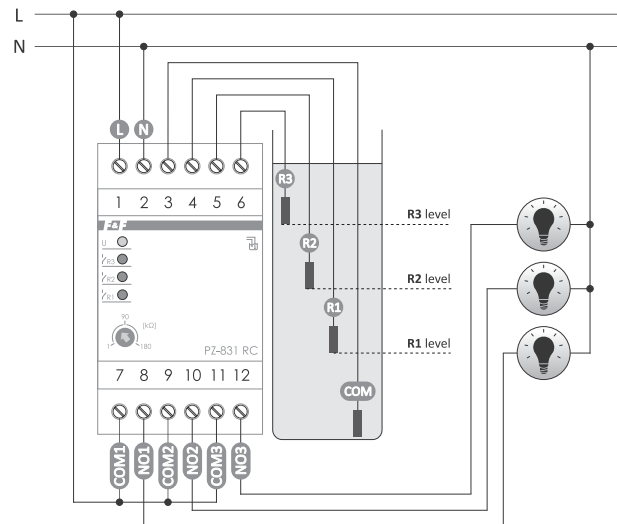
## Liquid resistance table

| Type of liquid | Specific resistance |
|---|---|
| Drinking water | 5÷10 kΩ |
| Well water | 2÷5 kΩ |
| River water | 2÷15 kΩ |
| Rainwater | 15÷25 kΩ |
| Sewage water | 0.5÷2 kΩ |
| Sea water | 0.03 kΩ |
| Natural hardness water | 5 kΩ |
| Chlorinated water | 5 kΩ |
| Distilled water | no detection |

# Dedicated probes for liquid control relays

## PZ probe for PZ-828, PZ-828 RC



| | |
|---|---|
| flood probe | electrode |
| probe dimensions | 30×25×5 mm |
| wire length | 1.5 m |
| length of the electrodes | 30 mm |
| spacing of the electrodes | 5 mm |
| voltage sensor | 6 V |
| probe current | <0.13 mA |
| extension cord length | <100 m |

### Connection of the probe

The design of the probe allows it to be mounted on a flat horizontal ground such as on the floor in a room with hydro-valves, flow pipes or in the laundry room, which allows quick detection of a failure and flooding of the room with liquid, with simultaneous switching off of electrical circuits or activation of sound or light signaling (alarm). The probe cable can be extended to 100 m.

Up to 10 probes (in series or parallel) can be connected to input 5-6:

- in series – for a dependent fluid level control system at multiple points, all connected sensors must be shorted simultaneously for the relay to trip;
- in parallel – for an alternative fluid level control system at multiple points, at least one of the connected sensors must be shorted. With a serial connection, the sensitivity of the sensors decreases (conductivity decreases).
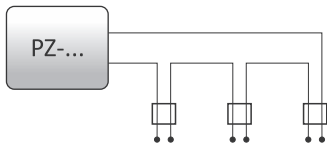


Serial connection
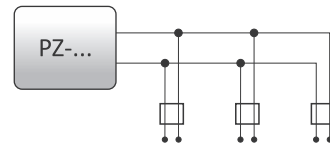


Parallel connection

## PZ2 probe for PZ-829, PZ-829 RC, PZ-831 RC, PZ-832 RC



| | |
|---|---|
| maximum liquid temperature | 85°C |
| flood sensor | stainless steel electrode +plastic casing for the electrode +PG9 gland |
| probe dimensions | ø15, l= 9.5 cm |
| probe voltage | <6 V |
| probe current | <0.13 mA |
| connecting cable | for example, DY 1 mm² |
| length of the connecting cable | <100 m |

# Automatic Anti-flood System (AFS)

**Purpose**

The Automatic Anti-Flood System (AFS) is an autonomous system to prevent flooding of single and multi-family residential buildings. It is used to comprehensively protect property from the effects of flooding.
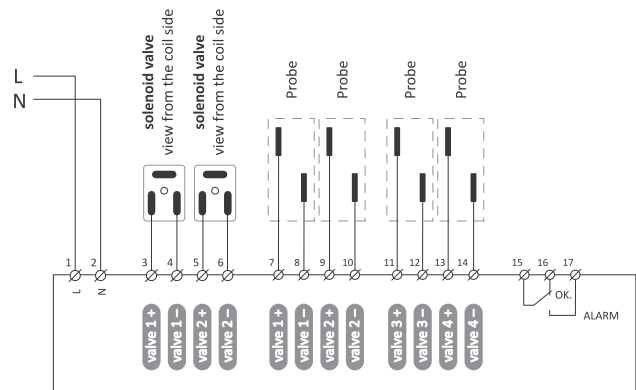




**Functions**

- Detection of leaks and spills;
- Cutting off the water supply to the facility;
- Notifying the user about the situation;
- The bistable solenoid valve remains closed after the power supply is cut off;

- The solenoid valve coil is not permanently powered (power supply at switchover);
- Own emergency power supply;
- It can be integrated with alarm and fire protection systems.

**System elements**

- Distribution box containing: central controller SAM-01, protection of electrical circuits and a battery to support the operation of the system at short power outages.
- Solenoid valve size 1", 2", 3/4" or 5/4" – 1 piece
- SON-K flood probe for boiler room – 1 piece
- SON-M flood probe for living quarters – 2 pieces
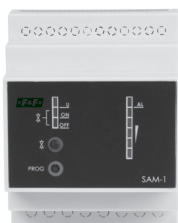


| SAM-1 multifunctional controller for AFS system management | Solenoid valve to shut off the water supply to the object (1", 2", 3/4" or 5/4") | SON-K Flood probe for use in the boiler room | SON-M Flood probe for use in living quarters |

Chapter 42

# Temperature controllers

**Purpose**

Temperature controllers are used to controlling heating or ventilation devices to maintain a constant ambient temperature.

| Product | Type | Application | Settings | Built-in clock programmable | Actuator element | Maximum load courrent AC-1: | Contact configu-ration | Contact separation | Range of adjustment of temperature | Hysteresis | Type of probe | Probe | Page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CRT-04 | digital, for DIN rail | with the weekly programmer | display, keyboard | • | relay | 16 A | 1×NO/NC | • | 0÷60 °C | 0÷10 °C | DS1820 | • | 264 |
| CRT-05 | digital, for DIN rail | 2-function (heating, cooling) | display, keyboard | – | relay | 16 A | 1×NO/NC | • | -100÷400 °C | 0÷10 °C | PT100 | – | 265 |
| CRT-06 | digital, two-channel, For DIN rail | 10-function | display, keyboard | – | relay | 16 A | 2×NO | • | -100÷400 °C | 0÷10 °C | PT100 | – | 265 |
| CRT-15T | digital PID, panel-mounted | PID control | display, keyboard | – | relay | 3 A | 1×NO/NC | • | 0÷400 °C | – | PT100 | • | 267 |
| RT-820 | analog, for DIN rail | general | potentiometers | – | relay | 16 A | 1×NO/NC | • | 4÷30 °C | 0.5÷3 °C | KTY81-210 | • | 262 |
| RT-821 | analog, for DIN rail | anti-icing systems | potentiometers | – | relay | 16 A | 1×NO/NC | • | -4÷5 °C | 0.5÷3 °C | KTY81-210 | • | 262 |
| RT-822 | analog, for DIN rail | general | potentiometers | – | relay | 16 A | 1×NO/NC | • | 30÷60 °C | 0.5÷3 °C | KTY81-210 | • | 262 |
| RT-823 | analog, for DIN rail | general | potentiometers | – | relay | 16 A | 1×NO/NC | • | 60÷95 °C | 0.5÷3 °C | KTY81-210 | • | 262 |
| RT-824 | analog, wall-mounted | wall-mounted, mechanical | potentiometer | – | relay | 16 A | 1×NO | – | 5÷35 °C | 3 °C | NTC | • | 263 |
| RT-825 | digital, wall-mounted | wall-mounted, with the weekly programmer and display | display, keyboard | • | relay | 16 A | 1×NO | – | 5÷60 °C | 1 °C | NTC | • | 263 |
| RT-826 | digital, for DIN rail | digital, with display | display, keyboard | – | relay | 16 A | 1×NO | • | -25÷130 °C | 1÷30 °C | KTY81-210 | – | 262 |
| RT-833 | digital, with control of the fan speed, for DIN rail | with control of the fan speed | potentiometers | – | transistor +relay | fan 6 A DC, relay 10 A | 1×NO/NC | • | 25÷60 °C | 5÷30 °C | KTY81-210 | – | 267 |
| CR-810 | analog, for protection of electrical equipment, such as engines for DIN rail | cooperation with PTC thermistors | not | – | relay | 16 A | 1×NO/NC | • | not applicable | not applicable | PTC | – | 267 |

# RT-820 + RT probe, temperature range 4÷30°C
# RT-821 + RT probe, temperature range -4÷5°C, **do grzewczych systemów przeciwoblodzeniowych**
# RT-822 + RT probe, temperature range 30÷60°C
# RT-823 + RT2 probe, temperature range 60÷95°C

## Functioning

Until the desired ambient temperature is reached, the relay contact is in position 2-1 and the heating device is switched on. When the set temperature is reached, the contact is switched to position 2-8 and the heater is switched off or the ventilation unit is switched on. Temperature drop by the value of hysteresis will switch the heating device on again (contacts 2-1 closed) until the preset temperature is reached.

| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| temperature adjustment range | |
| RT-820 | 4÷30°C |
| RT-821 | -4÷5°C |
| RT-822 | 30÷60°C |
| RT-823 | 60÷95°C |
| hysteresis (adjustable) | 0.5÷3°C |
| setting accuracy | 1°C |
| measurement accuracy | ±1°C |
| temperature sensor type | RT/RT2 |
| power indication | green LED |
| work status indication | red LED |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The parameters of the dedicated RT or RT2 probe can be found in the table on page 264.

# RT-826 digital, temperature range -25÷130°C (probe not included)

| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | 1×NO |
| temperature adjustment range | -25÷130°C |
| hysteresis (adjustable) | 1÷30°C |
| setting accuracy | 1°C |
| measurement accuracy | ±1°C |
| alarm indication | |
| audible | |
| volume | 80 dB |
| frequency | 2.4 kHz |
| control output | |
| type | open collector |
| maximum voltage | 24 V |
| maximum load current | 30 mA |
| display | 3-digit LED 5×9 mm |
| contact signalling activation | red LED |
| temperature sensor type | RT/RT2 |
| power consumption | 1.1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 2 modules (35 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Controller functions

- Operating modes: heating or cooling;
- Indication correction ±9°C;
- Display of the currently measured temperature value;
- Audible and visual alarm when the temperature exceeds the set value by 5°C;
- Cooperation with RT or RT2 probes.

(!) The parameters of the dedicated RT or RT2 probe can be found in the table on page 264.

Chapter 43

# RT-824 + RT45 probe, temperature range 5÷35°C
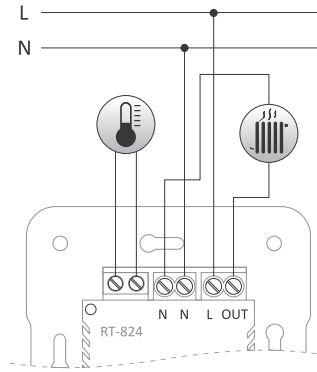


| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | 1×NO |
| temperature adjustment range | 5÷35°C |
| hysteresis | 3°C |
| setting accuracy | 1°C |
| measurement accuracy | ±1°C |
| internal temperature sensor | NTC |
| power consumption | 0.8 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | |
|    front | 83.5×83.5 mm; depth: 22 mm |
|    back | ø50; depth: 27.5 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## Controller functions

- One desired temperature can be programmed;
- A knob on the front panel for setting the desired temperature;
- Indication of heating system activation;
- 2 temperature sensors: internal and external;
- 3 modes of the controller operation: operation with the internal temperature sensor, operation with the external temperature sensor, operation with 2 temperature sensors;
- In the mode of operation with the internal temperature sensor, in case of its failure, the controller will switch to the so-called "safe automatic model" mode in an effort to maintain the set temperature;
- Automatic switching to the internal sensor mode in case of external sensor failure;
- In the mode of operation with 2 temperature sensors, the external sensor is a limiter and, regardless of the set temperature on the knob, does not allow the temperature to exceed 27°C;
- In the mode of operation with 2 temperature sensors, in case of failure of both temperature sensors, the controller will switch to the so-called "safe automatic model". When operating in intermittent mode, the controller tries to keep the temperature at 80% of the set value.

(!) The parameters of the dedicated RT45 probe can be found in the table on page 264.

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# RT-825 + RT45 probe, temperature range 5÷60°C
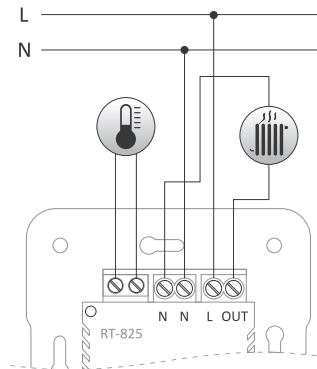


| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | 1×NO |
| temperature adjustment range | 5÷60°C |
| anti-freeze temperature adjustment range | 0÷10°C |
| hysteresis | 1°C |
| setting accuracy | 1°C |
| measurement accuracy | ±1°C |
| reading accuracy | 0.1°C |
| backup time clock operation | <1 h |
| internal temperature sensor | NTC |
| power consumption | 0.8 W |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.2 Nm |
| dimensions | |
|    front | 83.5×83.5 mm; depth: 22 mm |
|    back | ø50; depth: 27.5 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

## Controller functions

- A control panel that allows you to program and monitor the operation of the device;
- Maintaining the set temperature according to the programmed hours and days of the week;
- 4 intervals with the desired temperature per day can be programmed;
- 12 program entries: 4 with the desired temperature for working days (Mon-Fri); 4 with the desired temperature for Saturday (Sat) and 4 with the desired temperature for Sunday (Sun);
- Quick manual correction of the currently maintained temperature;
- Adjustable hysteresis;
- 2 temperature sensors: internal and external;
- 3 modes of the controller operation: operation with the internal temperature sensor, operation with the external temperature sensor, operation with 2 temperature sensors;
- In the mode of operation with 2 temperature sensors, the external sensor is a limiter h a temperature set in the range of 15÷50°C.

(!) The parameters of the dedicated RT45 probe can be found in the table on page 264.

# Digital, programmable

**Purpose**

CRTs are programmable, multifunctional electronic controllers, designed for control of heating or cooling devices, in order to maintain constant room temperature, control the ambient temperature and the temperature of substances in industrial conditions with the ability to control technological processes.

## With a programmable control timer

# CRT-04  + RT4 probe, temperature range 0÷99°C

**Functioning**

The operating time and the desired temperature are implemented according to an individual program set by the user. CRTs have a calendar and a real-time clock, allowing the controlled device to be switched on and off at programmed times in cycles: daily, weekly, working days (Mon-Fri) or weekend (Sat, Sun).
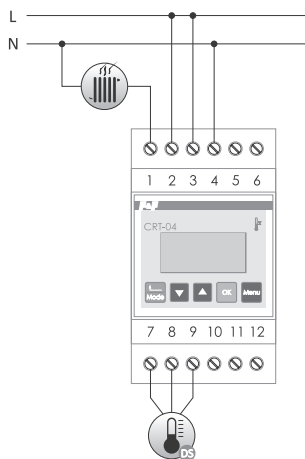
| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| battery life | 3 years* |
| temperature adjustment range | 0÷99°C |
| hysteresis (adjustable) | 0÷10°C |
| setting accuracy | 0.1°C |
| temperature correction | ±5°C |
| temperature sensor type | RT4 |
| switch-on time lighting (adjustable) | 1÷15 min. |
| power consumption | 1.5 W |
| working temperature | -20÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

\* battery life depends on weather conditions and frequency of mains failure

**Controller functions**

- A control panel that allows you to program and monitor the operation of the device;
- **Heating** and **Cooling** modes of operation – maintaining the set temperature according to the programmed hours and days of the week;
- **Continuous** mode of operation – maintaining one preset temperature, executed without program entries;
- **Measurement** mode of operation – an indication of the current temperature without controlling the connected device;
- 50 program entries:
- Interval – the ability to program up to 8 desired temperatures (3 in the so-called **My1**, **My2**, **My3** modes, and additionally 5 in the following modes: **Morning**, **Work**, **Dinner**, **Day**, **Night**, for the daily time intervals related to the lifestyle of the household members;
- Delay – programmable delay time when passing through the temperature limit values;
- Correction – elimination of the error of temperature reading in relation to the reference thermometer;
- Sensor – visual indication of the temperature sensor failure;
- DST – automatic time change with the possibility of program switching to manual mode;
- Light – definition of the display backlight mode;
- Language: program menu in one of 3 languages: Polish, English or Russian.

