products catalogue 2025

domestic and industrial automation

«F&F»®


«F&F»

«F&F»

domestic and industrial automation

About the company

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 Belarus, Lithuania, Latvia, Czech Republic, Slovakia, Hungary, Romania, Serbia, Germany, Greece, Ireland, Portugal, Spain, Sweden, Norway, Australia, and the United States.

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New products

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single button
with backlight


double button

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voltage source


current source


pulse generator


control timer


working hour reader


potentiometer


dimmer

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with current output

digital sensor
of temperature DS1820

PTC probe

KTY probe

PT100 probe

K400 probe

Other sensors


brightness sensor


wind sensor

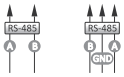

precipitation sensor


shock sensor


flood sensor

Signal outputs


SO pulse output



communication output
Modbus RS-485

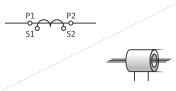
communication output
M-Bus

voltmeter

ammeter


OC transistor key

Additional markings



transformer


switchboard

Power sources


battery

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

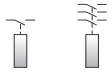

pomp


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	–	ø10 external probe	4.0 mm² screw terminals	surface-mounted	10
AZH-S 24 V	21÷27 V AC/DC	16 A	1×NO	–	ø10 external probe	4.0 mm² screw terminals	surface-mounted	10
AZH-S 12 V	11÷14 V AC/DC	16 A	1×NO	–	ø10 external probe	4.0 mm² screw terminals	surface-mounted	10
AZH-S PLUS	195÷253 V AC	16 A	1×NO	–	PLUS external probe	4.0 mm² screw terminals	surface-mounted	10
AZH-S PLUS 24 V	21÷27 V AC/DC	16 A	1×NO	–	PLUS external probe	4.0 mm² screw terminals	surface-mounted	10
AZ-B 230 V	195÷253 V AC	16 A	1×NO	–	ø10 external probe	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B 24 V	21÷27 V AC/DC	16 A	1×NO	–	ø10 external probe	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B PLUS 230 V	195÷253 V AC	16 A	1×NO	–	PLUS external probe	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B UNI	12÷264 V AC/DC	16 A	1×NO	–	ø10 external probe	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B UNI PLUS	12÷264 V AC/DC	16 A	1×NO	–	PLUS external probe	4.0 mm² screw terminals	for TH-35 rail	10
AZ-112	195÷253 V AC	16 A	1×NO	•	ø10 external probe	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 24 V	21÷27 V AC/DC	16 A	1×NO	•	ø10 external probe	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 PLUS	195÷253 V AC	16 A	1×NO	•	PLUS external probe	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 PLUS 24 V	21÷27 V AC/DC	16 A	1×NO	•	ø10 external probe	2.5 mm² screw terminals	for TH-35 rail	11

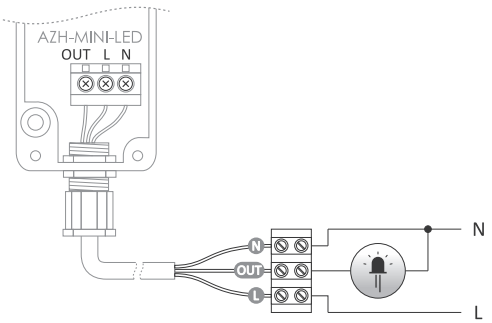
Make sure that the switched-on light source does not illuminate the sensor of the twilight switch.
Do not route the probe connection cable close to a parallel, live or high-current cable.

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

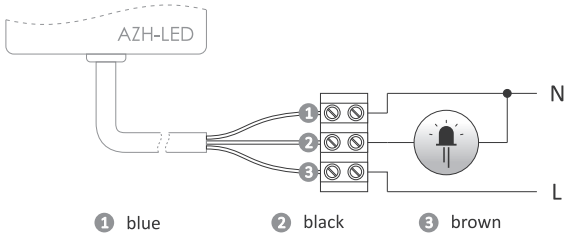
Miniature, hermetic, for LED lighting



power supply	165÷265 V AC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation 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	42×64×30 mm
mounting	surface
ingress protection	IP65

AZH-LED

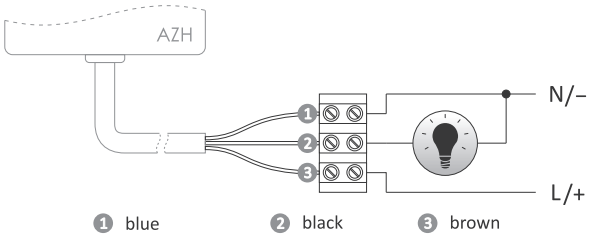
Hermetic.



power supply	195÷253 V AC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation 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 24V / AZH 12V

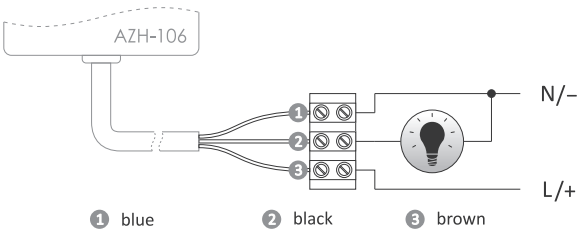
Hermetic.



power supply	
AZH	195÷253 V AC
AZH 24 V	21÷27 V AC/DC
AZH 12 V	11÷14 V AC/DC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation 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

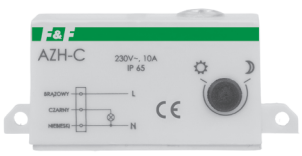
Hermetic.

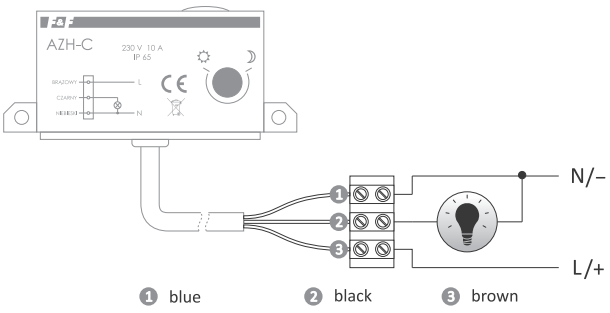


power supply	
AZH-106	195÷253 V AC
AZH-106 24 V	21÷27 V AC/DC
AZH-106 12 V	11÷14 V AC/DC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation delay	approx. 20 s
power consumption	0.56 W
terminal	OMY 3×1 mm², L=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

AZH-C / AZH-C 24V

Miniaturowy, Hermetic.

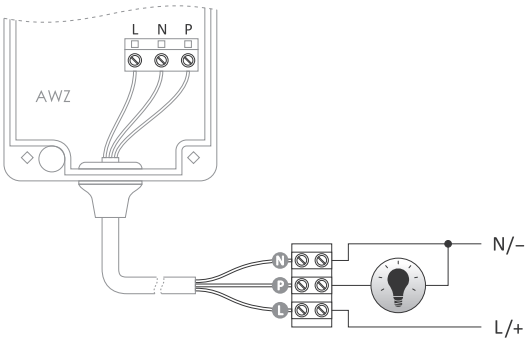




power supply	
AZH-C	195÷253 V AC
AZH-C 24 V	21÷27 V AC/DC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation delay	approx. 20 s
power consumption	0.56 W
terminal	OMY 3×0.75 mm², L= 0.45 m
working temperature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

AWZ / AWZ 24V

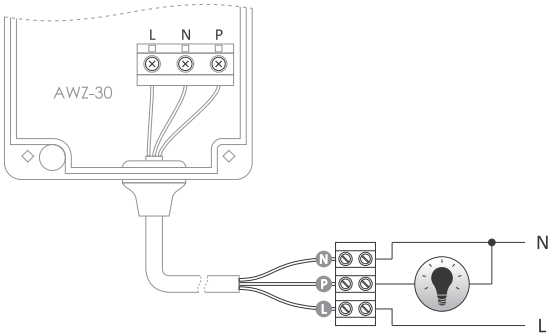
Hermetic. With internal connection.



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
activation delay	approx. 10 s
deactivation delay	approx. 20 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	60×85×35 mm
mounting	surface
ingress protection	IP65

AWZ-30

Hermetic. With internal connection.

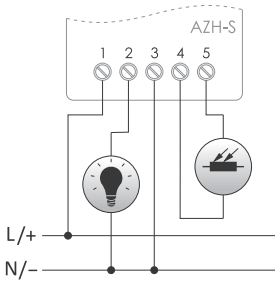


power supply	195÷253 V AC
maximum load current (AC-1)	30 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
activation delay	approx. 10 s
deactivation delay	approx. 20 s
power consumption	0.8 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	76×85×35 mm
mounting	surface
ingress protection	IP65

With external hermetic probe

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

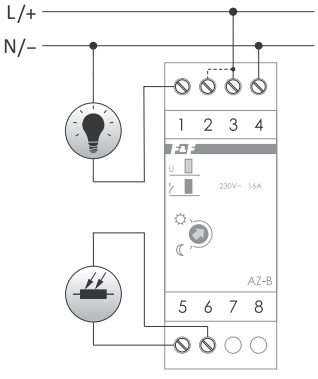
External, hermetic probe ø10 (AZH-S, AZH-S 24 V, AZH-S 12 V) or PLUS (AZH-S PLUS, AZH-S PLUS 24 V, AZH-S PLUS 12 V) included in the set (p. 11).



power supply	
AZH-S	195÷253 V AC
AZH-S 24 V/AZH-S PLUS 24 V	21÷27 V AC/DC
AZH-S 12 V/AZH-S PLUS 12 V	11÷14 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
activation delay	approx. 10 s
deactivation 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

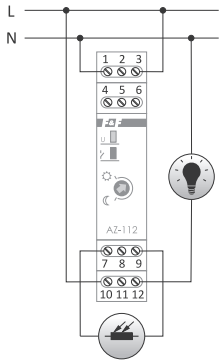
External, hermetic probe ø10 (AZ-B, AZ-B 24 V, AZ-B UNI) or PLUS (AZ-B PLUS, AZ-B PLUS UNI) included in the set (p. 11).



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
activation delay	approx. 10 s
deactivation 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, hermetic probe ø10 or PLUS included in the set (p. 11).



power supply	
AZ-112/AZ-112 PLUS/AZ-112-LED	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
activation delay	approx. 10 s
deactivation 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

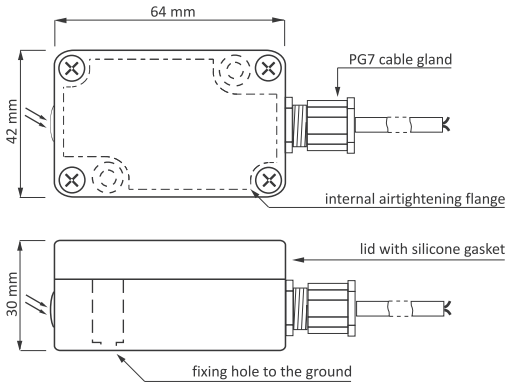
Device	Application
AZ-112	incandescent lighting
AZ-112-LED	incandescent lighting + LED

External, hermetic probes

PLUS probe

Purpose

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

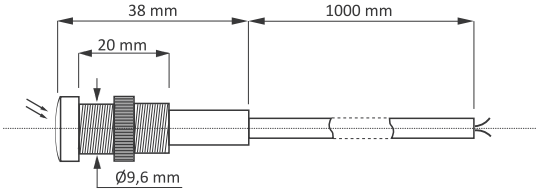


The photosensitive sensor in a special, small plastic box. Connected with round cable, max. ø7 (such as 2×0.5 mm²), through the PG7 cable gland.
Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

ø10 probe

Purpose

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



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

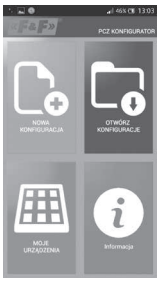
Devices related to twilight switches

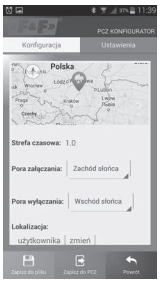
PCZ – Astronomical clocks

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.





Android app

More information on p. 138

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

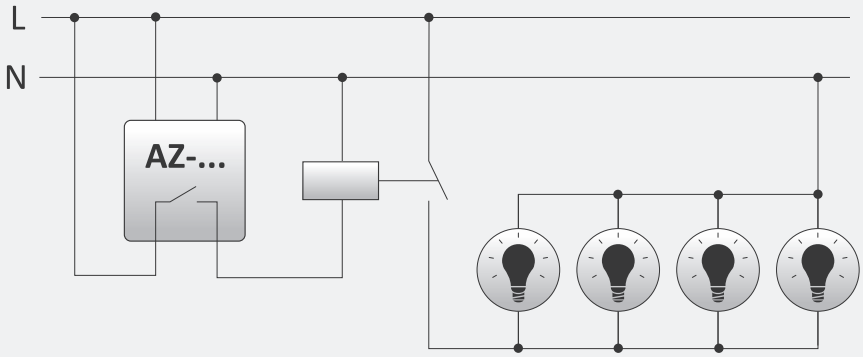
Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum ø7 (for example: 4×0.5 mm²). Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

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

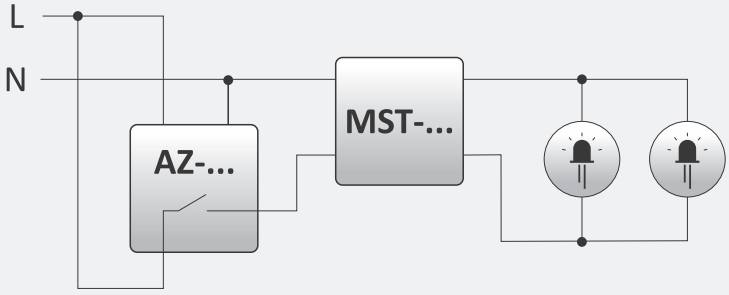
power supply	9÷30 V DC
maximum current consumption	40 mA
measuring range	1÷64000 lx
measurement accuracy	±5%
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power consumption	0.3 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-40÷70°C
dimensions	42×63×30 mm
mounting	surface-mounted
ingress protection	IP65

More information on p. 316

Interesting and practical applications



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



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

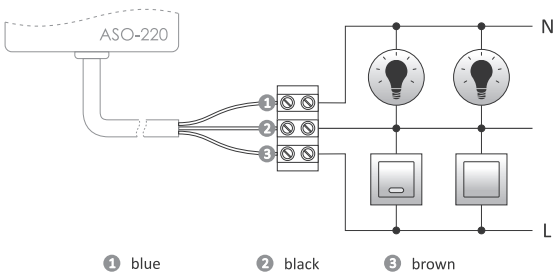
The automatic staircase lighting time switch switched on with the (bell) button, maintains the lighting for the preset time (from 30 s to 10 min.). After the set time has elapsed, the device will switch off the lighting automatically. When the lighting is switched off, it can be switched on again. The 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	Mounting	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 box	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	13
ASO-42	38÷46 V AC/DC	1.5 A	1×NO	–	–	–	–	surface	13
ASO-110	100÷120 V AC	10 A	1×NO	–	–	–	–	surface	13
ASO-201	195÷253 V AC	16 A	1×NO	–	–	–	●	surface	14
ASO-202	195÷253 V AC	16 A	1×NO	–	●	–	●	surface	15
ASO-203	21÷27 V AC/DC	16 A	1×NO	–	●	–	–	surface	15
ASO-204	21÷27 V AC/DC	16 A	1×NO	–	–	–	–	surface	14
ASO-205	195÷253 V AC	10 A	1×NO	–	–	–	●	in flush-mounted box	14
ASO-220	195÷253 V AC	10 A	1×NO	–	–	–	●	surface	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.



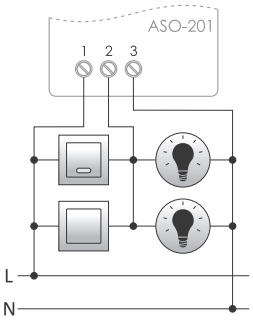
1 blue 2 black 3 brown

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
activation delay	<1 s
deactivation 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

Only ASO-220 can work with backlit buttons.

ASO-201 / ASO-204

With screw terminals.

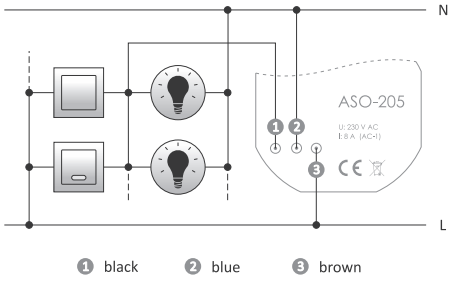


power supply	
ASO-201	195÷253 V AC
ASO-204	21÷27 V AC/DC
maximum load current (AC-1)	
ASO-201/ASO-204	16 A
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working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

Only ASO-201 can work with backlit buttons.

ASO-205

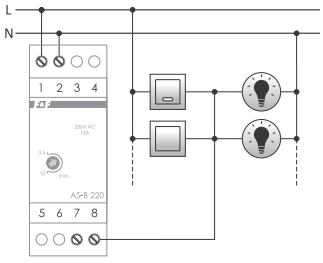
For flush-mounted box.



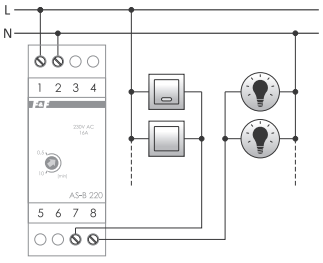
power supply	195÷253 V AC
maximum load current (AC-1)	8 A
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
power consumption	0.4 W
terminal	3×DY 1 mm², L= 10 cm
working temperature	-25÷50°C
dimensions	ø55, H= 13 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

ASO-205 can work with backlit buttons.

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



3-wire installation

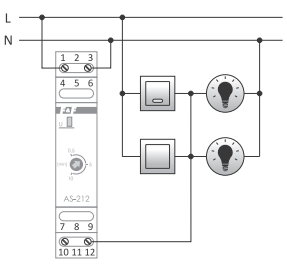


4-wire installation

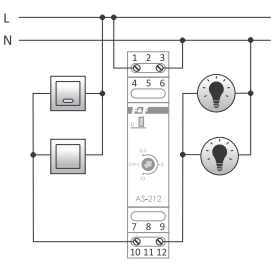
power supply	
AS-B 220	195÷253 V AC
AS-B 110	100÷120 V AC
AS-B 42	38÷46 V AC
AS-B 24	21÷27 V AC/DC
maximum load current (AC-1)	16 A
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
power consumption	1,2 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening 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
activation delay	<1 s
deactivation 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

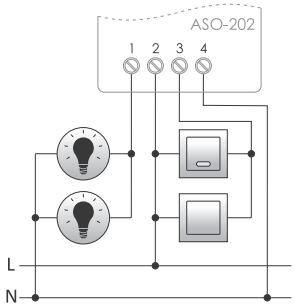
Only AS-212 can work with backlit buttons.

With anti-blocking function

Functioning

The anti-blocking function of the automatic staircase lighting control prevents the lighting from being continuously switched on if the switch is blocked (e.g. by a match). In such a case, the automatic control unit will measure the preset time and switch off the lighting. The lighting can be switched on again after the blockage is removed.

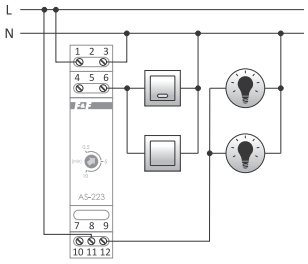
ASO-202 / ASO-203



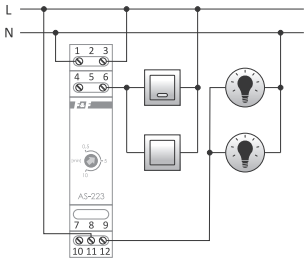
power supply	
ASO-202	195÷253 V AC
ASO-203	21÷27 V AC/DC
maximum load current (AC-1)	16 A
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	50×67×26 mm
mounting	surface-mounted
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
contact	1×NO
maximum load current (AC-1)	16 A
activation delay	0.1÷0.2 s
deactivation 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

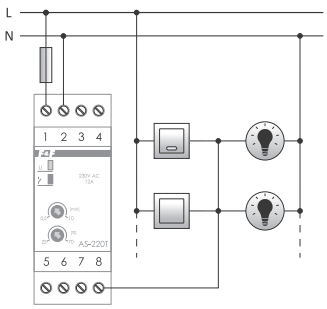
Only AS-223 can work with backlit buttons.

With light-off indication function

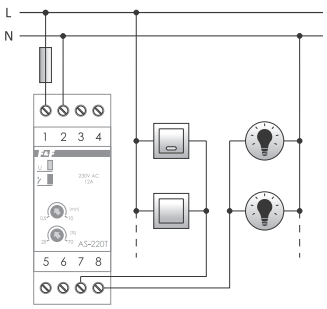
AS-220T

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
activation delay	<1 s
deactivation delay (adjustable)	30 s÷10 min.
lighting maintenance time with 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

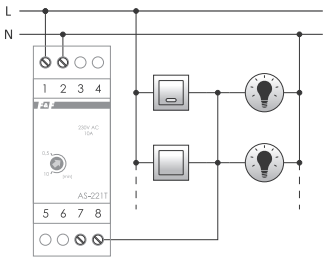
AS-220T can work with backlit buttons.

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.

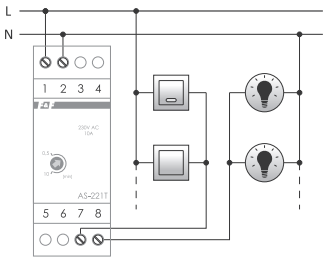
AS-221T with light-off indication function

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 (AC-1)	10 A
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
lighting maintenance time with 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

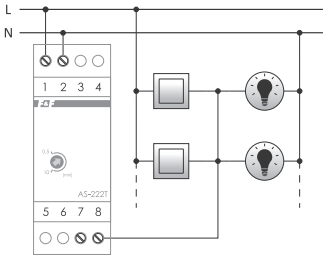
AS-221T can work with backlit buttons.

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.

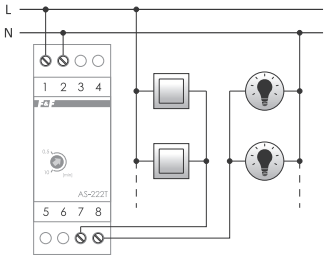
AS-222T with light-off indication function and anti-blocking function

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
activation delay	<1 s
deactivation delay (adjustable)	0.5÷10 min.
lighting maintenance time with 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

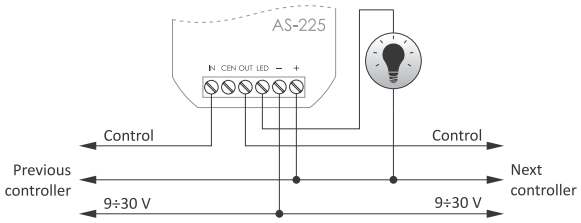
Purpose

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

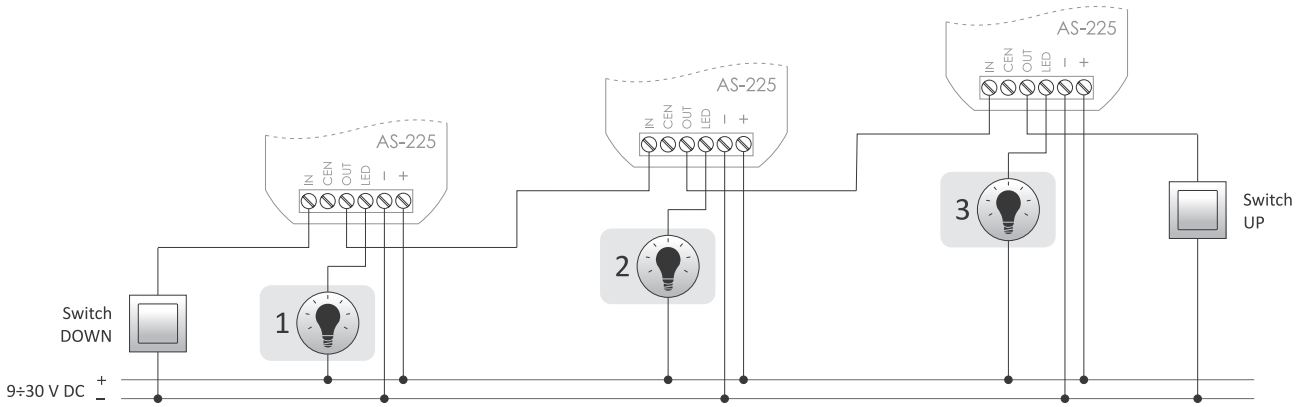


power supply	9÷30 V DC
output	
type	transistor OC (open collector)
maximum load current	4 A
maximum voltage	30 V DC
input type	potential-free
activation delay	<1 s
deactivation delay Ton (adjustable)	3÷30 s
activation delay TΔ (adjustable)	0÷100% Ton
power consumption	
standby	0.3 W
on	0.5 W
terminal	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. 50.



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).

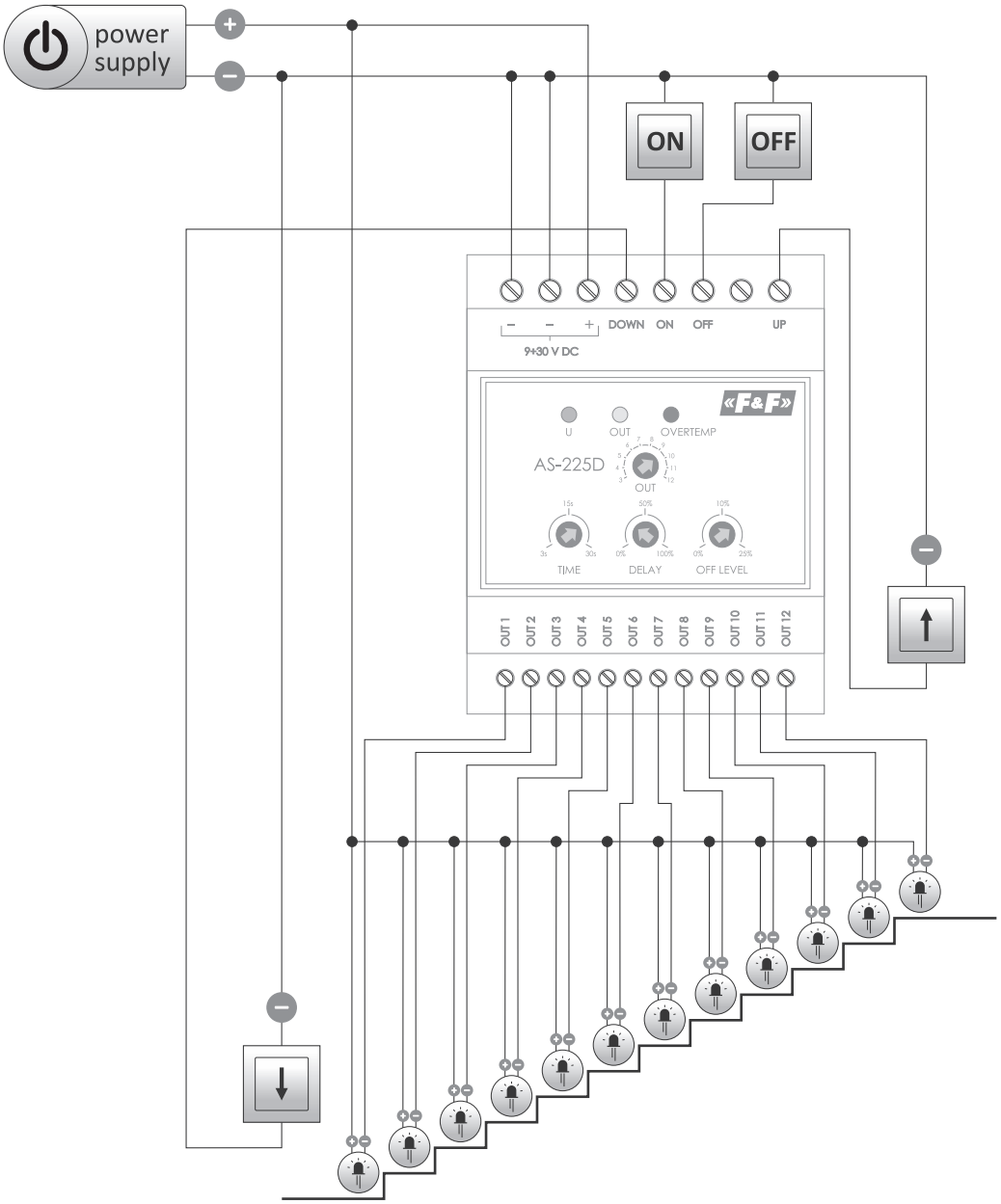
AS-225D 12-channels cascade controller

power supply	9÷30 V DC
output	
channel quantity	12
type	transistor OC (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
switch-on time (1 channel)	3÷30 s
activation delay on the next channel	0÷switch-on 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 (65 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. 50.



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
activation 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

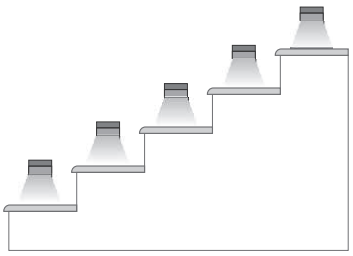
More information on p. 185

Chapter 3

LED stair 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.



Functioning

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. 82) allows you to adjust the brightness and achieve a smooth brightening and dimming effect.

INGA

With dimming feature.

satin

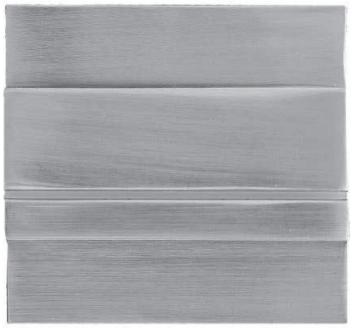
white

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	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.



satin

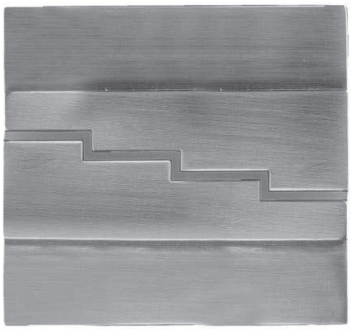
white

anthracite

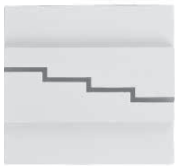
power supply	12 V DC
power consumption	1.2 W
color temperature	
warm	3000 K
cold	6000 K
luminous flux	100 lm
number of activations	>40.000
lighting time to 100%	0.5 s
working temperature	0÷40°C
dimensions	
external	85×75×20 mm
groove	ø60 mm, depth >40 mm
mounting hole	ø60 mm
screw spacing	58 mm
mounting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

MAYA

With dimming feature.



satin



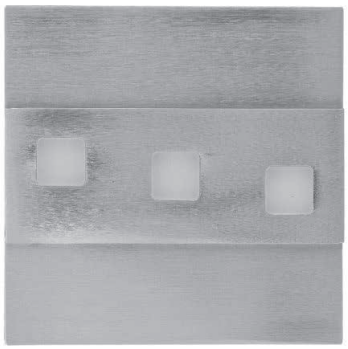
white

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	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 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.

More information on p. 17

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.

More information on p. 18

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.

More information on p. 50

Chapter 4

Glass panels

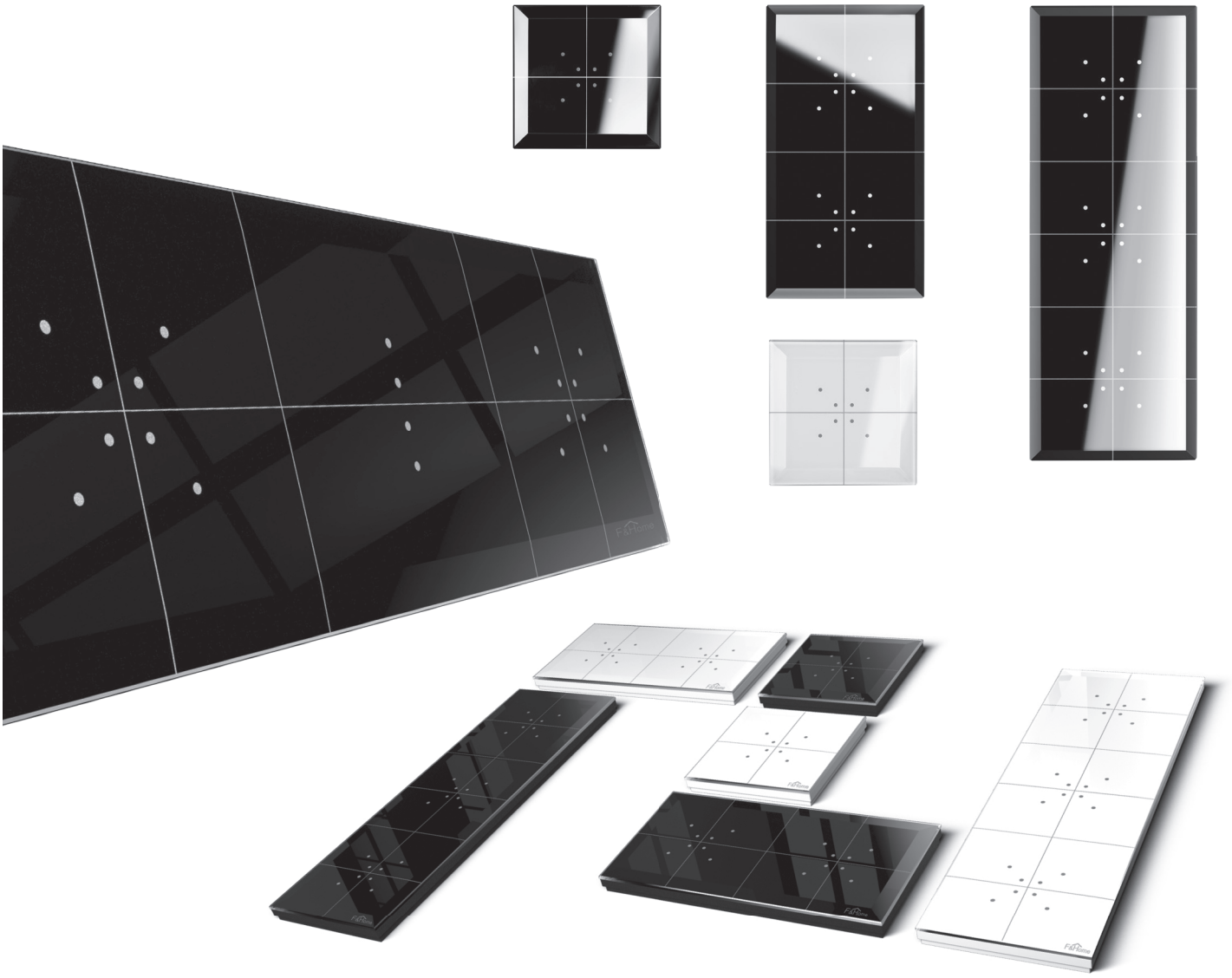
Purpose

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 smart system.

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 ø60 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

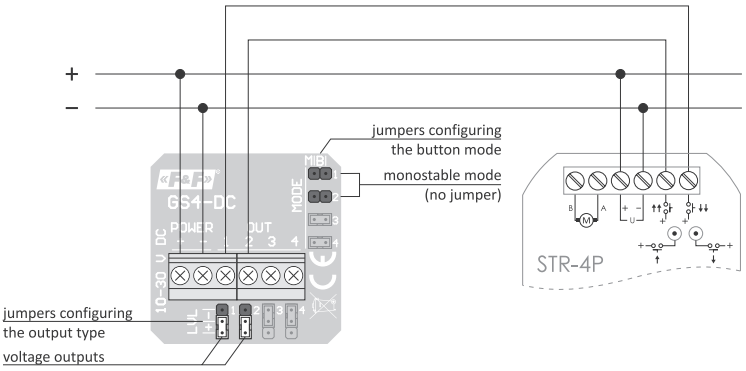
Purpose

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



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

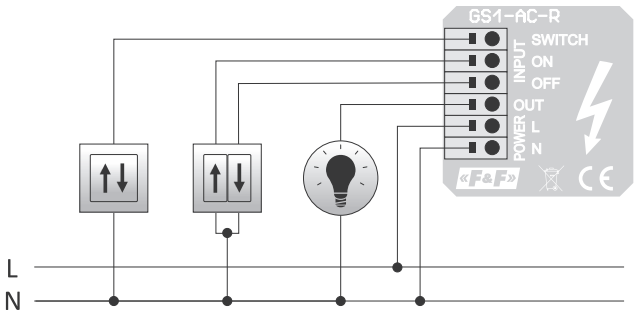
Purpose

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



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

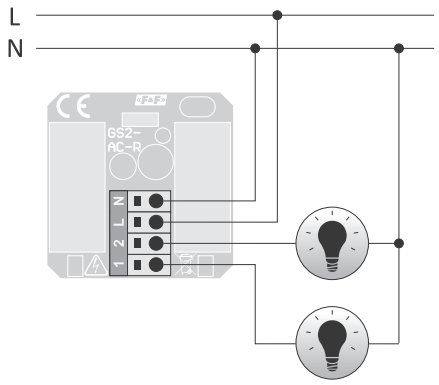
Purpose

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

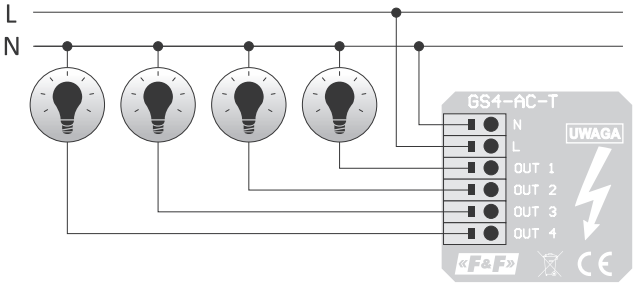
Purpose

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

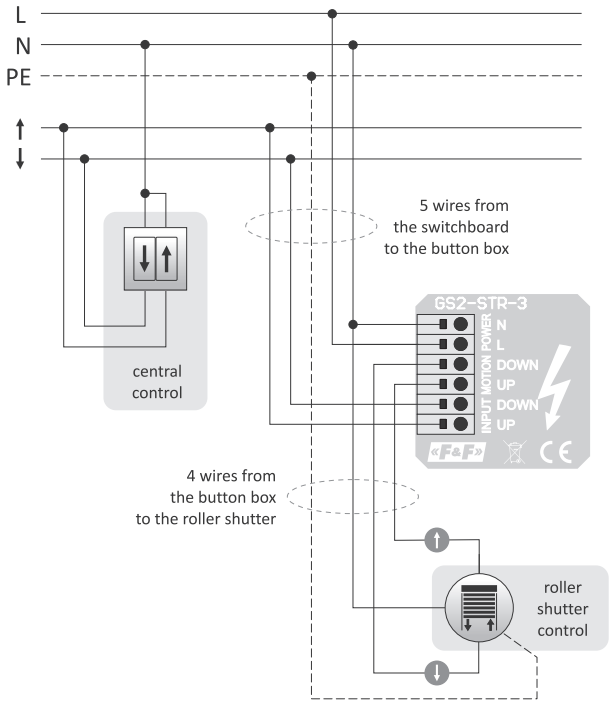
Purpose

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.

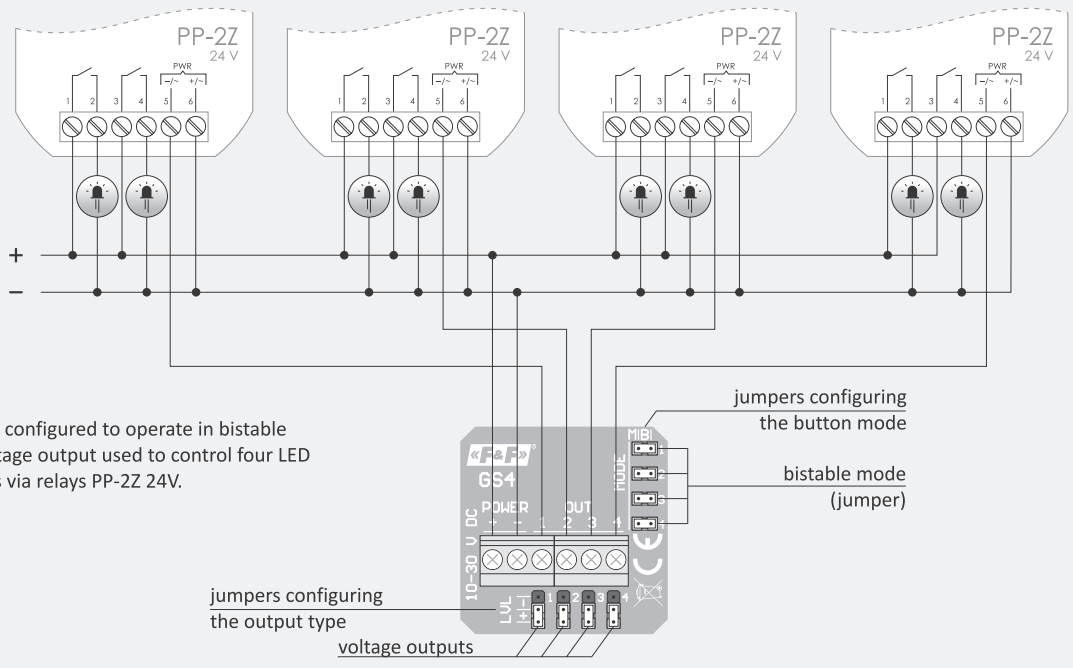
Example of application



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.