(!) The parameters of the dedicated RT4 probe can be found in the table below. The probe is included.

## Dedicated probes for temperature controllers

| Product | Sensor of temperature | Range of measurement | Dimensions of the sensor | Insulation of the sensor | Type of cable | Purpose |
|---|---|---|---|---|---|---|
| K400 | K400 | 0÷400°C | M6 thread; h= 15 mm | steel | PC 2×0,34 mm²; l= 1 m (in metal braid) | CRT-15T |
| RT | KTY 81-210 | -50÷130°C | ø5; h= 20 mm | heat shrink tubing | OMY 2×0,34 mm²; l= 2,5 m | AT-1I, AT-1U, AT-1I-KT, AT-1U-KT, AT-2I, AT-2U, RT-820, RT-821, RT-822, RT-826, RT-833 |
| RT2 | KTY 81-210 | -50÷130°C | ø8; h= 40 mm | metal tubing | SIHF 2×0.5 mm²; l= 2,5 m | AT-1I, AT-1U, AT-1I-KT, AT-1U-KT, AT-2I, AT-2U, RT-823, RT-826 |
| RT4 | DS18S20 | -55÷125°C | ø5; h= 30 mm | heat shrink tubing | UYY 3×0,34 mm²; l= 2,5 m | AT-1I-DS, AT-1U-DS, CRT-04, MB-DS-2, MB-DS-10, MB-DS-30 |
| RT45 | NTC | – | ø7; h= 25 mm | PC sleeve | PC 2×0,34 mm²; l= 3 m | RT-824, RT-825 |
| RT56 | PT100 | -100÷400°C | ø4; h= 85 mm | steel tubing | PC 3×0,34 mm²; l= 1.5 m (in metal braid) | AT-1I-PT, AT-1U-PT, AT-3I, CRT-05, CRT-06, MB-PT-100 |

# CRT-05　2-function, temperature range -100÷400°C (probe not included)



| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| temperature adjustment range | -100÷400°C |
| hysteresis (adjustable) | 0÷10°C |
| setting accuracy | 1°C |
| indication correction | ±20°C |
| temperature sensor type | RT56 (PT100) |
| power consumption | 1.5 W |
| working temperature | -20÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions

- A control panel that allows you to program and monitor the operation of the device;
- 2 modes of operation: **Heating** or **Cooling**;
- 2 adjustable hysteresis; **Lower** and **Upper**;
- Automatic mode: working with one (selected) function;
- Manual mode: closing or opening the contact permanently without temperature measurement;
- Correction - elimination of the error of temperature reading in relation to the reference thermometer;
- Error - visual indication of the exceeding of the range, temperature sensor failure or over-speed of temperature rising or falling;
- Blocking access to the programming menu with a PIN code;
- Light - definition of the display backlight mode;
- Language: program menu in one of 3 languages: Polish, English or Russian.

( ! ) The parameters of the dedicated RT56 probe can be found in the table on page 264.

---

# CRT-06　10-function, temperature range -100÷400°C (probe not included)



| | |
|---|---|
| power supply | 230 V AC |
| maximum load current (AC-1) | 2×16 A |
| contact | separated 2×NO |
| temperature adjustment range | -100÷400°C |
| hysteresis (adjustable) | 0÷100°C |
| setting accuracy | 1°C |
| indication correction | ±20°C |
| switch-on time lighting (adjustable) | 0÷45 min. |
| sampling rate (adjustable) | 1÷120 samples |
| | /1 min. |
| temperature sensor type | RT56 (PT100) |
| power consumption | 1.5 W |
| working temperature | -20÷40°C |
| terminal | 2.5 mm² screw terminals (cord) |
| | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functions

- A control panel that allows you to program and monitor the operation of the device;
- 10 modes of operation;
- 2 independent temperature sensors, setting of two independent temperature values;
- 2 NO contacts assigned to temperature sensors;
- 2 hysteresis value settings for each sensor separately;
- Automatic mode: operating with one (selected) function;
- Manual mode: closing or opening the contact permanently without temperature measurement; separately for P1 contact and P2 contact;
- Delay - programmable delay time when passing through the temperature limit values;
- Correction - elimination of the error of temperature reading in relation to the reference thermometer;
- Error - visual indication of the exceeding of the range, temperature sensor failure or over-speed of temperature rising or falling;
- Memory function for highest and lowest recorded temperature independently for sensors C1 and C2;
- Blocking access to the programming menu with a PIN code;
- Light - definition of the display backlight mode;
- Language: program menu in one of 3 languages: Polish, English or Russian.

( ! ) The parameters of the dedicated RT56 probe can be found in the table on page 264.

**①**
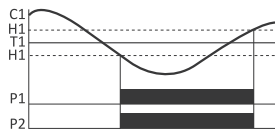
**Heating** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

**②**
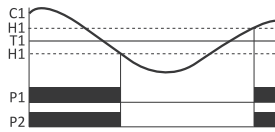
**Cooling** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

**③**
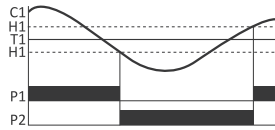
**Heating/Cooling** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– alternating contact operation: P1 – cooling; P2 – heating;
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

**④**
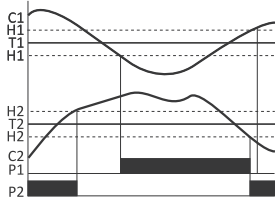
**Heating** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – heating; P2 – heating;
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

**⑤**
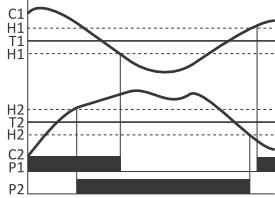
**Cooling** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – cooling; P2 – cooling
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

**⑥**
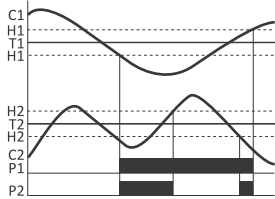
**Heating** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor;
P2 contact dependent on the C2 and C1 sensor (switched on only if the P1 contact is closed).
– 2 sensors: C1 and C2
– dependent contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

**⑦**
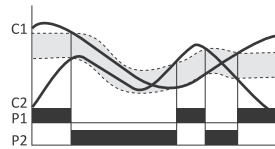
**Differential** mode.
P1 contact is switched on at a temperature difference greater than the setting.
P2 contact switches on in the opposite situation to the P1 contact - at a difference less than the setting.
– 2 sensors: C1 and C2
– alternating contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting

**⑧**
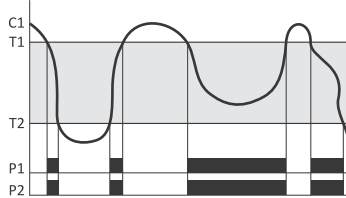
**Window** mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 1 sensor: C1
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no hysteresis setting: H1 and H2

**⑨**
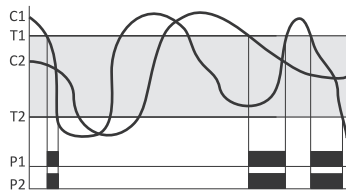
**Window** mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 2 sensors: C1 and C2
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting

**⑩**
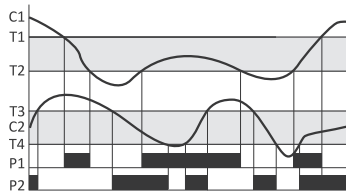
**Window** mode independent for P1 and P2 contacts.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
P2 and P2 contacts are switched on when the temperature of the C2 sensor is between set values of T3 and T4 temperatures.
– 2 sensors: C1 and C2;
– independent contact operation: P1 and P2;
– 4 temperature setting: T1 and T2 for P1 contact, T3 and T4 for P1 contact;
– no H1 and H2 hysteresis setting.

# CRT-15T  + K400 probe, temperature range 0÷400°C, PWM control
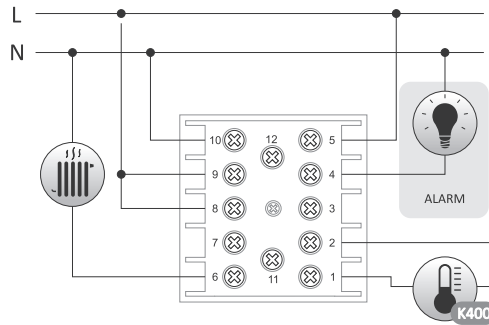


| power supply | 100÷240 V AC |
|---|---|
| controller output | |
| contact | separated 1×NO/NC |
| maximum load current (AC-1) | 3 A |
| control | PWM |
| alarm output | |
| contact | separated 1×NO |
| maximum load current (AC-1) | 1 A |
| temperature adjustment range | 0÷400°C |
| PID setting | |
| proportional part P | 0÷100 |
| integral part I | 0÷255 |
| derivative part D | 0÷255 |
| setting accuracy | 0.5°C (±1 digit) |
| indication correction | ±15°C |
| power consumption | 1 W |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 48×48×86 mm |
| mounting hole | 45×45 mm |
| ingress protection | IP20 |

### Controller functions

- A control panel that allows you to program and monitor the operation of the device;
- PID controller (proportional-integral-differentiating) + automatic tuning of the PID regulator;

- Adjustable alarm temperature threshold;
- Display of the set and current temperature;
- Output 1×NO/NC contact;
- Additional ALARM output contact 1×NO.

(!) The parameters of the dedicated K400 probe can be found in the table on page 264. The probe is included.

# RT-833  with fan speed control (sensor not included)

### Purpose

The controller is designed for direct control of 12/24 V DC fans in control cabinets (or similar installations) as a function of temperature.
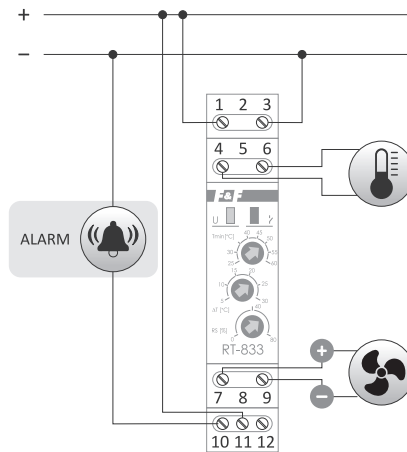


| power supply | 12÷24 V DC |
|---|---|
| control output | |
| maximum load current (DC-1) | 6 A |
| control | PWM |
| alarm output | |
| contact | separated 1×NC |
| maximum load current (AC-1) | 10 A |
| temperature adjustment range | |
| Tmin | 25÷60°C |
| ΔT | 5÷30°C |
| measurement accuracy | ±1°C |
| start speed setting | 0÷80% |
| temperature sensor type | RT/RT2 |
| power indication | green LED |
| work status indication | red LED |
| power consumption | |
| standby | 0.05 W |
| on | 0.6 W |
| working temperature | -15÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

### Functioning

If the temperature is higher than the setpoint Tmin value, the fan will start and its speed will be proportional to the measured temperature and the controller settings:
– for Tmin temperature, the fan speed will be equal to the set minimum speed;
– for Tmin+ΔT temperature, the fan speed is 100%;
– for temperatures in the Tmin <-> Tmin+ΔT range, the speed will be proportionally represented in the range from the set minimum to 100% speed. The controller has a relay output for signaling too high temperature or damage (no power supply) to the controller. During normal operation, the contact is closed (position 11-12). If the measured temperature is higher than the maximum value (Tmin+ΔT) for 3 minutes, the contact will be opened (position 10-11). If the controller fails or is not powered, contacts 10-11 can be used to signal an error.

(!) The parameters of the dedicated RT probe can be found in the table on page 264.

# Resistance relay

# CR-810 DUO   for use with PTC thermistor temperature sensors (probe not included)

**Purpose**

Resistance (thermal) relay is used to protect electrical equipment against unwanted temperature rise using PTC thermistor sensors connected in series in the amount of 1-6 pieces.

**Functioning**

Correct operation (closed contacts 11-12) is indicated by the green LED U (correct supply voltage, correct temperature of the controlled device, a properly functioning circuit of connected PTC sensors). An increase in the temperature of at least one of the sensors above the nominal value causes its resistance to increase above 3000 Ω. The relay is tripped (opening of contacts 11-12). The system will be switched on automatically if the resistance of the PTC sensor loop drops below 1800 Ω (a drop of the temperature of the controlled device). The actuator relay contact will also be opened when the loop resistance decreases to 70 Ω, for example when the PTC sensor wires are short-circuited or the relay supply voltage is switched off.

| | |
|---|---|
| power supply | 230 V AC / 24 V AC/DC |
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| contact opening resistance | R>3000Ω. R<70Ω |
| contact closing resistance | 110Ω<R<1800Ω |
| cold state resistance of sensor loop | R=1500Ω |
| power indication | green LED |
| damage indication | 2× red LED |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
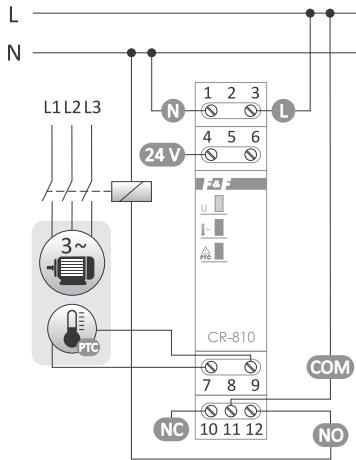
230 V version
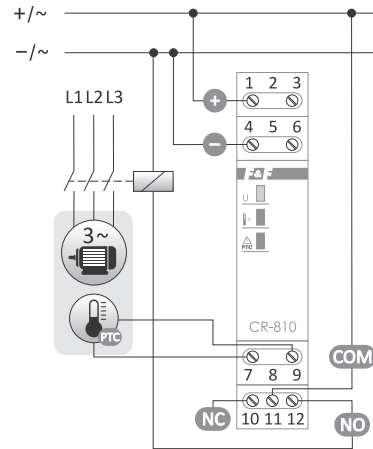
24 V version

# Section **XII**

## Measuring transducers and signal converters

# Auxiliary elements of automation systems

## Control signal separators

Control signal separators are used for separation in automation systems with separate control subgroups and central control.
The control signal is passed in one direction. In the opposite direction, the signal is blocked.

## SEP-01  control signal separator, for DIN rail



| maximum voltage | 250 V |
|---|---|
| maximum load current (AC-1) | 1 A |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## SEP-02  control signal separator, for flush-mounted box
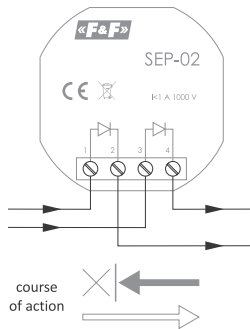


| maximum voltage | 250 V |
|---|---|
| maximum load current (AC-1) | 1 A |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ø55, h= 13 mm |
| mounting | in flush mounted ø60 |
| ingress protection | IP20 |

## SEP-03 USB  USB line amplifier/separator

SEP-03 USB is used for galvanic separation of devices connected by USB cable. It provides surge protection for HOST devices such as personal computers from external devices connected directly to power networks, industrial power supply or measuring high voltage systems. When an external power supply is connected, it serves as an amplifier of the transmitted signal and increases the current capacity up to 1 A for a system of connected devices, it can also work without external power supply.
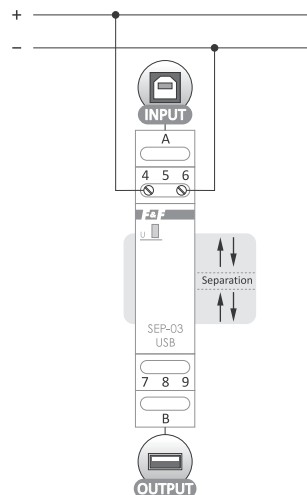


| power supply | |
|---|---|
| via a USB port (input) | 5 V DC |
| external Uopt | 12÷30 V DC |
| maximum load current (output) | |
| for USB power supply | 0.4 A |
| for Uopt power supply | 1 A |
| USB standard | 1.1/2.0 |
| speed | Low speed 1.5 Mbps/Full speed 12 Mbps |
| separation | |
| input <-> output | galvanic 5 kV |
| $U_{USB}$ <-> output | resistance |
| $U_{USB}$ <-> output | galvanic 1 kV |
| Uopt <-> input | galvanic 1 kV |
| Uopt <-> output | resistance |
| working temperature | -25÷40°C |
| terminals | |
| USB (input) | 1×USB-B |
| USB (output) | 1×USB-A |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# "Continuous/pulse" – type signal transducers

**Purpose**

"Continuous-pulse"-type signal transducers are used to convert a continuous control signal into single control pulses required in automation control systems. After receiving the control signal at the UST input (rising edge), the transducer generates a pulse at the output 12 (contact 11-12 will be closed for the set time). After receiving the control signal at the (rising edge), the transducer generates a pulse at the output 9 (contact 8-9 will be closed for the set time).
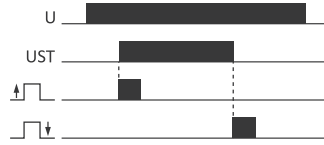
## PSI-02   for DIN rail
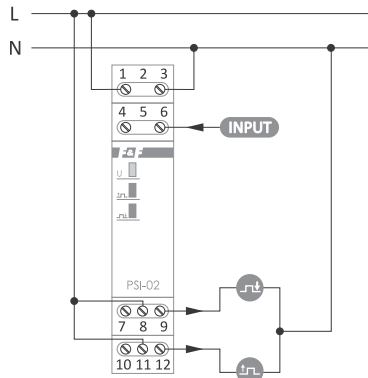


| power supply | |
|---|---|
| PSI-02 230 V | 165÷265 V AC |
| PSI-02 24 V | 21÷27 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO |
| input signal | |
| PSI-02 230 V | 230 V AC |
| PSI-02 24 V | 24 V AC/DC |
| output pulses time | 1 s |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## PSI-02D   with adjustable pulse length, for DIN rail
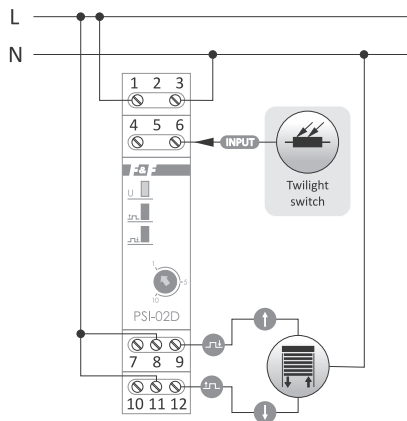


| power supply | |
|---|---|
| PSI-02D 230 V | 165÷265 V AC |
| PSI-02D 24 V | 9÷30 V AC/DC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO |
| input signal | |
| PSI-02D 230 V | 165÷265 V AC |
| PSI-02D 24 V | 9÷30 V AC/DC |
| output pulse time (adjustable) | 1÷10 s |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## PSI-02P   with adjustable pulse length, for flush-mounted box
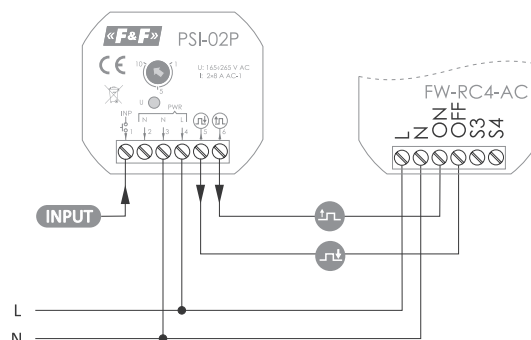


| power supply | |
|---|---|
| PSI-02P 230 V | 165÷265 V AC |
| maximum load current (AC-1) | 2×8 A |
| contact | separated 2×NO |
| input signal | |
| PSI-02P 230 V | 165÷265 V AC |
| output pulse time (adjustable) | 1÷10 s |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 48×43×20 mm |
| mounting | in flush mounted ⌀60 |
| ingress protection | IP20 |

Chapter 44

# MPG-03   full-wave rectifier bridge (Graetz bridge)

**Purpose**

MPG-03 is used to convert alternating current into unidirectional direct current.
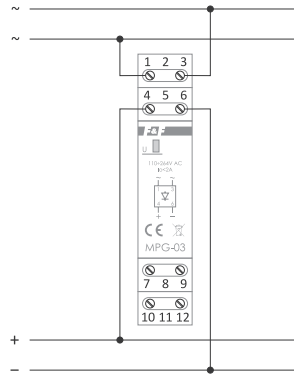


| power supply | |
|---|---|
| MPG-03 230 V | 110÷264 V AC |
| MPG-03 12÷48 V | 12÷48 V AC |
| maximum load current | 2 A |
| output voltage indication | green LED |
| working temperature | -25÷40°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) MPG-03 12÷48 V additionally contains a 940 µF filtering capacitor.

---

# RM-07   RS-485 network amplifier/separator

**Purpose**

The RM-07 module serves as a signal amplifier for Modbus RTU transmission and as a galvanic separator for RS-485 networks. It amplifies the signal to extend the bus range and connect more devices. It can also be used for branching out lines and protecting them against electromagnetic interference. The module amplifies the signal in both directions. Galvanic separation between ports.



| power supply | 9÷30 V DC |
|---|---|
| transmission rate | 1200÷115200 bps |
| system current | <25 mA |
| separation | |
| RS-485 (input) <-> RS-485 (output) | galvanic 1 kV |
| power supply <-> RS-485 (input) | resistive |
| power supply <-> RS-485 (output) | galvanic 1kV |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
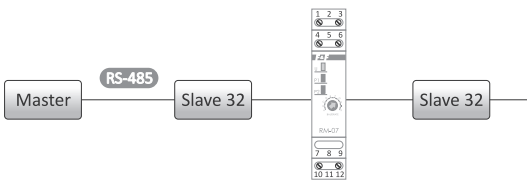


**Extension**
To extend the bus by another group of 32 receivers.
Extendable up to 4 groups for baud speed of 9600.



**Branch**
To reduce the impact of interference caused by branching long signal lines.



**Separation**
To protect a group of receivers against interference generated on the long communication networks.
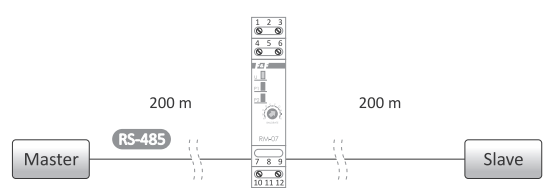


**Amplification**
For signal amplification in long communication networks.

Chapter 44

# LT-04   RS-485 network termination and polarization module

## Purpose

The LT module is used for terminating, polarizing and amplifying the signal line signal between devices exchanging data in accordance with the Modbus communication protocol standard via RS-485 network.

## Functioning

Termination is the termination of a signal line with appropriate resistances in order to maintain a uniform wave impedance of the entire line, which significantly improves the quality of transmitted data and eliminates errors that occur on the signal line.

The line is polarized when at least one of the Slave-type devices in the RS-485 network has no GND signal point. The polarization is carried out only for the Master-type device. The signal is amplified by actively powering the line with low voltage through one of the modules.

| | |
|---|---|
| power supply | 15÷30 V DC |
| system current | <10 mA |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |
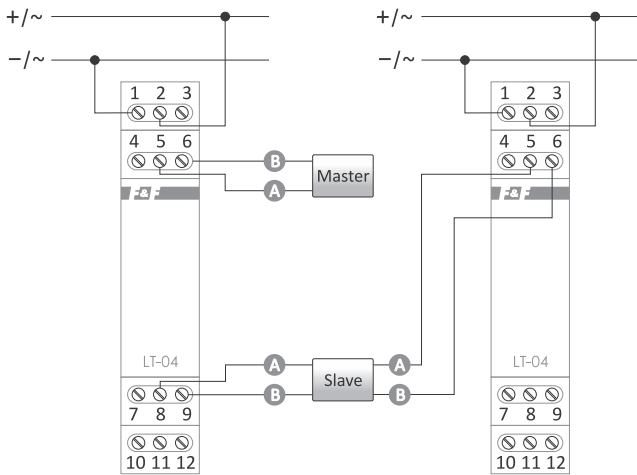
Network termination system
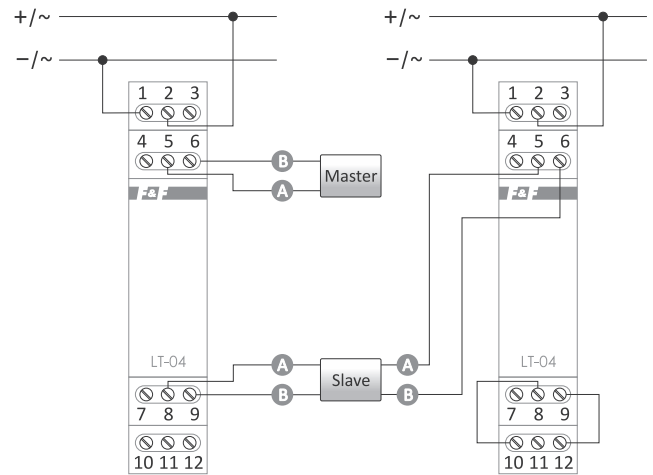
Network polarization system with termination
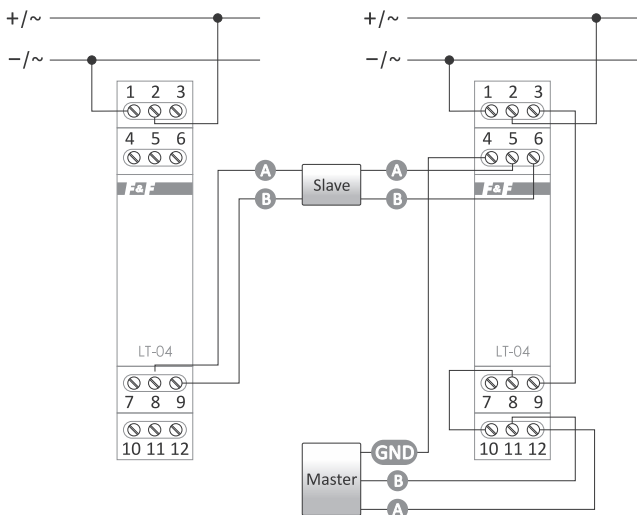
Network polarization system (with termination)
for Slave-type devices without GND

# AKS-08   analog signal converter/separator

## Purpose

The analog separator is a module that enables the processing of the analog signal from one form to another with additional galvanic separation between the input signal, output signal and power supply.

**Input signals IN:**
- voltage 0÷10 V;
- voltage 1÷10 V;
- current 0÷20 mA;
- current 4÷20 mA.

**Output signals OUT:**
- voltage 0÷10 V;
- voltage 1÷10 V;
- current 0÷20 mA;
- current 4÷20 mA.

| | |
|---|---|
| power supply | 9÷24 V AC/DC |
| current consumption | max 200 mA |
| | 9 V DC (outputs compact) |
| power consumption | <2 W |
| voltage input | |
|   voltage | 0÷10 V |
|   resistance | 690 kΩ |
|   maximum input voltage | 40 V |
| current input | |
|   current | 0÷20 mA |
|   resistance | 150 Ω |
|   maximum input current | 40 mA |
| voltage output | |
|   voltage | 0÷10 V |
|   output current | 10 mA |
| current output | |
|   current | 0÷20 mA |
|   voltage | 21 V |
|   load resistance | 1 kΩ |
| input/output separation | 1 kV DC |
| input/power block separation | 1 kV DC |
| output/power block separation | 1 kV DC |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- Analog input signal to analog output signal convertion (mA→V, V→mA, mA→mA, V→V);
- High processing speed – the ability to carry signals up to 100 Hz;
- Galvanic separation (min. 1 kV) between analog input, output and power supply;
- Visual validation of input and output signals.

## Application

- Protection of expensive automation elements (PLCs, inverters, regulators, etc.) from overvoltages that may appear on the signal wires.
- Adjustment of analog signal levels to the capabilities of controllers or regulators, for example, it is possible to connect a sensor with current output to a PLC equipped with voltage analog inputs only;
- Increasing the range of analog transmission, for example very susceptible to voltage interference analog signal can be converted to a resistant current signal (4÷20 mA). In this form, it can be sent through the, for example, factory hall, and then return to the form of a voltage signal with a second converter.

## Work systems
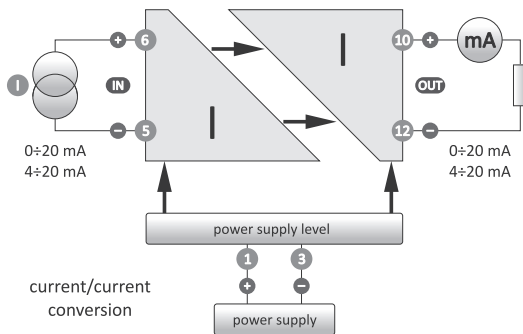


Current/current
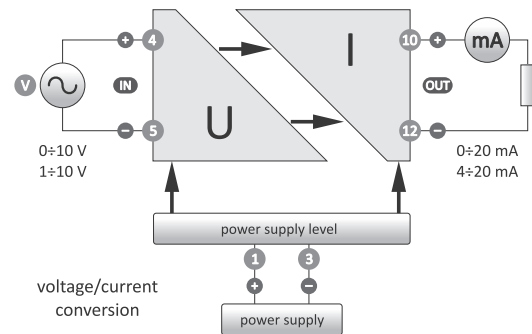


Voltage/current
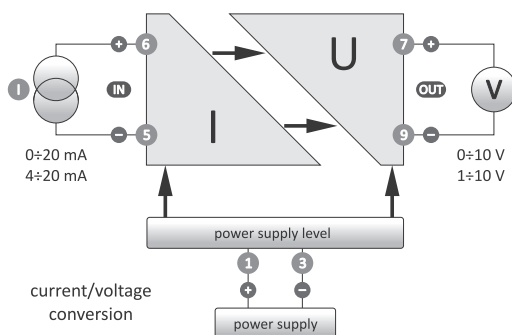


Current/voltage
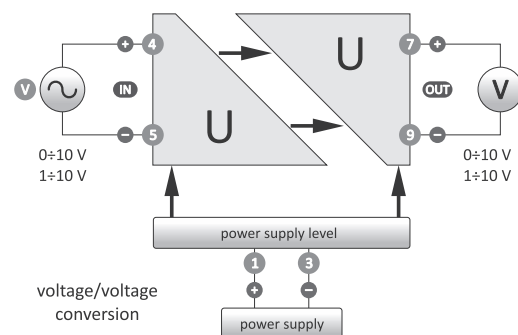


Voltage/voltage

# MAX-CN-ETH-485 RS-485 -> TCP/IP converter

**Purpose**

The converter enables access to the RS-485 serial port from any computer in the local network, and, using an IP address,
from any computer in the world connected to the Internet. The communication takes place via TCP, UDP, DHCP and other protocols.



| | |
|---|---|
| power supply | 9÷24 V DC |
| power supply (included) | 9 V DC |
| RS-485 connector | 1.0 mm² |
| TCP connector | RJ-45 socket |
| dimensions | 86×100×26 mm |
| mounting | surface |

---
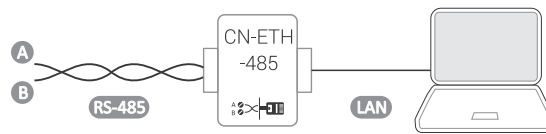
# MAX-CN-GPRS-485 RS-485 <-> GSM/GPRS network converter