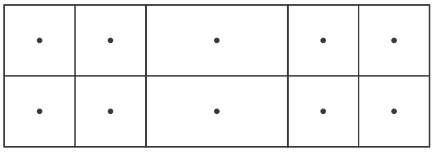
Interesting and practical applications

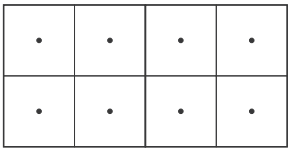


GS-4DC button configured to operate in bistable mode with voltage output used to control four LED lighting circuits via relays PP-2Z 24V.

Panel configurator

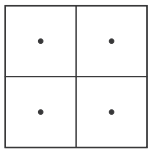
Panel size

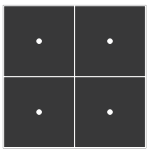
3 
Triple panel (GP3)

2 
Double panel (GP2)

GP3-421-W

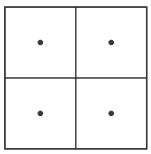
Button color

W 
White

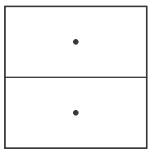
B 
Black

Button layout

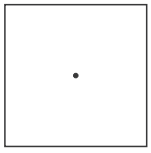
Each digit describes the number of buttons on a given panel:

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 series:
rH-S4L4-230 – F&Home quadruple transmitter, 230 V power supply
rH-S4L4-24 – F&Home 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 series:
rH-S2L2-230 – F&Home double transmitter, 230 V power supply
rH-S2L2-24 – F&Home 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
F&F	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.
F&Wave	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		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

Types of buttons (cont.)

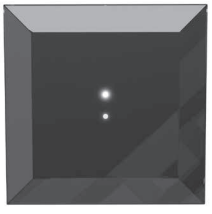
	Name	Button type	Panel	Description
F&Wave	FW-GS2-230	double	–	F&Wave module for integration with the glass panel GP2 (162×81 mm) or GP3 (243×81 mm), 230 V power supply. Requires ordering with GP2 or GP3 glass panel suitable for double (for FW-GS2) or quadruple (for FW-GS4) buttons. The GP2 and GP3 panel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

Glass panels

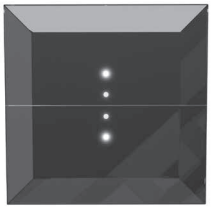
Single button, white
GS1-W

Double button, white
GS2-W

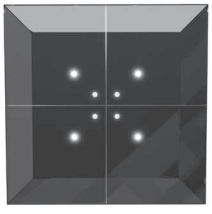
Quadruple button, white
GS4-W



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

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					

More information on p. 78

Glass touch buttons designed for the F&Home system

Works with system F&home

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

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

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

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

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

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

Model	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					

More information on p. 73

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.

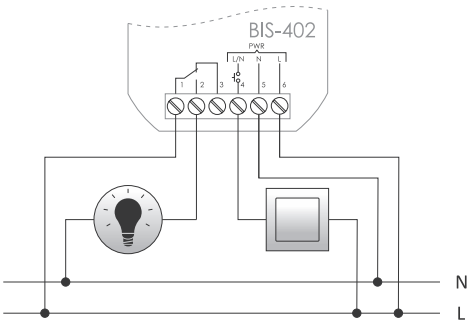
Product	Supply voltage	Maximum load current (AC-1)	Contact configuration	Contact separation	Resistance to shock currents	Number of channels	Functionality	Front button	Cooperation with backlit buttons	Status memory after power failure	Function "Switch on for a time"	Central control dedicated inputs	Mounting	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

Functioning

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.

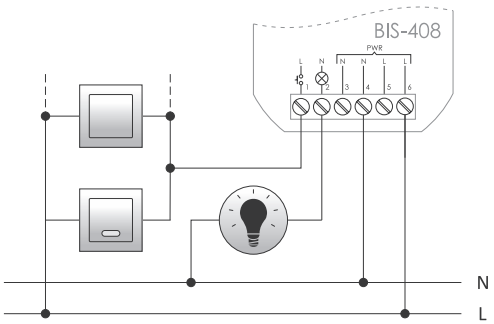
BIS-402



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
activation 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

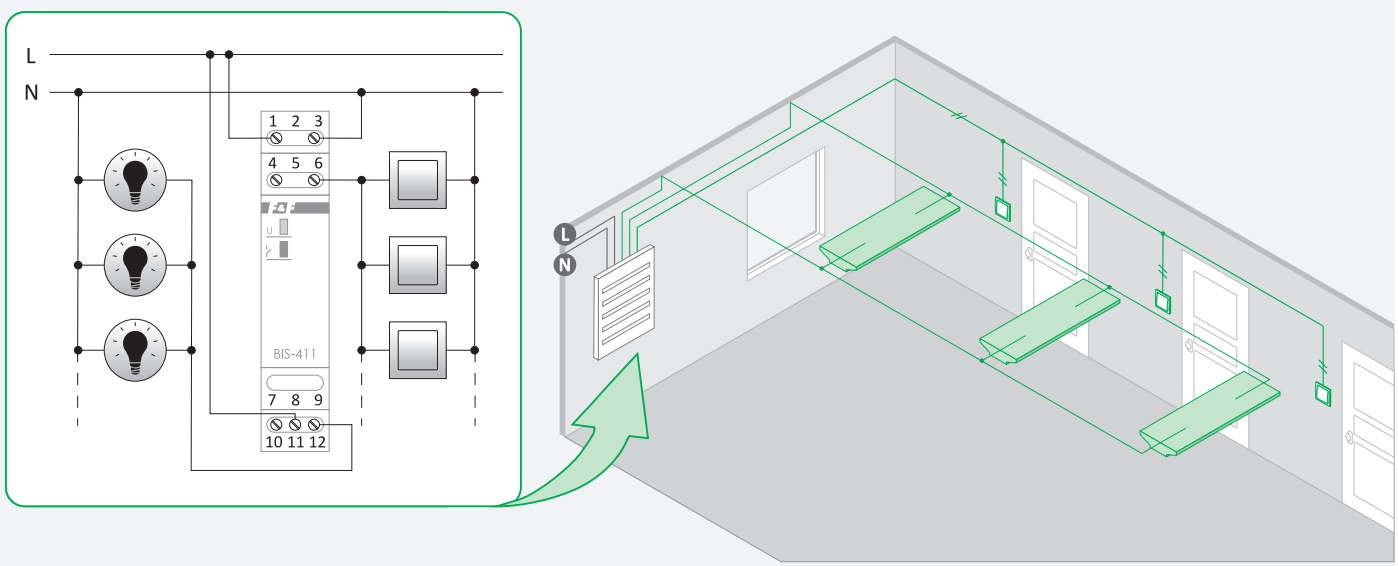


power supply	165÷265 V AC
contact	1×NO
maximum load current (AC-1)	
BIS-408	16 A
BIS-408-LED	16 A (120 A / 20 ms)
control pulse current	<5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power consumption	
standby	0.15 W
on	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working 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.

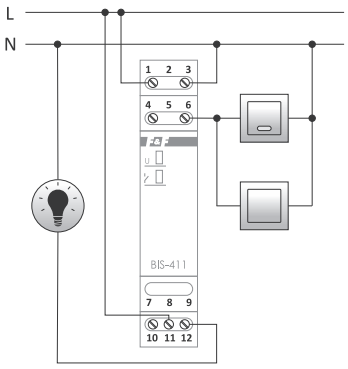
Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

Interesting and practical applications

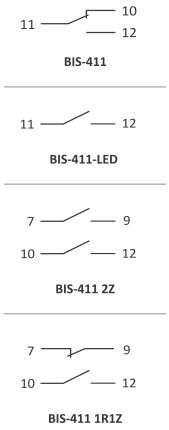


Example of a lighting control system with three points in a corridor

BIS-411 / ...

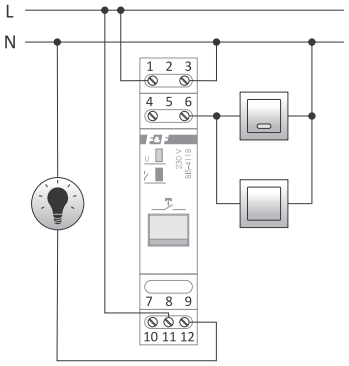


Example of connection
with control pulse N

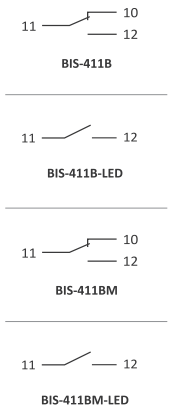


power supply	
BIS-411... 230 V	165÷265 V AC
BIS-411... 24 V	9÷30 V AC/DC
contact / maximum load current (AC-1)	
BIS-411	separated 1×NO/NC / 16 A
BIS-411-LED	separated 1×NO / 16 A (120 A/20 ms)
BIS-411M	separated 1×NO/NC / 16 A
BIS-411M-LED	separated 1×NO / 16 A (120 A/20 ms)
BIS-411 2Z	separated 2×NO / 2×8 A
BIS-411 1R1Z	separated 1×NO, 1×NC / 2×8 A
control pulse current	<5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power activation	red LED
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



Example of connection
with control pulse N



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
activation delay	0.1÷0.2 s
power indication	green LED
power activation	red LED
mechanical life of 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.

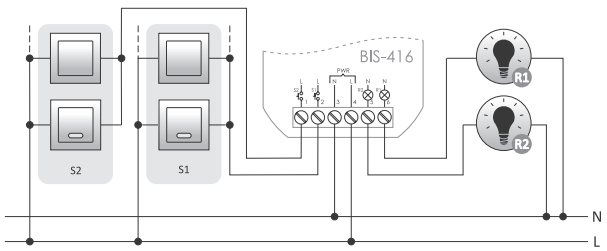
Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

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.



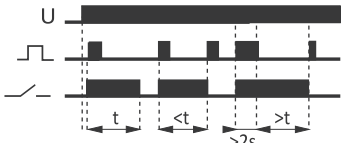
power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8 A
control pulse current	<5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power consumption	
standby	0.15 W
on	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

BIS-416 can work with backlit buttons.

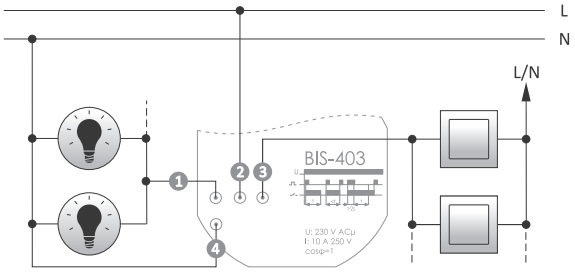
With timer switch

Functioning

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

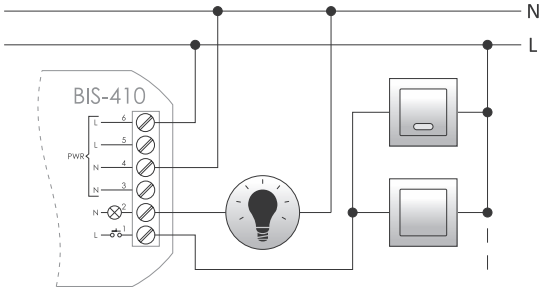


1 black 2 brown 3 red 4 blue

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
activation 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

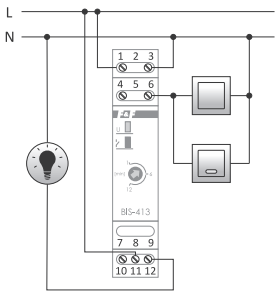


power supply	
BIS-410... 230 V	165÷265 V AC
BIS-410... 24 V	9÷30 V AC/DC
contact	1×NO
maximum load current (AC-1)	
BIS-410	16 A
BIS-410-LED	16 A (120 A / 20 ms)
control pulse current	<5 mA
activation delay	0.1÷0.2 s
adjustment time	1÷15 min.
power indication	green LED
power consumption	
standby	0.15 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

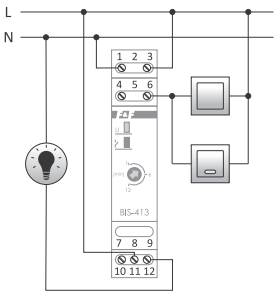
BIS-410 / BIS-410-LED can work with backlit buttons with a maximum current of 5 mA.

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 / ...



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	separated 1×NO/NC
BIS-413-LED/BIS-413M-LED	separated 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
activation delay	0.1÷0.2 s
adjustment time	1÷12 min.
power indication	green LED
power activation	red LED
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.

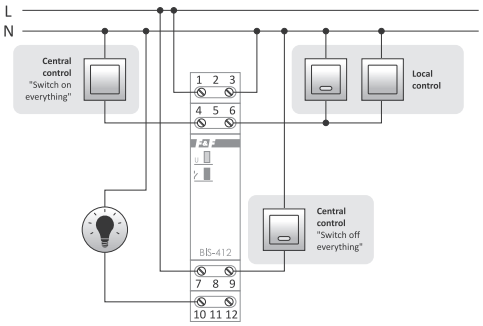
Version with the "M" index - version with "memory" of the contact position, which means when the power supply is switched back on, the relay will be restored to the state it was when the power supply was switched off.

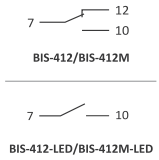
Group (hotel) with "Switch on everything" and "Switch off everything" control inputs

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 / ...





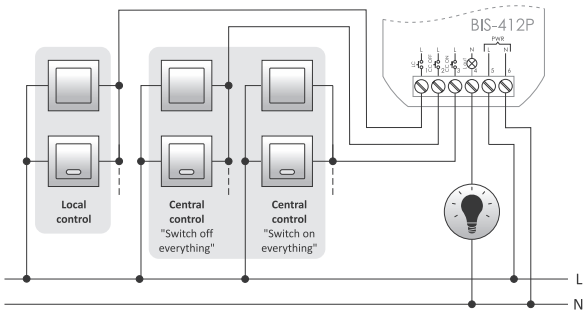
power supply	
BIS-412... 230V	165÷265 V AC
BIS-412... 24V	9÷30 V AC/DC
contact	
BIS-412/BIS-412M	separated 1×NO/ NC
BIS-412-LED/BIS-412M-LED	separated 1×NO
maximum load current (AC-1)	
BIS-412/BIS-412M	16 A
BIS-412-LED/BIS-412M-LED	16 A (120 A/20 ms)
control pulse current	≤5 mA triggered with N level
total backlight current control buttons	5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power activation	red LED
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
activation delay	0.1÷0.2 s
power activation	green LED
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**

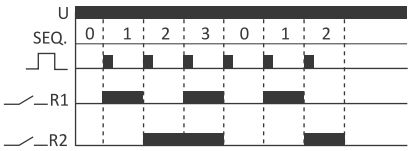
  The receiver is switched on after a current pulse caused by pressing anyone momentary button from the local control group. The relay contact will be closed. After the next pulse, the contact will be open.

- **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

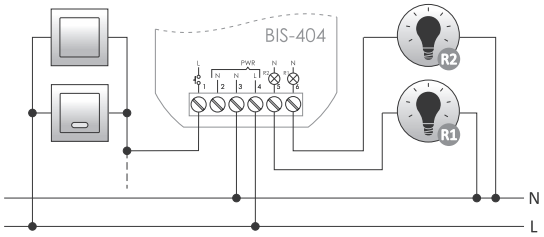
The sequential relay has 2 separate outputs. Each time the button is pressed, the status of the outputs will change according to the operating schedule shown below.



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 0-1-2-3.

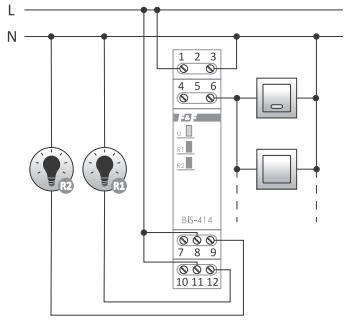
BIS-404

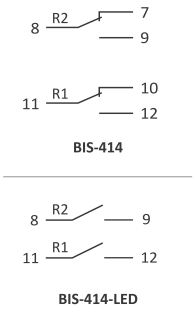


power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8 A
control pulse current	<1 mA
total backlight current	
control buttons	5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power consumption	
standby	0.15 W
on	0,7 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

BIS-404 can work with backlit buttons.

BIS-414 / BIS-414-LED



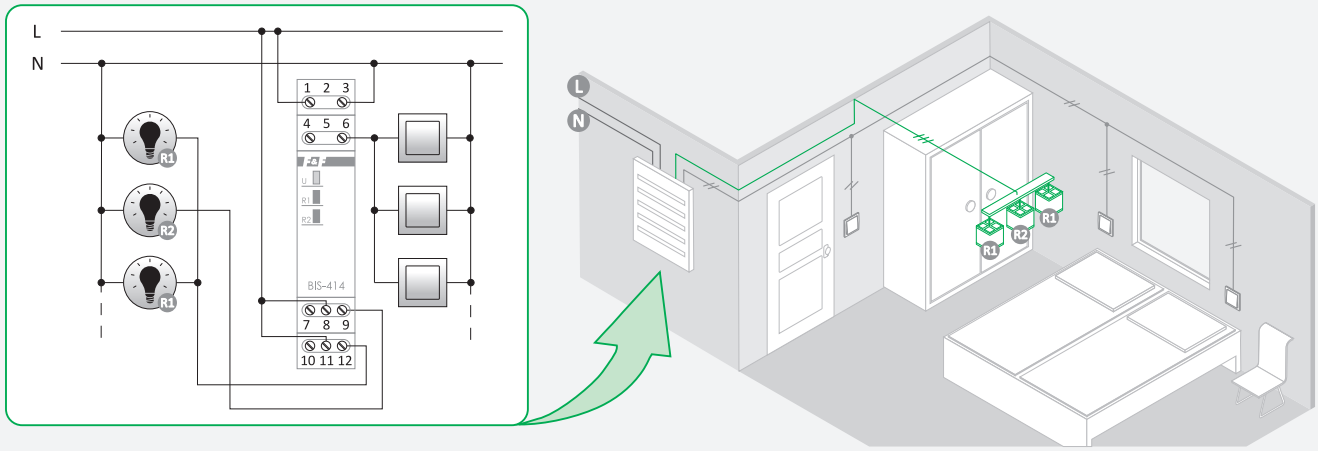


power supply	
BIS-414... 230 V	165÷265 V AC
BIS-414... 24 V	9÷30 V AC/DC
contact	
BIS-414	2×NO/NC
BIS-414-LED	2×NO
maximum load current (AC-1)	
BIS-414	2×16 A
BIS-414-LED	2×16 A (120 A / 20 ms)
control pulse current	<1 mA
total backlight current	
control buttons	5 mA
activation delay	0.1÷0.2 s
power indication	green LED
power activation	2× red LED
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.

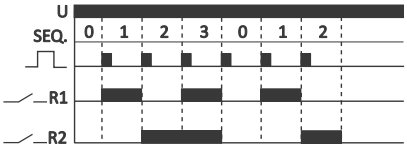
Interesting and practical applications



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

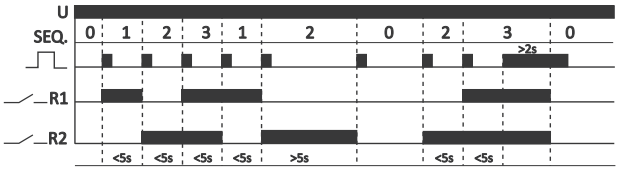
Sequential (gang switch) – four-function

A mode



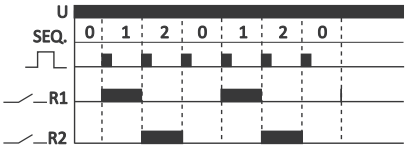
- Subsequent pressings of a button repeat the sequence 0-3.

B mode



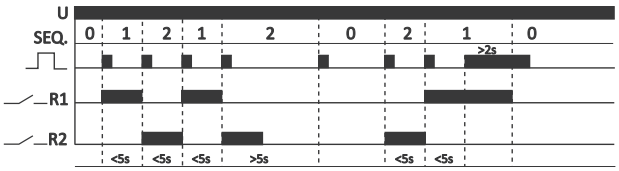
- Pressing the button again in less than 5 seconds repeats sequences 1-3.
- Pressing the button again after more than 5 seconds opens both contacts (sequence 0).
- A long press of the button - in any sequence - opens both contacts (sequence 0).
- After switching off both relays, pressing the button again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

C mode



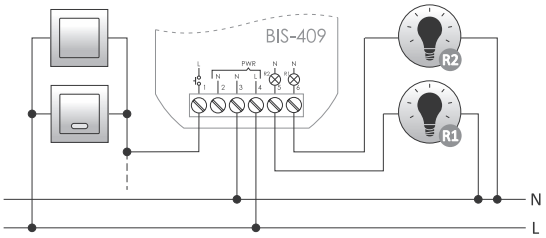
- Subsequent pressings of a button repeat the sequence 0-2.

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.

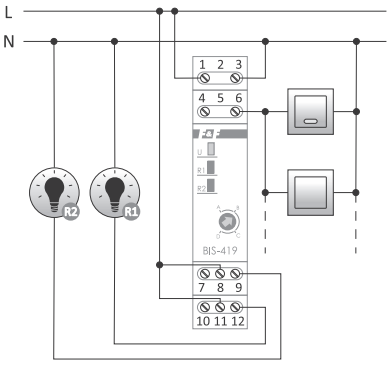
BIS-409

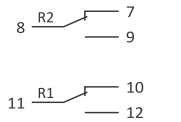


power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8 A
control pulse current	<1 mA
total backlight current control buttons	5 mA
activation delay	0.1÷0.2 s
power indication	LED green
power consumption	
standby	0.15 W
on	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

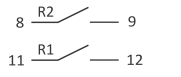
BIS-409 can work with backlit buttons.

BIS-419 / BIS-419-LED





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
activation 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.

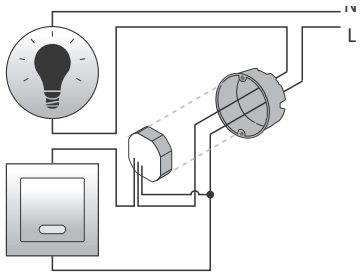
Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.

Chapter 6

Lighting dimmers

Purpose

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

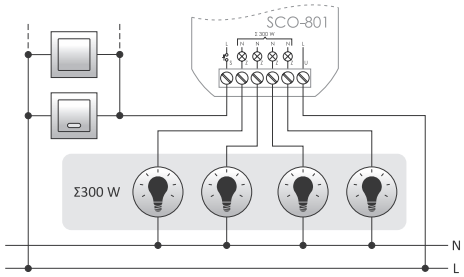
A group of dimmers designed for incandescent and halogen lamps (also powered by a transformer or electronic power supply, adapted to cooperate with dimmers). With some electronic power supplies, dimmers may work incorrectly (causing, for example, a flickering of the lighting). For some types, you should 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

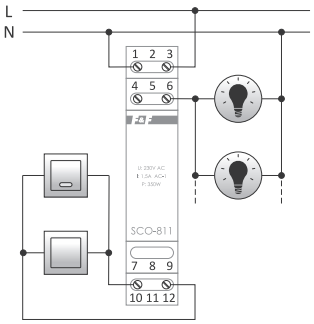
After each switching on, the lighting returns to maximum brightness.

SCO-801 300 W



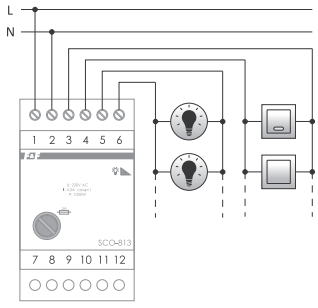
power supply	195÷265 V AC
maximum load current	1,3 A
maximum power connected light bulbs	300 W
power consumption	0.1 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	Ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

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
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

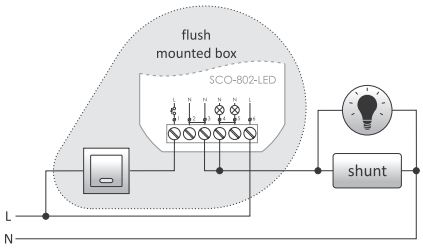
With "memory" of light intensity settings

Functioning

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

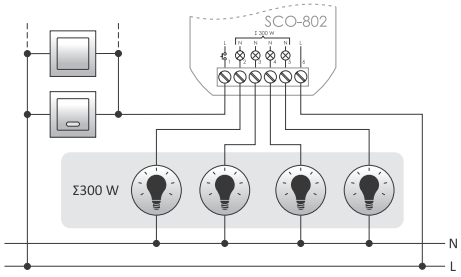


power supply	195÷265 V AC
power tolerance	-20/+10%
maximum load current (AC-1)	1.3 A
maximum power connected light bulbs	150 W
power consumption	<0.25 W
terminal	1.5 mm² screw terminals
tightening torque	0.3 Nm
working temperature	-25÷50°C
dimensions	Ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box Ø60
ingress protection	IP20

Functions

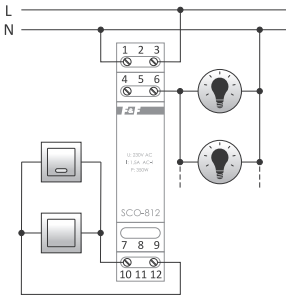
- Can be connected to both 3-wire and 2-wire installation, without available neutral wire, in the installation box;
- Memory of set brightness level (also after power failure and its return);
- Programmable minimum brightness level (elimination of LED lamps flashing at low brightness levels).

SCO-802 300 W, for incandescent lighting



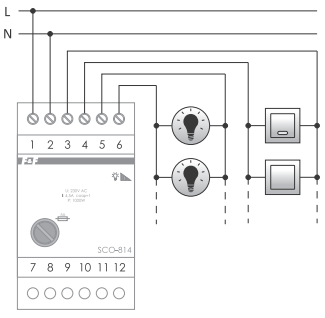
power supply	195÷265 V AC
maximum load current (AC-1)	1.3 A
maximum power connected light bulbs	300 W
power consumption	0.1 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	Ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box Ø60
ingress protection	IP20

SCO-812 350 W



power supply	195÷265 V AC
maximum load current (AC-1)	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-814 1000 W



power supply	195÷265 V AC
maximum load current (AC-1)	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

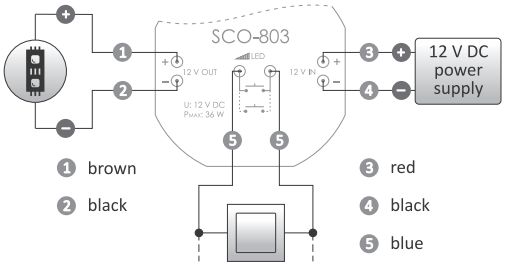
For 12 V LED lighting

With "memory" of light intensity settings

Functioning

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

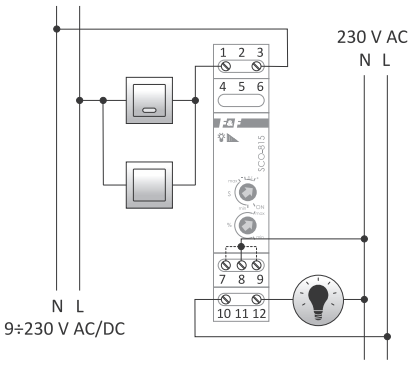
SCO-803 36 W



power supply	11÷14 V DC
maximum load current (AC-1)	3 A
maximum power connected light 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



power supply	195÷265 V AC
maximum load current (AC-1)	2 A
maximum power connected light bulbs	
(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 3600 W)

SCO-816 basic version
SCO-816A with 1÷10 V analog output

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.

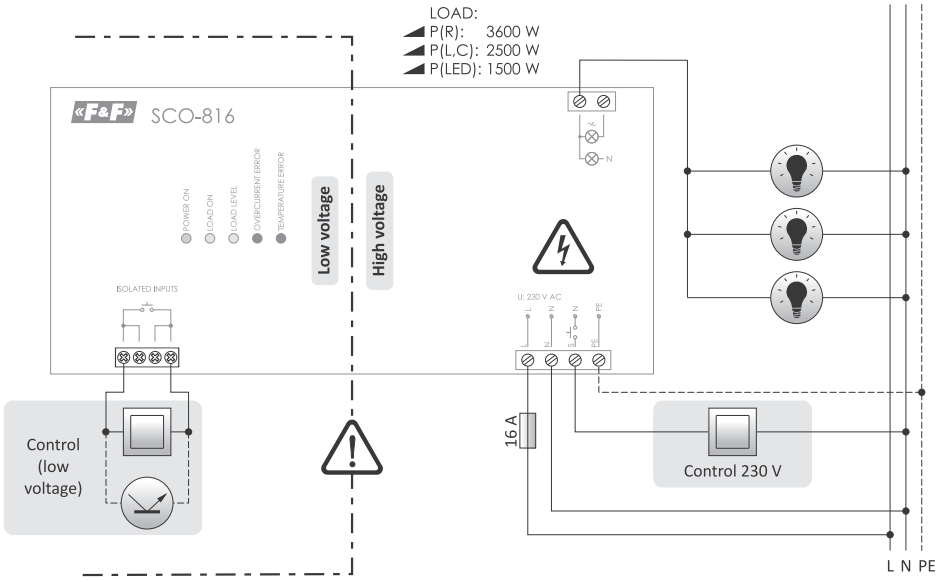
Functioning

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	3600 W
inductive and capacitive	2500 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

3600 W – resistive load: incandescent and halogen lamps.
2500 W – inductive and capacitive load: toroidal transformers, adjustable electronic transformers, and dimmable LED and ESL bulbs.



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 lighting activation when a person or other object appears in places such as corridors, courtyards, driveways, garages, etc. Using motion sensors to turn on the lights automatically makes lighting more convenient and cost-effective.

PIR motion sensors (infrared)

Characteristic features

- The most economical solution.
- The sensor uses an infrared converter to detect the movement of heat sources (e.g. people).
- The range of operation does not extend beyond the room's boundaries, i.e. doors, windows, partitions.
- Highest efficiency in detecting motion perpendicular to the sensor and lowest when motion is directly towards the sensor.
- The effectiveness can depend on the room temperature, presence of heat and light sources.
- The device cannot act as a presence sensor.

More information on p. 42

Microwave presence sensors

Characteristic features

- Advanced solutions based on exact high-frequency microwave sensors.
- The ability to detect both movement and the presence of people in a room (the sensor detects micro-movements such as chest movement during breathing or even heartbeat);
- It can penetrate through non-metallic obstacles, such as doors, wooden boards, plastics, and drywall.
- Insensitive to temperature and nearby light sources.

More information on p. 46

Microwave motion sensors/ceiling lights with built-in microwave motion sensor

Characteristic features

- Motion detection using high-frequency microwave sensors.
- Precise motion detection regardless of the direction of movement relative to the sensor.
- Lack of sensitivity to temperature and nearby light sources.
- Can penetrate through non-metallic obstacles, such as doors, wooden boards, plastics, and drywall;
- Due to its high sensitivity, the DRM can act as a presence sensor.

More information on p. 48

Laser distance sensors

Characteristic features

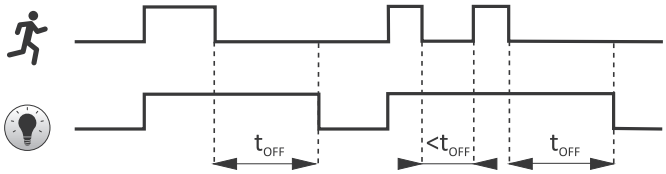
- Sensors reacting to the interruption of a laser beam to control lighting on stairs or corridors.
- Very precise detection range setting (10 cm÷2 m).
- This is not a motion sensor – the presence of a person/object is detected up to a set distance.

More information on p. 49

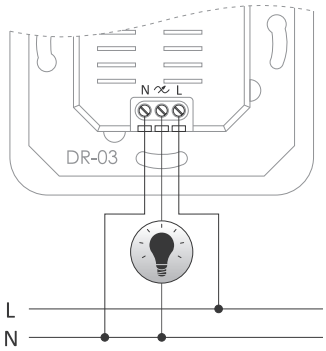
PIR motion sensors (infrared)

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.

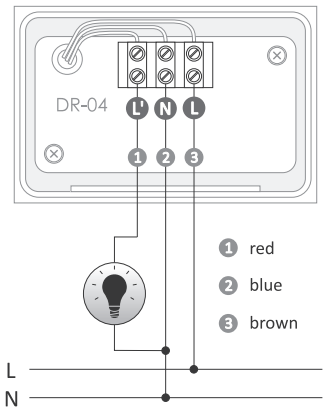


DR-03 white



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

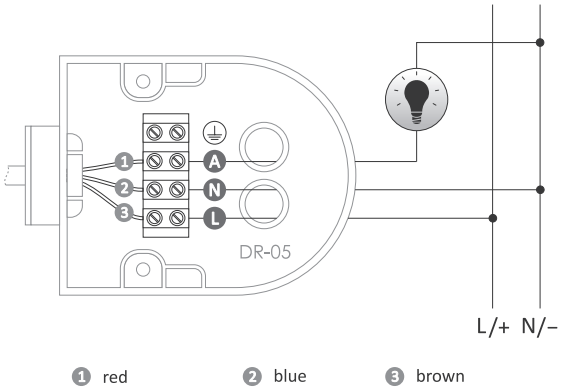
DR-04W / DR-04B / DR-04G white/black/gray, hermetic IP65



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

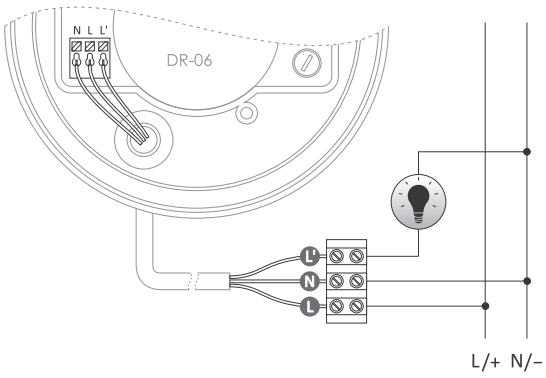


1 red 2 blue 3 brown

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-mounted
ingress protection	IP44

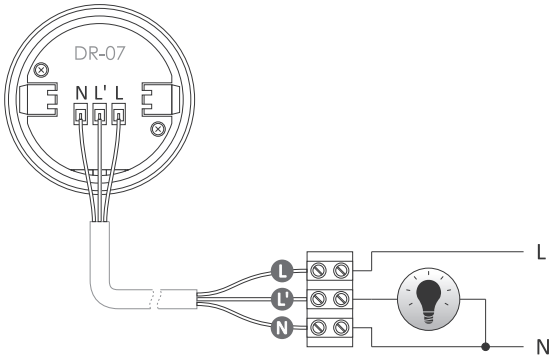
The sensor head can move in two planes, allowing for precise adjustment of the detection field depending on the individual requirements of the user.

DR-06W / DR-06W 24V / DR-06B / DR-06B 24V white/black



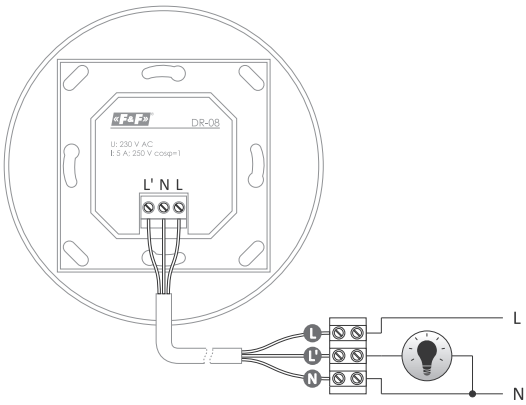
power supply	
DR-06B/DR-06W	195÷265 V AC
DR-06B 24 V/DR-06W 24 V	9÷30 V DC
maximum load current (AC-1)	4 A
twilight activation threshold	10÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷12 min. (±3 min.)
horizontal detection field	360°
maximum radius detection (for H= 2.3÷3.5 m, T<24°C)	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-mounted
ingress protection	IP40

DR-07 ceiling-mounted, built-in



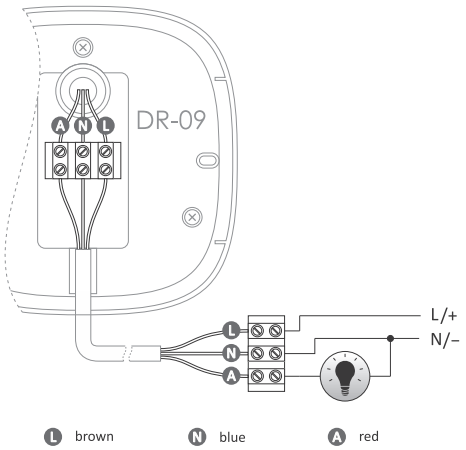
power supply	195÷265 V AC
maximum load current (AC-1)	1.5 A
twilight activation threshold	10÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷9 min. (±2 min.)
horizontal detection field	360°
maximum radius detection (for H= 2.3÷3.5 m, T<24°C)	4 m
sensor mounting height	2.5÷3.5 m
power consumption	
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 flush-mounted box ø60



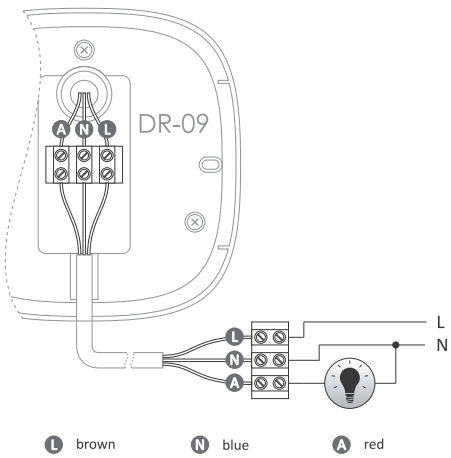
power supply	195÷265 V AC
maximum load current (AC-1)	5 A
twilight activation threshold	3÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷9 min. (±2 min.)
horizontal detection field	360°
maximum radius detection for (H= 2.3÷3.0 m, T<24°C)	2 m
sensor mounting height	2.5÷3.0 m
power consumption	
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

DR-09 / DR-09 24V ceiling-mounted motion detector with presence detector function, white
DR-09B / DR-09B 24V ceiling-mounted motion detector with presence detector function, black



power supply	
DR-09/DR-09B	195÷265 V AC
DR-09/DR-09B 24 V	9÷30 V DC
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	10 s (±3 s) ÷30 min. (±2 min.)
horizontal detection field	360°
maximum radius detection (T<24°C)	10 m
sensor mounting height	2.2÷6 m
power consumption	
standby	0.10 W
on	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-mounted
ingress protection	IP20

DR-09-IP65 hermetic, ceiling-mounted motion detector with presence detector function, white
DR-09B-IP65 hermetic, ceiling-mounted motion detector with presence detector function, black

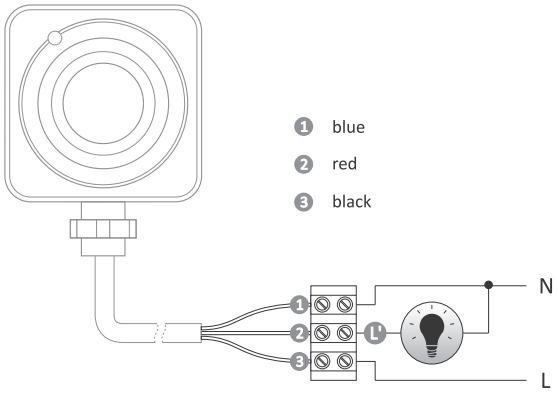


power supply	195÷265 V AC
maximum load current (AC-1)	10 A
twilight activation threshold	3÷2000 lx
motion of detection	0,6÷1,5 m/s
switch-off time	10 s (±3 s) ÷30 min. (±2 min.)
horizontal detection field	360°
maximum radius detection (T<24°C)	10 m
sensor mounting height	2.2÷6 m
power consumption	
standby	0.10 W
on	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-mounted
ingress protection	IP65

DR-30M surface-mounted, for high rooms

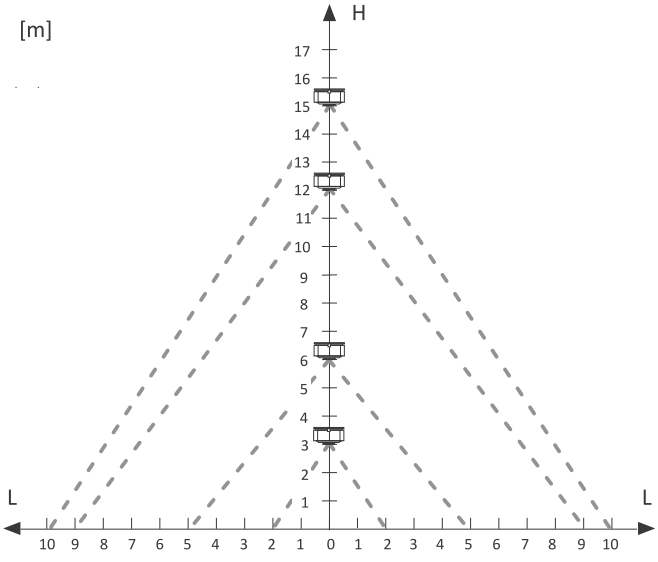
Functioning

PIR detector dedicated to high rooms, especially warehouses.
For mounting at a height of 15 metres, the diameter of the detection field reaches 20 metres.

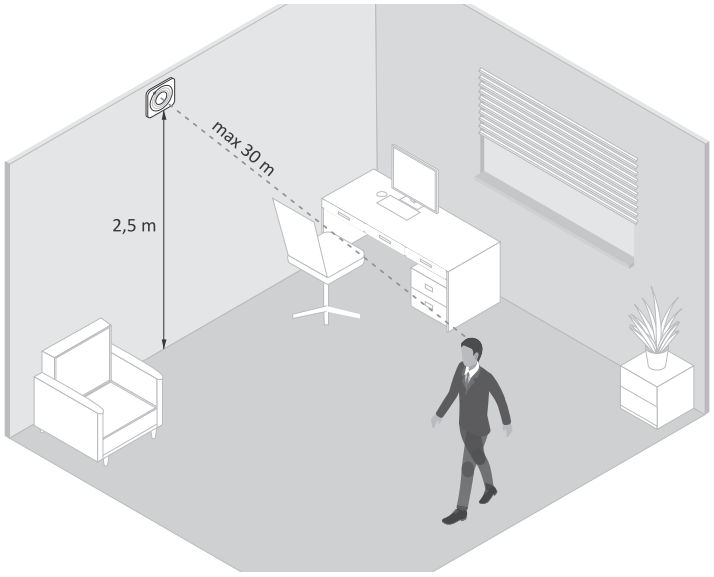


power supply	100÷277 V AC
maximum load current (AC-1)	16 A
maximum load	
cotinuous	2300 W
momentary	3000 W
twilight activation threshold	10÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-on time	10 s÷20 min. (±10 s)
horizontal detection field	80°
maximum radius detection (T<22°C)	
ceiling mounting (diameter)	20 m
wall mounting	30 m
sensor mounting height	
ceiling mounting	3÷15 m
wall mounting	2÷3 m
power consumption	
standby	0.45 W
on	1 W
terminal	OMY 3×1.5 mm², L= 0.2 m
tightening torque	0.3 Nm
working temperature	-10÷40°C
dimensions	
housing	90×82 mm; H= 48 mm
housing with handle	90×104 mm; H= 48 mm
mounting	surface-mounted
ingress protection	IP40

DR-30M sensor detection area



Sensor installation height (ceiling mounting)



Detection field range (wall mounting)

Microwave sensor with occupancy sensor feature

Functioning

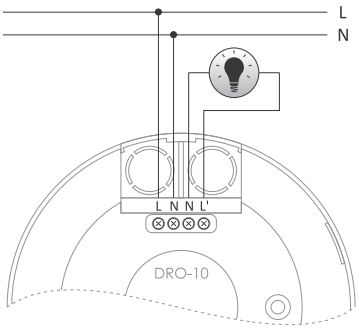
The microwave sensor detects changes in the reflection of high-frequency electromagnetic waves caused by the movement of objects. It is characterized by high detection sensitivity and independence from the influence of temperature. When motion is detected, the lighting is switched on. If a motion is 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.

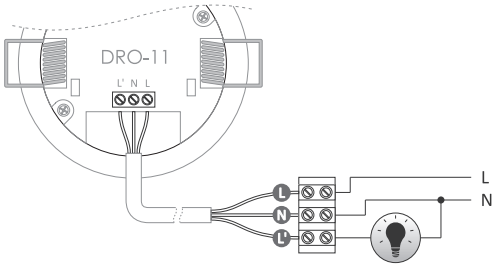
For comparison, the mobile phone radiates with a power of approx. 1000 mW (100 times stronger).

DRO-10 surface



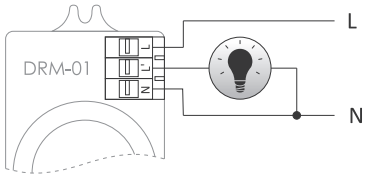
power supply	110÷240 V AC
maximum load current (AC-1)	5 A
microwave radiation frequency	24 GHz
radiation power	10 mW
detection field	360°
presence detection radius	3 m
motion detection radius	4.5 m
activation threshold (adjustable)	3÷2000 lx
switch-on time of receiver (adjustable)	10 s÷12 min.
activation delay	1 s
power consumption	0.9 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø115 mm; H= 24 mm
mounting	surface
mounting height	2÷4 m
ingress protection	IP20

DRO-11 built-in



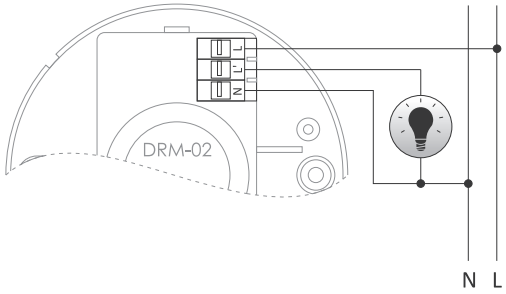
power supply	110÷240 V AC
maximum load current (AC-1)	5 A
microwave radiation frequency	24 GHz
radiation power	10 mW
detection field	360°
presence detection radius	3 m
motion detection radius	4,5 m
activation threshold (adjustable)	3÷2000 lx
switch-on time of receiver (adjustable)	10 s÷12 min.
activation delay	1 s
power consumption	0.9 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø76 mm; H= 67 mm
mounting	built-in
mounting height	2÷4 m
ingress protection	IP54

DRM-01 / DRM-01 24V built-in



power supply	
DRM-01	195÷265 V AC
DRM-01 24 V	18÷24 V DC
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.
activation 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

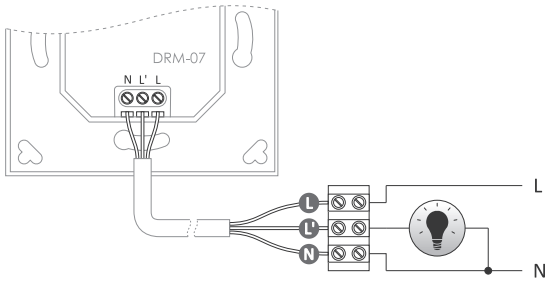
DRM-02 / DRM-02 24V surface, white
DRM-02B / DRM-02B 24V surface, black



power supply	
DRM-02/DRM-02B	195÷265 V AC
DRM-02 24 V/ DRM-02B 24 V	18÷24 V DC
maximum load current (AC-1)	5 A
microwave radiation frequency	5,8 GHz
radiation power	10 mW
detection field	360°
detection radius (adjustable) for H= 2.5 m	1÷10 m
activation threshold (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)	5 s÷12 min.
activation 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	ø103 mm; H= 44 mm
mounting	surface
mounting height	2÷6 m
ingress protection	IP40

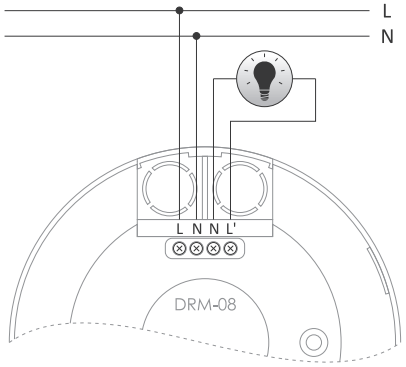
Wszystkie czujniki DRM-02 mogą współpracować z lampami LED.

DRM-07 for flush-mounted box ø60



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 area	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.)
activation 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	ø55 mm, H= 33 mm
mounting hole	ø60 mm
screw spacing	58 mm
mounting	in flush-mounted box ø60
mounting height	1,0÷1.8 m
ingress protection	IP20

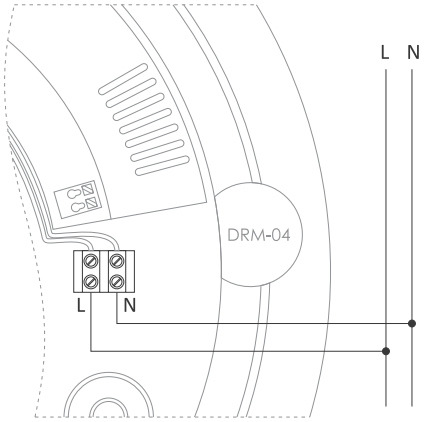
DRM-08 ceiling-mounted



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 area	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)
activation 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-mounted
mounting height	2÷6 m
ingress protection	IP20

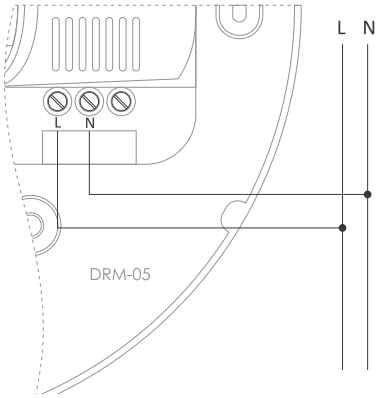
Ceiling lights with built-in microwave motion sensor

DRM-04 LED (×96) 15 W



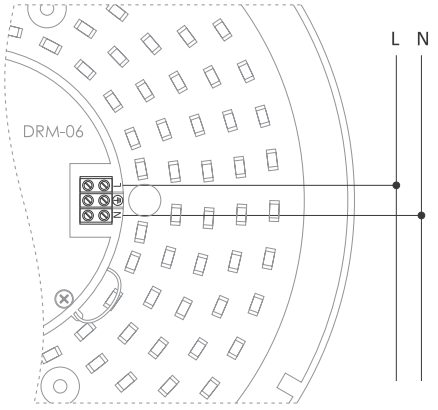
power supply	195÷265 V AC
lighting	
power	15 W
luminous flux	1030 lm
color	6000 K
frequency of microwaves radiation	5.8 GHz
motion sensors	
radiation power	10 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
detection radius (adjustable) for H= 2.5 m	1÷8 m
twilight activation (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)	5 s÷15 min.
activation 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	ø295, 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.
activation 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	ø280, 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



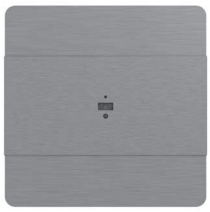
power supply	195÷265 V AC
lighting	
power	10 W
luminous flux	970 lm
color	6000 K
frequency of microwaves radiation	5.8 GHz
motion sensors	
radiation power	0.2 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
detection range (adjustable)	1÷8 m
twilight activation (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)	5 s÷12 min.
activation 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	ø260, H= 90 mm
mounting	surface
mounting height	2÷6 m
lampshade	HDPE material, milky white
ingress protection	IP40

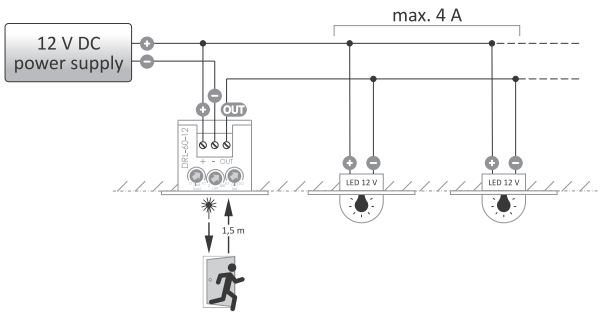
Laser distance sensors

Functioning

The principle of operation is to emit a light beam and measure the delay of light returning as a result of reflection from an obstacle. On this basis, it is possible to precisely determine the distance to the obstacle, which is then compared with the set detection range. The condition for switching on the light is the presence of an obstacle at a distance smaller than the set detection range, and a brightness level below the value set on the sensor. This solution is perfect for switching on lighting circuits for example on open stairs, where it is important that the sensor detects presence only on the stairs and ignores everything that happens outside them.

DRL-60-12 distance sensor for ø60 mm flush-mounted box, power supply 12÷24 V



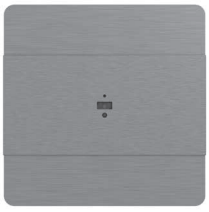


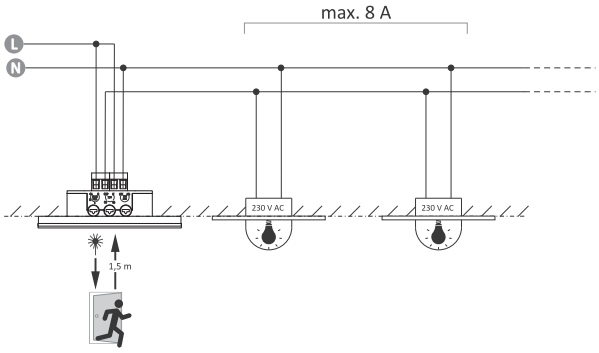
power supply	9÷27 V DC
maximum load current (AC-1)	4 A
detection range (adjustable)	0.1÷2.0 m
brightness level (adjustable)	2÷500 lx
activation time (adjustable)	0÷10 min.
detection	
sensor	ToF laser sensor
wave length	940 nm
safety	1st class
beam spreading	±18°
power consumption	0,3 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-10÷45°C
dimensions	
external	80×80×6.5 mm
internal (box)	ø60, deptH= 25 mm
mounting	flush-mounted
ingress protection	IP30

Functions

- Laser distance sensor ToF (Time of Flight);
- The detection range can be smoothly adjusted in the range of 0.1 to 2 m;
- A brightness sensor to prevent the light from turning on at high brightness levels;
- Adjustable light on hold time;
- Direct control of 12/24 V lighting circuits (load capacity up to 4 A, which can be increased by connecting LED-AMP amplifiers);;
- Soft on/off function for controlled lighting circuits;
- Can be integrated with AS-225 and AS-225D staircase automats;
- Installation in a standard ø60 installation box;
- LED indicating the operating status of the sensor;
- Thermal protection against exceeding the acceptable temperature inside the housing;
- **Color variations listed in the table at the bottom of the page.**

DRL-60-230 distance sensor for ø60 mm flush-mounted box, power supply 230 V





power supply	165÷265 V AC
maximum load current (AC-1)	8 A
detection range (adjustable)	0.1÷2.0 m
brightness level (adjustable)	2÷500 lx
activation time (adjustable)	0÷10 min.
detection	
sensor	ToF laser sensor
wave length	940 nm
safety	1st class
beam spreading	±18°
power consumption	
standby	0.5 W
on (relay on)	1 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-10÷45°C
dimensions	
external	80×80×6.5 mm
internal (box)	ø60, deptH= 30 mm
mounting	flush-mounted
ingress protection	IP30

Functions

- Laser distance sensor ToF (Time of Flight);
- The detection range can be smoothly adjusted in the range of 0.1 to 2 m;
- A brightness sensor to prevent the light from turning on at high brightness levels;
- Adjustable light on hold time;
- Separated relay output for direct control of 230 V circuits, or integration with any home automation system;
- Direct control of electrical circuits with a load of up to 8 A (AC-1);
- Installation in a standard ø60 installation box;
- LED indicating the operating status of the sensor;
- Thermal protection against exceeding the acceptable temperature inside the housing;
- **Color variations listed in the table at the bottom of the page.**

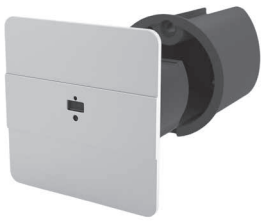
DRL-60-... versions

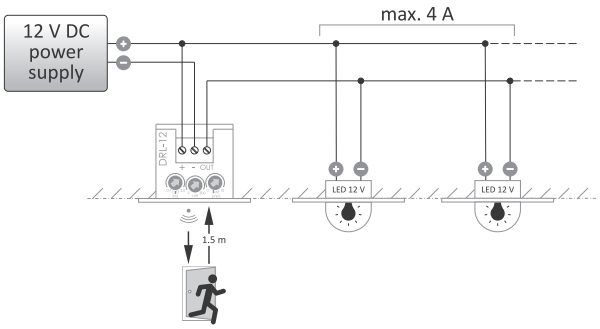
Color	DRL-60-12	DRL-60-12-1	DRL-60-12-9	DRL-60-230	DRL-60-230-1	DRL-60-230-9
white	–	●	–	–	●	–
black	–	–	●	–	–	●
satin (aluminium)	●	–	–	●	–	–

DRL-12 distance sensor for ø32 mm flush-mounted box, power supply 9÷27 V DC

Functioning

The DRL-12 is a laser distance sensor that detects obstacles in the range of 0 to 2 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
ingress protection	IP40

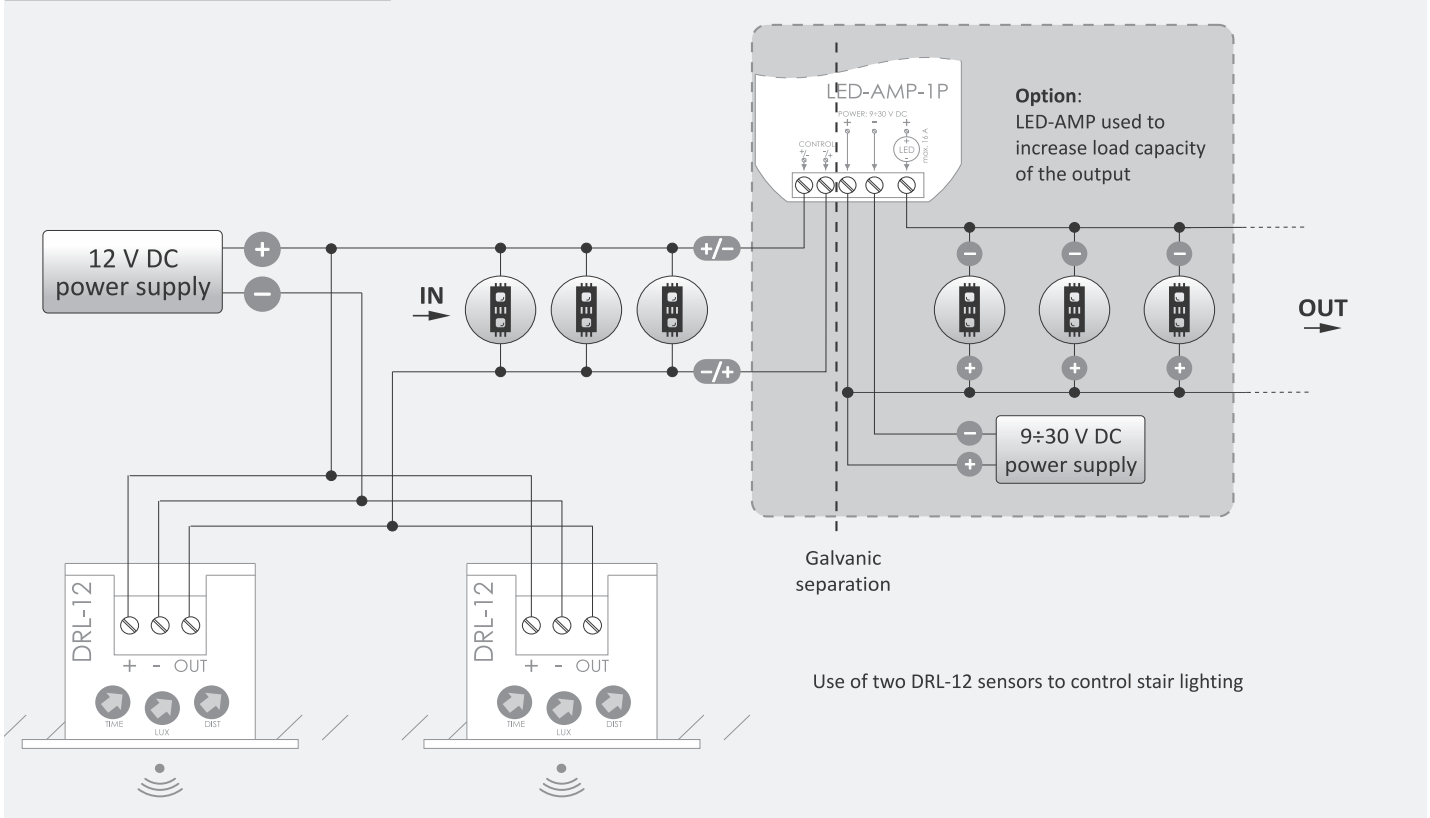
Functions

- 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	DRL-12-1	–	–	–	–	–	–	–
black	DRL-12-9	DRL-12-69	DRL-12-79	DRL-12-89	DRL-12-29	DRL-12-39	DRL-12-49	DRL-12-59
satin (aluminium)	DRL-12	DRL-12-60	DRL-12-70	DRL-12-80	DRL-12-20	DRL-12-30	DRL-12-40	DRL-12-50

Interesting and practical applications



Use of two DRL-12 sensors to control stair lighting

Chapter 8

Lighting controllers

Current surge arresters

Purpose

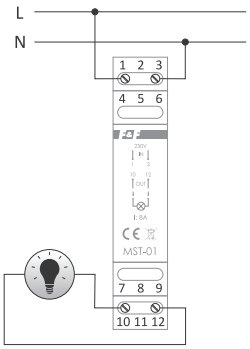
The MST is used for the reduction of current surges occurring when LED lighting, halogen lamps, impulse power supplies, etc. are switched on. In addition to extending the service life of the MST receivers, it also prevents overcurrent protection from being triggered by a sharp current surge.

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.

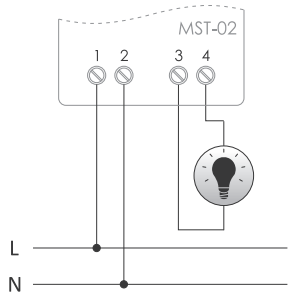
There is no effect of gradual illumination of lamps.

MST-01



input voltage IN	195÷253 V AC
output voltage OUT	UOUT=UIN
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

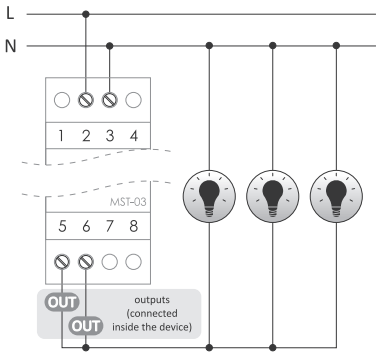


input voltage IN	195÷253 V AC
output voltage OUT	UOUT=UIN
maximum load current (AC-1)	8 A
executive element	relay+NTC thermistor
switching time	1 s
power consumption	0.1 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	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

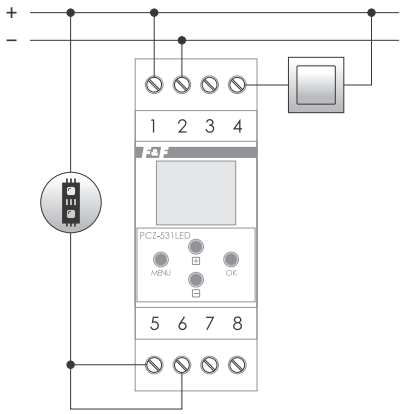
Purpose

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



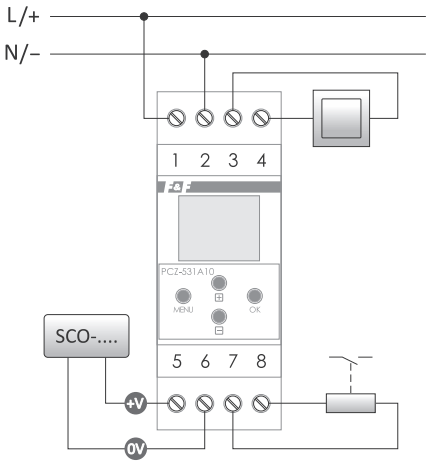
power supply	9÷30 V DC
output	open collector OC
maximum load current	8 A/50 V DC
input	potential-free (triggered with 0 V)
backup time clock operation	6 years*
battery type	2032 (lithium)
display maintenance	none
accuracy of the clock	1 s
time error	±1 s/24 h
time program setting accuracy	1 min.
program 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

Functions

- 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

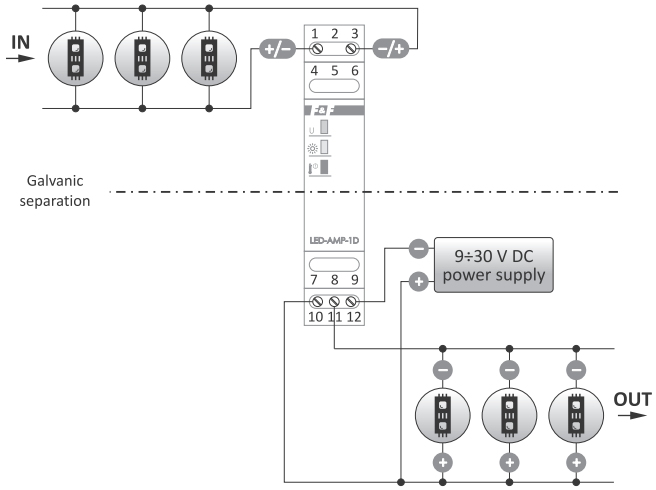
- 85÷265 V AC/DC power supply;
- 1÷10 V analog output voltage;
- Additional 6 A/250 V AC relay output activated when the light is switched on. To be used, for example, as a contactor control for switching on the power supply of the controlled lamps.

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.



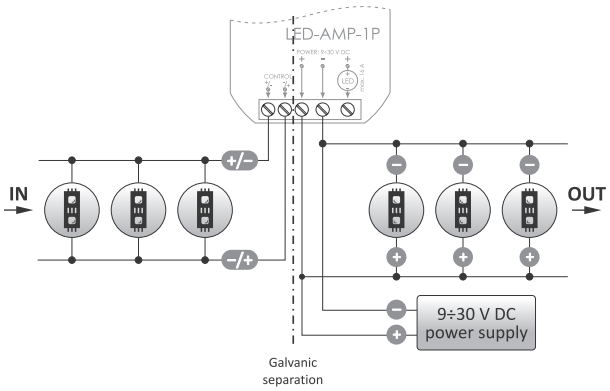
power supply	9÷30 V DC
input	
voltage	6÷30 V DC
current	5 mA
control signal	PWM
output	
voltage	as the power supply voltage
current (max)	16 A
actuator	transistor
separation between the output and the input	
type	galvanic
level	2.5 kV
power consumption	
Iout= 0 A	<0.05 W
Iout= 16 A	<1.2 W
working temperature (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

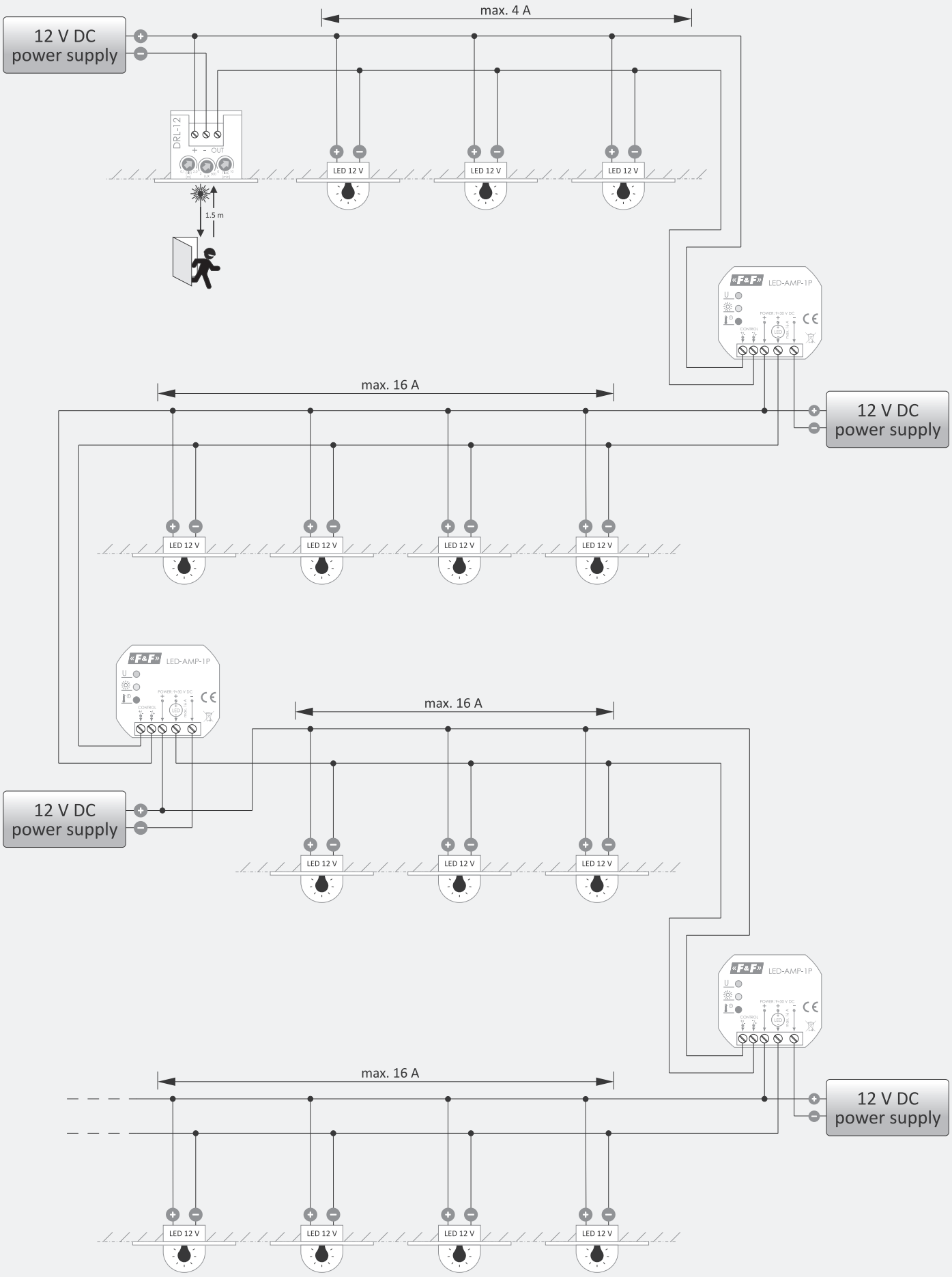
Purpose

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 applications



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

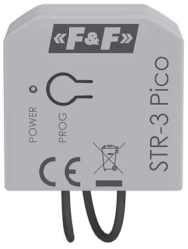
  Each movement direction has its own local button. Short press (<0.5 seconds) of a button causes the roller shutter to start to move in a preset direction for a programmed period of time. If the roller shutter is already in motion when the button is pressed, it will be stopped. Long press (>0.5 seconds)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

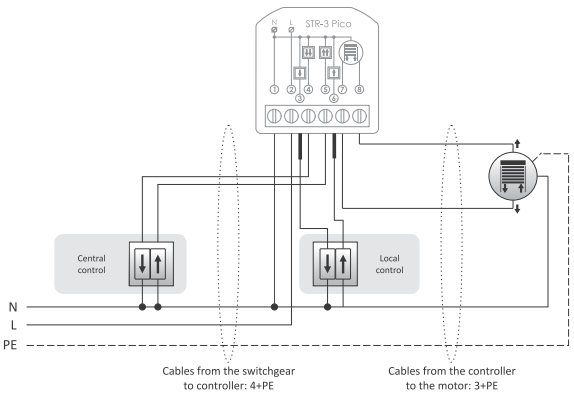
  One local button

  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).

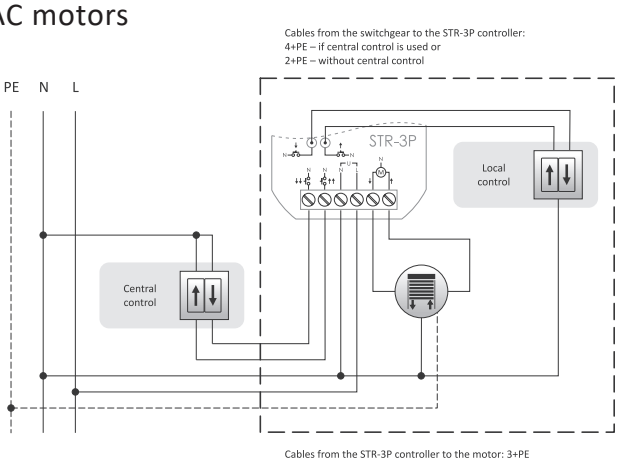
STR-3 Pico mini roller shutter controller for 230 V AC motors





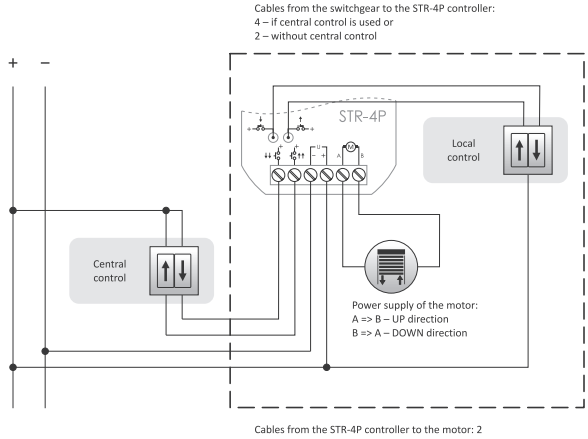
power supply	185÷265 V AC
contact load (AC-1/AC-3)	8 A/1.5 A
power consumption	
standby	<0,3 W
on	<0.6 W
control	triggered with N level
switch-on time (programable)	1 s÷5 min.
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
terminal sterowania lokalnego	2×DY 1 mm² / L= 10 cm
dimensions	35×36×19 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

STR-3P for 230 V AC motors



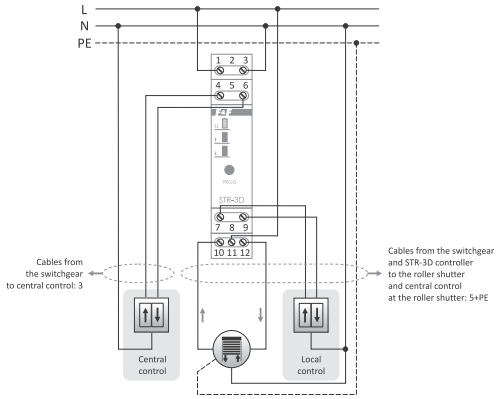
power supply	100÷265 V AC
load capacity (AC-1/AC-3)	8 A/1.5 A
power consumption	
standby	<0.15 W
on	<0.6 W
control	triggered with N level
switch-on time (adjustable)	1 s÷15 min.
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
local control terminal	2×DY 1 mm²/ L=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

STR-4P for 12/24 V DC motors



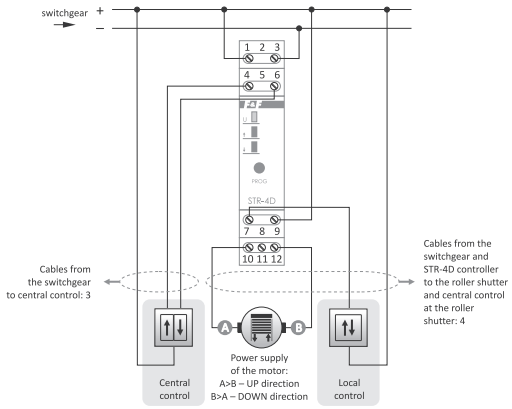
power supply	10÷27 V DC
load capacity	6 A
power consumption	
standby	<0.15 W
on	<0.6 W
control	triggered with 10÷27 V DC level
switch-on time (adjustable)	1 s÷15 min.
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
local control terminal	2×DY 1 mm²/ L= 10 cm
dimensions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

STR-3D for 230 V AC motors



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

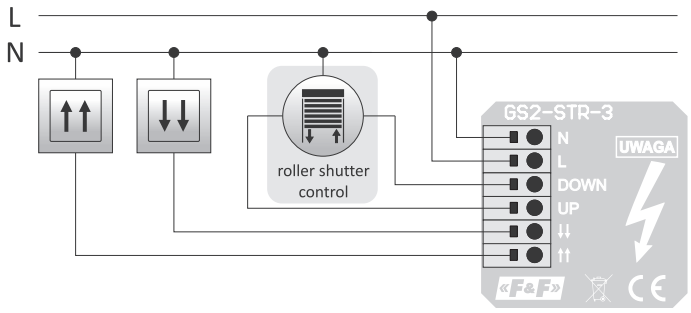


power supply	10÷27 V DC
load capacity	6 A
power consumption	
standby	<0.15 W
on	<0.6 W
control	triggered with 10÷27 V DC level
switch-on time (adjustable)	1 s÷15 min.
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35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



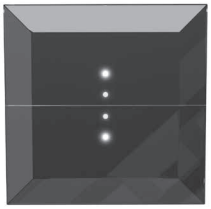
power supply	100÷265 V AC
load capacity (AC-1/AC-3)	8 A/1.5 A
power consumption	
standby	<0.15 W
on	<0.8 W
control	
local	buttons on the glass housing
central	triggered with N level
switch-on time (adjustable)	1 s÷15 min.
working temperature	-25÷50°C
terminal	spring terminals, cable 0.5÷2.5 mm²
dimensions	
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

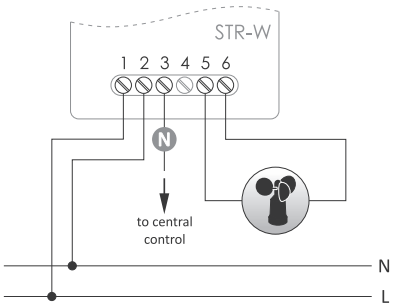


GS2-230-B

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

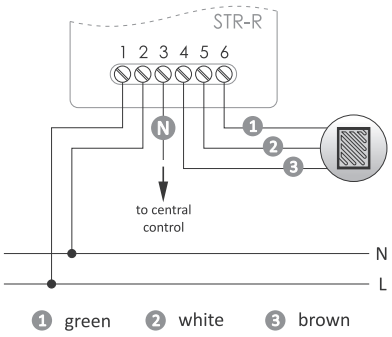
STR-R precipitation sensor (rain/snow)

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.

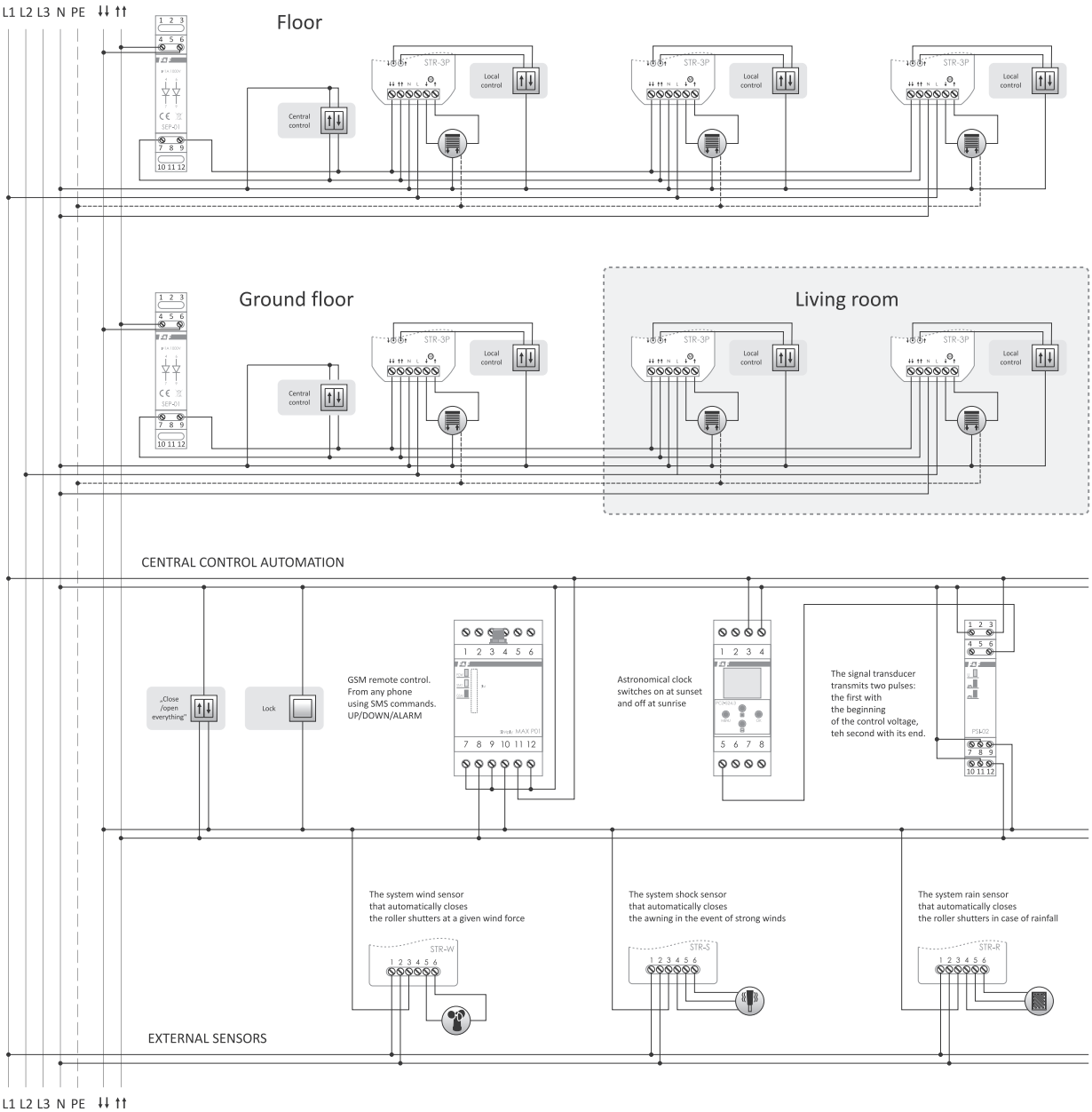


power supply	100÷265 V AC
power consumption	
standby	<0.2 W
on	<0.6 W
working temperature	-15÷50°C
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
dimensions	67×50×26 mm
mounting	surface mounting
ingress protection	IP20

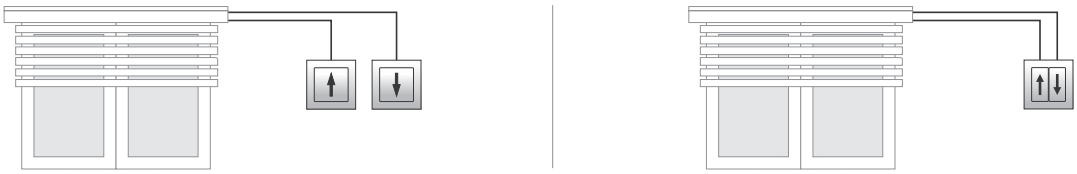
precipitation sensor

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

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"



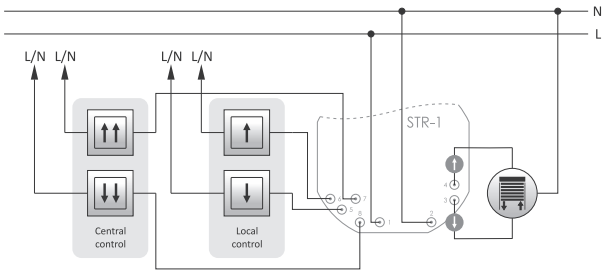
Functioning

- **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.