**Purpose**

The CN-GPRS-485 converter is used for bidirectional, transparent data transmission from the RS-485 serial port to the network.
The converter supports the Identity and Heartbeat packet mechanisms as well as socket connections.
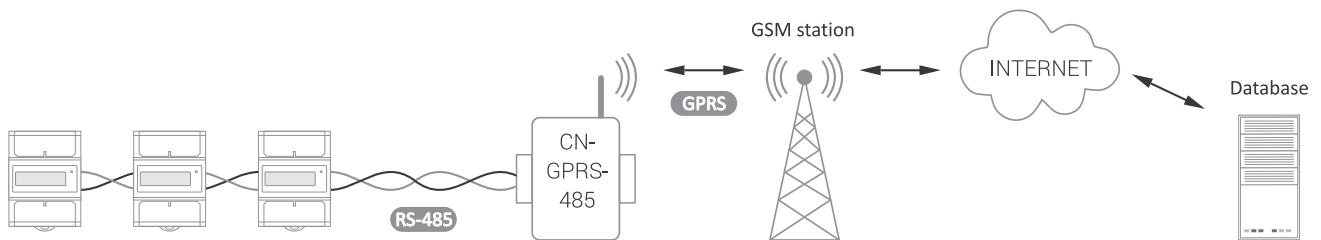


| | |
|---|---|
| power supply | 9÷24 V DC |
| power supply (included) | 9 V DC |
| RS-485 connector | 1.0 mm² |
| TCP connector | RJ-45 socket |
| dimensions | 83×86×24 mm |
| mounting | surface |



---

# MAX-CN-USB-485 RS-485 -> USB converter

**Purpose**

The converter enables access to the RS-485 port from any PC equipped with a USB interface.
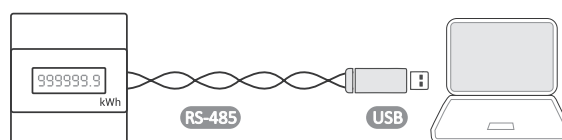


| | |
|---|---|
| wire length | 1.8 m |
| terminal RS-485 | 2×0.34 mm² |

# OP-230   anti-interference filter with surge protection system

It is used to protect electronic devices such as computers, PLCs, microprocessor systems, etc. against radio interference and overvoltage from the electrical system.
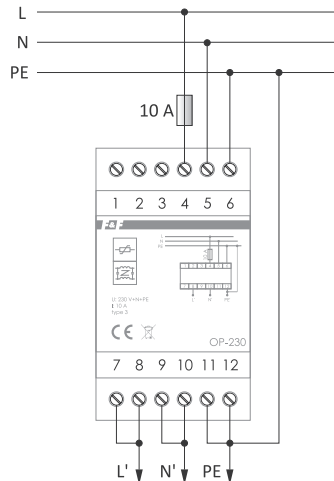
| norm No. | IEC 61643-1:2001 |
|---|---|
| surge arrester class | III |
| rated voltage | 230 V AC |
| rated current | 10 A |
| highest permanent operating voltage | 255 V |
| voltage protection level L→N (measured) | <1 kV |
| tripping time | <25 ns |
| additional protection | 10 A gL/gG or C10 A |
| system inductance | 1 mH/track |
| leakage current | 0.5 mA |
| system capacity L→N | 880 nF |
| system capacity L(N)→ PE | 2.2 nF |
| radio interference suppression | >85 dB |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals (cord) |
|  | 4.0 mm² screw terminals (wire) |
| tightening torque | 0.5 Nm |
| dimensions | 3 modules (52.5 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# WB-1   2-position switch with indicator light
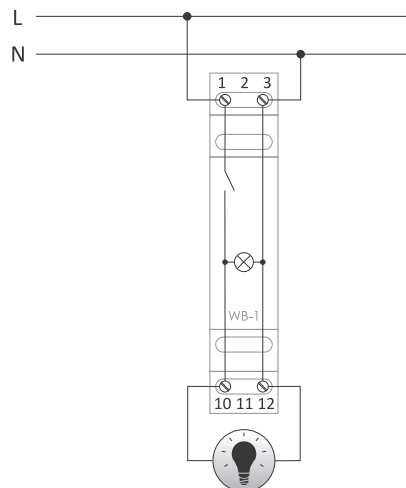
| maximum load current | 16 A/250 V |
|---|---|
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# ECH-06   DC power reserve module, with battery charging function (1.3÷7.2 Ah)

The ECH-06 module along with an external gel battery with a nominal voltage of 12 V constitutes a backup power supply system for receivers with a supply voltage of 9÷30 V DC.
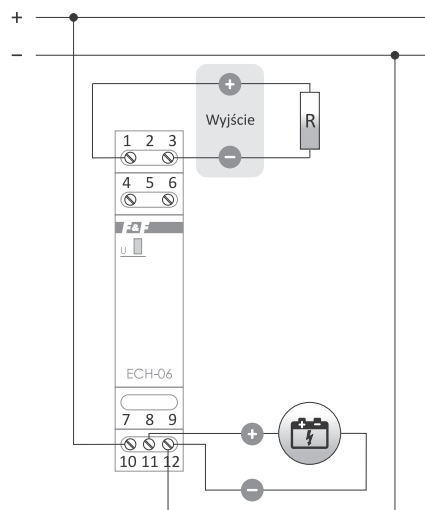
| power supply Uin | 18÷30 V DC |
|---|---|
| output voltage Uout | Uin -0.5 V DC |
|  | Uacu -0.5 V DC |
| maximum load current output Uout (AC-1) | 3 A |
| supported battery capacity | 1.3÷7.2 Ah |
| maximum voltage battery Uacu | 13.8 V DC |
| the maximum charging current | <0.35 A |
| power supply cut-off threshold | <10.5 V DC |
| power consumption | <1 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Measuring transducers

## Analog transducers

**Purpose**

Analog transducers designed for measuring physical values with an external or internal sensor and converting the measured value to a unified analog output signal of 4÷20 mA current or 0÷10 V voltage.

## Temperature transducers

# AT-1I-DS / AT-1U-DS for use with DS18(...)20 digital temperature sensors

Temperature transducer with 4÷20 mA current output (AT-1I-DS) or 0÷10 V voltage output (AT-1U-DS).
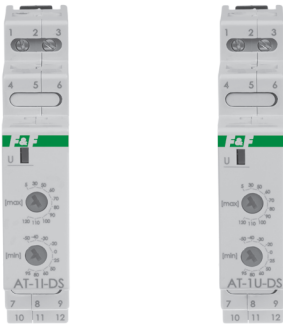
| power supply | |
|---|---|
| AT-1I-DS | 9÷30 V DC |
| AT-1U-DS | 12÷30 V DC |
| measuring range | -50÷120°C |
| setting range | |
| minimum temperature | -50÷95°C |
| maximum temperature | 5÷120°C |
| output signal | |
| AT-1I-DS | 4÷20 mA |
| AT-1U-DS | 0÷10 V |
| processing error | ±0.25°C |
| signal cable | |
| AT-1I-DS | <300 m |
| AT-1U-DS | <20 m |
| sensor wire | <50 m |
| temperature probe | RT4, DS1820, DS18B20, DS18S20 |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The connection diagrams for the AT-1I-DS and AT-1U-DS transmitters can be found on page 280.

(!) Full measuring range -50÷120°C, can be limited by potentiometers setting the upper and lower threshold of the measuring range. The parameters of the dedicated RT4 probe can be found in the table on page 264.

# AT-1I-KT / AT-1U-KT for use with KTY81-210 digital temperature transducers

Temperature transducer with 4÷20 mA current output (AT-1I-KT) or 0÷10 V voltage output (AT-1U-KT).
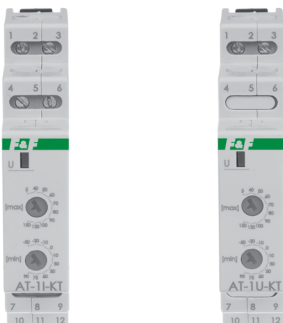
| power supply | |
|---|---|
| AT-1I-KT | 9÷30 V DC |
| AT-1U-KT | 12÷30 V DC |
| measuring range | -50÷150°C |
| setting range | |
| minimum temperature | -50÷95°C |
| maximum temperature | 5÷150°C |
| output signal | |
| AT-1I-KT | 4÷20 mA |
| AT-1U-KT | 0÷10 V |
| processing error | ±1°C |
| signal cable | 3 |
| AT-1I-KT | <300 m |
| AT-1U-KT | <20 m |
| sensor wire | <50 m |
| temperature probe | RT, RT2, KTY81-210 |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The connection diagrams for the AT-1I-KT and AT-1U-KT transmitters can be found on page 280.

(!) Full measuring range -50÷150°C, can be limited by potentiometers setting the upper and lower threshold of the measuring range. The parameters of the dedicated RT or RT2 probes can be found in the table on page 264.

# AT-1I-PT / AT-1U-PT   for use with PT100 3-wire temperature sensor

Temperature transducer with 4÷20 mA current output (AT-1I-PT) or 0÷10 V voltage output (AT-1U-PT).
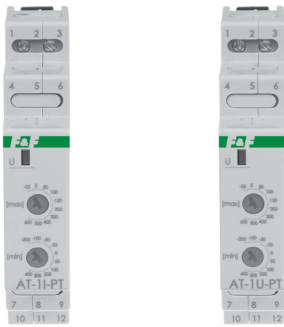
| | |
|---|---|
| power supply | |
| AT-1I-PT | 9÷30 V DC |
| AT-1U-PT | 12÷30 V DC |
| measuring range | -200÷600°C |
| setting range | |
| minimum temperature | -200÷400°C |
| maximum temperature | -25÷600°C |
| output signal | |
| AT-1I-PT | 4÷20 mA |
| AT-1U-PT | 0÷10 V |
| processing error | ±0.5°C |
| signal cable | |
| AT-1I-PT | <300 m |
| AT-1U-PT | <20 m |
| sensor wire | <50 m |
| temperature probe | RT56, PT100 (3-wire) |
| power consumption | 0.8 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The connection diagrams for the AT-1I-PT and AT-1U-PT transmitters can be found on page 280.

(!) Full measuring range -200÷600°C, can be limited by potentiometers setting the upper and lower threshold of the measuring range. The parameters of the dedicated RT56 probe can be found in the table on page 264.

# AT-1I / AT-1U   for use with KTY temperature sensor
Products available until stocks run out

Temperature transducer with 4÷20 mA current output (AT-1I) or 0÷10 V voltage output (AT-1U).
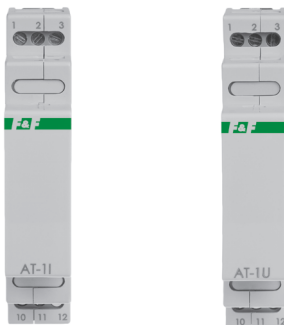
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -50÷100°C |
| maximum measurement error | ± 1.5°C |
| output signal | |
| AT-1I | 4÷20 mA |
| AT-1U | 0÷10 V |
| processing error | ±0.5% |
| signal cable | |
| AT-1I | 300 m |
| AT-1U | 20 m |
| temperature probe | RT/ RT2 |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The connection diagrams for the AT-1I and AT-1U transmitters can be found on page 281.

(!) The module cooperates with a resistance temperature sensor of the KTY81-210 type (or equivalent). The parameters of the dedicated RT or RT2 probes can be found in the table on page 264.

# AT-2I / AT-2U   with the internal KTY temperature sensor

Temperature transducer with 4÷20 mA current output (AT-2I) or 0÷10 V voltage output (AT-2U).

| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum measurement error | ±1.5°C |
| output signal | |
| AT-2I | 4÷20 mA |
| AT-2U | 0÷10 V |
| signal cable | |
| AT-2I | 300 m |
| AT-2U | 20 m |
| internal temperature sensor | KTY81-210 |
| temperature probe | RT/ RT2 |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ø55; h= 13 mm |
| mounting | in flush mounted box ø60 |
| ingress protection | IP20 |

(!) The connection diagrams for the AT-2I and AT-2U transmitters can be found on page 281.

(!) The module operates in one of two options: with an internal temperature sensor or external probe.
The module cooperates with a resistance temperature sensor of the KTY81-210 type (or equivalent).
The parameters of the dedicated RT or RT2 probes can be found in the table on page 264.

# AT-3I   for use with PT-100 temperature sensor
Product available until stocks run out

Transducer with 4÷20 mA current output.

| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -100÷100°C |
| maximum measurement error | ±1°C |
| output signal | 4÷20 mA |
| the maximum length of shielded signal cable | 300 m |
| temperature sensor | PT-100 |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

(!) The connection diagram for the AT-3I transducer can be found on page 281.

(!) The module cooperates with a temperature sensor of the PT-100 type (or equivalent).
The parameters of the dedicated RT56 probe can be found in the table on page 264.