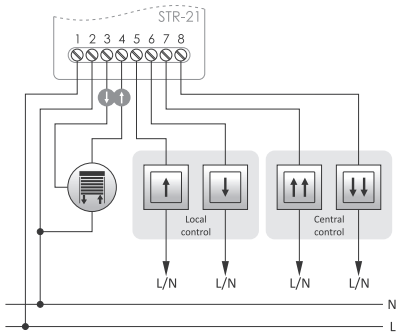
STR-1

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



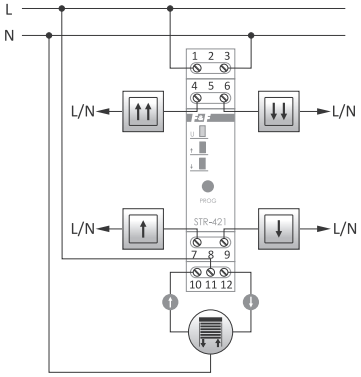
power supply	195÷253 V AC
maximum load current (AC-1/AC-3)	8 A/1.5 A
control	triggered with L or N level
control pulse current	<1 mA
switch-on time (adjustable)	0 s÷10 min.
power/programming indication	LED green
power consumption	<1 W
working temperature	-25÷50°C
signal terminal	4×DY 1 mm², L= 10 cm
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-21



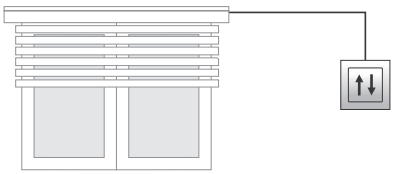
power supply	195÷253 V AC
maximum load current (AC-1/AC-3)	8 A/1.5 A
control	triggered with L or N level
control pulse current	<1 mA
switch-on time (adjustable)	0 s÷10 min.
power/programming indication	LED green
power consumption	<1 W
working temperature	-25÷50°C
terminal	4.0 mm² screw terminals
tightening 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"



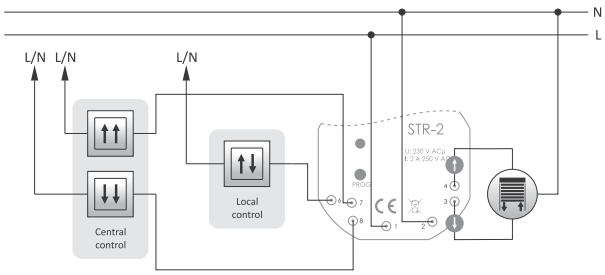
Functioning

- **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.

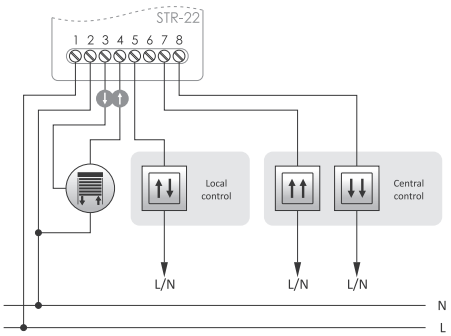
STR-2

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



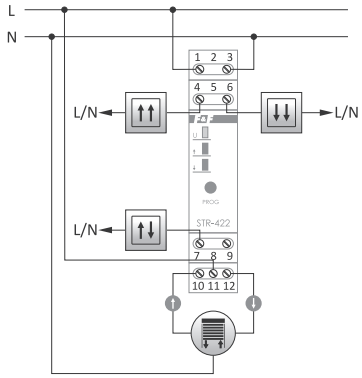
power supply	195÷253 V AC
maximum load current (AC-1/AC-3)	8 A/1.5 A
control	triggered with L or N level
control pulse current	<1 mA
switch-on time (adjustable)	0 s÷10 min.
power/programming indication	LED green
power consumption	<1 W
working temperature	-25÷50°C
signal terminal	4×DY 1 mm², L= 10 cm
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



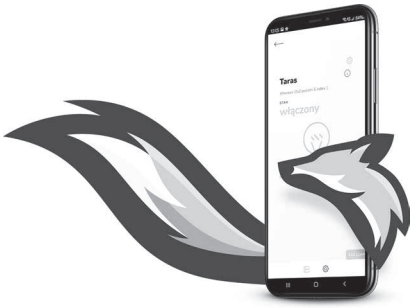
power supply	
STR-422 230 V	195÷253 V AC
STR-422 24 V	24 V AC/DC
maximum load current (AC-1/AC-3)	8 A/1.5 A
control	
STR-422 230 V	triggered with L or N level
STR-422 24 V	triggered with + level
control pulse current	<1 mA
switch-on time (adjustable)	0 s÷10 min.
power/programming indication	LED green
power indication	2×LED red
power consumption	<1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

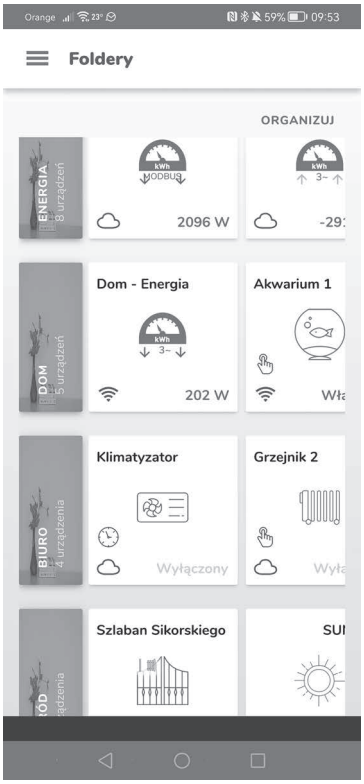
Chapter 10
Fox – Wi-Fi control system

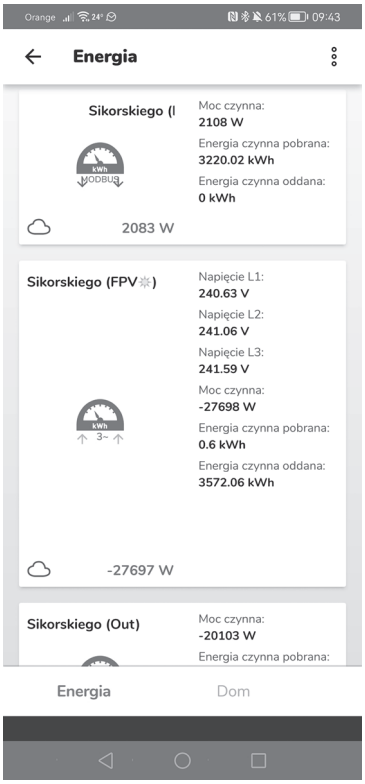
Easy to install and rich in possibilities, wireless home automation system

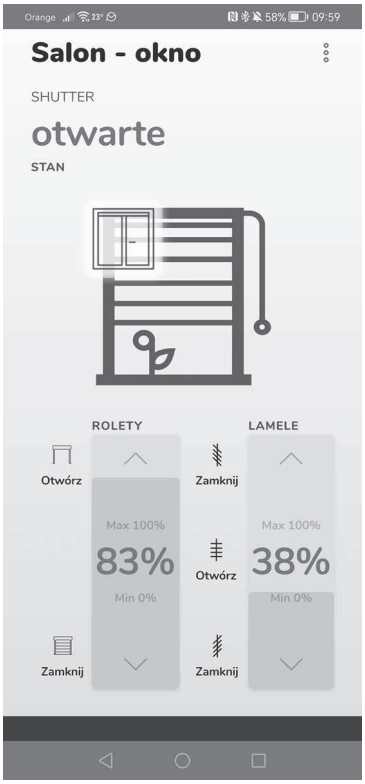
System characteristic

- 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 timers and astronomical programmers, also with the possibility of connecting online calendars (e.g. Google, Outlook);
- Easy to use, free mobile app for Android and iOS phones and tablets;
- Freedom to personalize application including: grouping devices, building scenes, arranging views in folders, choosing device icons;
- Clear presentation of information on energy production/consumption and other measured parameters;
- Works with Google voice assistant;
- Fully Polish software focused on security and users 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.

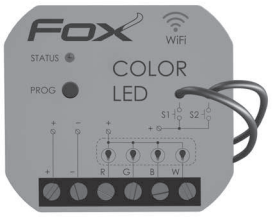


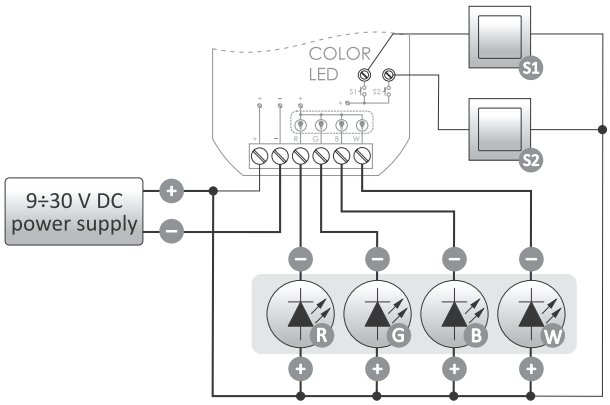






Color LED color LED controller, Wi-RGBW-P





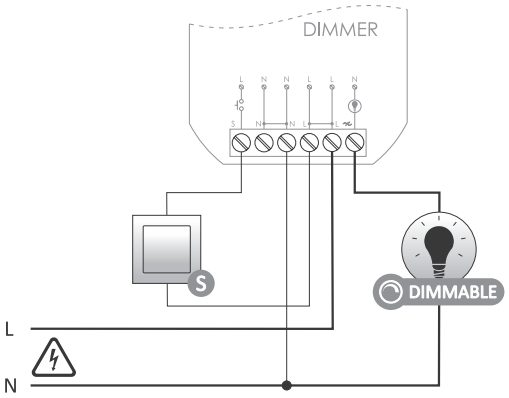
power supply	9÷30 V DC
control input	
control voltage	9÷30 V DC
control pulse current	<3 mA
maximum load current (AC-1)	
rated current	4 A/color
maximum current (instantaneous)	4 A/color
power consumption	
standby	<1.2 W
praca (output on)	<1.5 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
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 flush-mounted box Ø60
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. 53)

Dimmer 230 V dimmer, Wi-DIM1S1-P

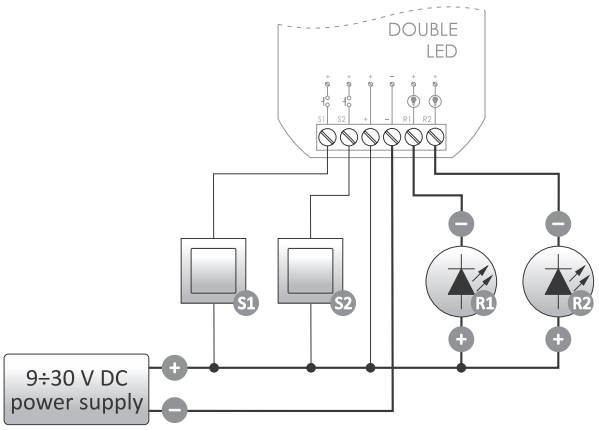


power supply	85÷265 V AC
control input	
control voltage	85÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	
rated current	180 W
maximum current (instantaneous)	300 W
power consumption	
standby	<1.2 W
operation (relay on)	<1.6 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
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 (no condensation of steam and aggressive gases)	<90%
dimensions	Ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box Ø60
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 12V LED dimmer, Wi-LED2S2-P



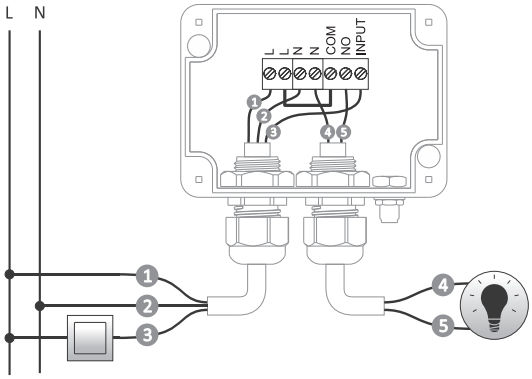
power supply	9÷30 V DC
control input	
control voltage	9÷30 V DC
control pulse current	<3 mA
maximum load current (AC-1)	
rated current	2×4 A
maximum current (instantaneous)	2×8 A
power consumption	
standby	<1.2 W
operation (outputs on)	<1.5 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
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 (no condensation of steam and aggressive gases)	<90%
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
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.

* The load capacity can be increased using additional amplifiers LED-AMP-1P or LED-AMP-1D (see p. 53)

Hermetic Box hermetic, single relay, Wi-R1S1-H



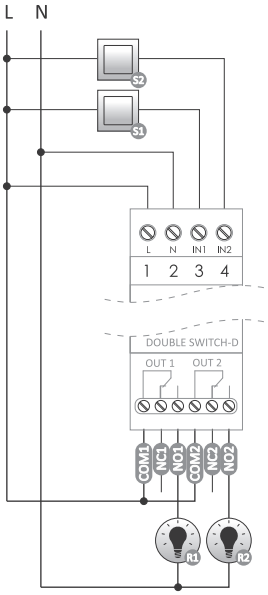
power supply	165÷265 V AC
control input	
control voltage	165÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	16 A
current overload capacity	120 A/20 ms
power consumption	
standby	<1.2 W
operation (relay on)	<2.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-30÷50°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions (without glands and antenna)	88×64×40 mm
mounting	surface
ingress protection	IP65

Functions

- Hermetic housing adapted for outdoor installation*;
- 1-channel 230 V relay with load capacity up to 16 A [AC-1] with separated NO output contact;
- Direct control of load circuits or integration with any garden automation;
- Relay contact suitable for loads with high initial current (such as LED lighting), up to 120 A/20 ms;
- Ability to connect local control button and set its function;
- Controlling receivers with a mobile app and time programmers;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of programmers even without a Wi-Fi connection;
- REST API support enabling integration of the relay with other home automation systems;
- Built-in thermal protection;
- External antenna for greater connection range.

* The level of protection depends on how the cables are mounted and clamped in the cable glands.

Double Switch-D double relay module, Wi-R2S2-D

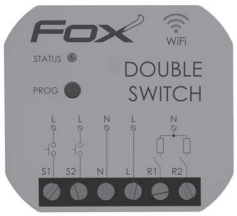


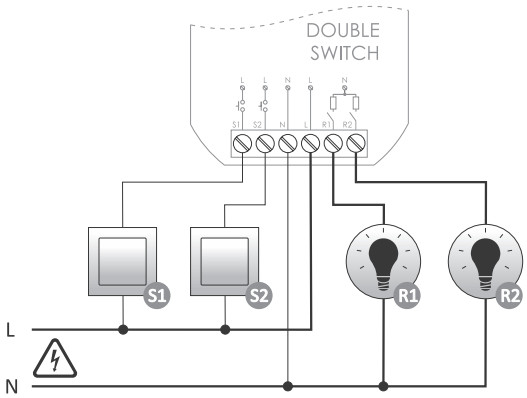
power supply	165÷265 V AC
control input	
control voltage	165÷265 V AC
control pulse current	<2 mA
maximum load current (AC-1)	2×16 A
power consumption	
standby	<1.2 W
operation (relays on)	<1,5 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	0÷45°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

- 2-channel 230 V relay with load capacity up to 16 A [AC-1] and with separated changeover contacts;
- Possibility to connect 2 external buttons for local control of the unit;
- Control of the receiver via mobile app and timers;
- Built-in clock with power backup and a backup copy of the operating program guarantees proper operation of programmers even without a Wi-Fi connection;
- REST API support enabling integration of the relay with other home automation systems;
- Built-in thermal protection;
- DIN rail mounting;
- 2S housing, external Wi-Fi antenna.

Double Switch double relay, Wi-R2S2-P





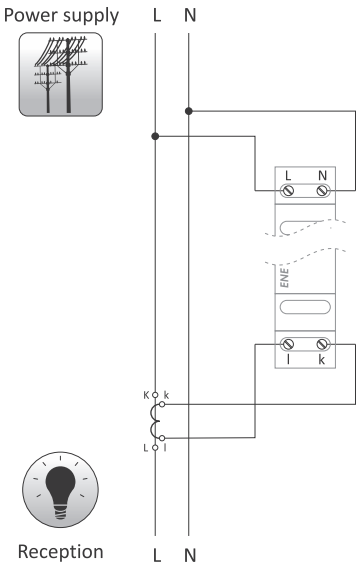
power supply	85÷265 V AC
control input	
control voltage	85÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	
rated current	2×5 A
maximum current (instantaneous)	2×8 A
power consumption	
standby	<1.2 W
operation (relay on)	<2.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
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 (no condensation of steam and aggressive gases)	<90%
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

Functions

- 2-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

Energy-1-40 1-phase energy consumption monitor, Wi-MEF-1

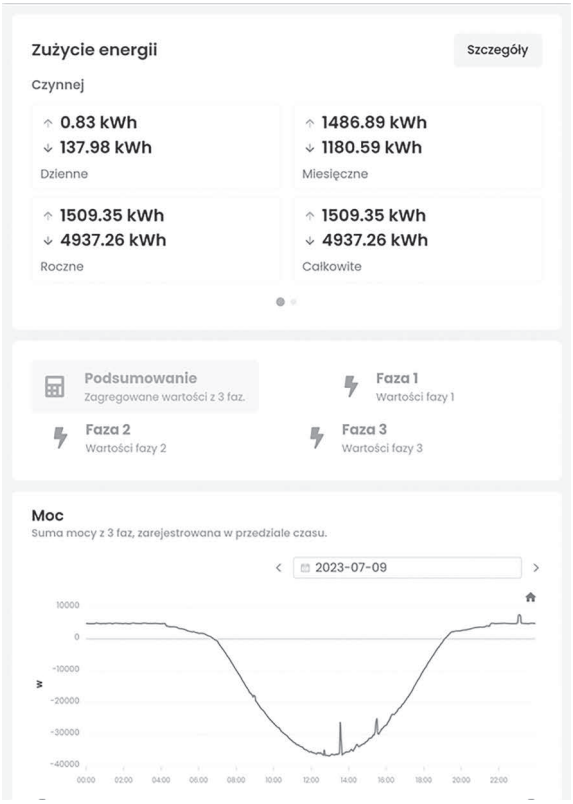


installation	1-phase, 2-wire
power supply	230 V AC
frequency	50÷60 Hz
transformer parameters	
primary current	40 A
secondary current	30 mA
accuracy	
meter	1%
measuring transformers	0.5%
cable diameter	10 mm
signalling	device status, presence of power, energy consumption
meter constant	1000 pulses/kWh
power consumption	<2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-20÷50°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

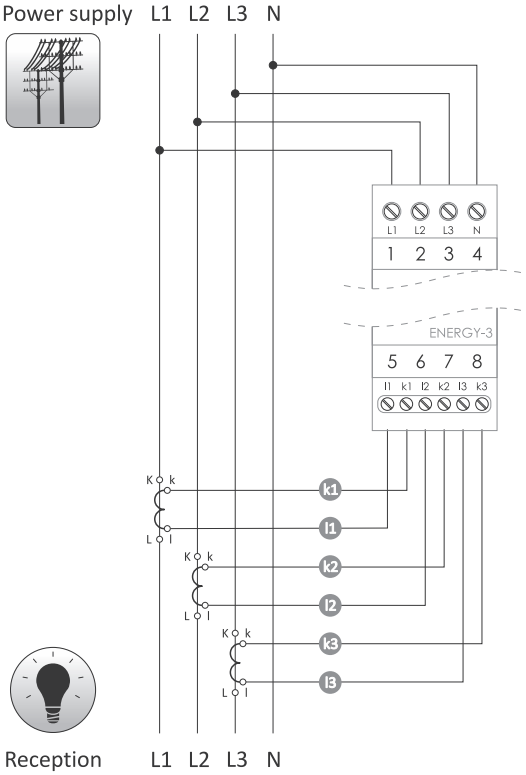
- 1-phase, 2-way, 4-quadrant energy consumption monitor, perfect for monitoring 1-phase photovoltaic systems, heat pumps, and energy consumption of household appliances such as:
- Monitoring of all relevant parameters of the electrical network;
- Registration of average, minimum and maximum values;
- Calculation of energy consumption for different tariff plans;
- Notifications in the event of energy over-consumption or abnormal supply voltage;
- Non-invasive installation using miniature opening current transformers;
- It comes with a 40 A transformer for a cable with a diameter of max. 10 millimeters
- High measurement accuracy;
- Ability to export data to spreadsheets;
- Access the measurement history via the app or a web browser;
- Mounting in a distribution box (DIN rail);
- No external antenna - can be installed even in shallow switchboards.

Fox app screen



Energy consumption summary

Energy-3-.../Energy-3-Opti-... 3-phase energy consumption monitor, Wi-MEF-3-...



installation	3-phase, 4-wire
power supply	3×230/400 V AC
frequency	50÷60 Hz
transformer parameters	
primary current	
Energy-3/Energy-3-Opti-40	40 A
Energy-3-100/Energy-3-Opti-100	100 A
Energy-3-200/Energy-3-Opti-200	200 A
Energy-3-400/Energy-3-Opti-400	400 A
secondary current	30 mA
accuracy	
meter	1%
measuring transformers	0.5%
cable diameter	
Energy-3/Energy-3-Opti-40	10 mm
Energy-3-100/Energy-3-Opti-100	16 mm
Energy-3-200/Energy-3-Opti-200	24 mm
Energy-3-400/Energy-3-Opti-400	36 mm
signalling	device status, presence of power, energy consumption
meter constant	1000 pulses/kWh
power consumption	<2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-20÷50°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

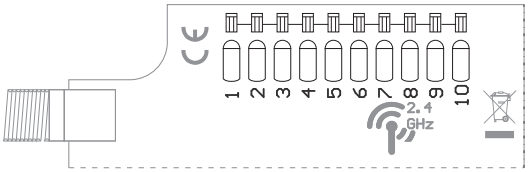
Functions

- 3-phase, 2-way, 4-quadrant energy consumption monitor, perfect for monitoring photovoltaic and ©heat pump installations;
- Monitoring of all relevant parameters of the electrical network;
- Registration of average, minimum and maximum values;
- Calculation of energy consumption for different tariff plans;
- Notifications in the event of energy over-consumption or abnormal supply voltage;
- Non-invasive installation using miniature opening current transformers;
- High measurement accuracy;
- 2 versions of the device:
  - » MEF-3 – with external Wi-Fi antenna (for use with poor Wi-Fi coverage);
  - » MEF-3-OPTI – with built-in antenna for locations with good Wi-Fi signal levels (excellent for shallow switchboards);
- Adapted to different current ranges: 40 A, 100 A, 200 A, 400 A;
- Ability to export data to spreadsheets;
- Access the measurement history via the app or a web browser;
- Mounting in a distribution box (DIN rail);

Table of types

Type	Index	Description
Energy-3	Wi-MEF-3-40	external antenna, 40 A range
Energy-3-100	Wi-MEF-3-100	external antenna, 100 A range
Energy-3-200	Wi-MEF-3-200	external antenna, 200 A range
Energy-3-400	Wi-MEF-3-400	external antenna, 400 A range
Energy-3-Opti-40	Wi-MEF-3-Opti-40	built-in antenna, 40 A range
Energy-3-Opti-100	Wi-MEF-3-Opti-100	built-in antenna, 100 A range
Energy-3-Opti-200	Wi-MEF-3-Opti-200	built-in antenna, 200 A range
Energy-3-Opti-400	Wi-MEF-3-Opti-400	built-in antenna, 400 A range

Gate gate controller Wi-Gate (Wi-TO2S2) and Wi-Gate-G (Wi-TO2S2-G)



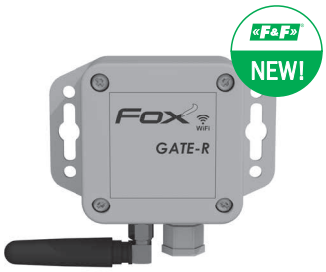
1. PWR +/-/~
2. PWR -/+/~
3. OUT 1 +
4. OUT 1 -
5. OUT 2 +
6. OUT 2 -
7. IN 1 +
8. IN 1 -
9. IN 2 +
10. IN 2 -

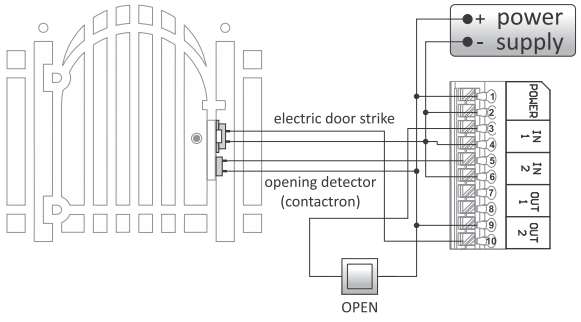
power supply	9÷30 V DC
	16÷27 V AC
control inputs	2
control voltage	9÷30 V DC
control pulse current	<3 mA
control outputs	
type	open collector
maximum load current (AC-1)	<20 mA
voltage	40 V
power consumption	
standby	<1.2 W
operation (output on)	<1.5 W
communication	
radio frequency	2.4 GHz
transmission	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-mounted
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).

Gate-R gate controller with relay output, Wi-TO2S2-R



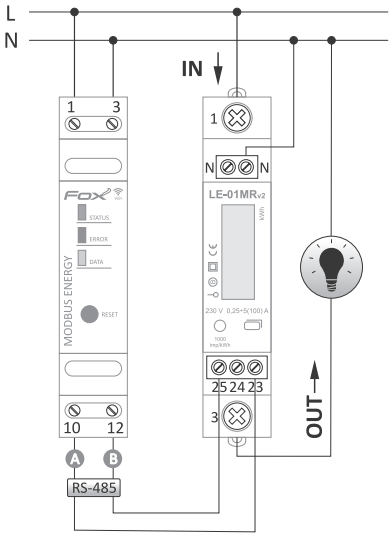


power supply	9÷30 V AC/DC
control inputs	2
type	digital
galvanic separation	yes
control voltage	9÷30 V AC/DC
control pulse current	<3 mA
outputs	2
type	relay
contact	1×NO
galvanic separation	yes
maximum load current	
resistive load	6 A
inductive/capacitive load	1.5 A
contact voltage	250 V AC/24 V DC
power consumption	
standby	<1.2 W
operation (relays on)	<2.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 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	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

- Designed for integration into any gate operator automation or for direct control of electric door openers and locks;
- 2 separated relay outputs with a load capacity of up to 6 A per channel;
- Control of a gate, 2 gates, gate and wicket, 2 wickets, ..;
- Operation of 2 separated local inputs allowing:
  - » Opening/closing a gate or wicket;
  - » Connection of sensors for opening/closing the gate or wicket;
- Google Assistant integration – possibility of voice gate opening e.g. via Android Auto;
- REST API support for integration of the controller with external systems (including Home Assistant, among others);
- External antenna to guarantee increased operating range;
- Hermetic housing suitable for outdoor installation;

Modbus Energy integrator of energy meters, Wi-Modbus-D



power supply	230 V AC
frequency	50÷60 Hz
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-20÷50°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

- Integration of energy meters manufactured by F&F with the Fox system;
- Extend the functionality of existing energy meters to record and visualize energy consumption and electrical network parameters;
- The ability to connect MID-declaration-compliant energy meters to the Fox system;
- 1 energy meter can be connected to each Modbus Energy device;
- Monitoring of all relevant parameters of the electrical network*;
- Registration of average, minimum and maximum values;
- Calculation of energy consumption for different tariff plans;
- Notifications in the event of energy over-consumption or abnormal supply voltage;
- High measurement accuracy;
- Ability to export data to spreadsheets;
- Access the measurement history via the app or a web browser;
- Mounting in a distribution box (DIN rail);
- Power supply directly from the 230 V mains;
- No external antenna - can be installed even in shallow switchboards.

* The number of parameters recorded depends on the capabilities of the connected meter.

Supported energy meters

- LE-01MR;
- LE-01MQ;
- LE-01MW;
- LE-03MQ;
- LE-03MQ CT;
- LE-03MW;
- LE-03MW CT.

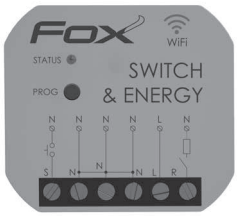
Devices related to Fox system

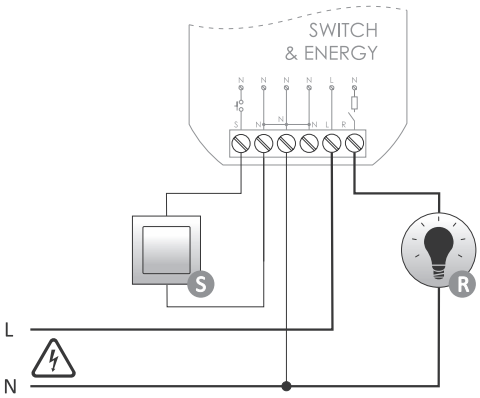
FPV3-4K / FPV3-6K / FPV3-8K / FPV3-10K FPV3 series photovoltaic inverters

Works with system

More information on p. 217

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





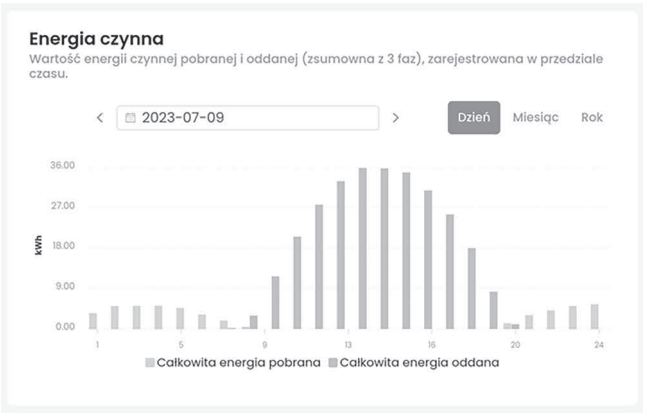
power supply	85÷265 V AC
control input	
control voltage	85÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	
rated current	10 A
maximum current (instantaneous)	16 A
power consumption	
standby	<1.2 W
operation (relay on)	<2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<13 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	0÷45°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

Functions

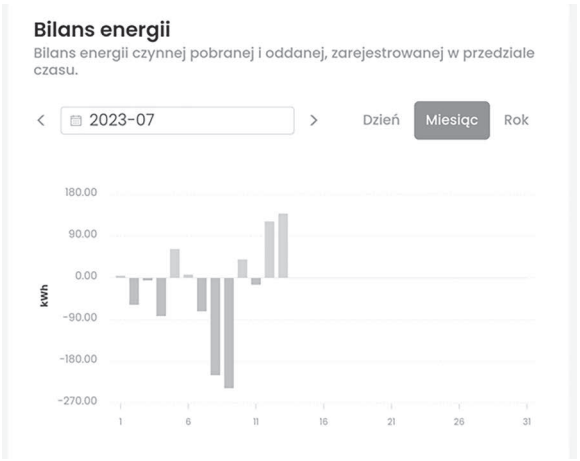
- 1-channel 230 V relay with 10 A rated capacity and 16 A* maximum capacity;
- Ability to connect local control buttons and set its function;
- Monitoring of network parameters: voltage, current, power (active and reactive), energy (active and reactive);
- Power limitation can be set, also in connection 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

Fox app screens

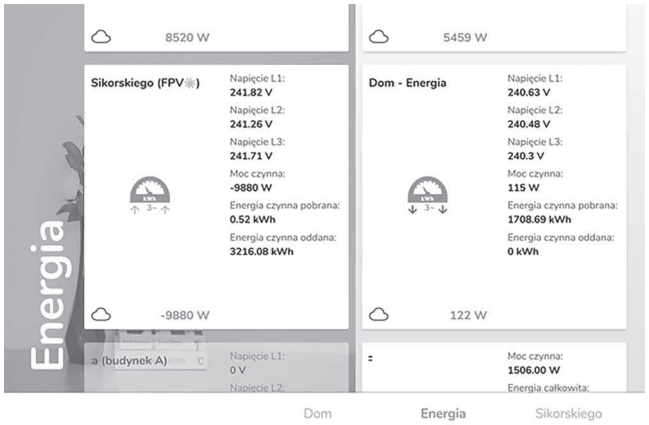


Daily active energy chart



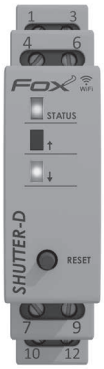
Monthly energy consumption balance

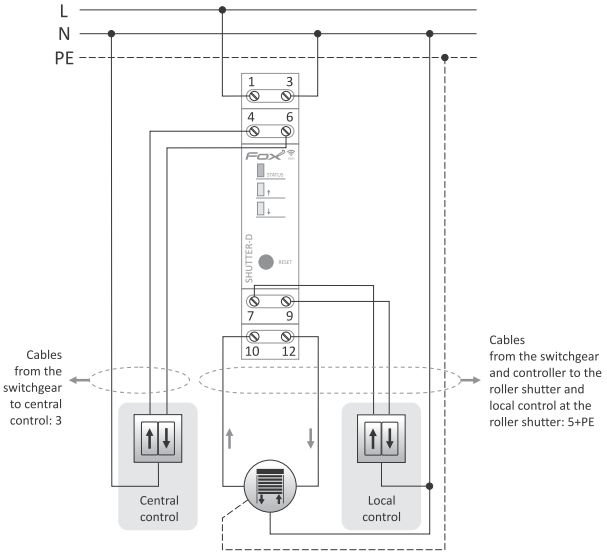
Diagram of voltage over a specific time interval



Application view

Shutter-D 230 V roller shutter controller for DIN rail, Wi-STR1S4-D



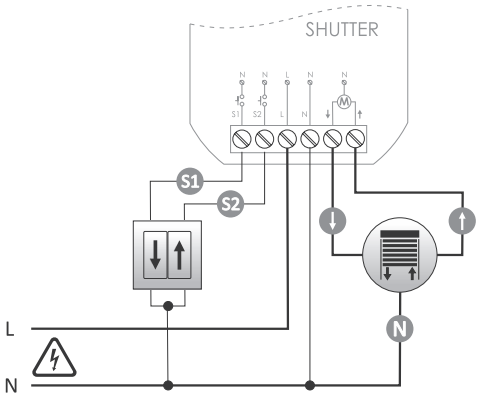


power supply	165÷265 V AC
control input	
control voltage	165÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	
resistive (AC-1)	6 A
motor (AC-3)	1.5 A/320 W
power consumption	
standby	<0.8 W
operation (motor on)	<1.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	0÷45°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

- Control of a single roller shutter with a with a load capacity of up to 320 W;
- Direct connection of buttons for local and central control;
- Ability to control the pitch of the slats;
- Set the desired level of roller shutter opening and slat tilt using the mobile app and timers;
- 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 programmers even without a Wi-Fi connection;
- Built-in thermal protection;
- Mounting in a distribution box (DIN rail);
- No external antenna - can be installed even in shallow switchboards;
- The ability to easily replace the classic STR-421 and STR-3D controllers with the Fox solution.

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

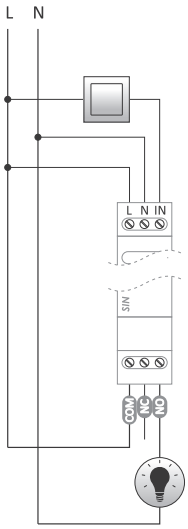


power supply	165÷265 V AC
control input	
control voltage	165÷265 V AC
control pulse current	<1 mA
maximum load current (AC-1)	
resistive (AC-1)	6 A
motor (AC-3)	1.5 A/320 W
power consumption	
standby	<1.2 W
operation (relay on)	<2.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	0÷45°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	ø54 (size 48×43 mm), H= 25 mm
mounting	in flush-mounted box ø60
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.

Single Switch-D single relay module, Wi-R1S1-D

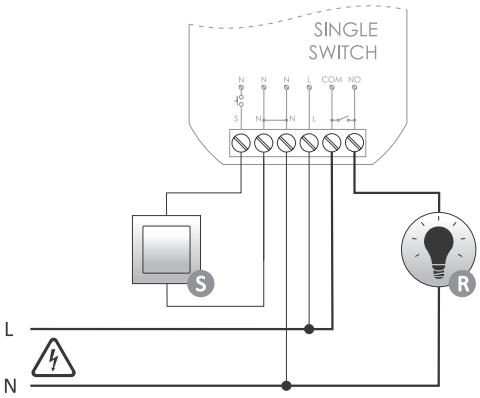


power supply	165÷265 V AC
control input	
control voltage	165÷265 V AC
control pulse current	<2 mA
maximum load current (AC-1)	16 A
power consumption	
standby	<1.2 W
operation (relays on)	<2.2 W
communication	
radio frequency	2.4 GHz
transmission	Wi-Fi
radio power	<20 dBm
receiver sensitivity	-98 dBm
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	0÷45°C
humidity (no condensation of steam and aggressive gases)	<90%
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Functions

- 1-channel 230 V relay with up to 16 A [AC-1] load capacity and with separated NO/NC changeover contact;
- Possibility to connect an external button for local control of the unit;
- Receiver control via mobile app and timers;
- Built-in clock with power backup and own copy of the operating programme, guaranteeing correct functioning also without Wi-Fi connection;
- REST API support to integrate the controller also into other home automation systems;
- Built-in thermal protection;
- Mounting in a distribution box (DIN rail);
- 1S housing.

Single Switch single relay, Wi-R1S1P-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)	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 (no condensation of steam and aggressive gases)	<90%
dimensions	ø54 (size 48×43 mm), H= 20 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

Functions

- 1-channel 230 V relay with up to 16 A [AC-1]* load capacity and separated NO output contact;
- Possibility of connecting a local control button and setting its function;
- Receiver control via mobile app and timers;
- Built-in clock with power backup and own copy of the operating programme, guaranteeing correct functioning also without Wi-Fi connection;
- REST API support to integrate the controller also into other home automation systems;
- Built-in thermal protection;
- Convenient mounting in an installation box with a diameter of 60 mm.

The standard of the future in your home

Purpose

F&Home is a comprehensive system designed for apartments, single-family homes and utility and industrial objects. Provides all building automation functionalities and integration with external systems:

- Management and control of any type of heating;
- 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, and household appliances;
- Control of sprinklers and integration with irrigation systems;
- Control and management of air conditioning, heat recovery, and ventilation;
- Remote control via a dedicated app;
- Integration with alarms and access control systems.

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 characteristic

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 hybrid system that incorporates wired (CAN bus) and wireless (proprietary radio) devices for controlling lighting, blinds, heating, air conditioning, and other devices powered by any voltage. An essential feature of the system is the unrestricted use of accessories. It is compatible with buttons, switches, and sockets from any manufacturer, including DOMINO equipment produced by F&F

Software

The system is based on proprietary software – both on the server side and mobile applications. Remote access is provided by the cloud developed by F&F, which allows for control from anywhere on Earth and system configuration. The configuration process is carried out through a www (logging into the local IP address of the server) based on the NodeRED tool.

Advantages of the system

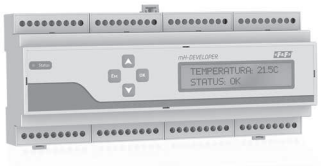
- Operational stability – efficient and stable servers guarantee reliable and swift control based on programmed logic.
- Quality - the CAN bus ensures correct and error-free operation of all wired devices.
- Server-based architecture allows us to achieve unprecedented functionality using a relatively narrow range of universal actuator and sensory elements.
- Flexible system expansion and scaling;
- Non-invasive installation of radio system components through 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 modernisation of existing installations without costly and time-consuming renovation work.
- Easy reconfiguration of system components in the event of expansion of the house, apartment, or an increase in user requirements or change in household preferences.
- The ability to connect and control the operation of already installed devices without the remote control feature that makes 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.).

System installation

The F&Home system may only be installed by a qualified installer who has received training in installation, operation, and configuration. If an independent or unauthorised installer is used, the F&F company may refuse to provide free technical support and terminate the warranty conditions for the system's components and installation.
The authorised installer holds an individual card with his name, surname and authorisation number.

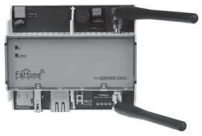
Central unit

The central element of the system is the server, which comes in many variants – it is selected according to the object's characteristics and the client's needs. The server can be a standalone unit in the installation – the DEVELOPER version has onboard digital inputs/outputs, temperature sensor support, and solenoid valves. A separate group of central units is servers equipped with radio, which enables wireless control through 868 MHz data transmission.



The mH-DEVELOPER is the most basic and most developed server. It has an onboard programmable central unit, digital (relay) and temperature inputs and outputs, and support for CAN and Modbus protocols.

The mH-DEVELOPER MINI – a server containing a programmable central unit, as well as digital (relay) and temperature inputs-outputs. The device differs from the mH-DEVELOPER by having fewer I/O and temperature inputs and lacks support for CAN and modBUS protocols. The advantages of this server are its small size and attractive list price.



The rH-DIN2 Server – a server featuring a programmable central unit, 868MHz radio (support for wireless devices) and the Modbus protocol.

The rH-SERVER 2.0 – a server containing a programmable central unit and 868 MHz radio (support for wireless devices).

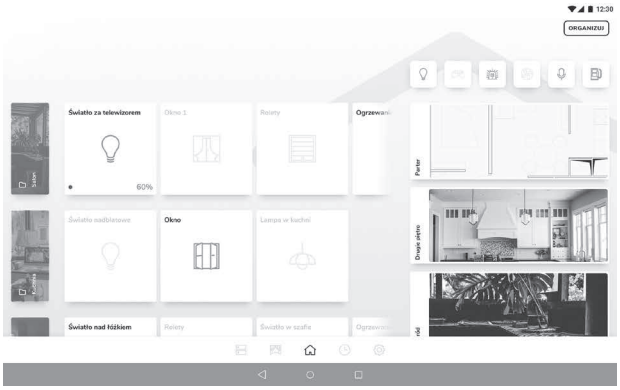
Offer for Developers

A complete apartment control system can be built in multi-family housing based on the mH-DEVELOPER or mH-DEVELOPER MINI server. This system is designed to control heating, lighting, and electrical outlets and allows for additional integration. The main module is a standalone unit developed based on a detailed analysis of customer needs and in collaboration with developers. The basic module can also be extended with other functionalities (control of roller shutters, gates, RGB lighting, and garden watering) using extension modules from the F&Home system.
The main module and the extension elements are mounted in the switchgear.
The system does not require the installation of additional devices under the buttons, so it does not require the use of deepened boxes.
The whole system is characterised by a simple installation, compact design, and functional mobile application that allows you to configure and control the system's elements.
Using the central unit provides considerable opportunities in the field of home automation:

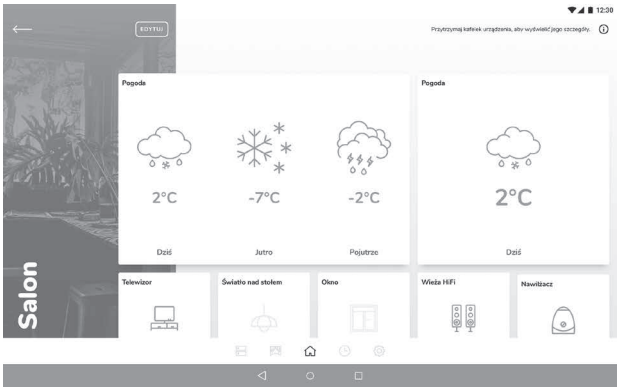
- Heating control;
- Ability to connect an external temperature sensor;
- Light and electrical socket control;
- Control of water, gas and other media valves;
- Scenarios (device grouping);
- Time programming of devices (programmers);
- Control via mobile applications for Android and iOS;
- Remote control via the cloud.

Application

An integral part of the system is a mobile application for configuring and controlling devices connected to the mH-DEVELOPER module. The app can be personalised – each user can have their own configuration (for example, children do not need to control all devices).
The module's connection is carried out automatically – when we are at home, we connect locally (via WIFI). While we are away from home, the application switches to cloud-based control

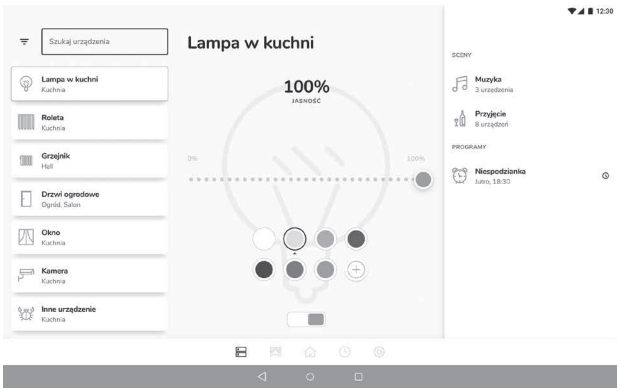


Mobile app: Management of devices in individual rooms



Mobile app: Weather forecast

Mobile app: Management of heating



Mobile app: Lighting management

F&F cloud

Remote control of intelligent systems requires a connection through an external cloud service. In the case of F&Home, the proprietary F&F cloud was designed from the beginning with systems in mind that need to be controlled remotely (outside the local network). The F&F Cloud supports the F&Home system and FOX – a simple Wi-Fi control system.
The advantages of the F&F cloud are efficiency (there is practically no difference in device response speed, although this may depend on the connection speed – especially on the phone), safety, and operational stability. Regarding security, it should be emphasised that the F&F cloud only establishes a connection between the customer's phone and his smart installation – it does not store any data itself. It cannot directly connect with installations, which makes it highly secure.

Type	Description
mH-DEVELOPER	Central unit, 12 inputs/12 outputs, 9 temperature sensors
mH-DEVELOPER MINI	Central unit, 6 inputs/6 outputs, 3 temperature sensors
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-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
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-AC15S4R4	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-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-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-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-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

Section III
Remote control

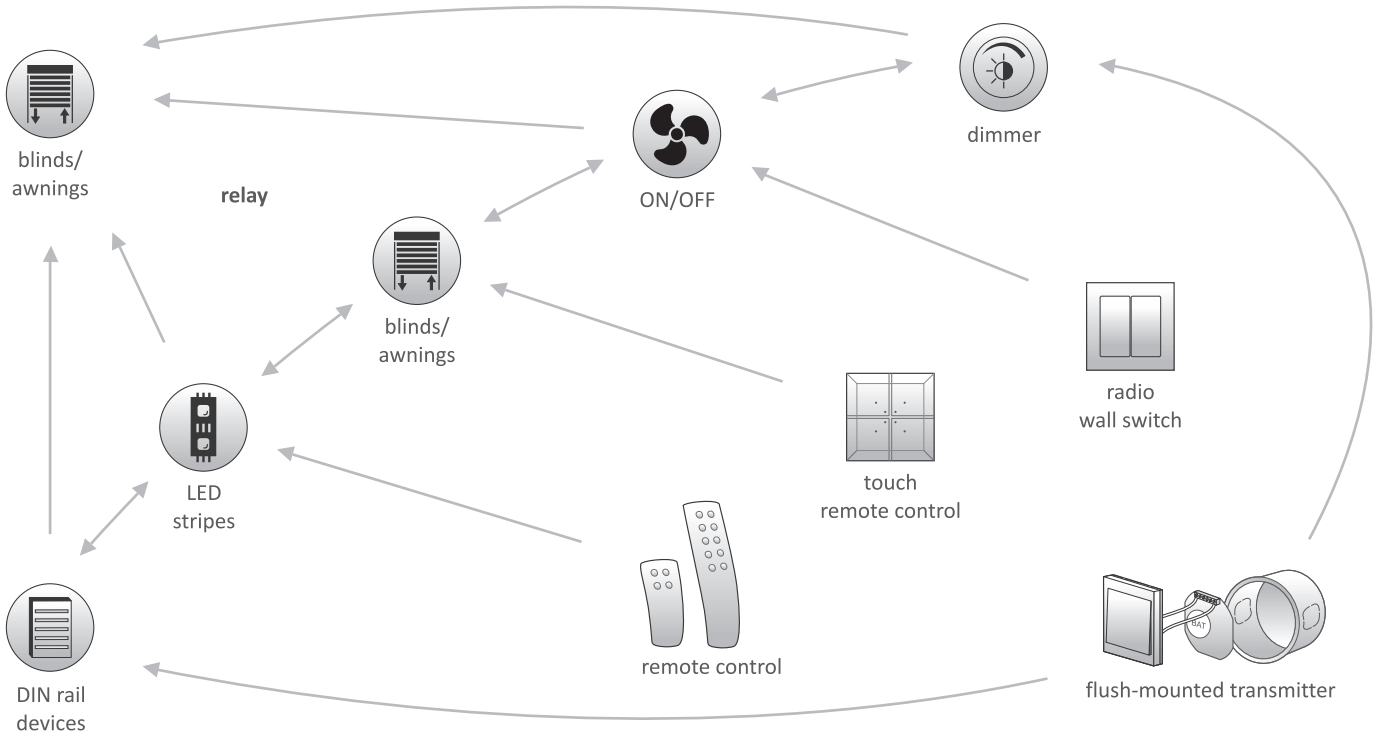
F&Wave – radio control system

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.



FW-SET1 2×FW-R1P + 1×FW-KEY set

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

FW-R1P	
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-SET2 1×FW-R1P-P + 1×FW-WSO2 set

FW-WSO2	
power supply	3 V
battery	2032 (lithium)
voltage	3 V DC
power consumption	
pressed button	20 mA
standby	15 nA
battery life	approx. 10 hours broadcasting (key pressed on 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-R1P-P	
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-SET3 FW-TO1S1 + 2×FW-KEY set

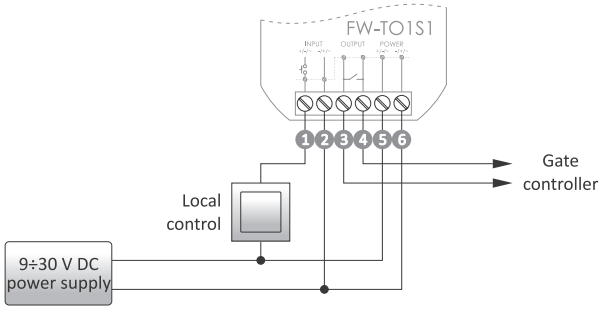
FW-KEY	
power supply	3 V
battery	CR2032
radio frequency	868 MHz
power consumption	
standby	0.04 µW
on	50 mW
dimensions	36×59 mm

FW-TO1S1	
power supply	9÷30 V AC/DC
control	9÷30 V AC/DC
control pulse current	<3 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-TO1S1 single controller for gates and wickets

Functions

- Dedicated to integration with gate automation or direct control of electric door openers;
- Monostable mode – the relay contact remains closed as long as the button on the remote control or the local control button is pressed;
- Local control – the ability to directly control the relay using any momentary (bell) button;
- The relay can be controlled from 32 transmitters.



power supply	9÷30 V AC/DC
control	9÷30 V AC/DC
control pulse current	<3 mA
power consumption	
standby	0.25 W
on (relay)	0.6 W
output load (AC-1)	8 A/250 V
radio frequency	868 MHz
maximum power of emitted frequency	10 mW
working temperature	-25÷65°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

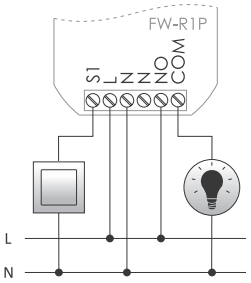
ON/OFF relays

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.

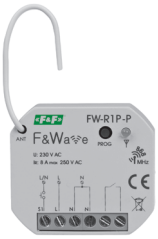
FW-R1P single bistable relay

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

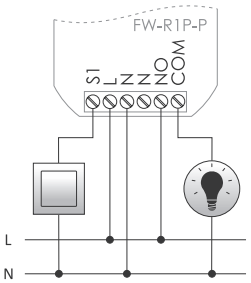


power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
on	0.6 W
output load (AC-1)	8 A/250 V
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	43×48×20 mm
mounting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

FW-R1P-P single multifunctional relay



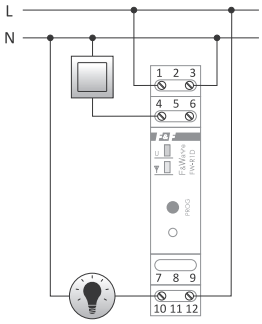
- 1-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters;
- Separated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

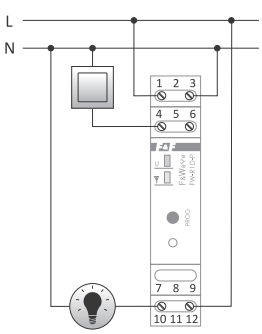
- 1-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters;
- Separated output contact.



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

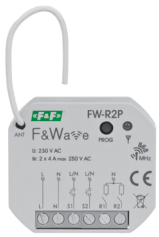
FW-R1D-P single multifunctional relay

- 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.

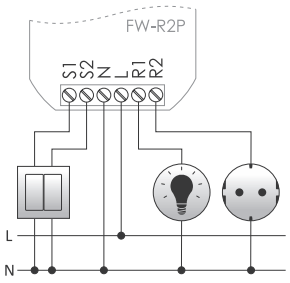


power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
on	0.6 W
output load (AC-1)	16 A/250 V
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)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

FW-R2P double bistable relay



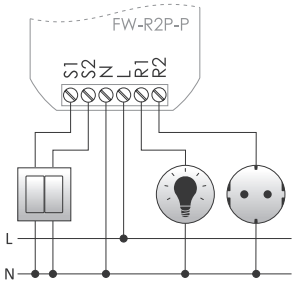
- 2-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters.



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

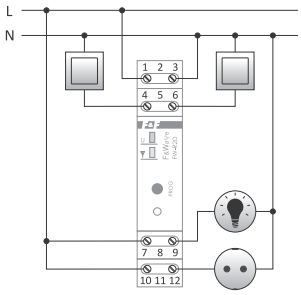
- 2-channel multifunctional relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting the relay with 32 transmitters.



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

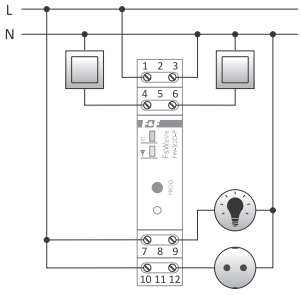
- 2-channel bistable relay;
- Local and remote control;
- The relay can be connected with 8 transmitters;
- 2 independently separated output contacts.



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.

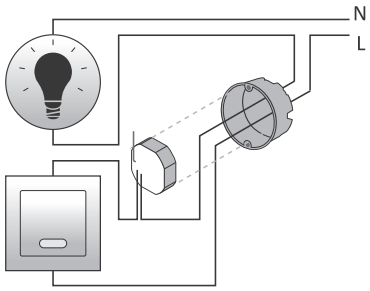


power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
on (2 relays)	1 W
output load (AC-1)	2×16 A/250 V
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module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

Multifunction relays without neutral wire

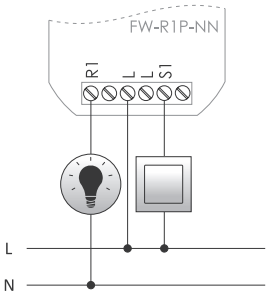
Purpose

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

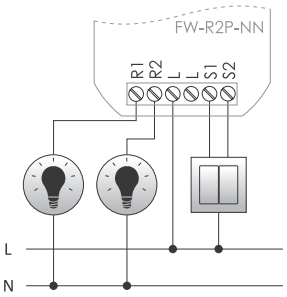
- The power supply in standard 2-wire installation (no neutral wire in the switch box);
- 1-channel multifunctional bistable relay:
  – bistable (ON/OFF);
  – monostable (pulse);
  – time (from 1 s to 48 hours);
  – always on (ON);
  – always off (OFF);
- Each button/transmitter (local and remote) can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

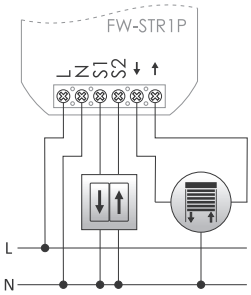
power supply	195÷265 V AC
working temperature	-25÷50°C
terminal	2×LY 0.75 mm²
dimensions	12×26×11.5 mm
ingress protection	IP20

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

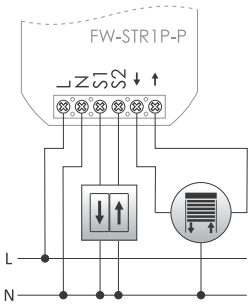
- 230 V drive controller;
- 2-button local and remote control;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- The relay can be connected with 8 transmitters.



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

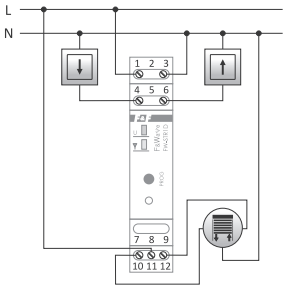
- 230 V drive controller;
- Local and remote control:
  – 1-button;
  – 2-button;
  – 2-button central;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- Each button/transmitter (local and remote) can perform a different function;
- Possibility of connecting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

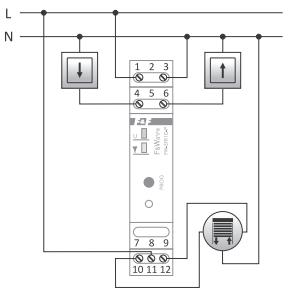
- 230 V drive controller;
- 2-button local and remote control;
- Lock feature to prevent the power supply to both motor windings from being switched on;
- The relay can be connected with 8 transmitters.



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

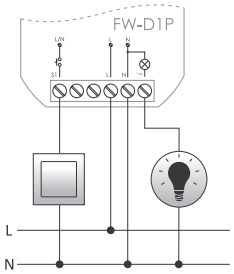
Purpose

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 single 230 V AC universal dimmer (incandescent, ELS, LED)

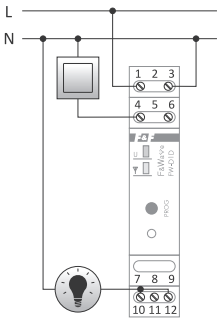
- 1-channel universal dimmer supports:
  – light bulbs;
  – halogen lamps;
  – ELS fluorescent lamps;
  (with dimming feature);
  – 230 V LED lamps
  (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with 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 ø60
ingress protection	IP20

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

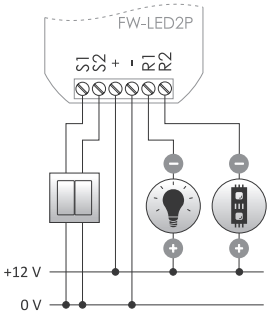
- 1-channel universal dimmer supports:
  – light bulbs;
  – halogen lamps;
  – ELS fluorescent lamps;
  (with dimming feature);
  – 230 V LED lamps
  (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with 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 double 12 V DC LED controller

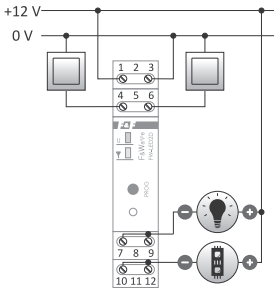
- 2-channel 12 V LED dimmer supports:
  – 12 V LED strips (with dimming feature);
  – 12 V LED lamps (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The 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)	2×4 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 ø60
ingress protection	IP20

FW-LED2D double 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)	2×6 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 single 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 ø60 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

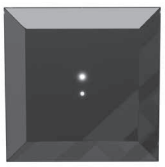
Product	Button type	Panel	Description
FW-GS1-230-W	single		F&Wave transmitter integrated with the glass panel 81×81 mm, 230 V power supply
FW-GS1-24-W	single		F&Wave transmitter integrated with the glass panel 81×81 mm, 24 V power supply
FW-GS1-230-B	single		F&Wave transmitter integrated with the glass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

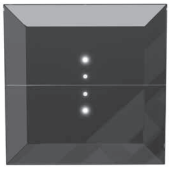
FW-GS1-24-W
FW-GS1-230-W
rH-S1L1-24-W
rH-S1L1-230-W

FW-GS2-24-W
FW-GS2-230-W
rH-S2L2-24-W
rH-S2L2-230-W

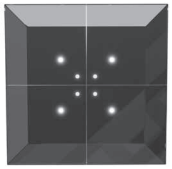
FW-GS4-24-W
FW-GS4-230-W
rH-S4L4-24-W
rH-S4L4-230-W



FW-GS1-24-B
FW-GS1-230-B
rH-S1L1-24-B
rH-S1L1-230-B



FW-GS2-24-B
FW-GS2-230-B
rH-S2L2-24-B
rH-S2L2-230-B



FW-GS4-24-B
FW-GS4-230-B
rH-S4L4-24-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 ø60 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 ø60
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 ø60 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 ø60
ingress protection	IP20

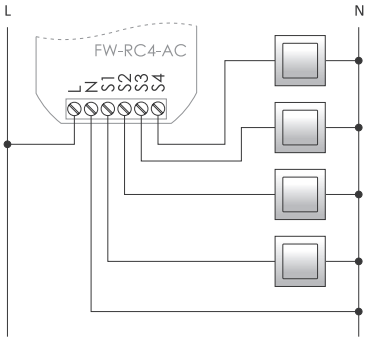
Variants of execution

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	48×43×20 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			
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

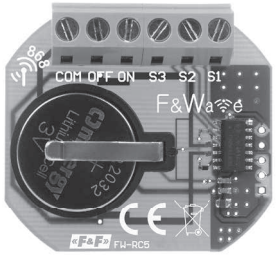
power supply	3 V
battery	CR2032
radio frequency	868 MHz
power consumption	
standby	0.04 µW
on	50 mW
dimensions	36×59 mm

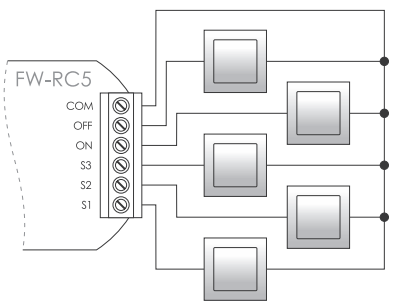
Very low power consumption in the standby mode extends battery life.

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 single remote control transmitter (battery)
FW-WS02 double 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 quadruple remote control transmitter (battery)

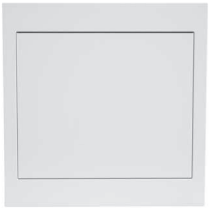
Works with the Sonata accessories family from OSPEL®

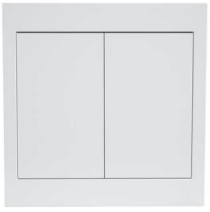
Purpose

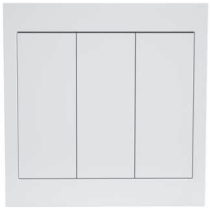
The **FW-WSO4** is a 2-key, 4-channel remote control transmitter belonging to the Sonata equipment family from Ospel and is dedicated to operating with all devices of the F&Wave system.

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-key, radio wall-button
FW-WS2 2-key, radio wall-button
FW-WS3 3-key, radio wall-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

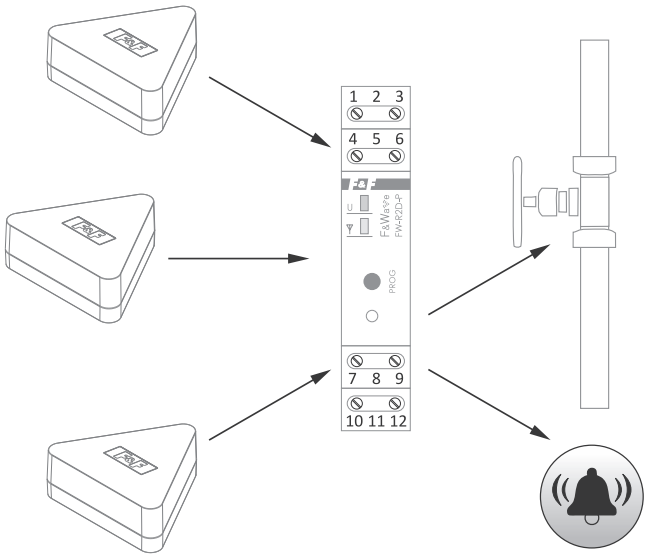
The FW-FS1 is a wireless sensor designed to detect the presence of water and other conductive liquids. Information about the presence of water is transmitted via radio to F&Wave* receivers, through which an external alarm can be activated or the water supply shut off. The sensor is additionally equipped 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



GSM remote control

Remote controls relays

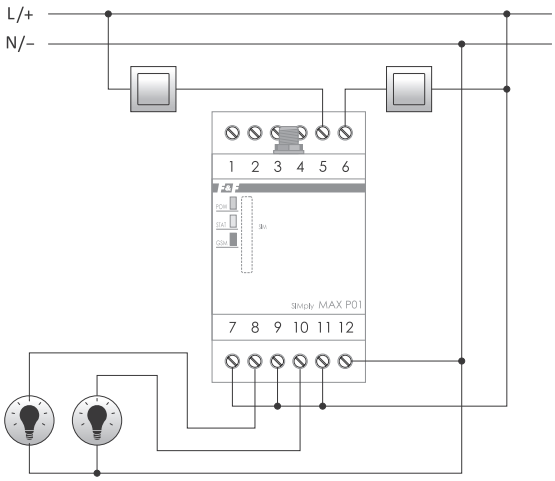
Purpose

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

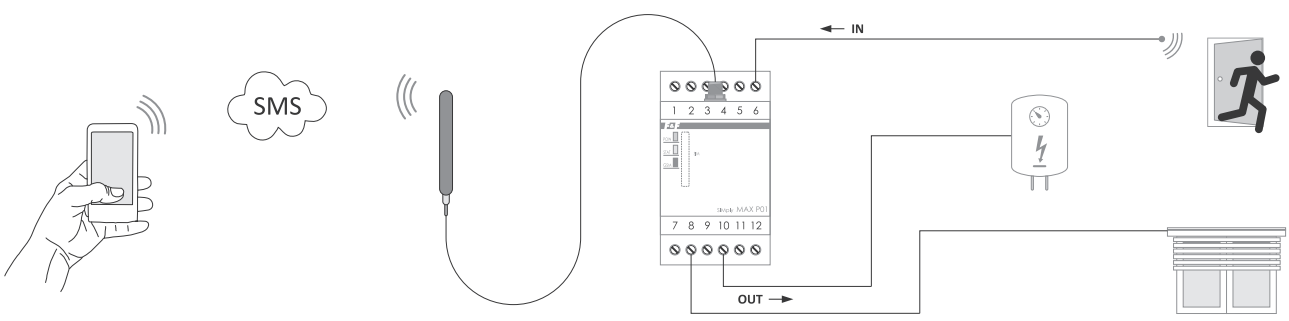
GSM antenna

connector	SMA
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.



SIMply MAX P04 with on/off/alarm feature

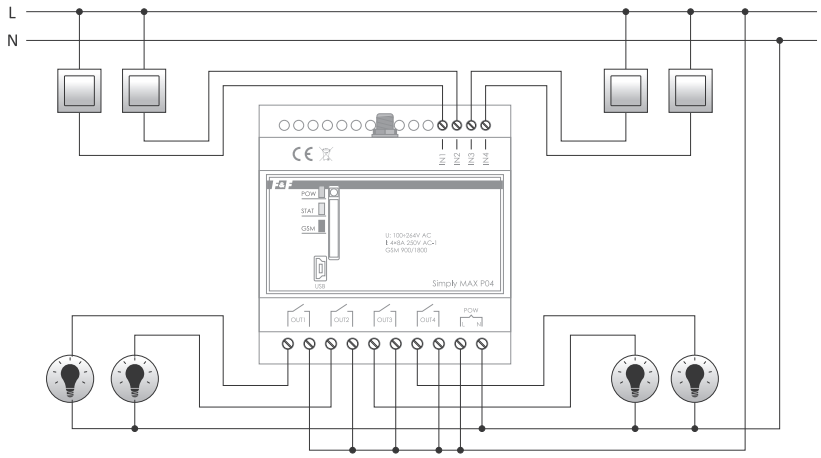
Purpose

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

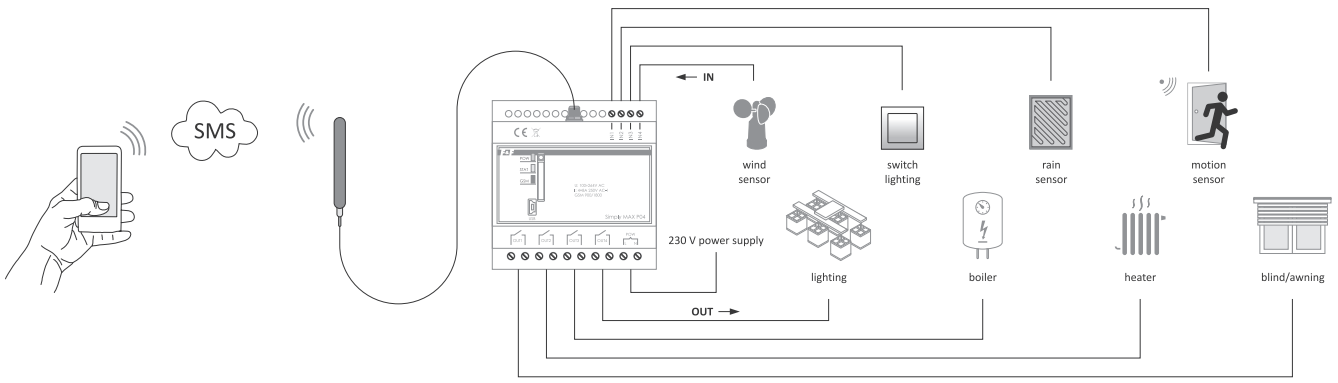
GSM antenna

connector	SMA
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.

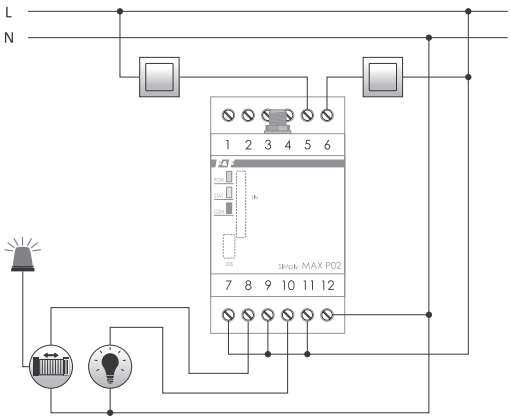


Cost-free GSM control of the gate, gateway and barrier control

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

Purpose

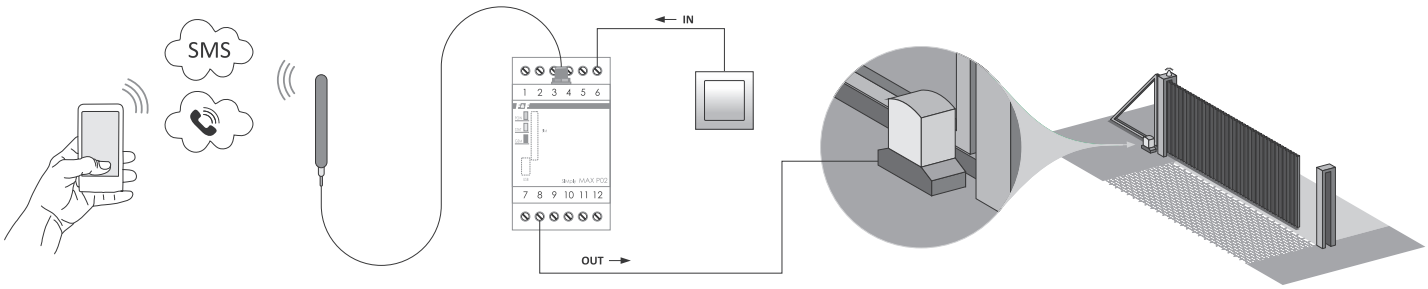
The MAX P02 relay with a built-in GSM communicator is used to remotely open automatic entrance gates, garage doors, barriers and gates using a mobile phone. It applies to objects with protected access and a large number of users with access rights, such as housing estates, garages, public and company 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	
connector	SMA
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.



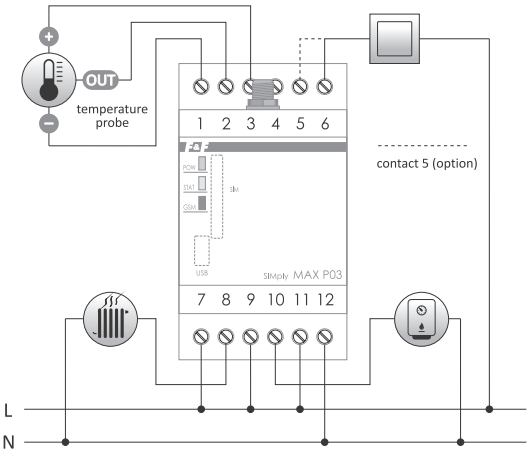
Functions

- 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

Purpose

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 anntena

connector	SMA
antenna dimensions	20×100 mm
wire lenght	2.5 m
mounting	self-adhesive tape

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.

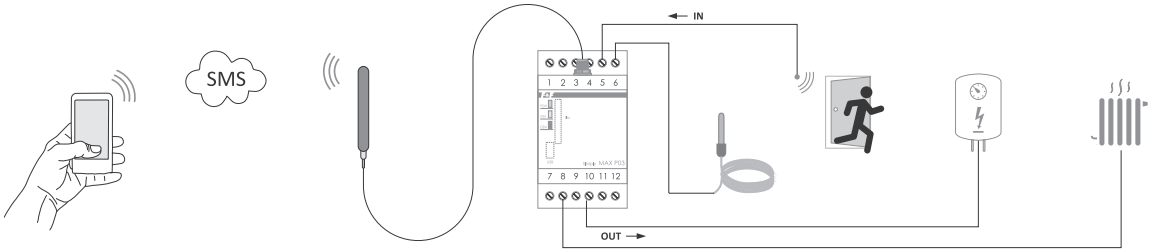
4. Anti-freeze temperature
- The anti-freeze feature can be switched on/off (ON/OFF);
- The activated function works despite the inactive temperature control.

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;

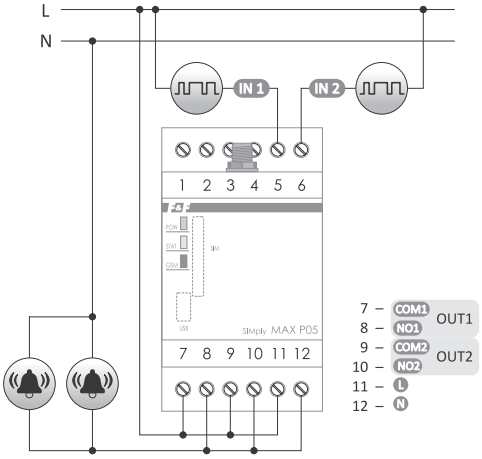
6. Input IN
- Redefinition of the input name, for example: IN1= TUMPER DETECT;
- Select the option to trigger an SMS message: ON - signal appears; OFF - signal loss; ON/OFF - loss and appearance of the signal;
- Notifications about input activation are sent to 5 phone numbers.



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	
connector	SMA
antenna dimensions	20×100 mm
wire lenght	2.5 m
mounting	self-adhesive tape

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:

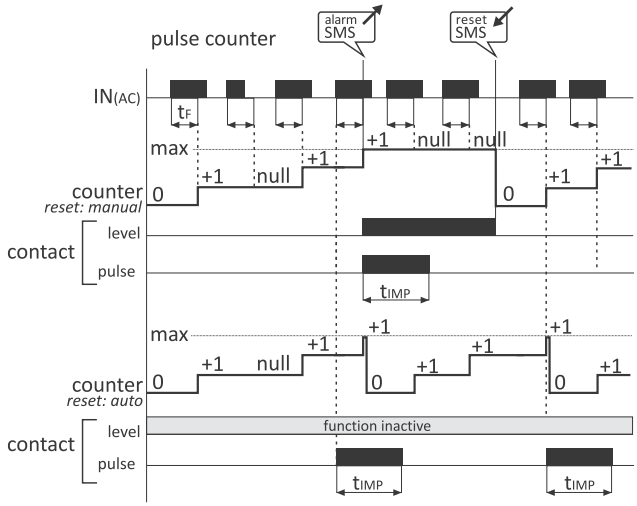
  – output controlled directly by SMS commands;
  – redefinition of the output name, for example: OUT1= POMPE;
  – ON/OFF control and time switching on of the output;

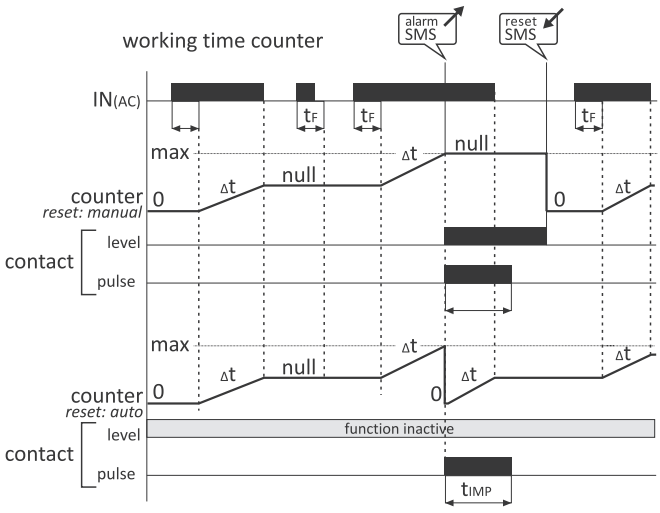
  ALARM mode:

  – 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.

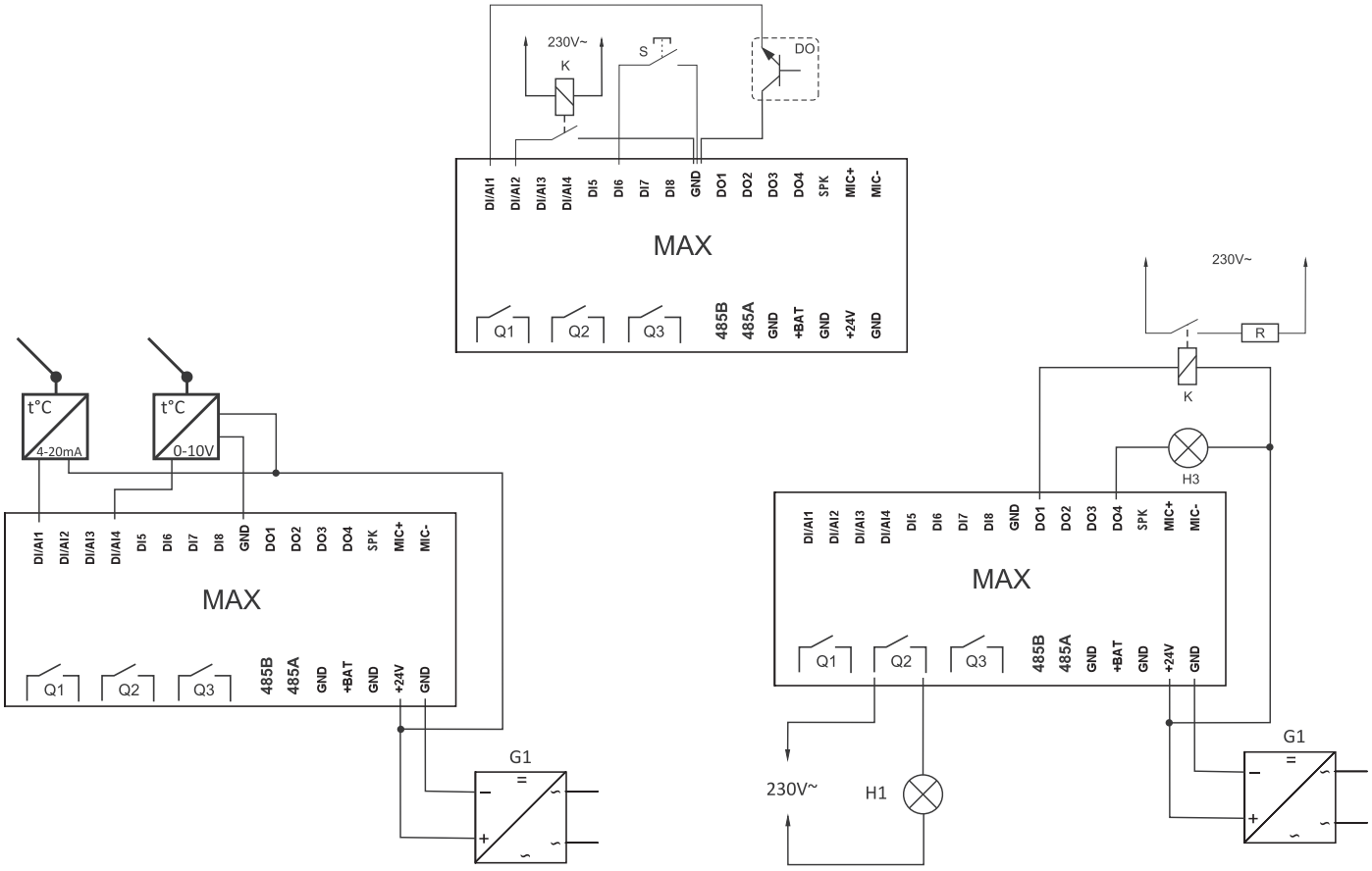
Hardware resources, which means the number of outputs/inputs and software functions allow us to connect only one controller and use all functions analogous to those of Simply MAX P-series relays. This allows you to easily control the system through one device and one phone number, and avoid the costs 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



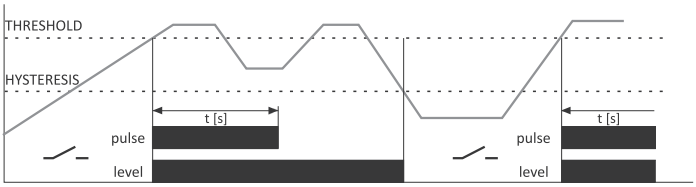
H04 Config PC configuration software

Purpose

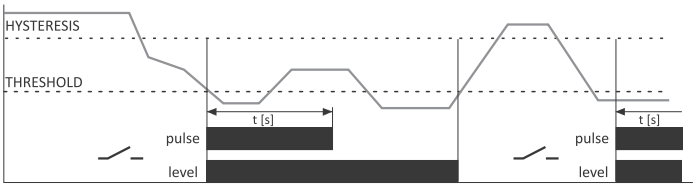
An easy and simple way to configure the controller using H04 Config.
Definition of phones, a setting of alarm thresholds, scaling of analog inputs, time synchronization, etc.