# Connection diagrams for temperature sensors
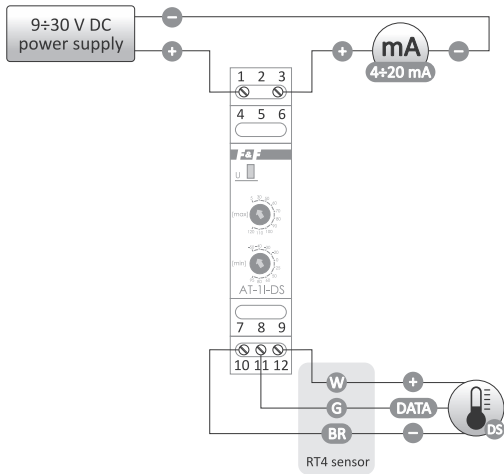


AT-1I-DS
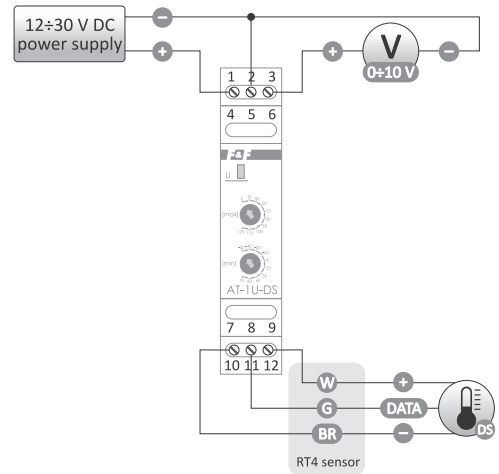


AT-1U-DS
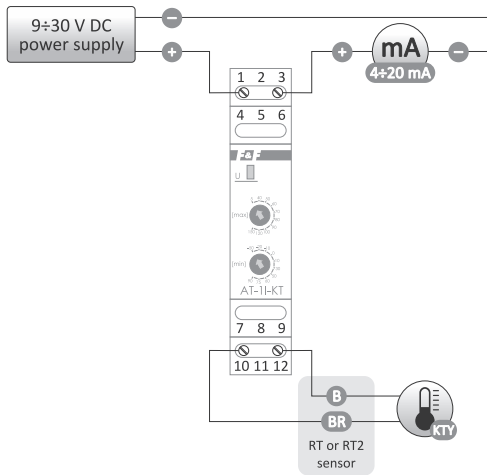


AT-1I-KT
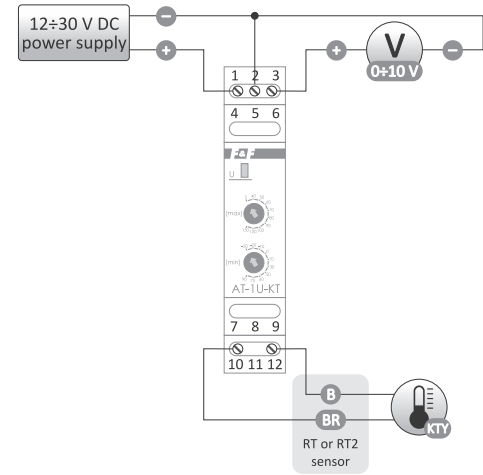


AT-1U-KT
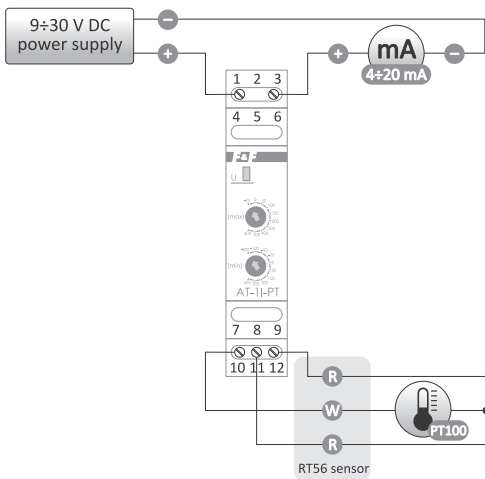


AT-1I-PT
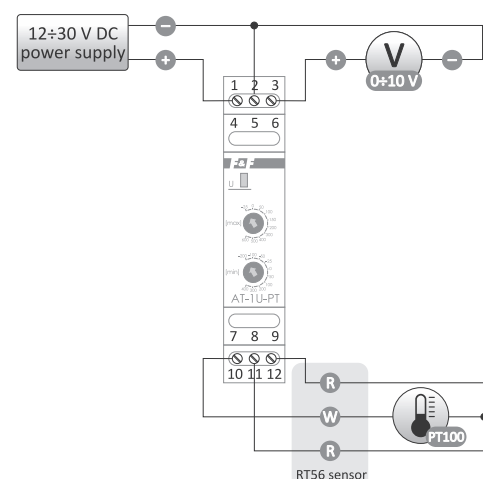


AT-1U-PT

# Connection diagrams for temperature sensors cont.
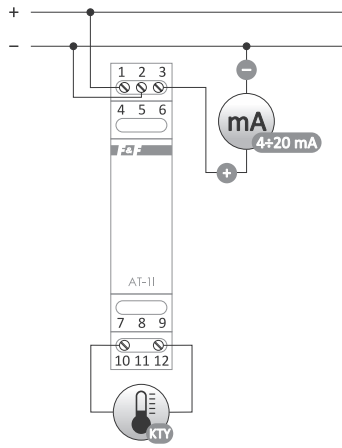


AT-1I
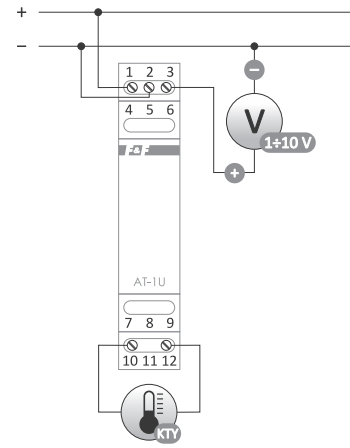


AT-1U
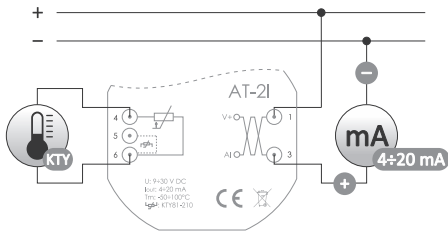


AT-2I
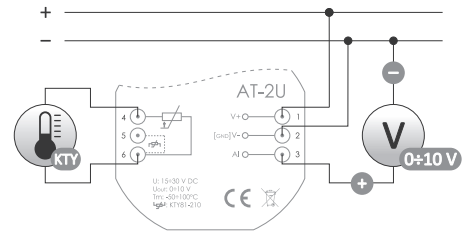


AT-2U
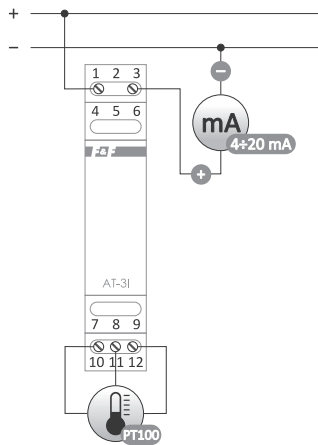


AT-3I

# Voltage transducer

## AV-1I  1-phase 230 V AC/400V DC

**Purpose**

The AV-1I transducer is designed to measure AC/DC voltage (True RMS) and to convert the measured value into an analog current output signal in the range of 4÷20 mA.
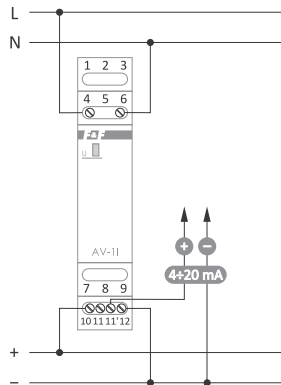
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range (True RMS) | |
| AC alternating voltage | 0÷285 V |
| DC constant voltage | 0÷400 V |
| maximum voltage at the measuring input | 320 V AC |
| | 450 V DC |
| maximum measurement error | ±1 V |
| output signal | 4÷20 mA |
| maximum length of shielded signal cable | 300 m |
| overvoltage IN->OUT | 3 kV |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# Current transducer

## AC-1I 5A  1-phase 5 A AC / AC-1I 15A 1-phase 15 A AC (20 A DC)

**Purpose**

The AC-1I transducer is designed to measure AC/DC voltage (True RMS) and to convert the measured value into an analog current output signal in the range of 4÷20 mA.
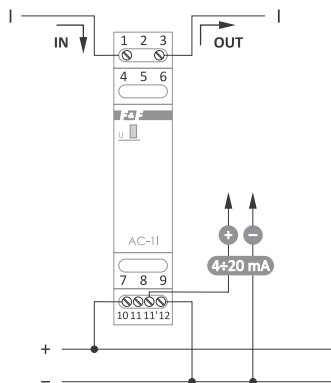
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range (True RMS)/maximum voltage | |
| AC-1I 5A | 0÷5 A/285 V AC |
| AC-1I 15A | 0÷15 A/285 V AC |
| permissible overload | 100 A/100 ms |
| maximum measurement error | ±2.5% |
| output signal | 4÷20 mA |
| maximum length of shielded signal cable | 300 m |
| overvoltage IN->OUT | 2.1 kV |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MeternetPRO  network parameter recording system
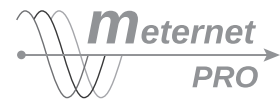
**Purpose**

The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or LAN local networks. The program along with its database is installed on a special MT-CPU-1 server, which operates in the LAN network. The software user interface is a Web application (website). The program is accessible through any web browser. In the case of a LAN with a public IP address, you can configure the program to operate and read data over the Internet.

# Relays with analog input

## PA-01I  analog relay with the current input

The PA-01I device is used to convert a 0÷20 mA/4÷20 mA analog signal to a relay output control signal. This allows sensors with analog output to be used in automation systems. The measurement chain is galvanically isolated from the power supply of the device.

| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum load current (AC-1) | 8 A |
| contact | separated 1×NO/NC |
| maximum current consumption | 100 mA |
| range of input signals | 0÷ 20 mA |
| hysteresis setting range | 0÷5 mA |
| input resistance | 150 Ω ±0.1 % |
| measurement resolution | 5 µA |
| measurement error | 1% |
| hysteresis in the "window" mode | 200 µA |
| working temperature | -20÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## PA-01U  analog relay with voltage input

The PA-01U device is used to convert a 0÷10 V analog signal to a relay output control signal. This allows sensors with analog output to be used in automation systems. The measurement chain is galvanically isolated from the power supply of the device.
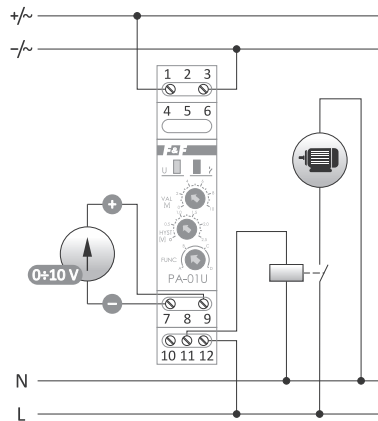
| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum load current (AC-1) | 8 A |
| contact | separated 1×NO/NC |
| maximum current consumption | 100 mA |
| range of input signals | 0÷10 V |
| hysteresis setting range | 0÷2.5 V |
| input resistance | 69 kΩ ±0.1 % |
| measurement resolution | 2.5 mV |
| measurement error | 1% |
| hysteresis in the "window" mode | 100 mV |
| working temperature | -20÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Interesting and practical**
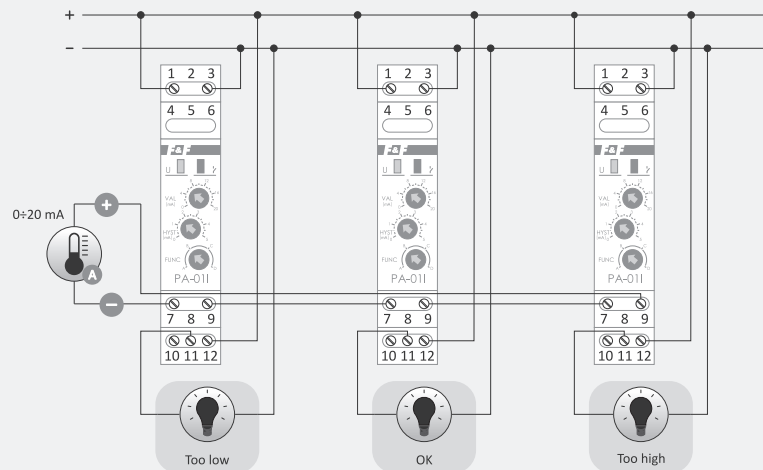
Temperature status indication

Chapter 45

# PA-02-MBT   analog panel relay 0÷20 mA/0÷10 V with display

**Purpose**

PA-02-MBT is a panel transducer of 0÷20 mA/0÷10 V signals with the ability to set two independent alarms that control two relays. The measurement result is displayed on a 14 mm display. The device is equipped with a Modbus RTU bus which enables configuration and reading of measured parameters.

**Selected functions**

• 2 independent alarms controlling 2 outputs;
• Measurement of 0÷10 V voltage and 0÷20 mA current;
• Galvanic separation between the power supply and measurement chain;
• Display value can be scaled.

| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum load current (AC-1) | 8 A |
| contact | separated 1×NO/NC |
| maximum current consumption | 100 mA |
| range of input signals | 0÷ 20 mA |
| hysteresis setting range | 0÷5 mA |
| input resistance | 150 Ω ± 0.1 % |
| measurement resolution | 5 µA |
| measurement error | 1% |
| hysteresis in the "window" mode | 200 µA |
| working temperature | -20÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.5 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |



0÷20 mA current loop measurement
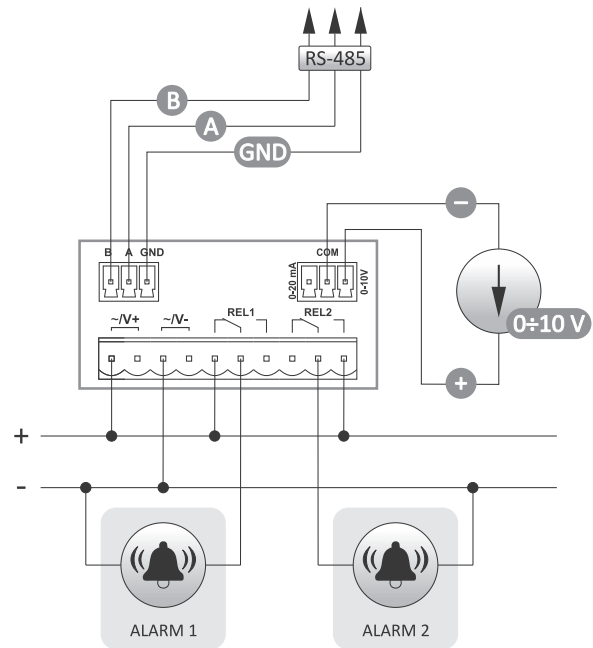


0÷10 V voltage loop measurement

# Transducers with Modbus RTU output

**Purpose**

The transducers designed to measure physical values using an external or internal sensor with the possibility to read data from their internal registers using the Modbus RTU communication protocol.

## Current transducer

# MB-1I-1 5A 1-phase / MB-1I-1 15A 1-phase
# MB-3I-1 5A 3-phase / MB-3I-1 15A 3-phase

**Purpose**

The transducer is designed for AC/DC (True RMS) current measurement with communication output RS-485 (Modbus RTU).

| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range (True RMS) | |
| MB-1I-1 5 A | 0÷5 A AC |
| MB-1I-1 15 A | 0÷15 A AC |
| MB-3I-1 5 A | 0÷5 A AC |
| MB-3I-1 15 A | 0÷15 A AC |
| maximum measurement error | ±0.5% |
| reading registry precision | 0.1 A |
| overvoltage IN->OUT | 2.1 kV |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Voltage transducers

# MB-1U-1 1-phase
# MB-3U-1 3-phase

**Purpose**

The transducer is designed for AC/DC voltage (True RMS) measurement with communication output RS-485 (Modbus RTU).
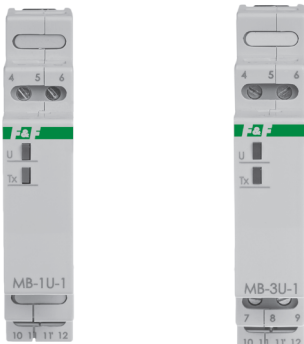
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range (True RMS) | |
| AC voltage | 0÷285 V |
| DC voltage | 0÷400 V |
| maximum measurement error | ±0.5% |
| reading registry precision | 1 V |
| overvoltage IN->OUT | 3 kV |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.8 W |
| working temperature | -20÷50°C |
| relative air humidity (for +30°C) | 85% |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

Chapter 45

# Connection diagrams for measuring transducers
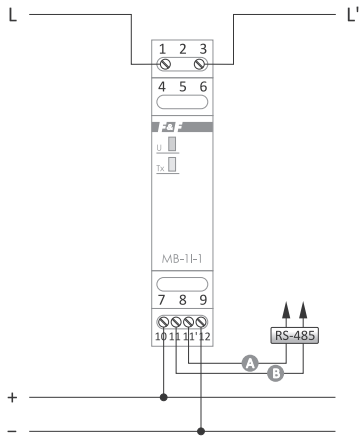


MB-1I-1 5A/MB-1I-1 15A
direct measurement
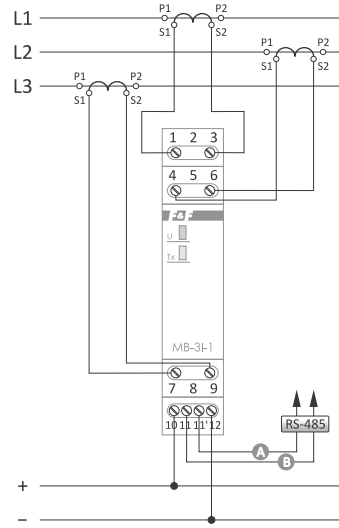


MB-3i-1 5A/MB-3i-1 15A
half indirect measurement
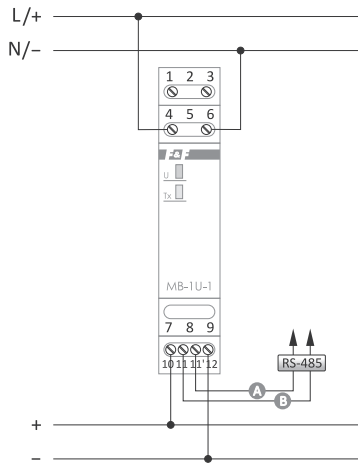


MB-1U-1
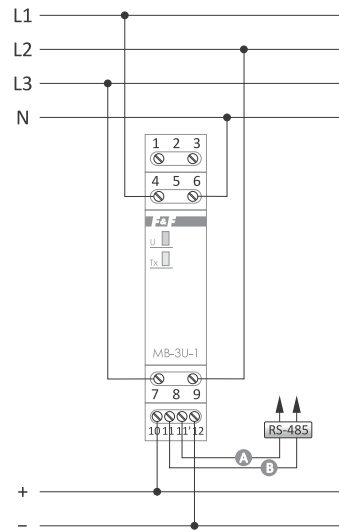


MB-3U-1

## Temperature transducers

# MB-DS-2   for use with DS1820 digital temperature sensor

Temperature recording from 2 independent measuring channels in the range from -55 to 125°C. Saving the maximum and minimum recorded temperature in the non-volatile memory. A dedicated RT4 probe can be found in the table on page 264.

| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -55÷125°C |
| maximum measurement error | ±1°C |
| temperature sensor type | DS1820/DS18B20/DS18S20 |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MB-DS-10   for use with DS1820 digital temperature sensor (up to 10 pcs.)

The transmitter supports up to 10 sensors on one channel (1-Wire bus). Recorded value: current temperature.
A dedicated RT4 probe can be found in the table on page 264.

| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -55÷125°C |
| maximum measurement error | ±1°C |
| temperature sensor type | DS1820/DS18B20/DS18S20 |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MB-DS-30   for use with DS1820 digital temperature sensor (up to 30 pcs.)