Functions

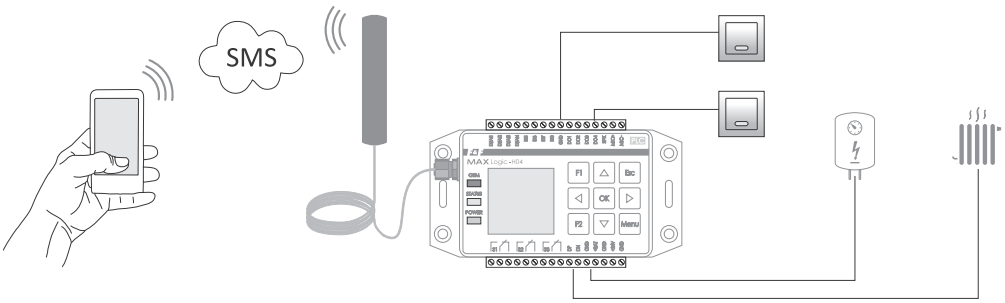
- Control of outputs via SMS commands;
- Two-state regulation of the HEATING/COOLING type (based on the definitions of the analog input scale, threshold, and output assigned to it);
- Selection of options for actuation and alarm triggering (high state "1" or low state "0");
- Queries about the status 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);



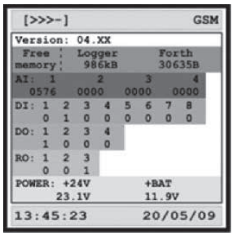
– PULSE option - time activation of the output for a set time after the input has been activated;

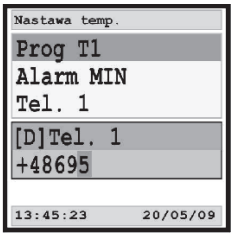


- Printing of states and values on LCD;
- User menu for settings of alarm threshold values and adjustments, telephone numbers, control options, etc.
- Control of the selected output as a function of CLIP (dial-up access) and astronomical clock.



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.

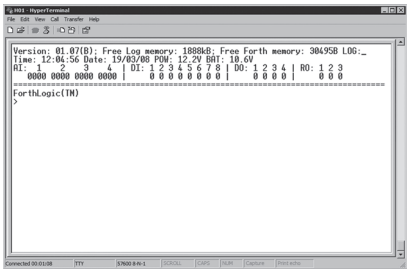
Direct operation with the system of the controller is called **dialog mode**.

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

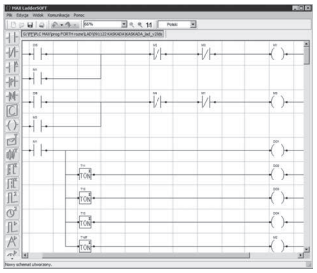
Terminal mode means working with a **HyperTerminal**-type program (MAX-PC connection via USB). The terminal mode is primarily used to learn to program, solve programming tasks or solve problems in controller operation.

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.

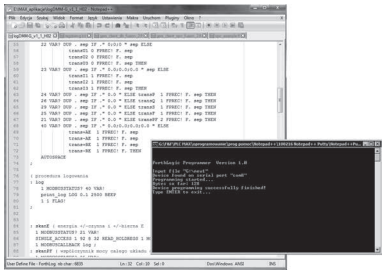
The **MAX Tool** service program allows you to set controller operating parameters, upload firmware, and Forth language applications, open Extensions and communicate directly in a simplified terminal mode.



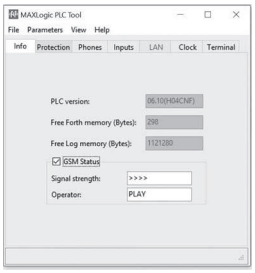
HyperTerminal



MaxLadder Soft



Notepad++Putty+Forthlogic Programmer



Max Tool

Section IV

Video intercoms, door stations, mailboxes

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	•[3]	•	•	•	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	•[3]	•	–	•	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

Legend:
[1] The MK-10 series does not work with other monitors
[2] Monitors read the AHD signal
[3] With the additional handset
[4] For each camera separately

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

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

[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

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-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
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

Keypads

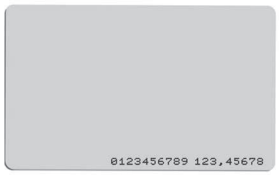
KS-01

- 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

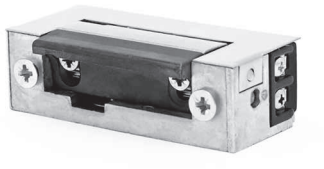
KB-04 RFID sticker

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	–	•

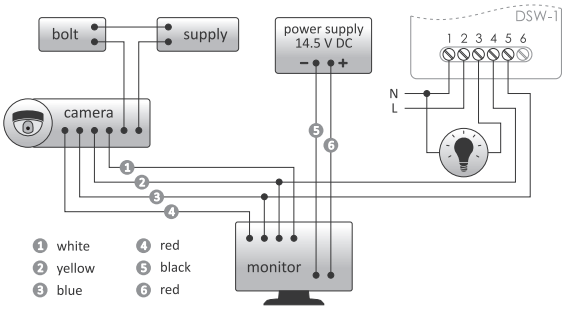
Application

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

DSW-1 low voltage acustic signaller

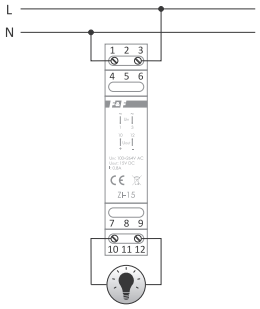
Purpose

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.



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	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

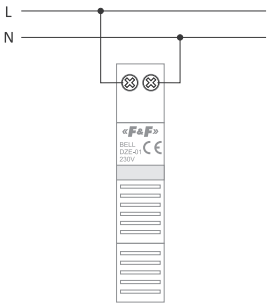


input voltage	15 V DC
output power	12 W
current limit	Imax= 110% Iout
minimum load	0%
keying frequency	70 kHz
terminal	2.5 mm² screw terminals
working temperature	-10÷40°C
dimensions	1 module (18 mm)
weight	80 g
mounting	for TH-35 rail
protection level	IP20
ingress protection	IP20

DZE-01 230 V electric bell

Purpose

The electric bell is used for audible signalling in a 230 V AC, 50/60 Hz circuit and does not require a bell transformer.



rated voltage	230 V AC
rated frequency	50/60 Hz
volume	78 dB
terminal	10 mm² screw termnials
tightening torque	1 Nm
working temperature	-10÷40°C
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

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

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 electromagnetic 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 electromagnetic 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 electromagnetic 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

Modular contactors

for all applications

- **Power supply** 230 V AC, 24 V AC, 24 V AC/DC
- **Connectors** - 25 A, 40 A, 63 A, 100 A
- **Classic version and with lever** for manual control

F&F Filipowski L.P., ul. Konstantynowska 79/81, 95-200 Pabianice, tel. +48 (42) 214 90 37
www.fif.com.pl

Section V
Time control

Chapter 17

Time relays

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	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	195÷253 V AC	relay	8 A	for TH-35 rail	–	1	on delay	117
PCR-513-16	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 box	•	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 UNI	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	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	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 DUO	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	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	195÷253 V AC	relay	10 A	surface	•	1	off delay	126
PO-405 24 V	21÷27 V AC/DC	relay	10 A	surface	•	1	off delay	126
PO-406	195÷253 V AC	relay	10 A	in flush-mounted box	•	1	off delay	126
PO-415	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

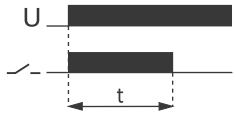
Single-function

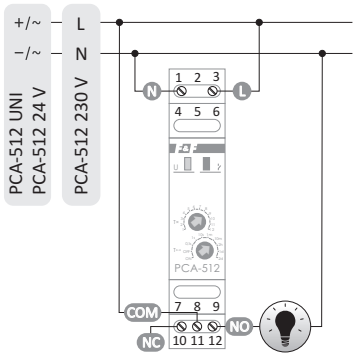
With operating function: off delay

PCA-512 / PCA-514

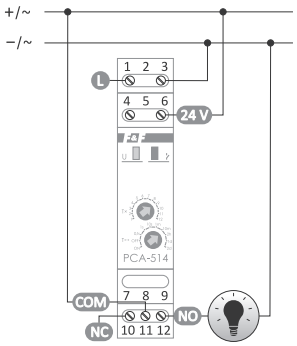
Functioning

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.





PCA-512



PCA-514 230 V + 24 V

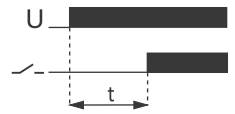
power supply	
PCA-512 230 V	195÷253 V AC
PCA-512 24 V	21÷27 V AC/DC
PCA-512 UNI	12÷264 V AC/DC
PCA-514 DUO	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷576 h
activation delay	<50 ms
power indication	green LED
contact status indication	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

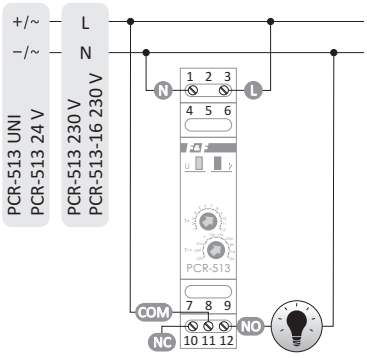
With operating function: on delay

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

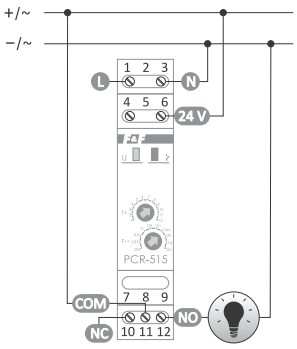
Functioning

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.





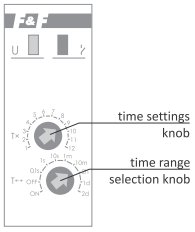
PCR-513



PCR-515 230 V + 24 V

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

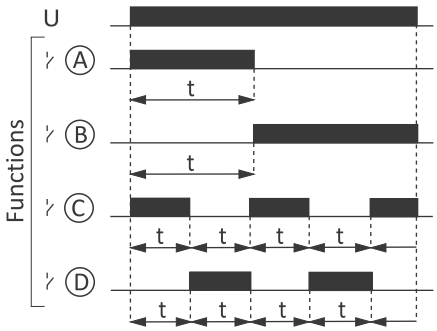
- Moving the rotary timer switch to position:
  – ON – permanently closes the contact if the power supply is switched on.
  – OFF – permanently opens the contact if the power supply is switched on.
- When the power supply is switched on, the system does not react to the change of time range settings.
- 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.



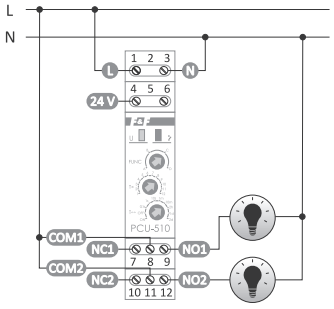
Multifunctional

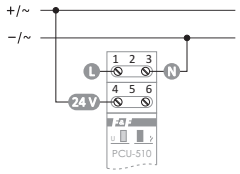
Functioning

- **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



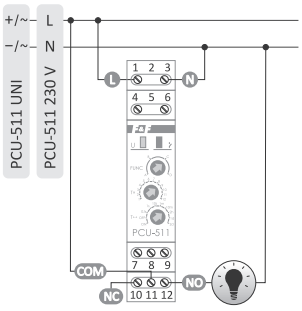


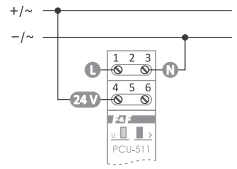
PCU-510 DUO 24 V

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 (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

PCU-511 1×NO/NC contact



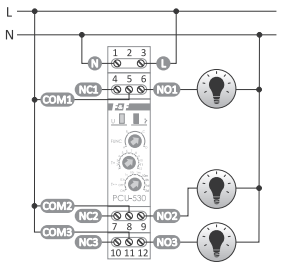


PCU-511 24 V

PCU-511
230 V power supply

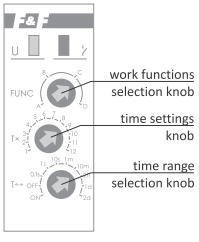
power supply	
PCU-511 230 V	195÷253 V AC
PCU-511 DUO	195÷253 V AC 21÷27 V AC/DC
PCU-511 UNI	12÷264 V AC/DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	green LED
contact status indication	red LED
power consumption	0.8 W
terminal	2.5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

PCU-530 3×NO/NC contact



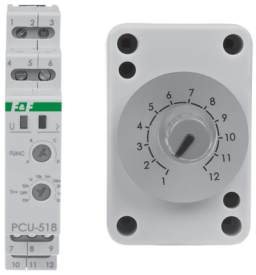
power supply	100÷264 V AC/DC
maximum load current (AC-1)	3×8 A
contact	separated 3×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	green LED
contact status indication	red LED
power consumption	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions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

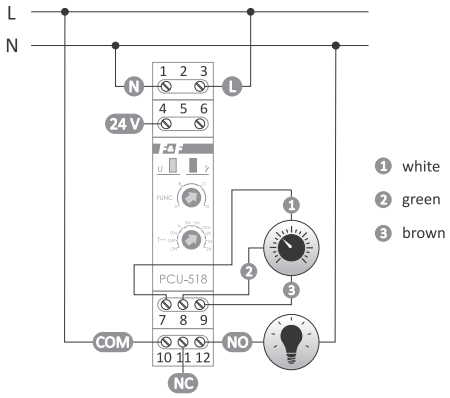
- Moving the rotary timer switch to position:
  – ON – permanently closes the contact if the power supply is switched on.
  – OFF – permanently opens the contact if the power supply is switched on.
- When the power supply is switched on, the system does not react to the change of time range settings.
- 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.



With external potentiometer for time setting

PCU-518 DUO + 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 (18 mm)
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	42×83×30 mm
height/diameter of the mandrel	30 mm/ø6
mounting hole	ø10
resistance	100 kΩ

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

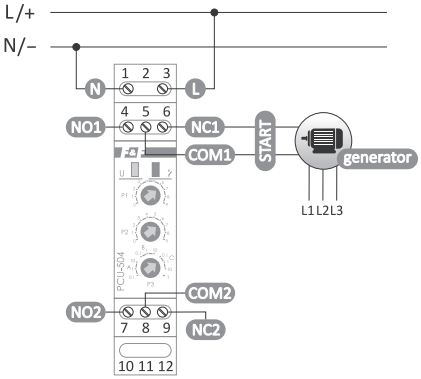
Closing of the contacts after switching on the power supply voltage. After a power failure, the contacts are closed for a set period of time.

B

On delay feature.
The back-up feature is not implemented.

C

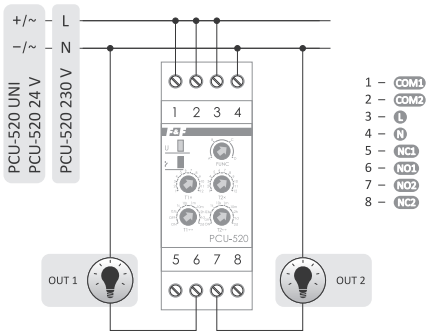
After the power supply voltage is switched on, the contacts are closed after the preset time (on delay). After a power failure, the contacts are closed for a set period of time.



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 (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

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

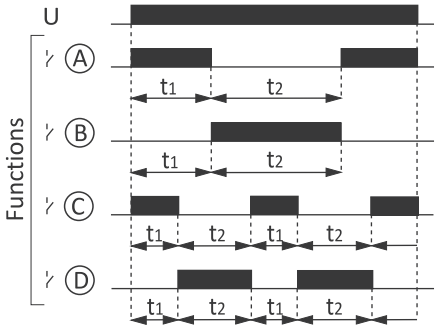
PCU-520 4-function



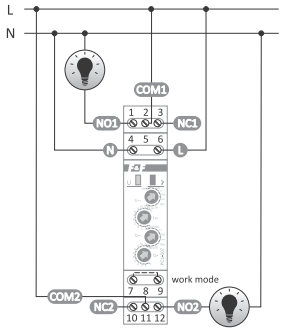
power supply	
PCU-520 230 V	195÷253 V AC
PCU-520 24 V	21÷27 V AC/DC
PCU-520 UNI	12÷264 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO/NC
working time (adjustable)	0.1 s÷576 h
break time (adjustable)	0.1 s÷576 h
power indication	green LED
contact status indication	red LED
power consumption	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.



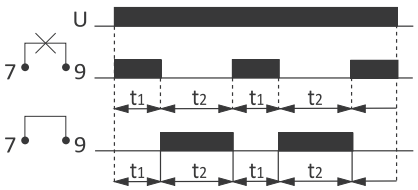
PCU-507 2-function



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

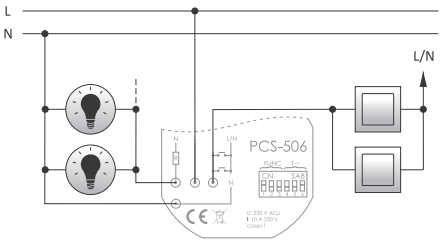
- **Off delay – cyclic**
  The contacts remain in position 2-3 and 11-10 until the relay is switched on. When the power supply voltage is applied, the contacts are switched to position 2-1, 11-12 for the time t_1. After the time t_1 has elapsed, the contacts return to position 2-3, 11-10 for a duration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

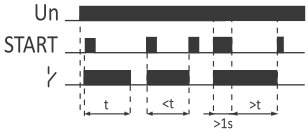


power supply	195÷253 V AC
maximum load current (AC-1)	10 A
contact	1×NO
control pulse current	<1 mA
working time (adjustable)	0.1 s÷24 h
power consumption	0.8 W
terminal	4×DY 1 mm², L= 10 cm
working temperature	-25÷50°C
dimensions	ø55, H= 13 mm
mounting	in flush mounted box ø60
ingress protection	IP20

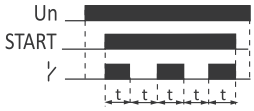
The selection of a specific time range and relay operation function means setting the appropriate combination of switches (the black field in the diagram indicates the position of the switch).

Ⓐ 

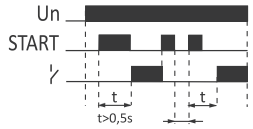
Presence simulator. When the START signal is given, the circuit randomly switches the relay on and off for the time from 20 s to 20 min. It starts with switching on of the relay. After the START signal is canceled, the system switches off the relay. It does not respond to time settings.

Ⓑ 

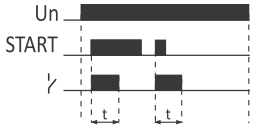
Bistable relay with automatic staircase lighting time switch. One press of the START button switches on the relay for a set time. Another START pulse during the time measurement causes the relay to be switched off. Pressing and holding the control button for more than 1 second will switch the lighting on permanently until the next pulse is given, which will switch off the relay.

Ⓒ 

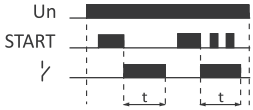
Generator with a duty cycle of 50%, starting from the switch-on state.
It is active when the START voltage is applied. When the START signal is disconnected, it breaks the operation.

Ⓓ 

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.

Ⓔ 

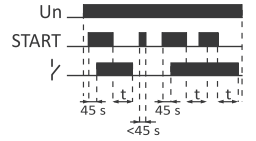
Generating a single pulse with time "t" by the rising edge of the START signal.
During the time measurement, the system does not react to START pulses.

Ⓕ 

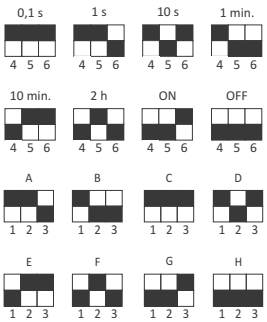
Generating a single pulse with time "t" by the trailing edge of the START signal.
During the time measurement, the system does not react to START pulses.

Ⓖ 

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 starts the operating cycle from the beginning.

Ⓗ 

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).

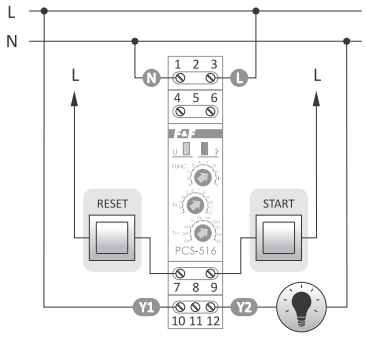


Time ranges
Setting the time range switch to ON when the power supply is switched on causes the relay to be permanently switched on.
Setting the time range switch to OFF when the power supply is switched on causes Switch relay to be permanently switched off.

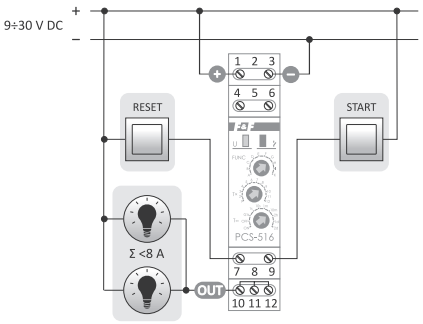
Operating features
When the power supply is switched on, the system does not react to the change of operating mode and time range settings.
Operation with the newly set operating mode and time range takes place after the power supply is switched off and back on.

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

10-function, with "Start" and "Reset" control inputs



PCS-516 AC



PCS-516 DC

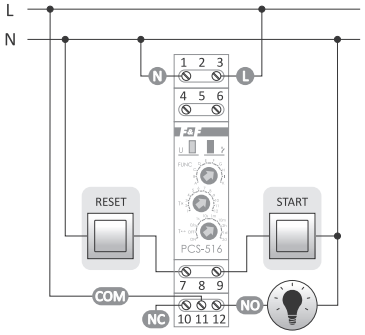
Features

PCS-516 AC:

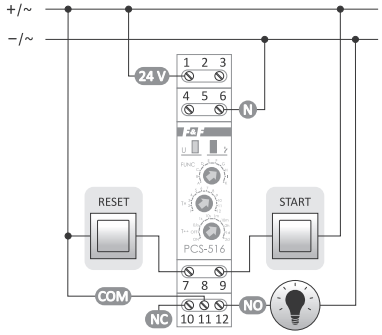
- Semiconductor output (symistor) for controlling loads supplied with AC voltage;
- Zero voltage switching on, zero current switching off – low surge when switched on;
- No problems with wear and tear of the relay contacts – dedicated for operation with high switching frequency;
- Output separated from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

PCS-516 DC:

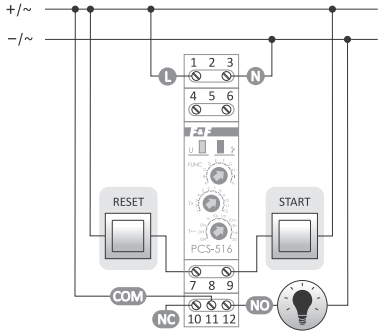
- Semiconductor outputs (transistor in the open collector system – OC);
- No problems with wear and tear of the relay contacts – dedicated for operation with high switching frequency.



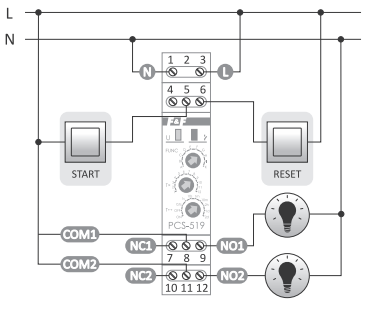
PCS-516 DUO 230 V



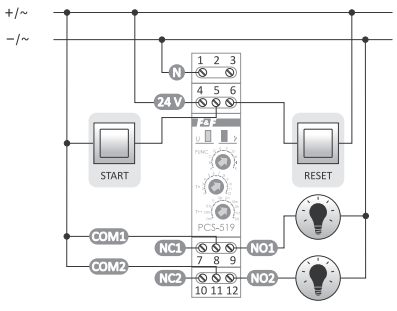
PCS-516 DUO 24 V



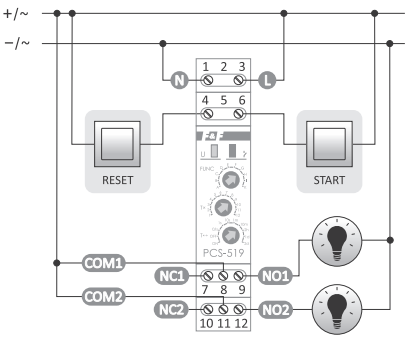
PCS-516 UNI



PCS-519 DUO 230 V



PCS-519 DUO 24 V



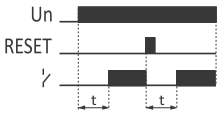
PCS-519 12 V

	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, E: 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;

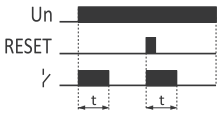
When the power supply is switched on, setting the time range rotary switch to position:
- ON – causes the contact to be permanently closed;
- OFF – causes the contact to be permanently open.

Ⓐ



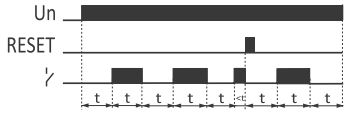
On delay. After the supply voltage is switched on (the green LED U is on), the contact remains in opened position [3-5] and the set operating time "t" is measured. After the preset time has elapsed, the contact switches to closed position [3-7] (the red LED R is on). To execute the operating mode of 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.

Ⓑ



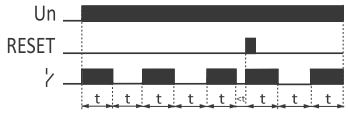
Off delay. The contact remains in opened position [3-5] until the relay is switched on. After the supply voltage is switched on (the green LED U is on), the contact is switched to closed position [3-7] and the set operating time "t" is measured (the red LED R is on). To execute the operating mode of 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.

Ⓒ



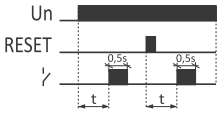
On delay – cyclic. On delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

Ⓓ



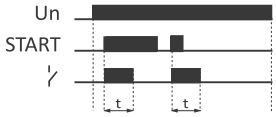
Off delay – cyclic. Off delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

Ⓔ



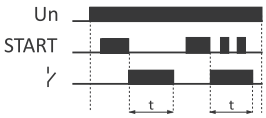
Generating pulse 0.5 s after the preset time "t".

Ⓕ



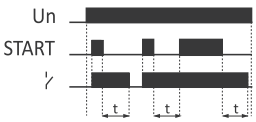
Generating a single pulse with time "t" by the rising edge of the START signal.
During the time measurement, the system does not react to START pulses.

Ⓖ



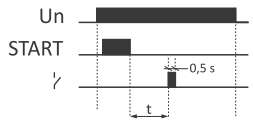
Generating a single pulse with time "t" by the trailing edge of the START signal.
During the time measurement, the system does not react to START pulses.

Ⓗ



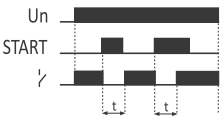
Off delay with back-up feature. The rising edge of the START signal causes the relay to be switched on, while the trailing edge causes the start of time measurement.
Applying the START signal during the time measurement causes the cycle to be extended by another time "t" by the trailing edge.

Ⓘ



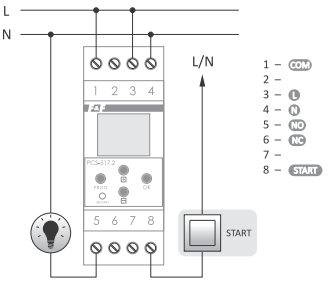
Generating a single 0.5 s pulse after time "t" by the triggered trailing edge of the START signal.

Ⓚ



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

PCS-517 18-function



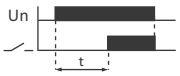
Time setting range (0.25 s ÷ 100 h) allows for a very precise adjusting of the contact closing, such as 2 h 13 min. 27 s.

power supply	24÷264 V AC/DC
maximum load current (AC-1)	16 A
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

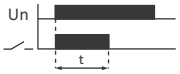
The state of "inactivity"

P01



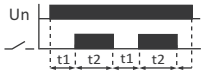
After the supply voltage is applied, the contact remains in position 1-6 (off) and the set delay time "t" is measured. After the set time "t" has elapsed, the contact switches to position 1-5 (on). To execute the operating mode of the relay again you need to switch off the power supply voltage and switch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

P02



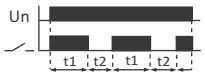
The contact remains in position 1-6 (off) until the voltage is switched on. After the supply voltage is applied, the contact is switched to position 1-5 (on) and the set time "t" is measured. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it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

P03



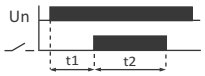
On delay operating mode is carried out cyclically at the preset intervals of the operating time "t_1" and break time "t_2" (on).

P04



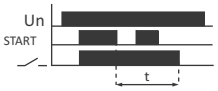
Off delay operating mode is carried out cyclically at the preset intervals of the operating time "t_1" (on) and break time "t_2".

P05



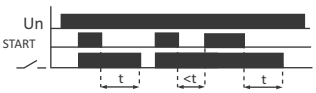
When the power supply voltage is applied, the contact remains in position 1-6 (off) and the preset delay time "t_1" is measured. After the time t_1 has elapsed, the contacts switch to position 1-5 (on) for a duration of time "t_2". To execute the operating mode of the relay again you need to switch off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

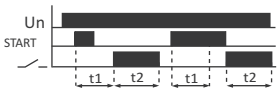


After the START signal is given, the contact is switched to position 1-5 (on). After the START signal loss, the contact is backed-up for the set time "t". The reappearance of the START signal during the time "t" measurement interrupts its countdown and the contact remains switched on (position 1-5).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

P08

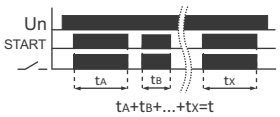
On delay of the contact (position 1-5) after time "t" by the rising edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal. After the loss and reappearance of the START signal, the contact is disconnected (position 1-6) for the time "t".

P09



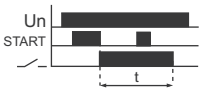
Triggering the delay time "t_1" (position 1-6) by the rising edge of the START signal. Triggering the time of closing "t_2" (position 1-5) occurs always after START signal loss, but not earlier than after time "t_1". After counting down the time "t_1", the contact is switched on (position 1-5) for the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

P10



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

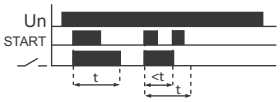


Closing of the contact (position 1-5) for a time "t" by the trailing edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal.

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

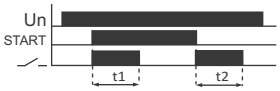


Closing of the contact (position 1-5) for a time "t" by the rising edge of the START signal. Reapplying of the START signal during the time "t" countdown stops it and disconnects the contact (position 1-6).

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.

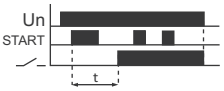
P16

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

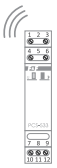
On delay of the contact (position 1-5) after time "t" by the triggered rising edge of the START signal. Another START signal opens the contact (position 1-6) for the time "t". The reappearance of the START signal during the time "t" measurement triggers the countdown of the time "t" from the beginning.

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.

PCS-533 UNI with NFC wireless communication

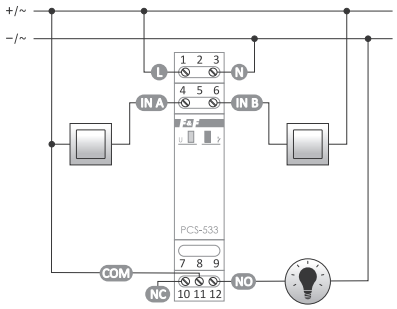


Purpose

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, 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

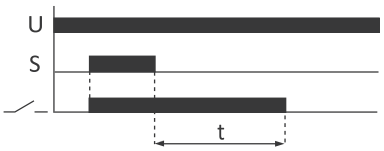
With off delay (fan)

Purpose

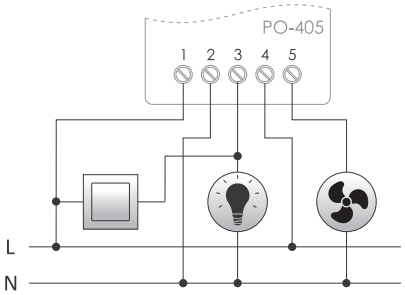
Time relays with off delay are used to maintain the power supply of the controlled receiver for a specified period of time after the loss of the control voltage, for example in bathroom ventilation systems, where it is necessary to maintain the fan operation (switched on along with the lighting) for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

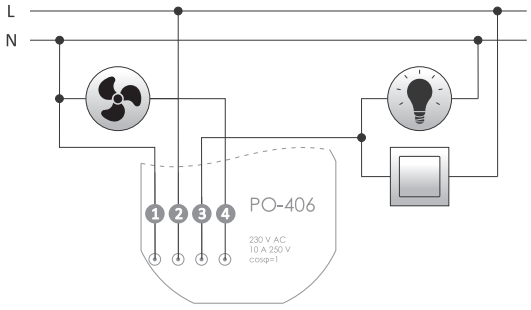


PO-405



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

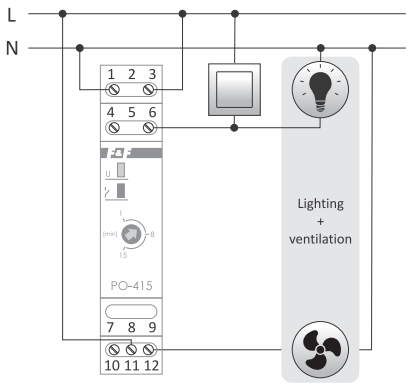
PO-406



1 blue 2 brown 3 red 4 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



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

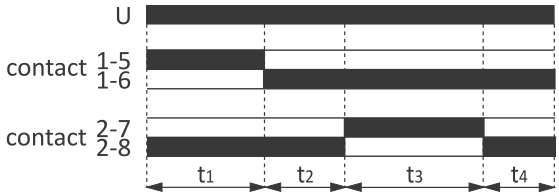
STP-541 time controller, type: right/left operation

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.

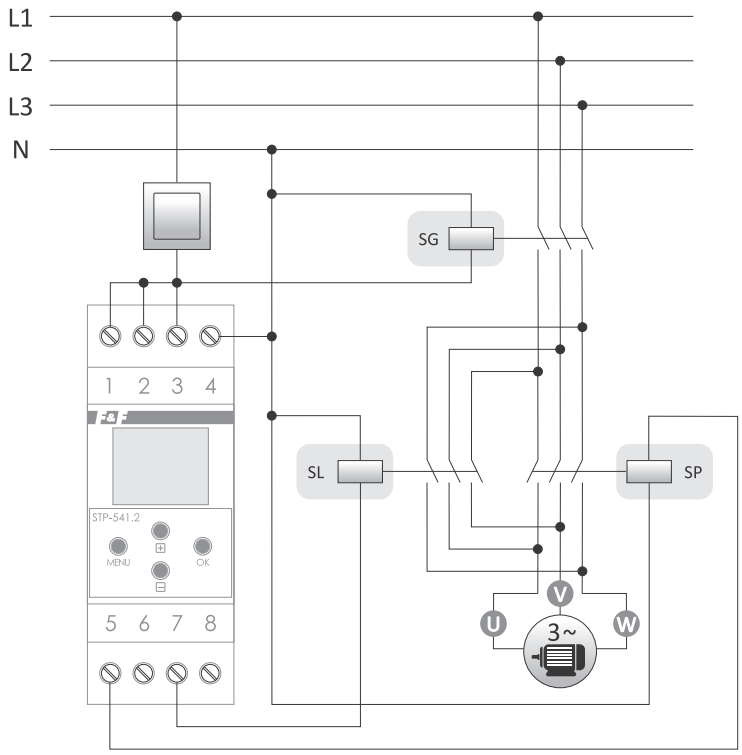
Functioning

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

PCG-417 DUO to control the "star"/"delta" contactor switching system

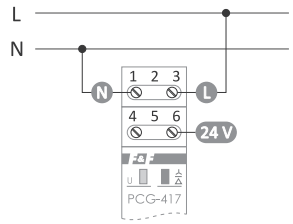
Purpose

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.

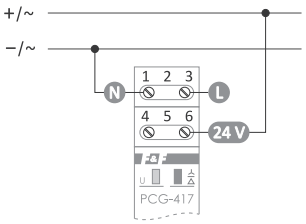
Functioning

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).



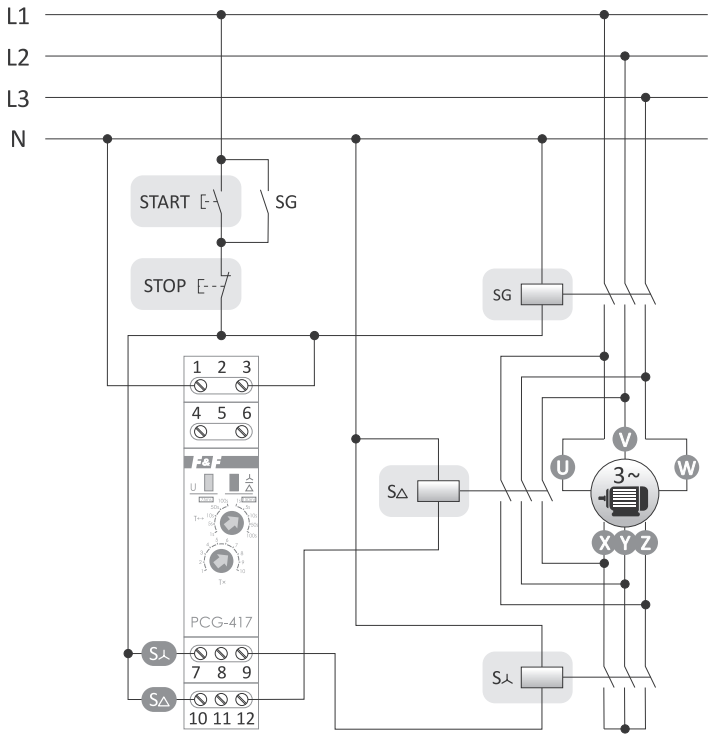
230 V version



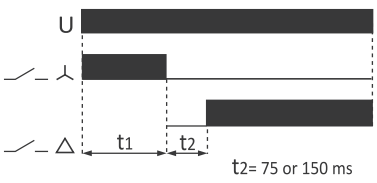
24 V version

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

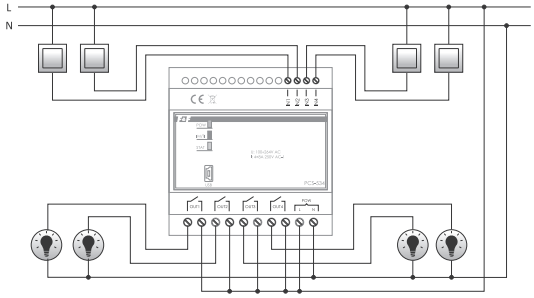


t_2= 75 or 150 ms

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
maximum number of sequences	125
communication port	miniUSB
power consumption	1.3 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
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:

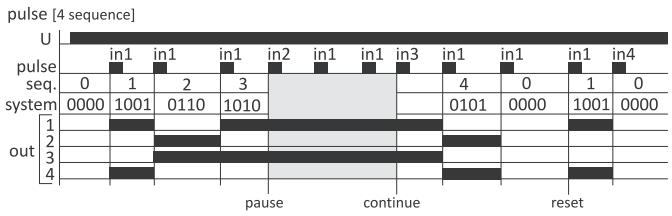
- Pulse - programmed contact sequences are executed after successive pulses of control input IN1.
  The first pulse switches from sequence 0 to sequence 1 and onwards after the subsequent pulses. After executing the last sequence, the relay executes the program from sequence 0 or 1 for the "autostart" 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).

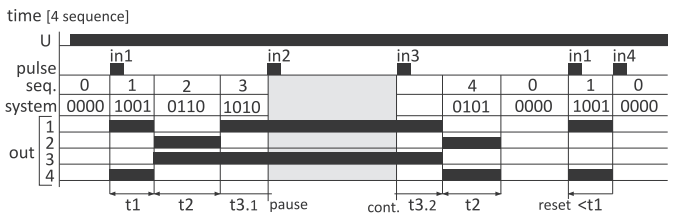
Additional options:

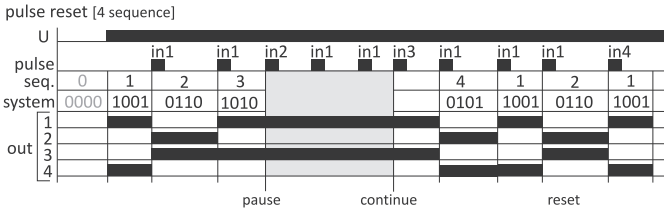
- Autostart - automatic start option. In the pulse mode, it means an automatic transition to sequence 1 after the power supply is switched on.
  In time mode, it means an automatic start of operation according to the time schedule.

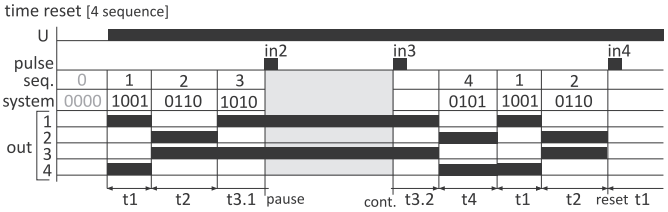
Input functions:

- 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-528.3	**universal, programmable timer**	**1**	**relay**	135
PCZ-529.3	yearly	1	relay	132
PCZ-531A10	programmable, weekly	1	analog output	52
PCZ-531LED	programmable, weekly	1	transistor	52

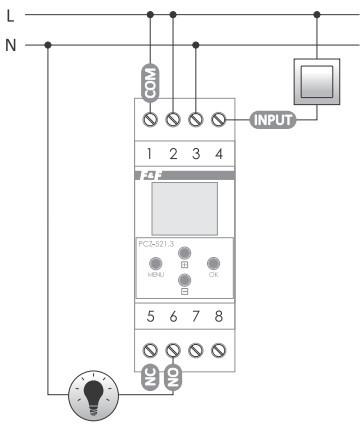
Weekly programmable timer – is used to time control devices in a home or industrial automation system according to an individual time program set by the user. In this type of timer, the minimum time of relay activation is 1 minute.
Pulse timer (bell timer) – used for time control of devices in a home 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

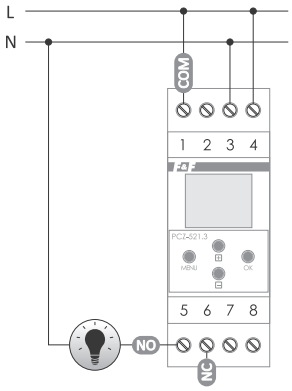
* battery life addicted to weather conditions and frequency of mains failure

PCZ-521.3 PLUS cannot 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.



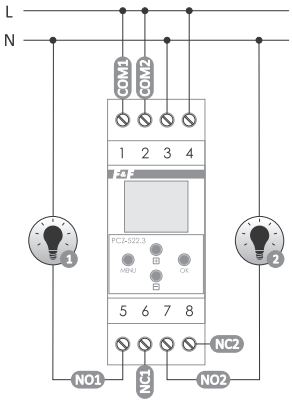
power supply	24÷264 V AC/DC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
backup time clock operation	6 years*
battery type	2032 (lithium)
backup time display operation	no
accuracy of the clock	1 s
time error	±1 s/24 h
time program setting accuracy	1 min.
program memory cells	500
power consumption	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

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

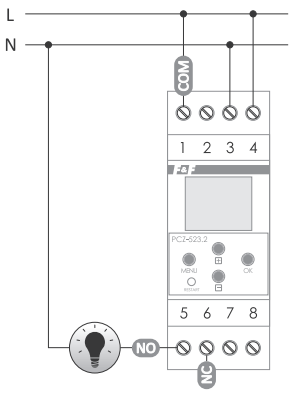
* battery life addicted to weather conditions and frequency of mains failure

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

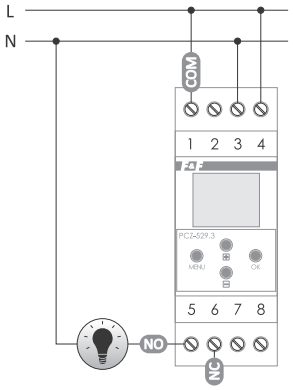
PCZ-529.3 1-channel

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

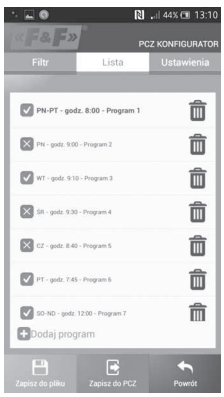
* battery life addicted to weather conditions and frequency of mains failure

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, 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:

ANDROID APP ON Google play

https://play.google.com/store/apps/details?id=pl.com.fif.clockprogramer

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

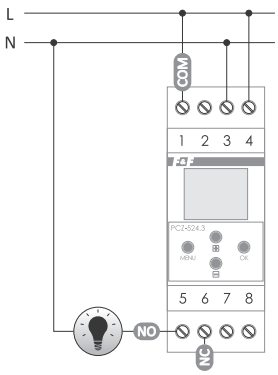
- **Automatic operation** – automatic operation according to programmed switch-on and switch-off points.
- **Semi-automatic operation** – possibility to manually switch the contact state during automatic operation. The change will be effective until the next switch on/off resulting from the automatic 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

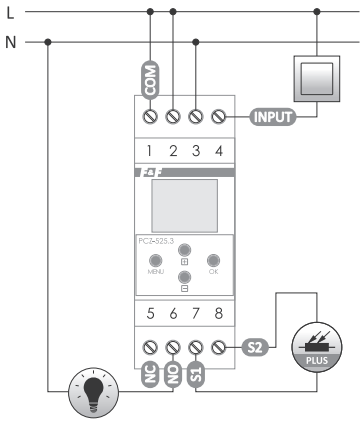
Functioning

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

- 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

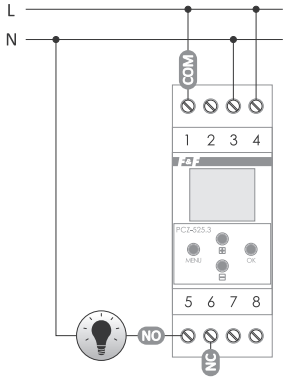
* battery life addicted to weather conditions and frequency of mains failure

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

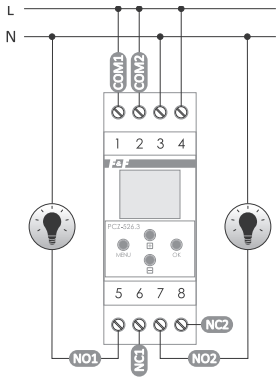
* battery life addicted to weather conditions and frequency of mains failure

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.

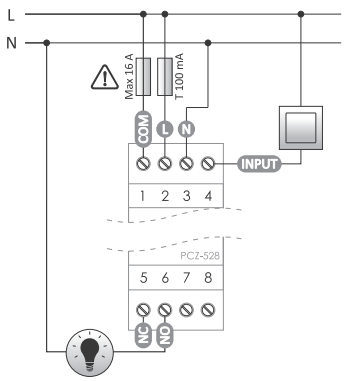
PCZ-528.3 1-channel, universal programmable timer

Functions

- 256 relay on/off programmes;
- Each programme can be executed in one of the seven date ranges defined in the annual cycle;
- Up to 32 holidays can be entered and it is possible to select which programmes will be executed on holidays;
- For each of the work programmes, it can be independently determined whether the programme is executed in an hourly cycle (fixed hour and minute) or astronomical cycle (linked to the position of the sun in relation to the horizon);
- In each of the astronomical programmes, the on/off offset relative to the selected astronomical point can be set independently (e.g. on one hour before sunset, off two hours after dusk);
- For each programme, it is possible to freely select on which days of the week it will be executed;
- Possibility of programming the timer using the free PCZ Configurator mobile app using the NFC* short-range radio communication mechanism;
- Possibility to protect the clock settings with a PIN code;
- Advanced operating time counter for measuring the time of time the receiver is switched on:
  – on the current day and month,
  – monthly, over the last 12 months,
  – total since the first start-up of the clock,
- Auxiliary, erasable, operating time counter;
- Possibility of limiting the total time of activation of the receiver (up to a maximum of 99999 hours);
- Control input for connectingexternalgo button;
- Backlit LCD display with adjustable level of brightness and contrast brightness and contrast;
- Replaceable 2032-type battery for maintaining clock operation in case of power failure**.

* Remote programming requires an Android phone with built-in NFC communication support and the free PCZ Configurator app installed (downloadable from the Google Play shop). The NFC communication range is limited to a few centimetres, therefore a direct connection of the phone to the clock is required to transfer the configuration from the app to the clock.

** In the event of a power failure, the internal battery only maintains the internal clock so that the current time and date are not lost. In the event of a power failure, all external clock functions, such as the display and relay, remain disabled.



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 depends on the operating conditions and how long the clock is powered from the battery only. Low ambient temperatures severely limit battery life.

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

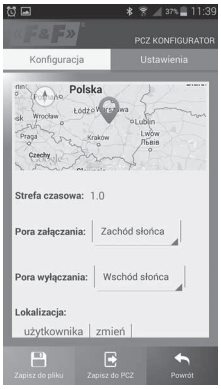
- Setting the timer configuration in offline mode (without the connection with the timer);
- Reading and writing the configuration to the controller;
- Quick programming of multiple controllers with one configuration;
- Reading and writing the configuration to the file;
- Configuration sharing via e-mail, 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. 53

Section VI
Programmable controllers

Chapter 20

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

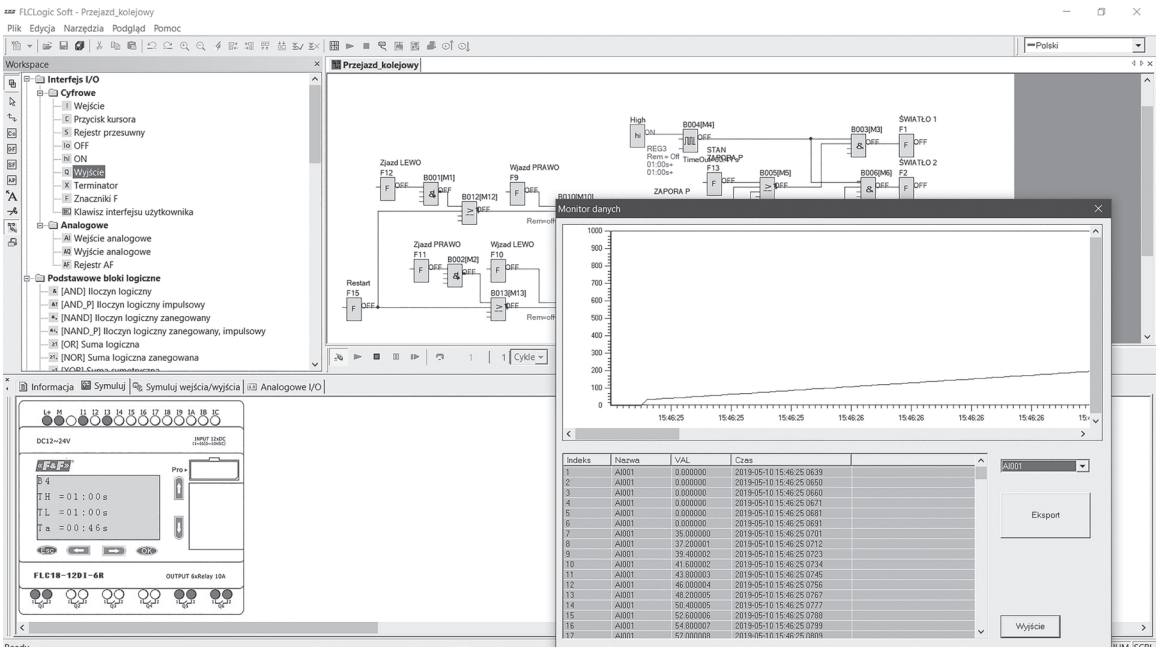
Purpose

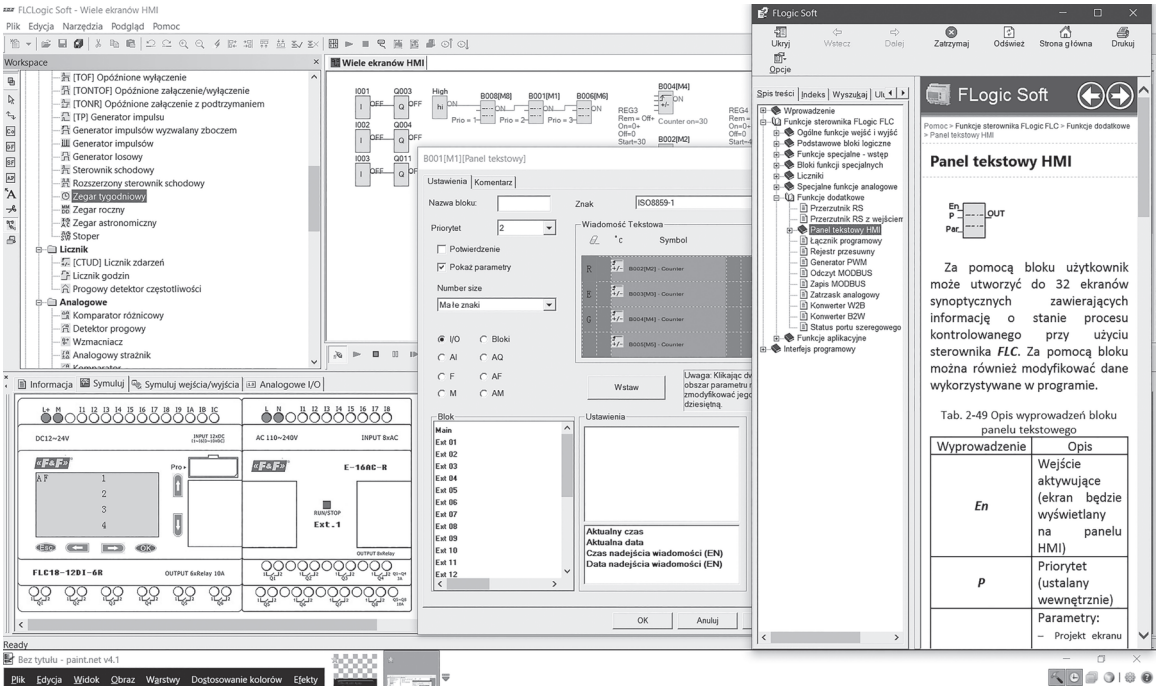
The free FLCLogic Soft utility software is used to program FLC drivers.
Basic features of the application:

- 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.





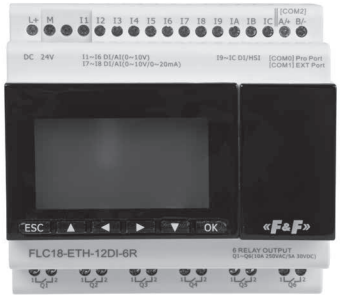
FLC18-ETH-12DI-6R CPU central unit with Ethernet

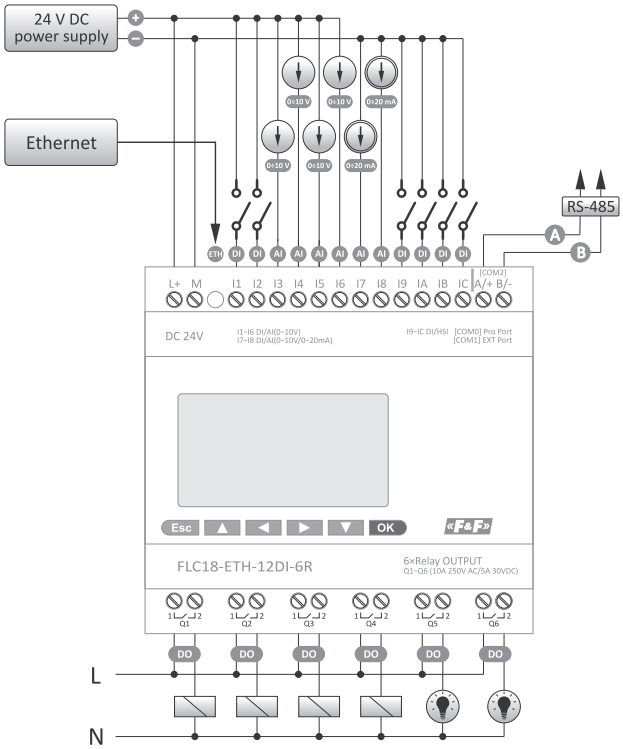
Purpose

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

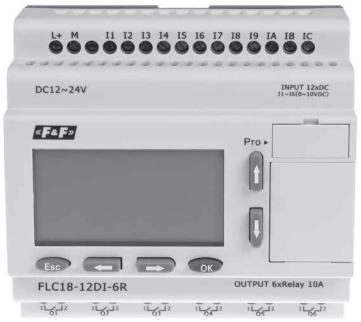
FLC18-12DI-6R CPU central unit

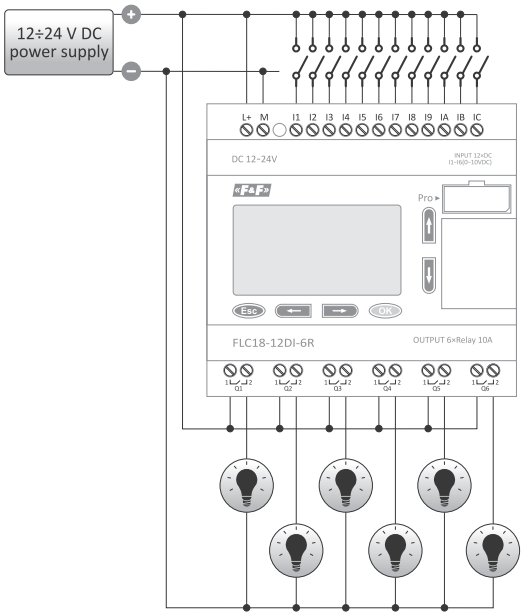
Purpose

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

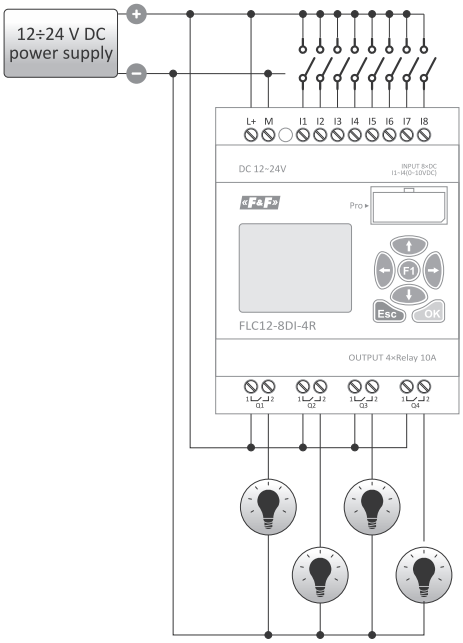
FLC12-8DI-4R CPU central unit

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.

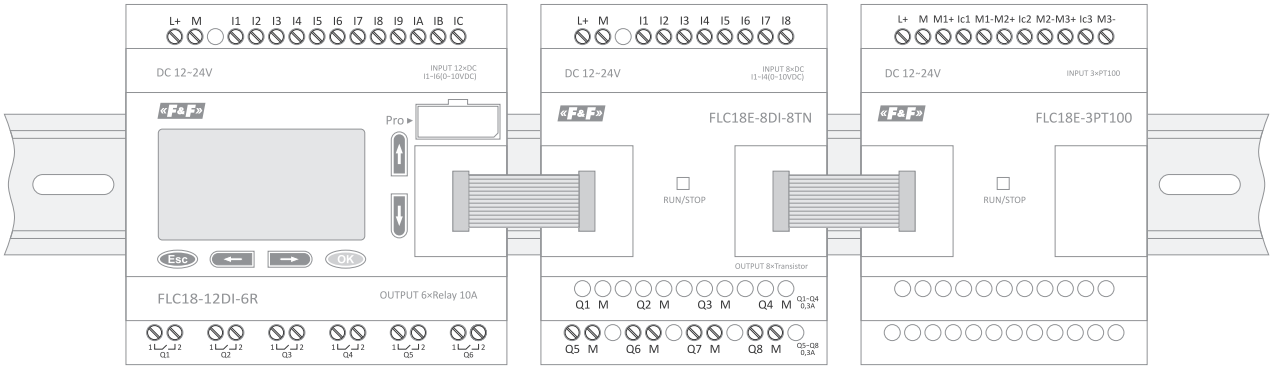
Functions

- 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

Connection of modules



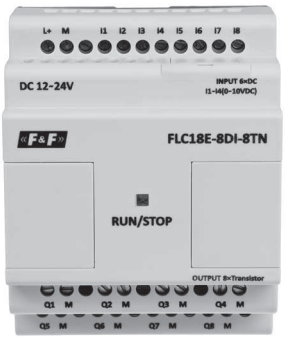
FLC-USB (programmer) interface for programming FLC drivers

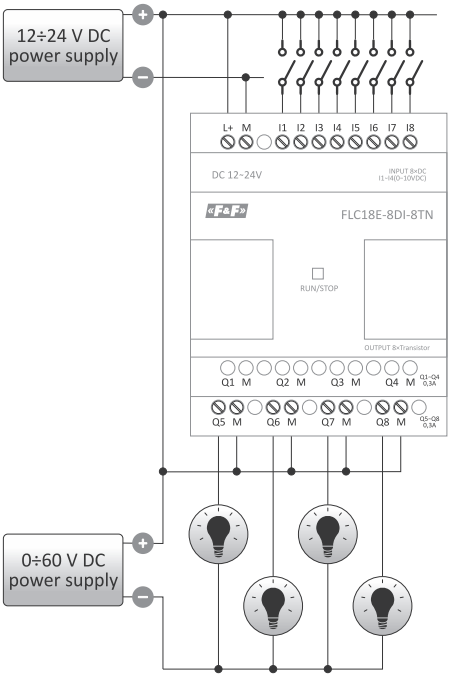
Purpose

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

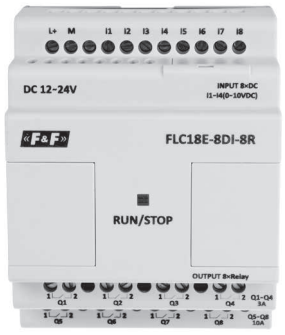
FLC18E-8DI-8TN expansion module of the analog-to-digital inputs/outputs

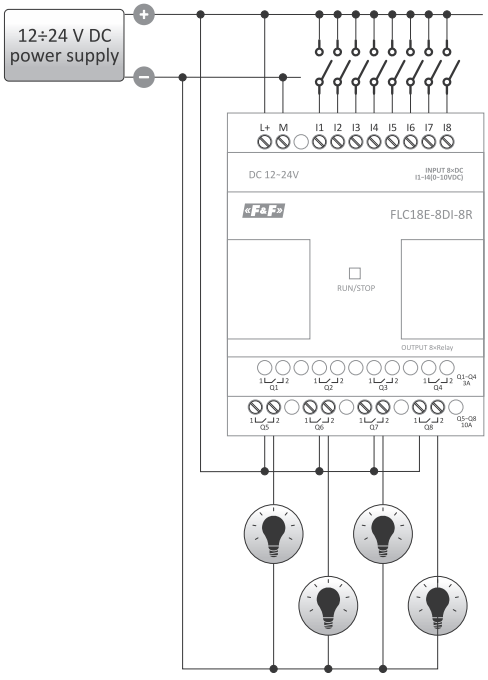




power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	3.5÷4 W
inputs	
total number of inputs	8 (I1÷I8)
number of digital inputs	8 (I1÷IC)
number of digital inputs	4 (I1÷I4) (0÷10 V DC)
range of input voltages	0÷28.8 V DC
input type	resistive
isolation between 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

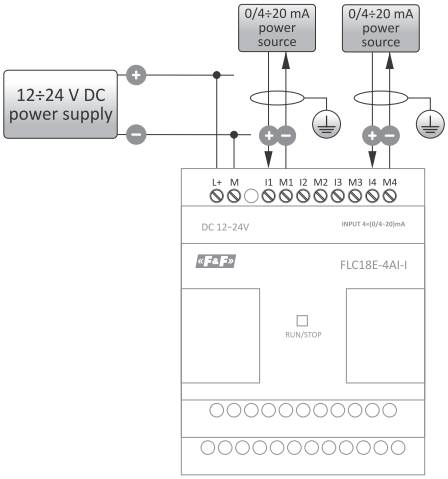
FLC18E-8DI-8R expansion module of the analog-to-digital inputs/outputs





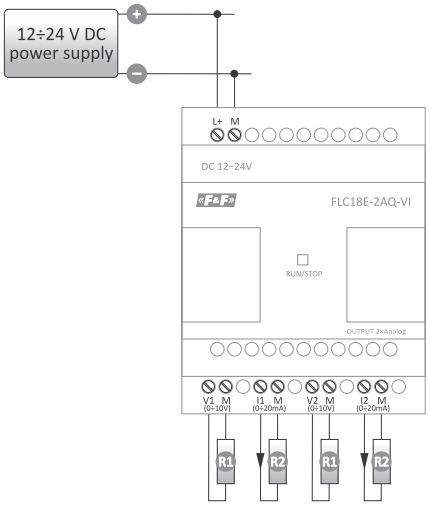
power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	3.5÷4 W
inputs	
total number of inputs	8 (I1÷I8)
number of digital inputs	8 (I1÷IC)
number of digital inputs	4 (I1÷I4) (0÷10 V DC)
range of input voltages	0÷28.8 V DC
input type	resistive
isolation between 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



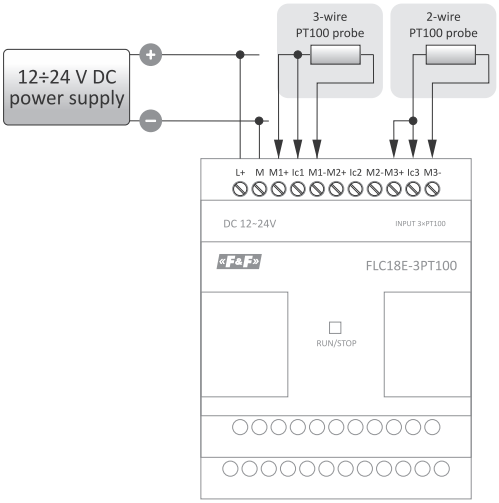
power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	1 W
analog inputs	
number of inputs	4 (AI1÷AI4)
measuring range	0/4÷20 mA
resolution	10 bit
switching time	50 ms
accuracy at 25°C	50 µV
other parameters	
cooperation with the CPU modules	FLC18-12DI-6R
working 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)



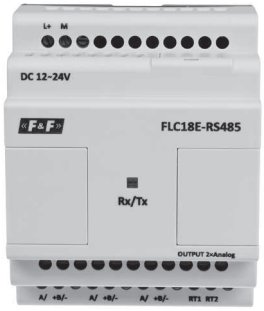
power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	1.8 W
analog voltage/current output	
number of analog outputs	2
range of output voltages	0÷10 V DC
range of output currents	0÷ 20 mA
resolution	10 bit
voltage accuracy at 25°C	20 mV
voltage accuracy at 25°C	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

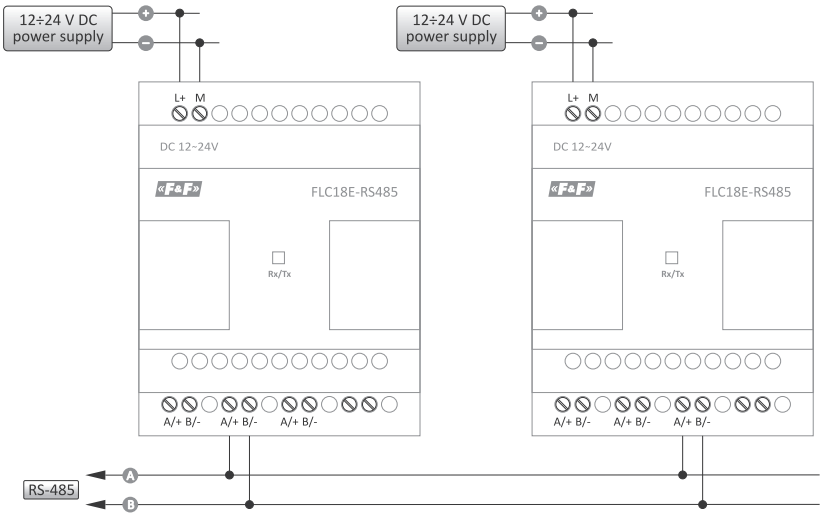


power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	1 W
sensor inputs PT100	
number of sensors	3 (AI1÷AI3)
measuring probe	PT100
probe type	2- or 3-wire
resolution	12 bit
measurement accuracy at 25°C	0.3°C
other parameters	
cooperation with the CPU modules	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)

Purpose

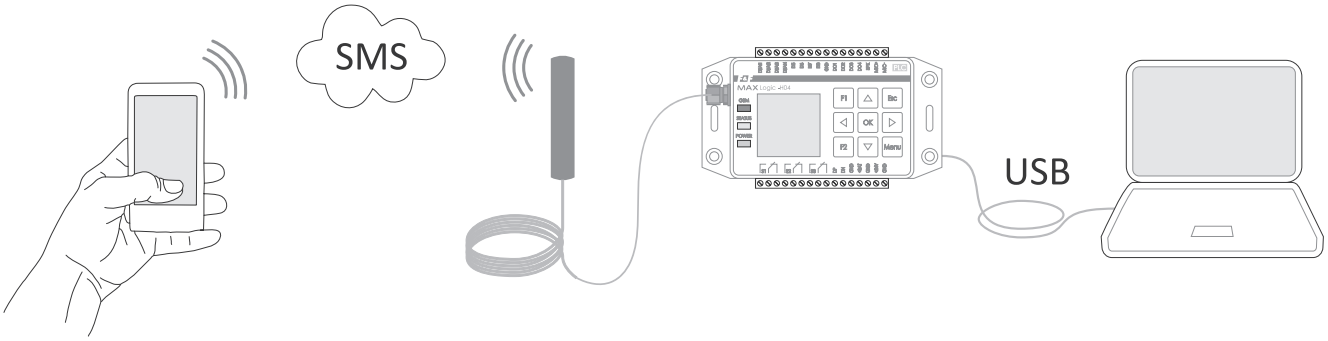
MAX H04 is a freely programmable logic controller (PLC) with a built-in GSM communicator. It is designed to solve a wide range of tasks of technological process management and data exchange via GSM mobile phone network in SMS, VOICE, and CLIP connection mode. The controller is used in home automation 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

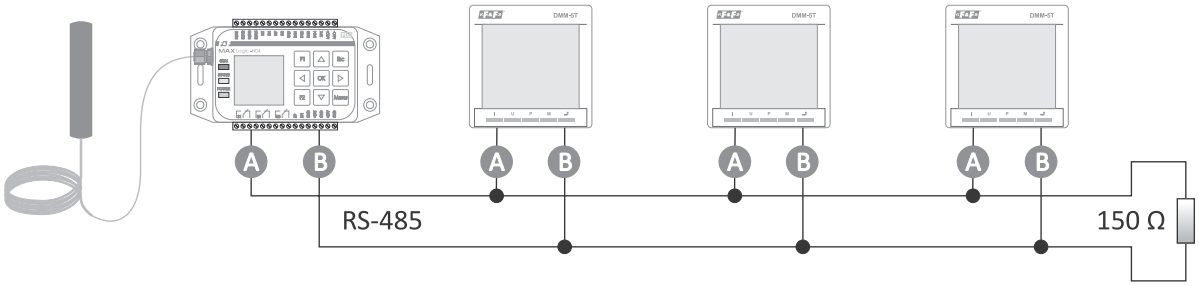
The MAX Logic controller works in GSM 900/1800 cellular networks of any operator operating in Poland (the device is unlocked). One of the basic conditions for using the GSM communicator of the controller is the existence of an appropriate infrastructure. In order for the controller to make calls and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



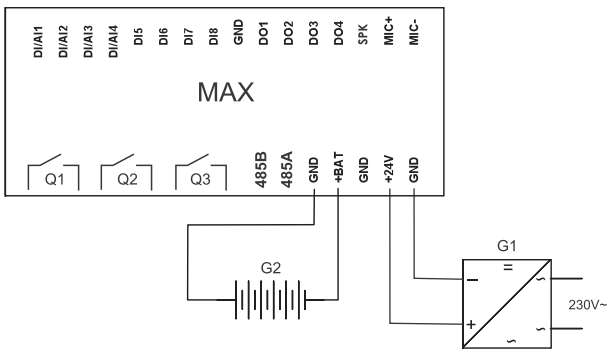
Functions

- **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.

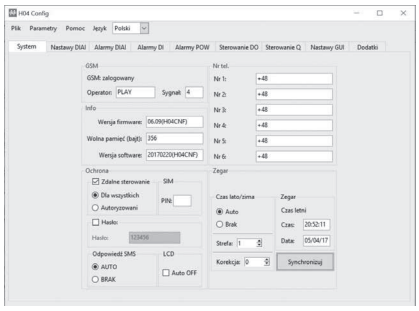
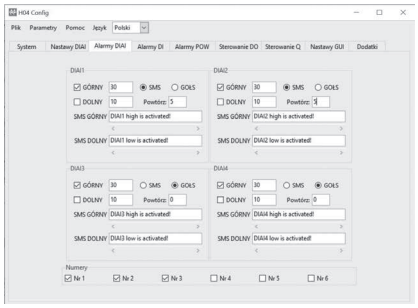
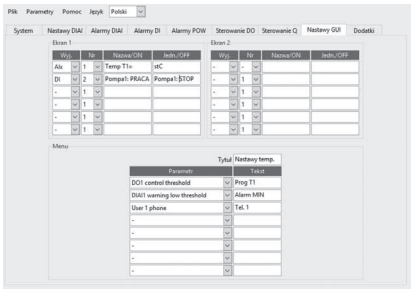


- **Clock**
  The controller has the function of automatic time change from the daylight saving time to standard time with the possibility of switching it off. In order to increase the accuracy of the system clock, it is possible to set the automatic time correction in seconds using the MAX Tool program. 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

Functions

- 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.

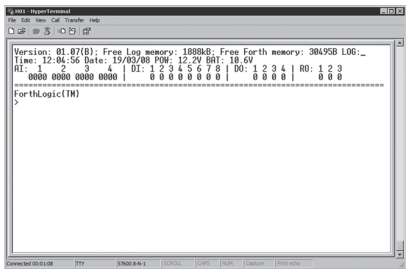
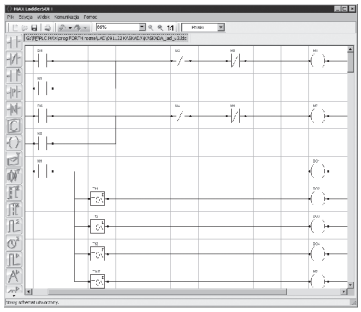
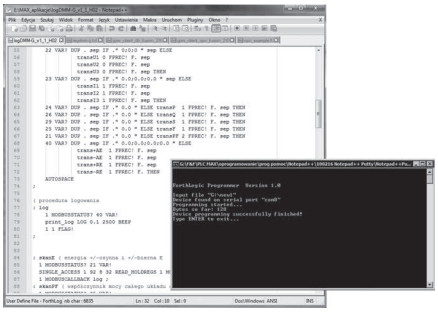
Screenshots from H04 Config program

Software tools

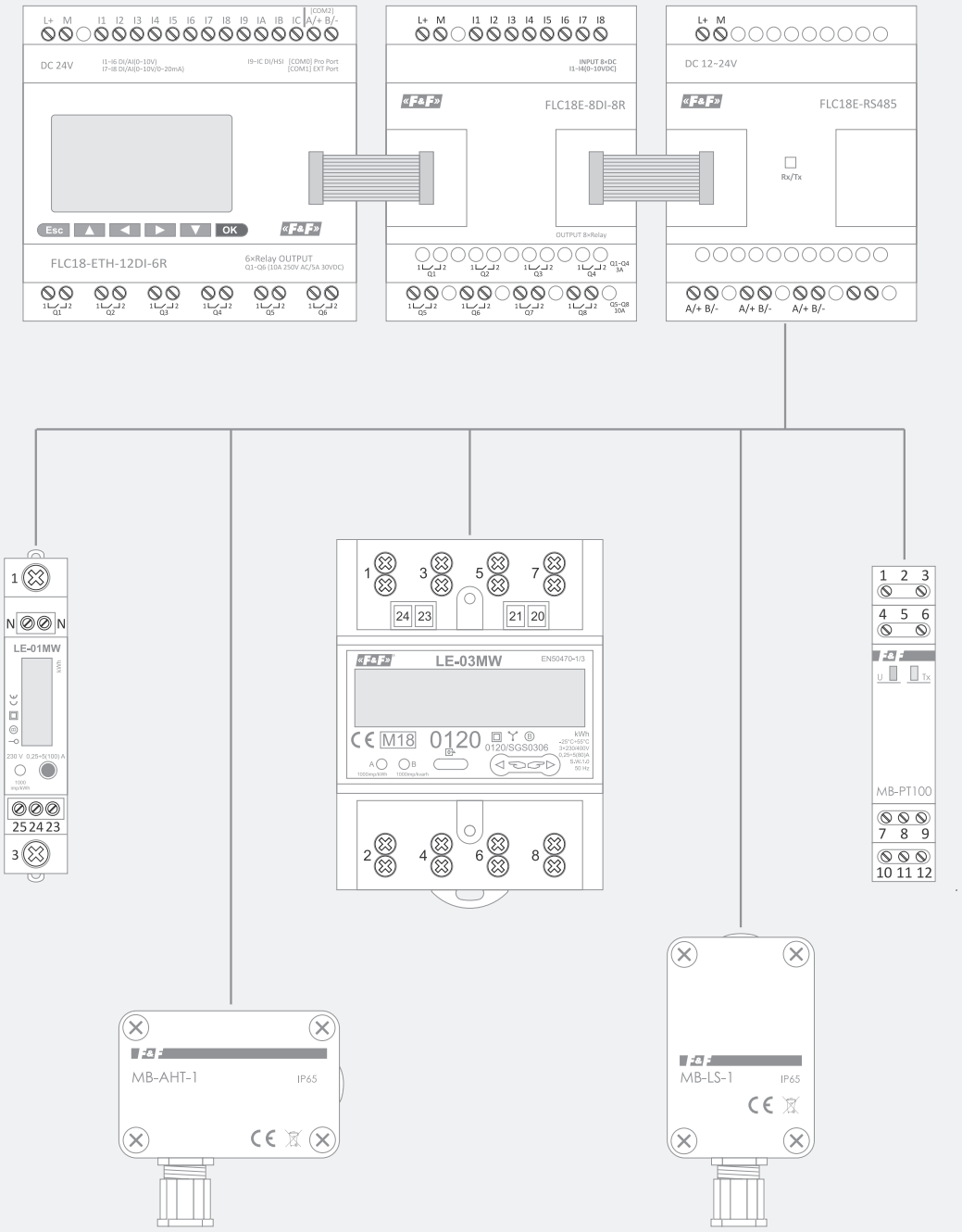
A hardware and software system called "forth-system" is responsible for the execution of tasks and interpretation of the software written with the **ForthLogic** programming language. The ForthLogic underlying computational model consists of stacks, global variables, a dictionary, an input buffer, and 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

Chapter 22

Phase loss sensors

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).

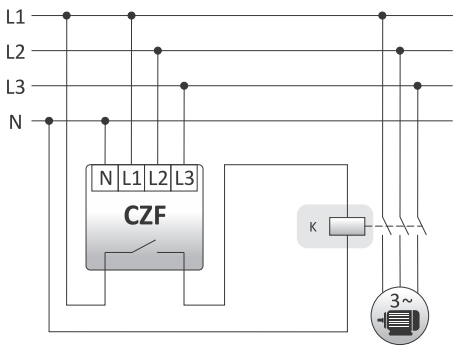
Additionally for the True RMS version:
- a voltage drop in at least one phase below 150 V;
- a voltage rise in at least one phase above 280 V.