The transmitter supports up to 30 sensors on one channel (1-Wire bus). Recorded value: current temperature.
A dedicated RT4 probe can be found in the table on page 264.

| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -55÷125°C |
| maximum measurement error | ±1°C |
| temperature sensor type | DS1820/DS18B20/DS18S20 |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MB-PT-100   for use with PT100 temperature sensor

Temperature recording in the range from -100 to 400°C. Saving the maximum and minimum recorded temperature in the non-volatile memory.
The module cooperates with a temperature sensor of the PT100 type (or equivalent).
The parameters of the dedicated RT56 probe can be found in the table on page 264.
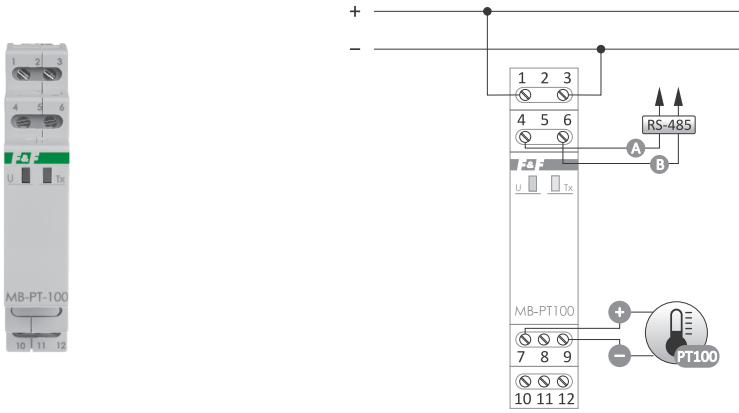
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | -100÷400°C |
| maximum measurement error | ±1°C |
| overvoltage IN->OUT | 2.1 kV |
| temperature sensor type | PT100 |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MB-TC-1   for use with K, J, E, N, T, S, R, B thermocouples

Recorded values: current temperature and recorded minimum and maximum temperature. Adjustable measurement parameters of the transducer: the averaging time of temperature measurement result and the standard temperature correction. The sensor type is software-set according to Modbus RTU protocol functions.
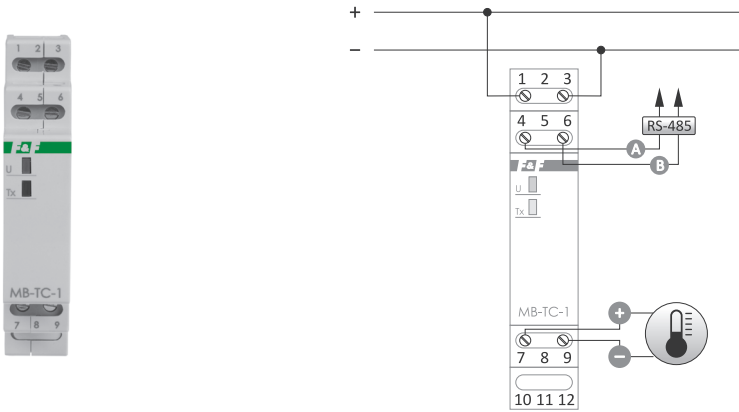
| | |
|---|---|
| power supply | 9÷30 V DC |
| measurement range | dependent on the type of sensor |
| maximum measurement error | ±2°C |
| temperature sensor type | K, J, E, N, T, S, R, B |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Pulse meter (4-channel)**

# MB-LI-4 Lo   low-voltage counting inputs
# MB-LI-4 Hi   high-voltage counting inputs
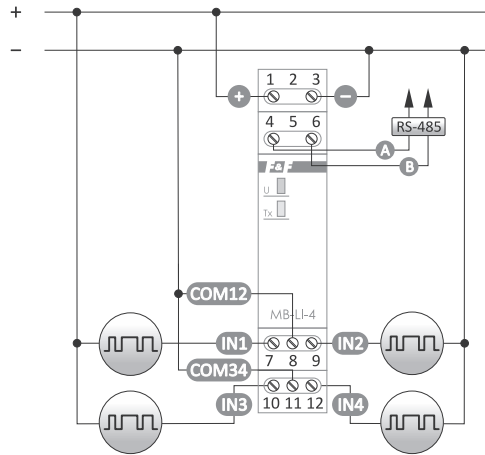


| power supply | 9÷30 V DC |
|---|---|
| number of counting inputs | 4 |
| counting input voltage | |
| MB-LI-4 Lo | 6÷30 V AC/DC |
| MB-LI-4 Hi | 160÷265 V AC/DC |
| maximum counting frequency | 100 Hz |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 4 independent counters;
- Counter input suitable for AC/DC signals;
- "n" of the factor (floating point value);
- Scaled value (number of pulses × factor);
- Selection of the state trigger option 1: high or low voltage level;
- Selection of the input pulse edge (rising or trailing);

- Frequency filter, which allows limiting the maximum frequency of the counted pulses (to eliminate interference at the input of the counter);
- The memory of the meter status after a power failure;
- Digital input function.

**Operating time meter (4-channel)**

# MB-LG-4 Lo   low-voltage counting inputs
# MB-LG-4 Hi   high-voltage counting inputs
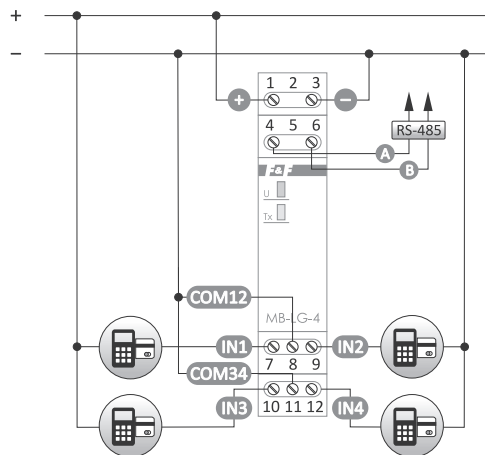


| power supply | 9÷30 V DC |
|---|---|
| number of counting inputs | 4 |
| counting input voltage | |
| MB-LG-4 Lo | 6÷30 V AC/DC |
| MB-LG-4 Hi | 160÷265 V AC/DC |
| maximum input signal frequency | 100 Hz |
| maximum measured time | >150 years |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 4 independent counters;
- Overall results in FLOAT (floating point) values for hours and INT (integer) values broken down into seconds, minutes, hours, days (4 registers per 1 counter);
- Counter input suitable for AC/DC signals;
- Selection of the state trigger option 1: high or low voltage level;

- Time filter, which allows limiting the maximum length of the input signal (to eliminate interference at the input of the counter);
- The memory of the meter status after a power failure;
- Digital input function.

# MB-AHT-1　humidity and temperature transducer

**Functioning**

The transducer performs continuous temperature measurement in the range -40÷70°C and humidity in the range 0÷100% RH.

Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum ⌀7 (for example: 2×0,5 mm²).
Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.
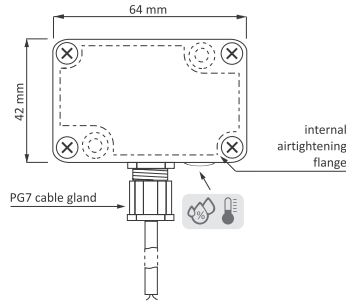
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | 0÷100% RH/-40÷70°C |
| maximum measurement error of temperature | ±1°C |
| maximum measurement error of humidity | ±4.5% (0÷80 RH) |
| | ±6.5% (80÷100 RH) |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -40÷70°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 64×42×30 mm |
| mounting | surface |
| ingress protection | IP65 |

---

# MB-LS-1　lighting brightness level transducer

**Functioning**

The transmitter continuously measures the level of brightness (sunlight) in the range of 1÷2000 lx.

Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum ⌀7 (for example: 2×0,5 mm²).
Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.
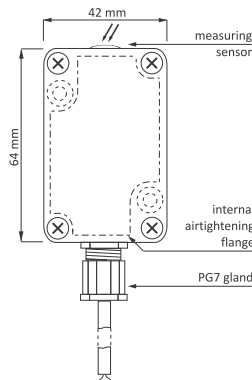
| | |
|---|---|
| power supply | 9÷30 V DC |
| measuring range | 1÷65000 lx |
| maximum measurement error | ±2% |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -40÷70°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 42×64×30 mm |
| mounting | surface |
| ingress protection | IP65 |

---

# MB-GPS-1　GPS location converter

**Functioning**

The converter is equipped with a standard GPS (Global Positioning System) satellite tracking module.
Based on the received signal, the converter provides current data for its location:
• geographical coordinates (length/width);
• date (year/month/day);
• time (hour/minute/second).

Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum ⌀7 (for example: 2×0,5 mm²).
Box with a special sealing flange, fixed to the base by means of 2 screws, closed with a cover with silicone gasket using 4 screws.

❶ factory reset jumper
❷ signal lights
❸ 120 Ω terminator jumper
❹ internal airtightening flange
❺ PG7 cable gland
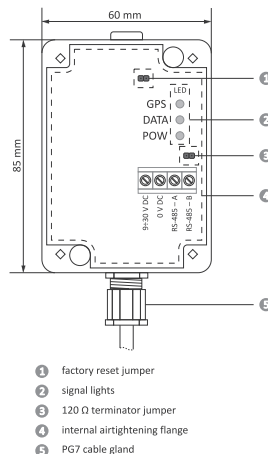
| | |
|---|---|
| power supply | 9÷30 V DC |
| maximum current consumption | 40 mA |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -40÷70°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 60×85×35 mm |
| mounting | surface |
| ingress protection | IP65 |

# I/O expansion modules with RS-485 port and Modbus RTU protocol

**Purpose**

MR modules serve as an external device extending inputs or outputs of the programmable controllers or other devices, where data exchange takes place via RS-485 port according to Modbus RTU protocol.

## MR-DIO-1   digital inputs (DI)/outputs (DO) module

**Functioning**

The module has 6 universal lines, which, depending on the way of connection and configuration, can act as a digital input or output. The module has a function of recording the status of outputs in the non-volatile local memory. Each time the power supply to the module is switched on, the outputs can be restored to the saved state.
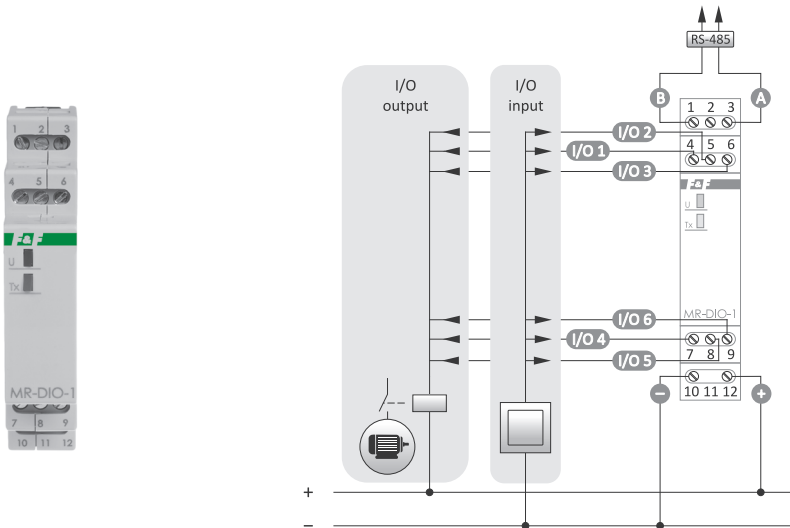


| | |
|---|---|
| power supply | 9÷30 V DC |
| number of I/O lines | 6 |
| maximum voltage on the I/O line | <50 V |
| the maximum current of the I/O line | |
| constant | 100 mA |
| pulse (20%) | 200 mA |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.5 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## MR-DI-4 Lo / MR-DI-4 Hi   digital inputs (DI) modules

**Functioning**

MR-DI-4 module has 4 inputs. The module has configurable options for activating the inputs (TRUE value) with low (0 V) or high (V+) signal and for closing or opening the input signal circuit. The time filter is used to eliminate interference (false pulses) that may appear at the input. This is a setting of the minimum duration of the input signal that will be seen at the input and will be treated as a status change. Shorter signals are ignored.
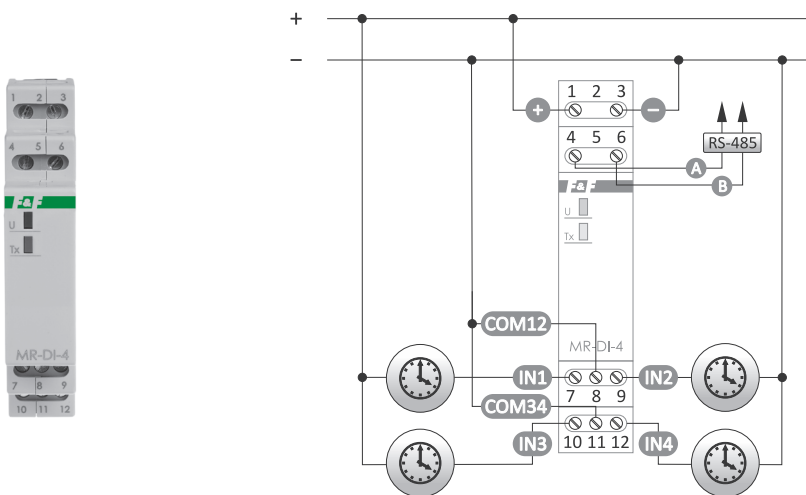


| | |
|---|---|
| power supply | 9÷30 V DC |
| number of digital inputs | 4 |
| voltage range for digital inputs | |
| MR-DI-4 Lo | 6÷30 V AC/DC |
| MR-DI-4 Hi | 160÷265 V AC/DC |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.3 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

**Functions**

- 4 independent inputs;
- Input suitable for AC/DC signals;
- Selection of the state trigger option 1: high or low voltage level;
- Selection of the state 1 trigger option: by closing or opening the input circuit;
- Time filter, which allows setting the minimum acceptable length of the input signal (to eliminate interference at the input).

# MR-RO-1 multifunctional relay output (RO) module; 1×NO/NC contact

## Functioning

MR-RO-1 module has a controllable relay output (separated contact 16 A).
Control via Modbus RTU protocol or standalone operation.
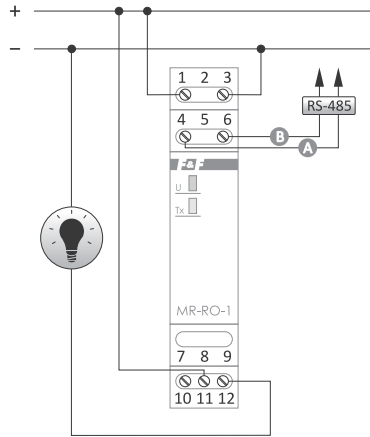


| power supply | 9÷30 V DC |
|---|---|
| maximum load current (AC-1) | 16 A |
| contact | separated 1×NO/NC |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.6 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- Control in ON/OFF mode;
- Time control;
  – off delay;
  – off delay for a preset time;
  – ON/OFF cyclic operation;
  – OFF/ON cyclic operation;

- The memory of the status after a power failure;
- The operation also in standalone mode;
- Autostart for time functions;
- Measuring of the time of the last relay activation;
- Number of relay activations;
- The number of performed cycles for time functions.

# MR-RO-4 relay output (RO) module; 4×NO contact

## Functioning

MR-RO-4 module has a controllable relay output (separated contacts 4×16 A).
Control via Modbus RTU protocol or standalone operation.
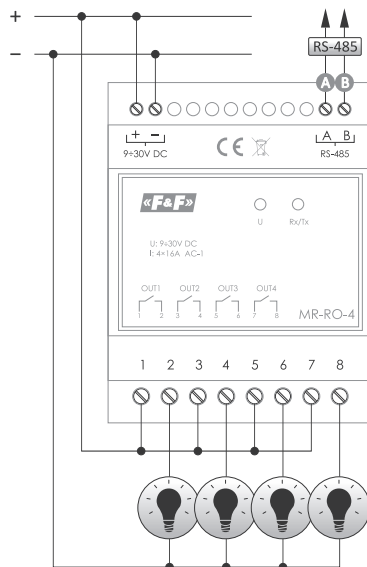


| power supply | 9÷30 V DC |
|---|---|
| maximum load current (AC-1) | 4×16 A |
| contact | separated 4×NO |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/1.5/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 2 W |
| working temperature | -20÷50°C |
| terminal | 1.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 4 modules (70 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## Functions

- Control in ON/OFF mode;
- Time control;
  – off delay;
  – off delay for a preset time;
  – ON/OFF cyclic operation;
  – OFF/ON cyclic operation;

- The memory of the status after a power failure;
- The operation also in standalone mode;
- Autostart for time functions;
- Measuring of the time of the last relay activation;
- Number of relay activations;
- The number of performed cycles for time functions.

Chapter 45

# MR-AI-1 analog inputs (AI) module

The module has 4 universal analog inputs. Input type, 0÷10 V voltage or 4÷20 mA current, is determined by internal jumpers. The module continuously measures current and voltage input values at all inputs regardless of the hardware configuration of the input types (jumper position). However, only the input values for which these inputs are configured will be measured correctly.
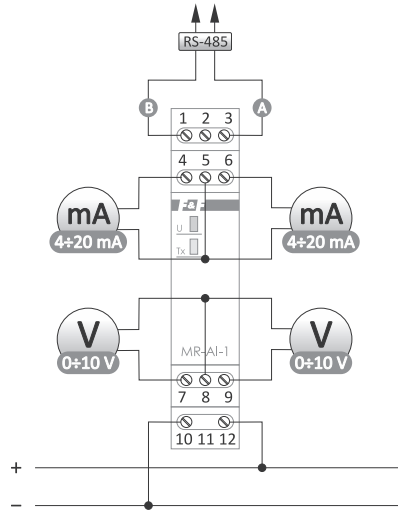


| power supply | 9÷30 V DC |
|---|---|
| number of analog inputs | 4 |
| current inputs | 4÷20 mA |
| voltage inpputs | 0÷10 V |
| current input resistance | 47 Ω |
| voltage input resistance | 110 Ω |
| measurement error | 1% |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 1 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MR-AO-1 voltage analog outputs (AO) module

The module has 4 analog outputs compliant with the 0÷10 V standard. The current voltage value of a given output is determined by means of Modbus RTU protocol commands. Additionally, the module has a function of recording the status of inputs in the non-volatile local memory. Each time the power supply to the module is switched on, the outputs can be restored to the saved state.
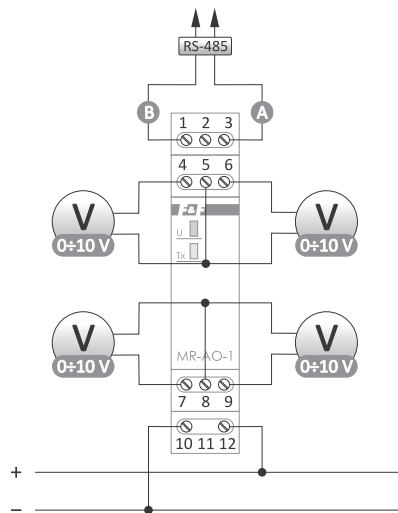


| power supply | 9÷30 V DC |
|---|---|
| number of analog output | 4 |
| output signal | |
| output voltage | 0÷10 V |
| output maximum load | 40 mA |
| the accuracy of output voltage settings | 0.1 V |
| port | RS-485 |
| communication protocol | Modbus RTU |
| type of work | Slave |
| power indication | green LED |
| communication indication | yellow LED |
| communication parameters | |
| baud rate (adjustable) | 1200÷115200 bit/s |
| data bits | 8 |
| stop bits | 1/2 |
| parity bit | EVEN/ODD/NONE |
| address | 1÷247 |
| power consumption | 0.5 W |
| working temperature | -20÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

# MR-LED-T panel display with buttons and Modbus RTU communication

## Purpose

MR-LED-T is a user panel for systems with Modbus RTU communication. It allows displaying the value read in the system and provides 3 buttons that can be used as inputs. The module is closed in a 36×72 mm panel housing with a 14 mm display at the front.
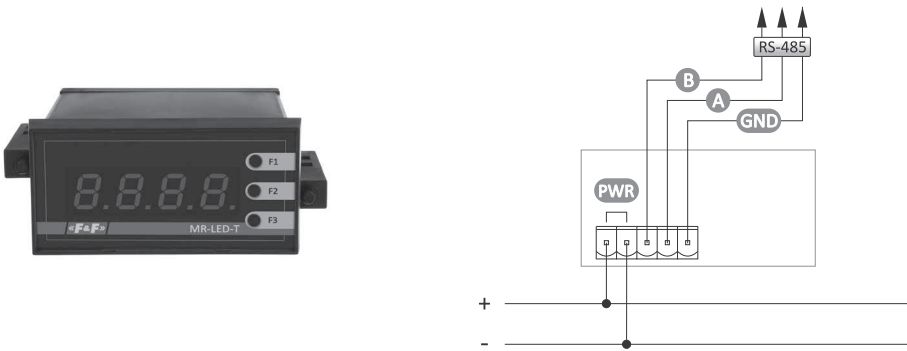
| power supply | 9÷30 V AC/DC |
|---|---|
| power consumption | max 100 mA |
| communication protocol | Modbus RTU |
| port | RS-485 |
| communication parameters | |
|   baud rate (adjustable) | 1200÷115200 bit/s |
|   data bits | 8 |
|   stop bits | 1 or 2 |
|   parity bit | EVEN/ODD/NONE |
|   address | 1÷247 |
| working temperature | -10÷40°C |
| terminal | 2.5 mm² detachable terminals |
| tightening torque | 0.4 Nm |
| dimensions | 72×36×72 mm |
| dimensions of the mounting hole | 67.5×32.5 mm |
| mounting | panel |
| ingress protection | IP20 |

## Interesting and practical



Example of a control system for a wood drying room
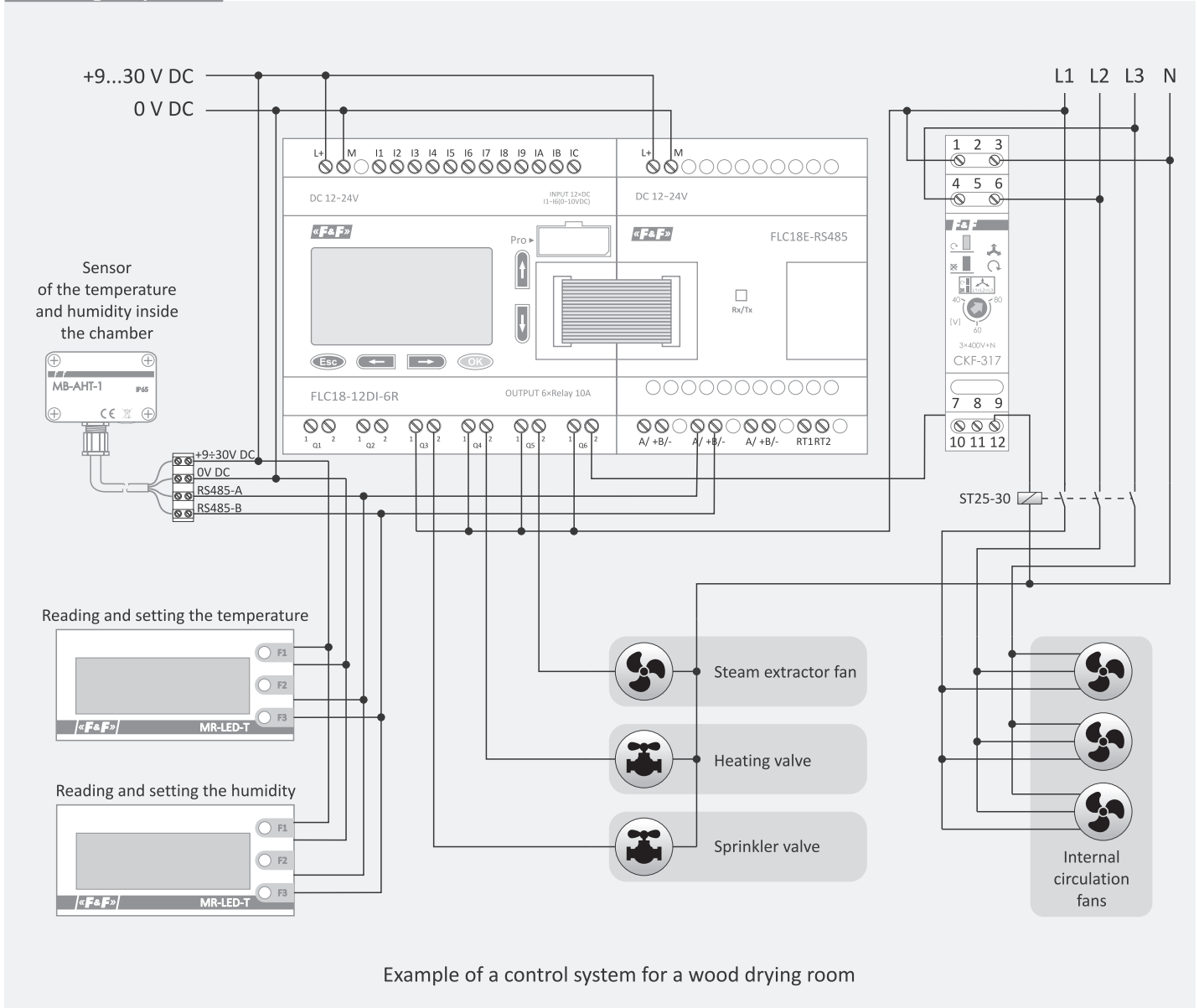
# Contactors and electromagnetic relays

## Modular contactors

Electromagnetic contactors in modular enclosures for direct mounting on TH-35 mm rail.

**Functioning**

If the power supply voltage is applied to the contactor coil, the contact will switch. The activation status of the contactor is indicated by a red marker in the window. After a power failure, the contacts return to their original position.

## ST25 / ST25-...-M



| Type of the device | Contacts | Current of main current circuit [A] | Total power AC-1 230 V [kW] | Total power AC-3 230 V [kW] | Voltage of power supply of the coil | Con-sumption of power [W] | Dimen-sions [module] | Weight [g] | Screw terminals [mm²] |
|---|---|---|---|---|---|---|---|---|---|
| ST25-02-24 DC | 2×NC | 25 | 4 | 1.3 | 24 V DC | 1.2 | 1 | 106 | 4 |
| ST25-11-24 DC | 1×NO+1×NC | 25 | 4 | 1.3 | 24 V DC | 1.2 | 1 | 106 | 4 |
| ST25-11 | 1×NO+1×NC | 25 | 4 | 1.3 | 230 V AC | 1.2 | 1 | 106 | 4 |
| ST25-20-24 DC | 2×NO | 25 | 4 | 1.3 | 24 V DC | 1.2 | 1 | 106 | 4 |
| ST25-20 | 2×NO | 25 | 4 | 1.3 | 230 V AC | 1.2 | 1 | 106 | 4 |
| ST25-20/24 | 2×NO | 25 | 4 | 1.3 | 24 V AC | 1.2 | 1 | 106 | 4 |
| **ST25-20-M** | **2×NO** | **25** | **4** | **1.3** | **230 V AC** | **1.2** | **1** | **106** | **4** |
| ST25-22 | 2×NO+2×NC | 25 | 9 | 2.2 | 230 V AC | 4.0 | 2 | 168 | 6 |
| ST25-30 | 3×NO | 25 | 9 | 2.2 | 230 V AC | 4.0 | 2 | 168 | 6 |
| ST25-31 | 3×NO+1×NC | 25 | 9 | 2.2 | 230 V AC | 4.0 | 2 | 168 | 6 |
| ST25-31/24 | 3×NO+1×NC | 25 | 9 | 2.2 | 24 V AC | 4.0 | 2 | 168 | 6 |
| ST25-40 | 4×NO | 25 | 9 | 2.2 | 230 V AC | 4.0 | 2 | 168 | 6 |
| ST25-40-24 AC/DC | 4×NO | 25 | 9 | 2.2 | 24 V AC/DC | 4.0 | 2 | 168 | 6 |
| ST25-40/24 | 4×NO | 25 | 9 | 2.2 | 24 V AC | 4.0 | 2 | 168 | 6 |
| **ST25-40-M** | **4×NO** | **25** | **9** | **2.2** | **230 V AC** | **4.0** | **2** | **168** | **6** |
| ST25-04 | 4×NC | 25 | 9 | 2.2 | 230 V AC | 4.0 | 2 | 168 | 6 |
| ST40-04 | 4×NC | 40 | 16 | 5.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST40-22 | 2×NO+2×NC | 40 | 16 | 5.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST40-31 | 3×NO+1×NC | 40 | 16 | 5.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST40-40 | 4×NO | 40 | 16 | 5.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST40-40/24 | 4×NO | 40 | 16 | 5.5 | 24 V AC | 6.4 | 3 | 241 | 16 |
| **ST40-40-M** | **4×NO** | **40** | **16** | **5.5** | **230 V AC** | **6.4** | **3** | **241** | **16** |
| ST63-31 | 3×NO+1×NC | 63 | 24 | 8.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST63-40 | 4×NO | 63 | 24 | 8.5 | 230 V AC | 6.4 | 3 | 241 | 16 |
| ST63-40-24 AC/DC | 4×NO | 63 | 24 | 8.5 | 24 V AC/DC | 6.4 | 3 | 241 | 16 |
| ST63-40/24 | 4×NO | 63 | 24 | 8.5 | 24 V AC | 6.4 | 3 | 241 | 16 |
| **ST63-40-M** | **4×NO** | **63** | **24** | **8.5** | **230 V AC** | **6.4** | **3** | **241** | **16** |
| ST100-20 | 2×NO | 100 | 22 | 8.0 | 230 V AC | 6.4 | 3 | 305 | 25 |
| ST100-40 | 4×NO | 100 | 38 | 13.0 | 230 V AC | 9.0 | 6 | 617 | 25 |

## ST40 / ST40-...-M



| | |
|---|---|
| norm No. | IEC 61095 |
| service life of the electrical connection | 1×10⁵ |
| service life of the mechanical connection | 1×10⁶ |
| insulation voltage | 4.0 kV |
| working temperature | -25÷50°C |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

## ST63 / ST63-...-M
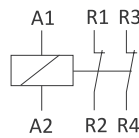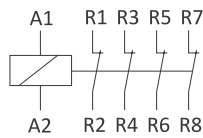




ST25-02

ST25-04
ST40-04
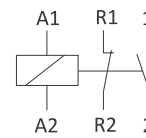
ST25-11
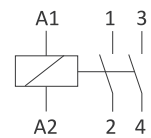
ST25-20
ST100-20
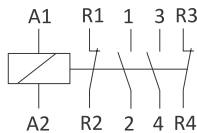
## ST100



ST25-22
ST40-22
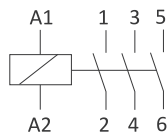
ST25-30
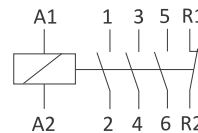
ST25-31
ST40-31
ST63-31
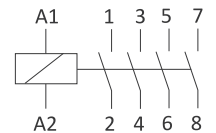
ST25-40
ST40-40
ST63-40
ST100-40

# Electromagnetic relays

If the power supply voltage is applied to the coil of the relay, the contact will switch. The activation status of the relay is indicated by a green LED. After a power failure, the contact returns to their original position.

## Modular for TH-35 rail

**PK-1P** — 1 contact NO/NC (<16 A)
**PK-1Z LED** — 1 contact NO (<16 A) **NEW!**
**PK-2P** — 2 contacts NO/NC (2×8 A)
**PK-3P** — 3 contacts NO/NC (3×8 A)
**PK-4PZ** — 2 contacts NO/NC (2×8 A) + 2 contacts NO (2×8 A)
**PK-4PR** — 2 contacts NO/NC (2×8 A) + 2 contacts NC (2×8 A)
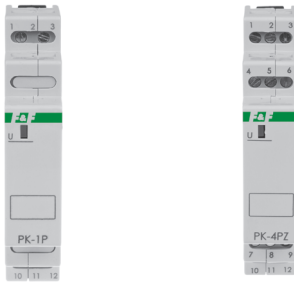
Example of marking when placing an order:

PK-2P   48 V        supply voltage

| power supply | |
|---|---|
| PK-...P... 230 V/PK-1Z LED 230 V | 230 V AC |
| PK-...P... 110 V | 110 V AC/DC |
| PK-...P... 48 V | 48 V AC/DC |
| PK-...P...24 V/PK-1Z LED 24 V | 24 V AC/DC |
| PK-...P... 12 V/PK-1Z LED 12 V | 12 V AC/DC |
| **contact/maximum load current (AC-1)** | |
| PK-1P | 1×NO/NC / <16 A 250 V AC |
| PK-1Z LED | 1×NO / <16 A (120 A/20 ms) 250 V AC |
| PK-2P | 2×NO/NC / 2×8 A 250 V AC |
| PK-3P | 3×NO/NC / 3×8 A 250 V AC |
| PK-4PZ | 2×NO/NC, 2×NO / 4×8 A 250 V AC |
| PK-4PR | 2×NO/NC, 2×NC / 4×8 A 250 V AC |
| mechanical durability | min. 5×10⁶ cycles |
| power consumption | 25 mA |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | 1 module (18 mm) |
| mounting | for TH-35 rail |
| ingress protection | IP20 |

⚠ Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.



PK-1P    PK-1Z LED    PK-2P    PK-3P    PK-4PR    PK-4PZ

## For ⌀60 flush-mounted box

**PP-1P** — 1 contact NO/NC <16 A 250 V AC
**PP-1Z LED** — 1 contact NO <16 A (120 A/20 ms) 250 V AC
**PP-2Z** — 2 contacts NO <16 A 250 V AC
**PP-2Z LED** — 2 contacts NO <16 A (120 A/20 ms) 250 V AC

| power supply | |
|---|---|
| PP-1P 24 V | 7÷30 V AC / 9÷40 V DC |
| PP-1P 230 V | 100÷265 V AC |
| PP-1Z LED 24 V | 7÷30 V AC / 9÷40 V DC |
| PP-1Z LED 230 V | 100÷265 V AC |
| PP-2Z 24 V | 7÷30 V AC / 9÷40 V DC |
| PP-2Z 230 V | 100÷265 V AC |
| PP-2Z LED 24 V | 7÷30 V AC / 9÷40 V DC |
| PP-2Z LED 230 V | 100÷265 V AC |
| **contact/maximum load current (AC-1)** | |
| PP-1P 24 V | 1×NO/NC / <16 A 250 V AC |
| PP-1P 230 V | 1×NO/NC / <16 A 250 V AC |
| PP-1Z LED 24 V | 1×NO / <16 A (120 A/20 ms) 250 V AC |
| PP-1Z LED 230 V | 1×NO / <16 A (120 A/20 ms) 250 V AC |
| PP-2Z 24 V | 2×NO / <16 A 250 V AC |
| PP-2Z 230 V | 2×NO / <16 A 250 V AC |
| PP-2Z LED 24 V | 2×NO / <16 A (120 A/20 ms) 250 V AC |
| PP-2Z LED 230 V | 2×NO / <16 A (120 A/20 ms) 250 V AC |
| mechanical durability | min. 5×10⁶ cycles |
| power consumption | <0.6 W |
| working temperature | -25÷50°C |
| terminal | 2.5 mm² screw terminals |
| tightening torque | 0.4 Nm |
| dimensions | ⌀54 (48×43 mm), h= 25 mm |
| mounting | in flush mounted box ⌀60 |
| ingress protection | IP20 |

⚠ Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.



PP-1P    PP-1Z LED    PP-2Z    PP-2Z LED

# Chapter 47
# Measuring current transformers

The current transformer is used for proportional change of high current intensities to lower values, adapted to the measuring ranges of control and measuring devices.

## TI-30 / ... / TI-80  1-phase closed-core transformers

| norm No. | IEC 60044 -1 |
|---|---|
| nominal secondary current Is | 5 A |
| rated voltage | 0.66 kV AC |
| insulation breakdown voltage | 3 kV/1 min. |
| frequency | 50/60 Hz |
| security factor | FS<5 |
| working temperature | -5÷40°C |
| S1/S2 terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| installation | board/busbar |
| orientation | vertical/horizontal |
| ingress protection | IP20 |

| Type | Transformer Ip/Is | Class | Power [VA] | P1/P2 hole dimensions [mm] | Dimensions [mm] | Weight [kg] |
|---|---|---|---|---|---|---|
| TI-30* | 30/5 | 1 | 2.5 | Ø22 | 44×67×30 | 0.135 |
| TI-40 | 40/5 | 1 | 1.0 | Ø22 | 44×67×30 | 0.135 |
| TI-50 | 50/5 | 1 | 1.5 | Ø22 | 44×67×30 | 0.135 |
| TI-60 | 60/5 | 1 | 1.5 | Ø22 | 44×67×30 | 0.135 |
| TI-75 | 75/5 | 1 | 1.5 | Ø22 | 44×67×30 | 0.135 |
| TI-80 | 80/5 | 1 | 1.5 | Ø22 | 44×67×30 | 0.135 |

* **Only applies to TI-30**: For the correct operation of the transformer, it is required to pass the current wire through the transformer opening 4 times.

## TI-100 / ... / TI-600  1-phase closed-core transformers

| norm No. | IEC 60044 -1 |
|---|---|
| nominal secondary current Is | 5 A |
| rated voltage | 0.66 kV AC |
| insulation breakdown voltage | 3 kV/1 min. |
| frequency | 50/60 Hz |
| security factor | FS<5 |
| working temperature | -5÷40°C |
| S1/S2 terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| installation | board/busbar |
| orientation | vertical/horizontal |
| ingress protection | IP20 |

| Type | Transformer Ip/Is | Class | Power [VA] | P1/P2 hole dimensions A1/A2/A3×B; C [mm] | Dimensions [mm] | Weight [kg] |
|---|---|---|---|---|---|---|
| TI-100 | 100/5 | 0.5 | 2.5 | 30/25/20×10; Ø22 | 61×80×37 | 0.235 |
| TI-150 | 150/5 | 0.5 | 2.5 | 30/25/20×10; Ø22 | 61×80×37 | 0.235 |
| TI-200 | 200/5 | 0.5 | 5.0 | 30/25/20×10; Ø22 | 61×80×37 | 0.235 |
| TI-250 | 250/5 | 0.5 | 5.0 | 30/25/20×10; Ø22 | 61×80×37 | 0.235 |
| TI-300 | 300/5 | 0.5 | 5.0 | 30/25/20×10; Ø22 | 61×80×37 | 0.235 |
| TI-400 | 400/5 | 0.5 | 5.0 | 40/30/00×10; Ø30 | 75×99×41 | 0.305 |
| TI-600 | 600/5 | 0.5 | 5.0 | 40/30/00×10; Ø30 | 75×99×41 | 0.305 |
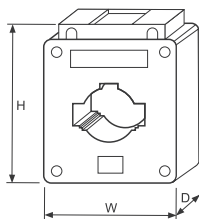
Dimensions
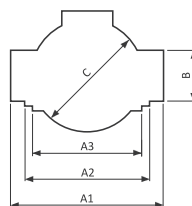
P1/P2 hole
TI-100; TI-150; TI-200; TI-250; TI-300
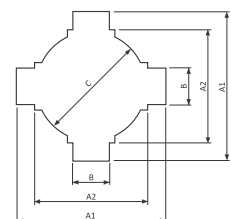
P1/P2 hole
TI-400; TI-600

# TO-100 / ... / TO-1000   1-phase open-core transformers

| | |
|---|---|
| norm No. | IEC 60044 -1 |
| nominal secondary current Is | 5 A |
| rated voltage | 0.66 kV AC |
| insulation breakdown voltage | 3 kV/1 min. |
| frequency | 50/60 Hz |
| security factor | FS<5 |
| working temperature | -15÷50°C |
| S1/S2 terminal | 4.0 mm² screw terminals |
| tightening torque | 0.5 Nm |
| installation | board |
| orientation | vertical/horizontal |
| ingress protection | IP20 |

| Type | Transformer Ip/Is | Class | Power [VA] | Dimensions [mm] | | | | | | | | | Weight [kg] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | A | B | C | D | E | F | G | H | I | |
| TO-100 | 100/5 | 1.0 | 1.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-150 | 150/5 | 1.0 | 1.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-200 | 200/5 | 0.5 | 1.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-250 | 250/5 | 0.5 | 1.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-300 | 300/5 | 0.5 | 1.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-400 | 400/5 | 0.5 | 2.5 | 21 | 32 | 51 | 90 | 112 | 34 | 45 | 40 | 32 | 0.78 |
| TO-600 | 600/5 | 0.5 | 2.5 | 50 | 80 | 78 | 116 | 146 | 33 | 33 | 35 | 33 | 0.90 |
| TO-750 | 750/5 | 0.5 | 5.0 | 50 | 80 | 78 | 116 | 146 | 33 | 33 | 35 | 33 | 0.90 |
| TO-1000 | 1000/5 | 0.5 | 5.0 | 50 | 80 | 78 | 116 | 146 | 33 | 33 | 35 | 33 | 0.90 |
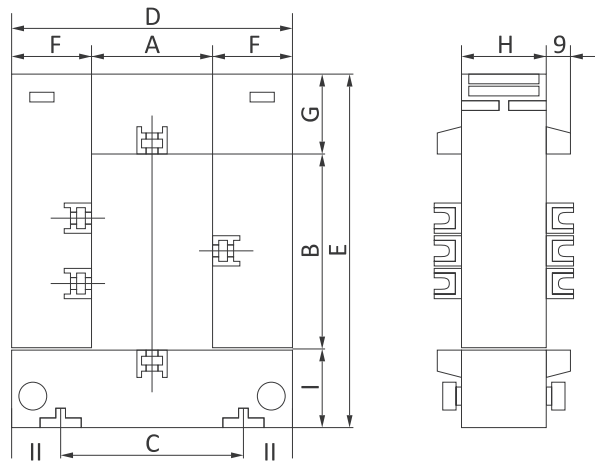
It is recommended to connect the secondary system with a wire with a diameter of at least 2.5 mm².
Grounding of the S2 terminal is recommended. Do not turn off the secondary system while the transformer is running (high voltage may cause injury to people or damage to the device).

# TOM-100 / ... / TOM-600 miniature 1-phase open-core transformers



| | |
|---|---|
| norm No. | IEC 60044 -1 |
| nominal secondary current Is | 5 A |
| rated voltage | 0.66 kV AC |
| insulation breakdown voltage | 2 kV/1 min. |
| frequency | 50/60 Hz |
| security factor | FS≤2 |
| working temperature | -15÷45°C |
| S1/S2 terminal | cable |
| tightening torque | not applicable |
| mounting | rail/cable |
| orientation | vertical/horizontal |
| ingress protection | IP20 |

| Type | Transformer Ip/Is | Class | Power [VA] | Dimensions [mm] | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | W | H | D | A | B | C |
| TOM-100 | 100/5 | 1 | 1.5 | 45 | 67 | 35 | 23 | 24 | ø22 |
| TOM-150 | 150/5 | 1 | 1.5 | 45 | 67 | 35 | 23 | 24 | ø22 |
| TOM-200 | 200/5 | 1 | 1.5 | 45 | 67 | 35 | 23 | 24 | ø22 |
| TOM-250 | 250/5 | 1 | 1.5 | 45 | 67 | 35 | 23 | 24 | ø22 |
| TOM-300 | 300/5 | 1 | 1.5 | 45 | 67 | 35 | 23 | 24 | ø22 |
| TOM-400 | 400/5 | 1 | 1.5 | 58 | 86 | 43 | 34 | 36 | ø32 |
| TOM-500 | 500/5 | 1 | 1.5 | 58 | 86 | 43 | 34 | 36 | ø32 |
| TOM-600 | 600/5 | 1 | 1.5 | 58 | 86 | 43 | 34 | 36 | ø32 |
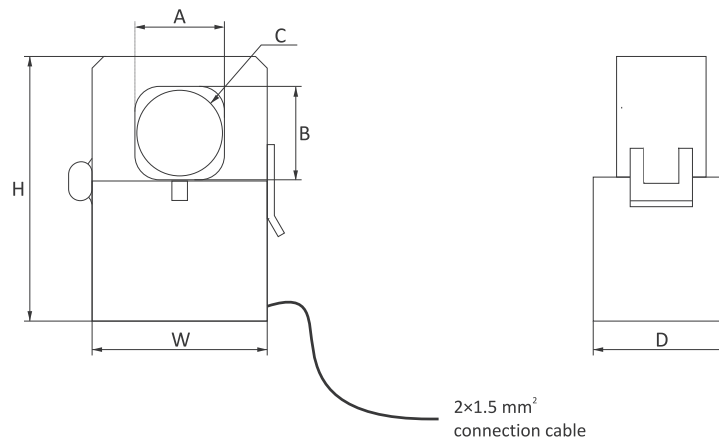


2×1.5 mm²
connection cable

It is recommended to connect the secondary system with a wire with a diameter of at least 2.5 mm².
Grounding of the S2 terminal is recommended. Do not turn off the secondary system while the transformer is running (high voltage may cause injury to people or damage to the device).

# 3-phase

**Purpose**

The 3-phase (3 in 1) current transformer is used for indirect measurements of 3-phase currents. Its design allows it to be mounted directly on the outputs of the cut-off switches (ABB Isomax series, Merlin Gerlin NS series and similar) saving assembly time and space in the switchgear.

# TP-100 / ... / TP-600 3-phase closed-core transformers
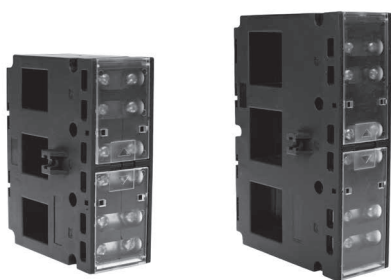
| norm No. | IEC 60044 -1 |
|---|---|
| nominal secondary current Is | 5 A |
| rated voltage | 720 V AC |
| insulation breakdown voltage | 3 kV/1 min. |
| frequency | 50/60 Hz |
| security factor | FS<5 |
| thermal short-circuit current (Ith) | 60×In |
| dynamic short-circuit-current (Idyn) | 2.55×Ith |
| working temperature | -5÷40°C |
| S1/S2 terminal | 4.0 mm² screw terminals |
| mounting | DIN rail/board/cable |
| orientation | vertical/horizontal |
| ingress protection | IP20 |

| Type | Transformer Ip/Is | Class | Power [VA] | P1/P2 hole dimensions W×H [mm] | Dimensions W×H×D [mm] | Weight [kg] |
|---|---|---|---|---|---|---|
| TP-100 | 100/5 | 1 | 1.5 | 15×21 | 105×80×51 | 0.452 |
| TP-150 | 150/5 | 1 | 2.5 | 15×21 | 105×80×51 | 0.452 |
| TP-200 | 200/5 | 1 | 2.5 | 15×21 | 105×80×51 | 0.452 |
| TP-250 | 250/5 | 1 | 2.5 | 15×21 | 105×80×51 | 0.452 |
| TP-300 | 300/5 | 1 | 2.5 | 31×31 | 142×96×51 | 0.570 |
| TP-400 | 400/5 | 1 | 2.5 | 31×31 | 142×96×51 | 0.570 |
| TP-600 | 600/5 | 1 | 2.5 | 31×31 | 142×96×51 | 0.570 |
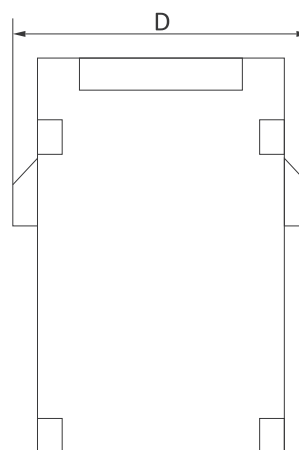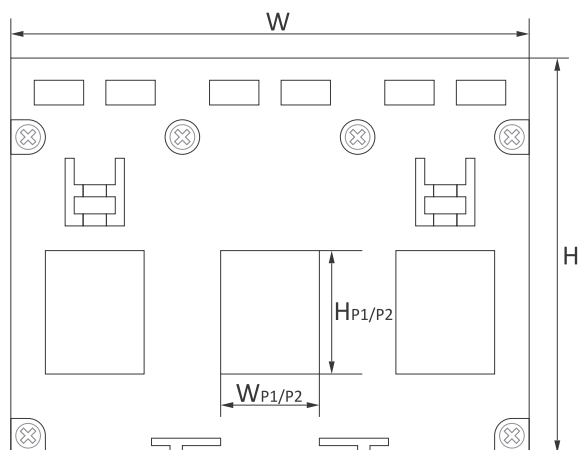
# Section XIII

## Indexes

**Chapter 48**