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

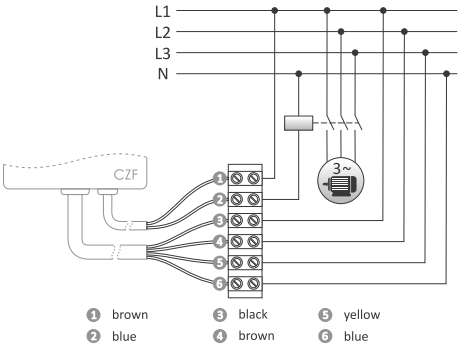
True RMS series devices, thanks to the use of microprocessor for voltage measurement, allow measurements in networks with large voltage distortions and disturbances. This is especially important nowadays, when there are already many pulse devices that cause interference in the network. Such devices include: 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 separation	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	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-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

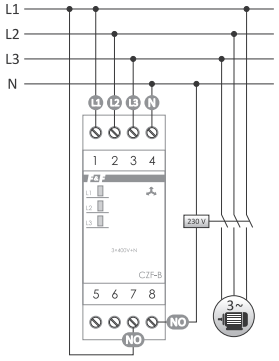
With a constant tripping threshold of voltage asymmetry

CZF / CZF TRMS surface-mounted, separated 1×NO contact



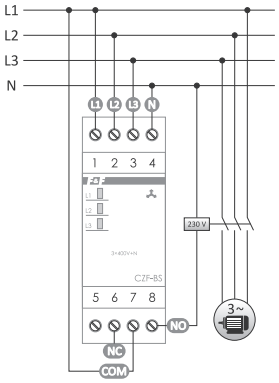
	CZF	CZF TRMS
power supply	3×400 V+N	
contact	separated 1×NO	
maximum load current (AC-1)	10 A	
minimum phase voltage	–	150 V
maximum phase voltage	–	180 V
effective voltage unbalance	45 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	4 s
switch-off delay on phase loss	1.5 s	1 s
activation 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



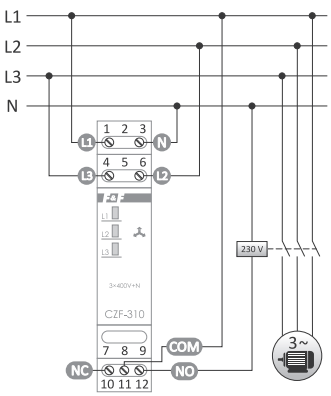
	CZF-B	CZF-B TRMS
power supply	3×400 V+N	
contact	separated 1×NO	
maximum load current (AC-1)	10 A	16 A
minimum phase voltage	–	150 V
maximum phase voltage	–	280 V
effective voltage unbalance	55 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	4 s
switch-off delay on phase loss	1.5 s	1 s
activation 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	

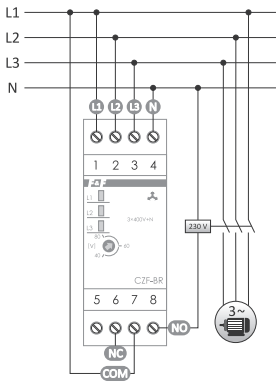
CZF-310 / CZF-310 TRMS separated 1×NO/NC contact



	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	

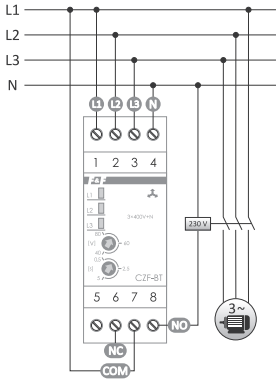
With an adjustable tripping threshold of voltage asymmetry

CZF-BR / CZF-BR TRMS separated 1×NO/NC contact, adjustable asymmetry



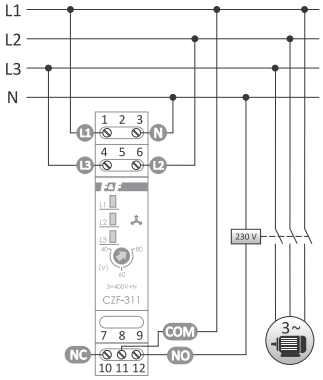
	CZF-BR	CZF-BR TRMS
power supply	3×400 V+N	
contact	separated 1×NO/NC	
maximum load current (AC-1)	10 A	16 A
minimum phase voltage	–	150 V
maximum phase voltage	–	280 V
effective voltage unbalance	40÷80 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	4 s
switch-off delay on phase loss	1.5 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



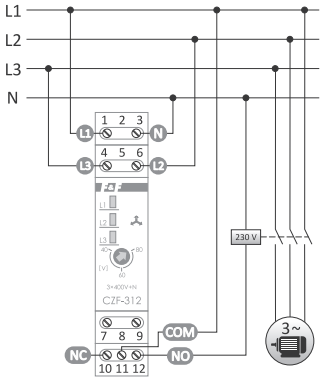
	CZF-BT	CZF-BT TRMS
power supply	3×400 V+N	
contact	separated 1×NO/NC	
maximum load current (AC-1)	10 A	16 A
minimum phase voltage	–	150 V
maximum phase voltage	–	280 V
effective voltage unbalance	40÷80 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	0.5÷5 s	1÷10 s
switch-off delay on phase loss	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



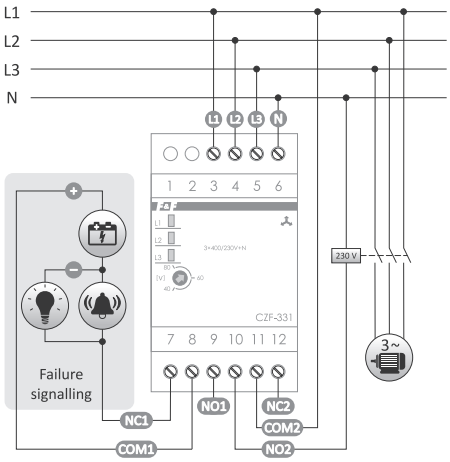
	CZF-311	CZF-311 TRMS
power supply	3×400 V+N	
contact	separated 1×NO/NC	
maximum load current (AC-1)	10 A	
minimum phase voltage	150 V	
maximum phase voltage	280 V	
effective voltage unbalance	40÷80 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	
switch-off delay on phase loss	1 s	
activation 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	

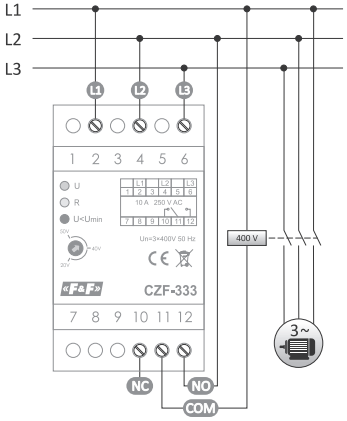
CZF-331 / CZF-331 TRMS separated 2×NO/NC contacts, adjustable asymmetry



	CZF-331	CZF-331 TRMS
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	4 s
switch-off delay on phase loss	4 s	1 s
activation delay	4 s	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	3 modules (52.5 mm)	
mounting	for TH-35 rail	
ingress protection	IP20	

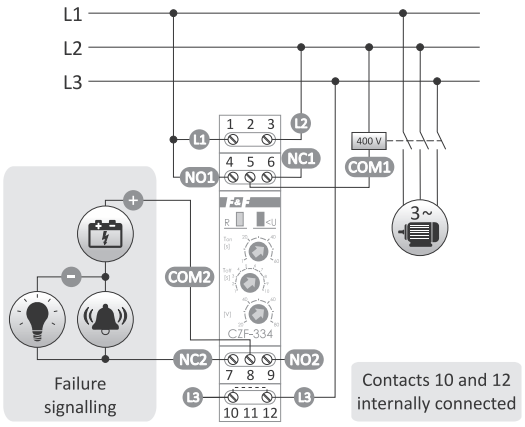
Adapted to work with a power generator (without neutral wire)

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 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



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

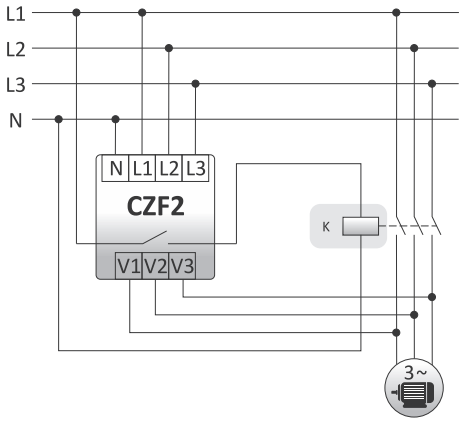
Purpose

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:

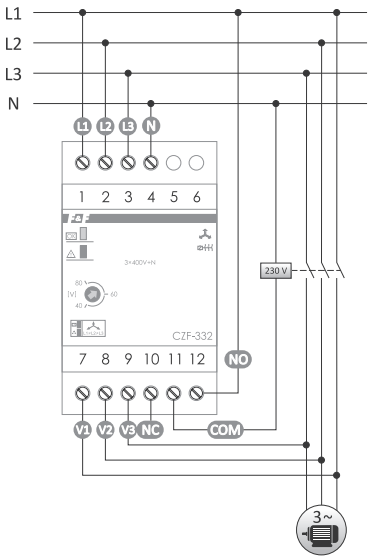
- a voltage loss in at least one phase;
- a voltage drop in at least one phase below 150 V;
- a voltage rise in at least one phase above 280 V;
- an asymmetry of voltages between phases above the set value;
- contactor contact failure.

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.

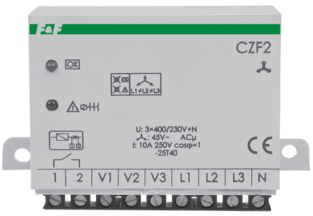


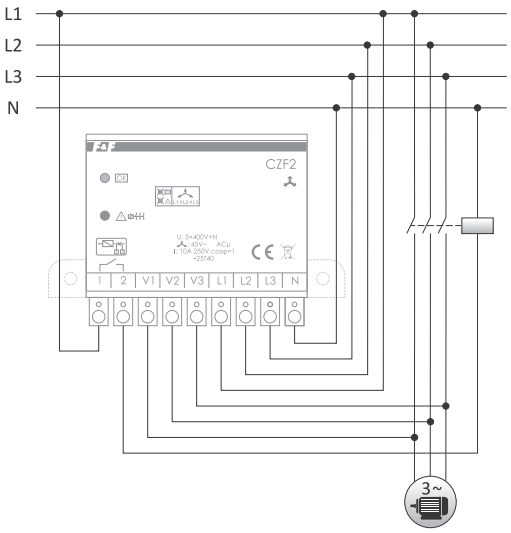
CZF-332 separated 1×NO/NC contact, adjustable asymmetry



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

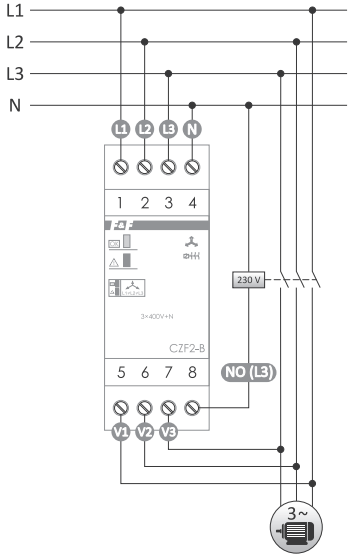
CZF2 surface-mounted, separated 1×NO contact





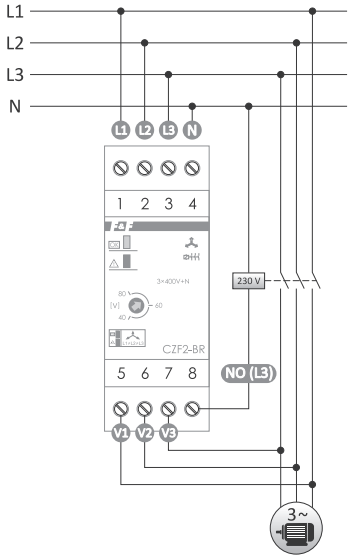
power supply	3×400 V+N
contact	separated 1×NO
maximum load current (AC-1)	10 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	45 V
voltage hysteresis	5 V
deactivation delay	4 s
power consumption	1.6 W
working temperature	-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 23

Phase sequence and phase loss sensors

Purpose

Phase loss sensor with with phase sequence control is designed for protection of electric motor supplied from three-phase mains in the following cases:

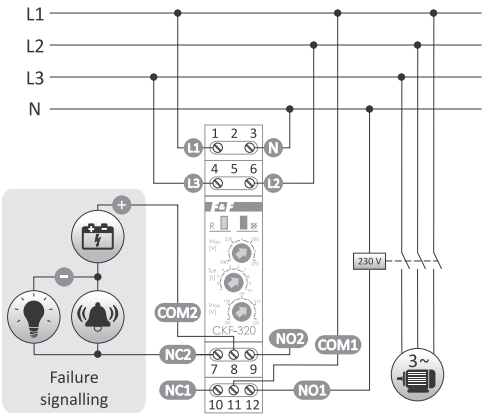
- **incorrect phase sequence;**
- a voltage loss in at least one phase;
- a voltage drop in at least one phase below 150 V;
- a voltage rise in at least one phase above 280 V;
- an asymmetry of voltages between phases above the set value.

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-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

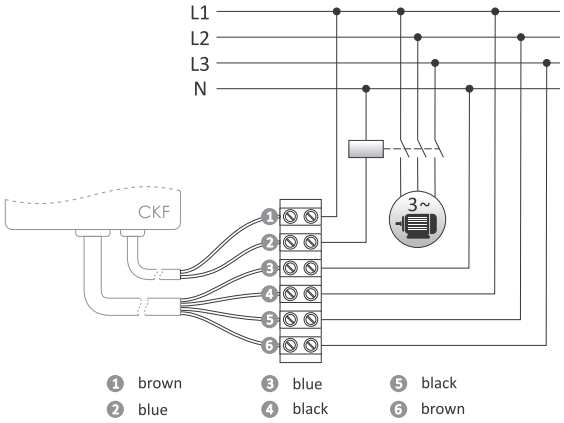
CKF-320 TRMS with a voltage window



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

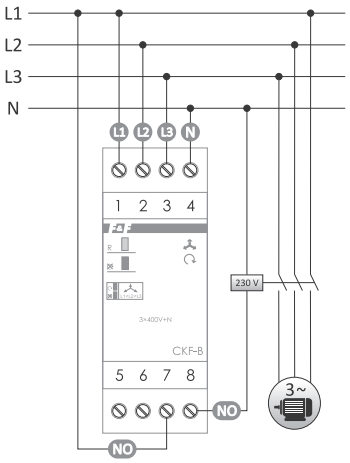
With a constant tripping threshold of voltage asymmetry

CKF / CKF TRMS surface-mounted, separated 1×NO contact



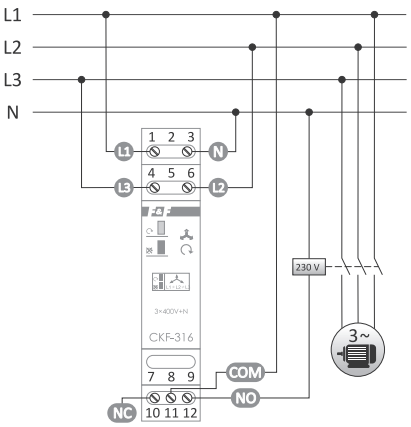
	CKF	CKF TRMS
power supply	3×400 V+N	
contact	separated 1×NO	
maximum load current (AC-1)	10 A	
minimum phase voltage	–	150 V
maximum phase voltage	–	180 V
effective voltage unbalance	45 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	4 s
switch-off delay on phase loss	1.5 s	1 s
activation 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	

CKF-B / CKF-B TRMS separated 1×NO contact



	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	

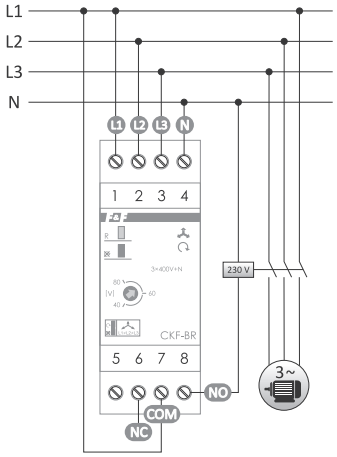
CKF-316 / CKF-316 TRMS separated 1×NO/NC contact



	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	

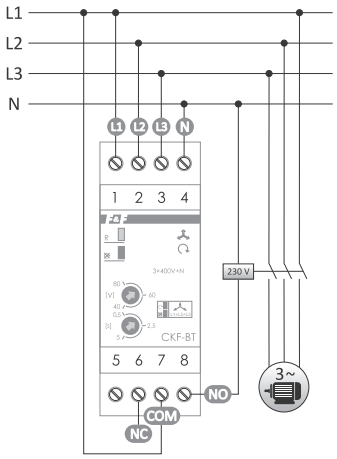
With an adjustable tripping threshold of voltage asymmetry

CKF-BR / CKF-BR TRMS separated 1×NO/NC contact, adjustable asymmetry



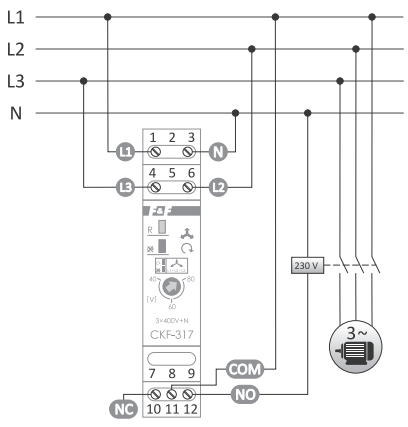
	CKF-BR	CKF-BR TRMS
power supply	3×400 V+N	
contact	separated 1×NO/NC	
maximum load current (AC-1)	10 A	16 A
minimum phase voltage	–	150 V
maximum phase voltage	–	280 V
effective voltage unbalance	40÷80 V	
voltage hysteresis	5 V	
switch-off delay on asymmetry	4 s	4 s
switch-off delay on phase loss	1.5 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	

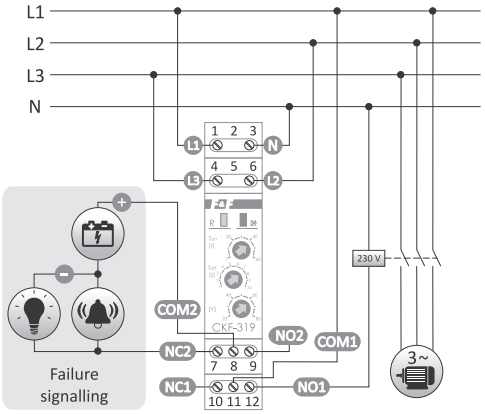
CKF-317 / CKF-317 TRMS separated 1×NO/NC contact, adjustable asymmetry



	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

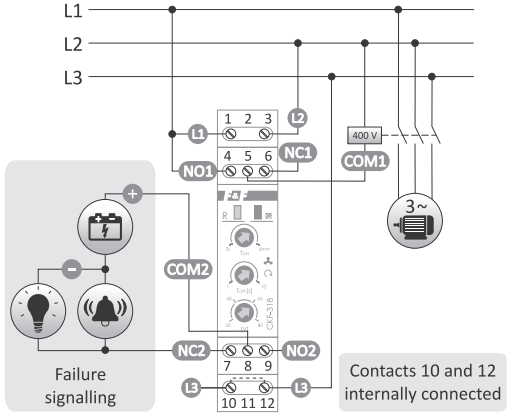


power supply	3×400 V+N
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	20÷80 V
voltage hysteresis	5 V
switch-off delay on asymmetry	1÷10 s
switch-off delay on phase loss	1 s
activation delay	1÷60 s
power consumption	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

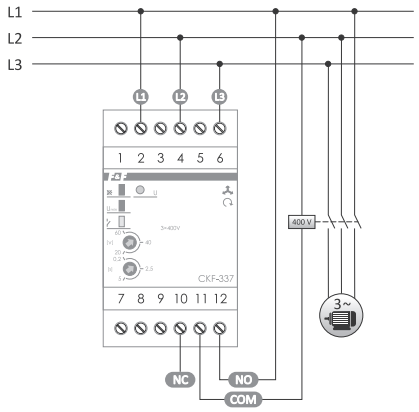
1-module housing, separated 2×NO/NC contacts, adjustable asymmetry, activation and deactivation delay, without neutral wire



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

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

Purpose

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.

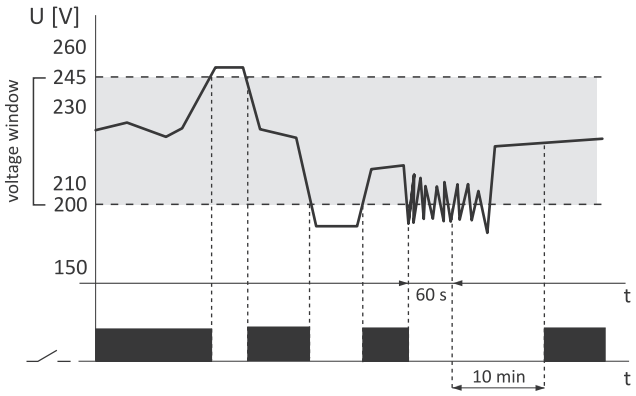
All types of voltage relays can be supplied with voltages up to 450 V. This allows for effective protection of the receiver even if the voltage exceeds the permissible standards. Also in cases of replacing the polarity of the power supply or disconnecting the "zero", it will not destroy (burn) the relay.

Functioning

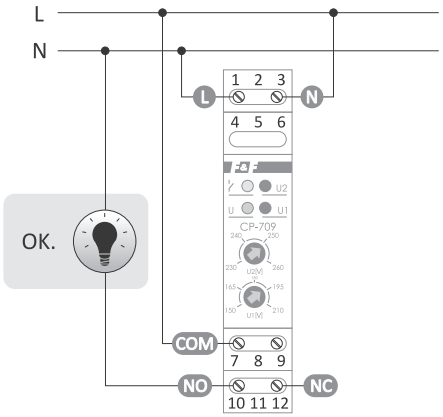
The potentiometers are used to set the lower (U_1) and upper (U_2) voltage thresholds. It is the so-called "voltage window", within the limits of which there may be changes of power supply voltage that do not cause the relay activation. Changing the supply voltage above or below the set voltage thresholds 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.

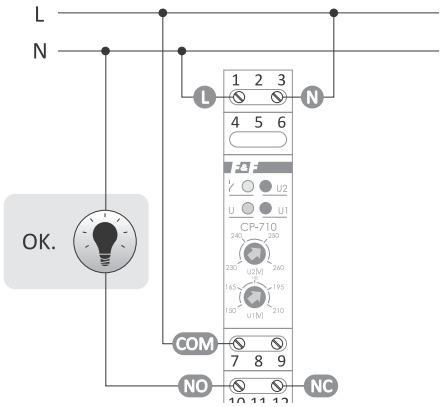


CP-709 without time lock



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

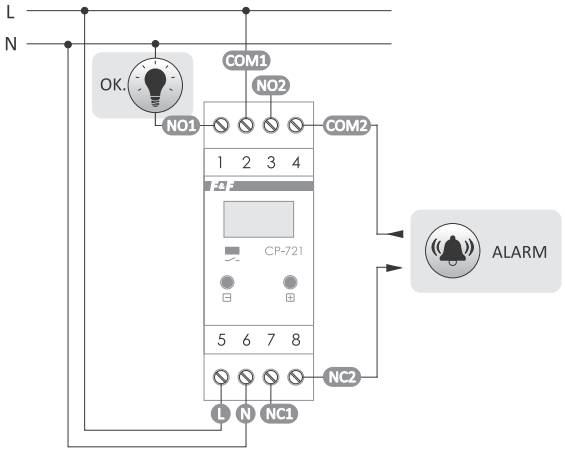
CP-710 1-phase, with time lock*



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

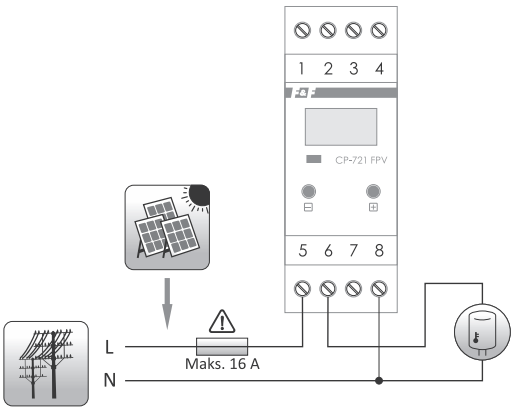
* The note is on the previous page

CP-721 programmable, without time lock



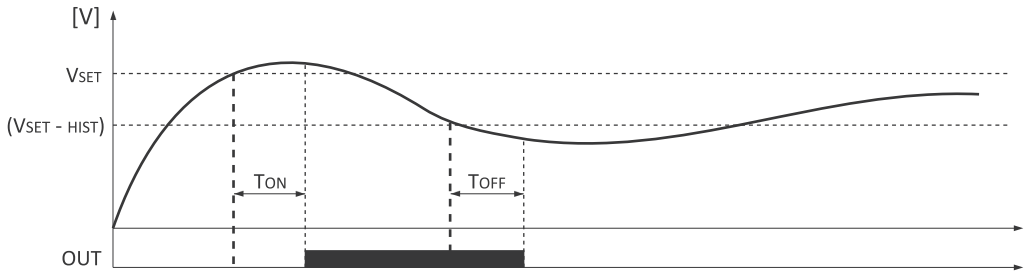
power supply	150÷450 V AC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
tripping voltage thresholds/step	
lower UL	150÷210 V/5 V
upper UH	230÷260 V/5 V
voltage hysteresis	
for threshold UL	5 V
for threshold UH	5 V
activation time/step	
for threshold UL	2÷10 s/1 s
for threshold UH	0.1÷1 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

CP-721-FPV 1-phase voltage relay, for photovoltaic systems

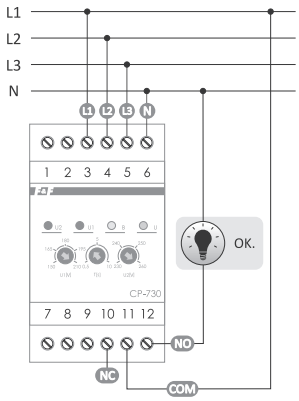


power supply	150÷300 V AC
contact	1×NO
maximum load current (AC-1)	16 A
activation voltage	245÷265 V
deactivation voltage hysteresis	1÷10 V
activation delay	0÷999 s
deactivation delay	0÷999 s
voltage setting accuracy	±1 V
hysteresis setting accuracy	0.5 V
measurement accuracy	±1 V
display	3 digits LED (5×9 mm)
signaling contact indication	1×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	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

Voltage relay dedicated to work in photovoltaic systems. In the case of detecting an exceedance of the preset voltage level, the output relay will switch on, with the help of which it is possible to switch on an additional consumer (e.g. boiler), thus increasing the self-consumption of energy in the home installation.



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

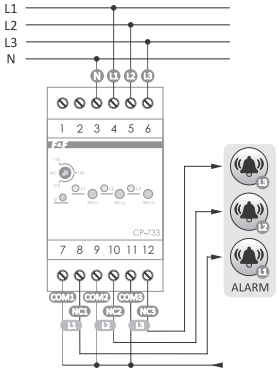
* The note is on the first page of the Chapter 24 (p. 163)

Under-voltage

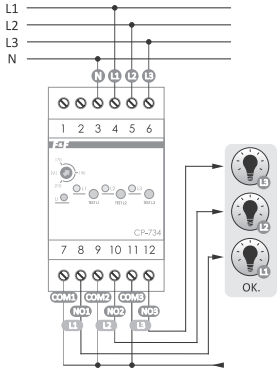
CP-733 3×NC contacts / CP-734 3×NO contacts

Functioning

At correct line voltages, the contacts remain open (CP-733) or closed (CP-734). The loss of voltage in a phase or its drop below the set trip voltage threshold will switch on (CP-733) or open (CP-734) the contact corresponding to that phase. Disconnection (CP-733) or closure (CP-734) of the contact will occur automatically after the phase voltage returns or the voltage rises by 5 V above the set threshold (by the voltage hysteresis value).



CP-733



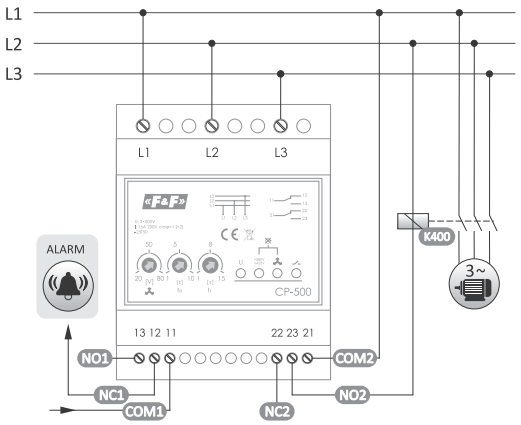
CP-734

power supply	3×(50÷450 V)+N
contacts	
CP-733	separated 3×NC
CP-734	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

CP-500 power supply 3×500 V, without neutral wire

Functioning

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 L_1, L_2, L_3	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

Functions

- 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.

Chapter 25

Automatic phase switches

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.

Product	Power supply voltage	Maximum load current (AC-1)	Współpraca ze stycznikami	TRMS measurement	Lower threshold activation	Upper threshold activation	Switching time	Voltage measurement error	Priority phase	Mounting	Page
PF-421 TRMS	3×230 V+N	16 A	–	•	160÷220 V	240÷280 V	0,2÷200 s	±1%	L1/brak*	for TH-35 rail	167
PF-431	3×230 V+N	16 A	–	•	195 V	280 V	1,0÷1,5 s	±1%	L1	for TH-35 rail	167
PF-431-LED	3×230 V+N	16 A (120 A/20 ms)	–	•	195 V	280 V	1,0÷1,5 s	±1%	L1	for TH-35 rail	167
PF-432 TRMS	3×230 V+N	16 A	•	•	207 V (230 V -10%)	253 V (230 V -10%)	min 0,2 s	±1%	L1	for TH-35 rail	168
PF-433 TRMS	3×230 V+N	16 A	•	•	207 V (230 V -10%)	253 V (230 V -10%)	min 0,2 s	±1%	–	for TH-35 rail	168
PF-434 TRMS	3×230 V+N	16 A	•	•	160÷220 V	240÷280 V	min 0,2 s	±1%	L1	for TH-35 rail	168
PF-435 TRMS	3×230 V+N	16 A	•	•	160÷220 V	240÷280 V	min 0,2 s	±1%	–	for TH-35 rail	168
PF-441	3×230 V+N	16 A	•	–	195 V	250 V	0,5÷0,8 s	±1%	L1	for TH-35 rail	169
PF-451	3×230 V+N	16 A	•	–	150÷210 V	230÷270 V	0,5÷0,8 s	±1%	–	for TH-35 rail	169
PF-452	3×230 V+N	16 A	–	–	150÷210 V	230÷270 V	0,5÷0,8 s	±1%	–	for TH-35 rail	170

* Possibility of operation with or without priority phase (selectable by user)

PF-421 TRMS automatic phase switch with adjustable lower and upper voltage thresholds

Functioning

Three-phase voltage (3×400 V+N) is connected to the input terminals of the device. At the output of the relay will appear single-phase voltage (230 V) of one of the phases. The electronic circuit of the switch controls the values of the voltages of the supplied phases so that the output voltage is not less or more than the set values. The phase with the correct parameters is directed to the switch output.

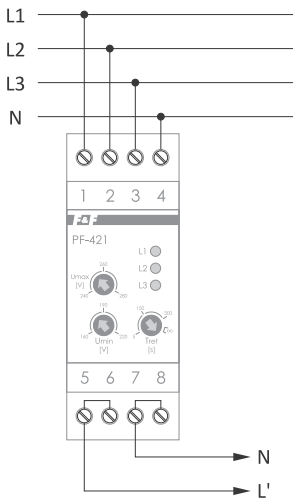
The device measures the RMS value of the voltage (True RMS), which makes it ideal for modern automation systems, where the supply voltage is often distorted due to the operation of nearby devices with switching power supplies. Depending on the mode set, the L1 phase is the priority phase, or the system operates without phase priority (Tret set to ∞).

Operation with phase priority

In this mode, the L1 phase is the priority phase, and if its parameters are correct for the time set by the Tret knob, it will be connected to the output. If the L1 phase exceeds the upper or lower setting level, the L2 or L3 phase voltage will be connected to the output. If the L3 phase is attached to the output and the L2 phase returns to the correct parameters, it will be switched to the output (the priority of phases from highest to lowest is L1, L2, L3).

Operation without priority phase (Tret set to ∞).

In this mode, all phases have the same priority, which means that the first of the correct phases will be connected to the output. The output phase will be changed only when the output voltage goes beyond the range set by the Vmin and Vmax knobs.

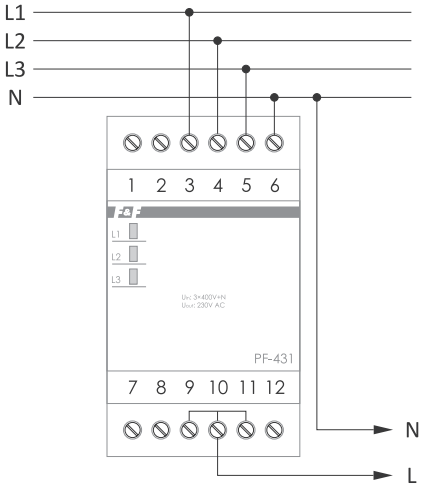


power supply	3×230 V+N
minimum operating voltage (when supplied from one phase)	85 V
maximum phase voltage	420 V
voltage frequency	45÷55 Hz
cooperation with power generators	no
maximum load current (AC-1)	16 A
mechanical strength contacts	1×10^7
electrical strength contacts (16 A/AC-1)	1×10^5
signal sampling frequency	4 kHz
executive element	3×relay
return hysteresis	10 V
setting range Vmin	160÷220 V
setting range Vmax	240÷280 V
voltage measurement error	±1%
switching time	max 200 ms
return time	5÷300 s
input voltage indication	3×LED
power consumption	1.5 W
working temperature	-25÷50°C
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

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	3×230 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 indication	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-432 TRMS for use with a contactor, with priority phase, with fixed lower (207 V) and upper (253 V) tripping thresholds

PF-433 TRMS for use with a contactor, without priority phase, with fixed lower (207 V) and upper (253 V) tripping thresholds

PF-434 TRMS for use with a contactor, with priority phase, with adjustable lower (160 V÷220 V) and upper (240 V÷280 V) tripping thresholds

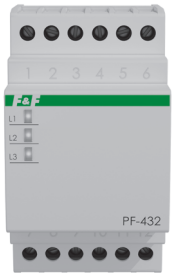
PF-435 TRMS for use with a contactor, without priority phase, with adjustable lower (160 V÷220 V) and upper (240 V÷280 V) tripping thresholds

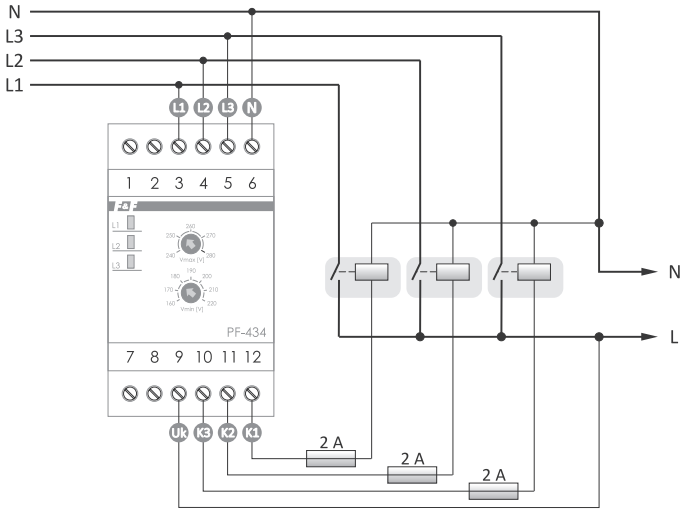
Functioning

Three-phase voltage (3×230 V+N) is connected to the input terminals of the device. At the output of the relay there will be a single-phase voltage (230 V) of one of the phases. The electronic circuit of the switch controls the voltage values of the input phases so that the output voltage is not lower or higher than the set values. The phase with the correct parameters is directed to the switch output. The device measures the rms value of the voltage (True RMS), making it ideal for modern automation systems, where the supply voltage is often distorted due to the operation of nearby devices with switching power supplies. The device has a control contact for continuous monitoring of the output state. Thanks to this, it is possible to detect such anomalies as a stuck contact of any of the contactors or a damaged contact. This protection also prevents the contactor from switching on if the voltage at the output is generated from outside.

Applies to PF-432 TRMS and PF-434 TRMS:
These devices have a priority phase (L1). This means that if its parameters are correct for a minimum of 5 s, it will be connected to the output, even if the other phases are correct. If the L1 phase has invalid parameters, then the voltage of the L2 or L3 phase will be connected to the output in turn, depending on which phase is correct.

Applies to PF-433 TRMS and PF-435 TRMS:
All phases have the same priority, which means that the first of the correct phases will be attached to the output. The output phase will be changed only when it exceeds the allowed parameters.



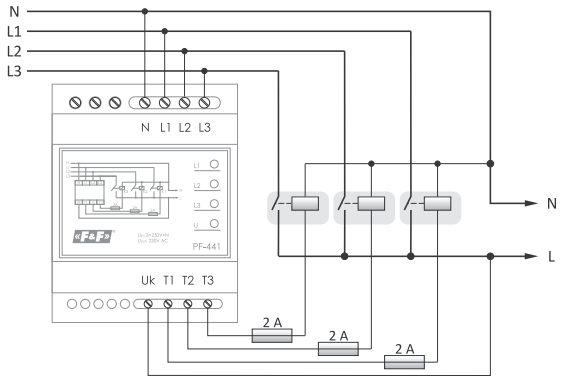


	PF-432 TRMS	PF-433 TRMS	PF-434 TRMS	PF-435 TRMS
power supply	3×230 V+N			
minimum operating voltage when supplied from one phase	85 V			
maximum phase voltage	420 V			
supply voltage frequency	45÷55 Hz			
cooperation with power generators	–			
maximum load current	16 A (AC-1)			
mechanical strength contacts	1×10⁷			
electrical strength contacts	(16 A/AC-1) 1×10⁵			
TrueRMS measurement	●			
signal sampling frequency	2 kHz			
executive element	3×relay			
hysteresis	5 V			
higher activation threshold	253 V (230 V ±10%)		160÷220 V	
lower activation threshold	207 V (230 V ±10%)		240÷280 V	
voltage measurement error	1%			
maximum switching time	200 ms			
return time	5 s			
working mode	with priority phase	without priority phase	with priority phase	without priority phase
output voltage indication	3×LED			
power consumption	<1,5 W			
working temperature	-25÷50°C			
terminal	4.0 mm² screw terminals			
tightening torque	0.5 Nm			
dimensions	3 modules (52.5 mm)			
mounting	on TH-35 rail			
ingress protection	IP20			

PF-441 for use with a 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.

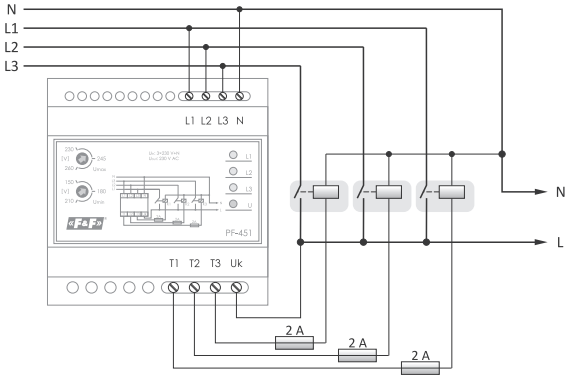


power supply	3×400 V+N
output voltage	230 V AC
maximum load current (AC-1)	
direct connection	16 A
with contactors	to the load capacity of contactor contacts
activation threshold	
lower	195 V
upper (adjustable)	250 V
voltage hysteresis	5 V
voltage measurement error	±1%
switching time	0.5÷0.8 s
power 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 use with a contactors, without a priority phase, with adjustable lower (150÷210 V) and upper (230÷260 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 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.

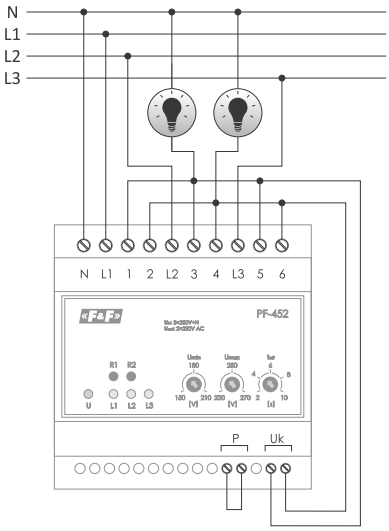


power supply	3×400 V+N
output voltage	230 V AC
maximum load current (AC-1)	
direct connection	16 A
with contactors	to the load capacity of contactor contacts
activation threshold L_1, L_2	<195 V
activation threshold L_3	<190 V
voltage hysteresis	5 V
voltage measurement error	±1%
switching time	0.3 s
input voltage indication	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)

Functioning

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.

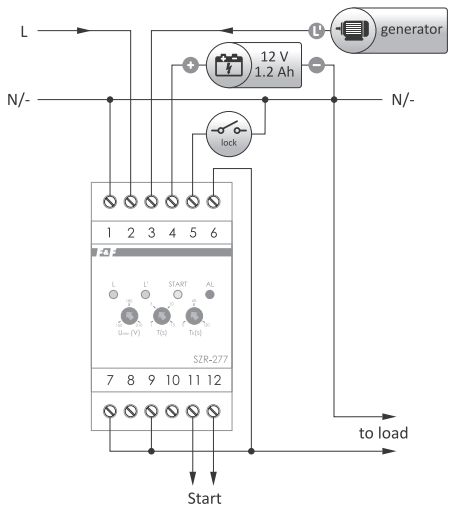
Function

- 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.

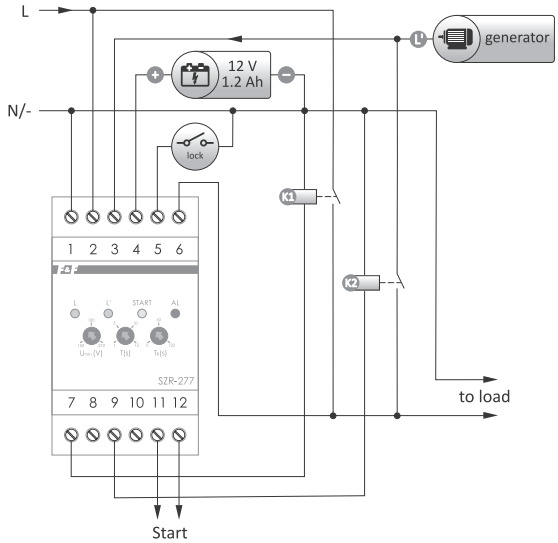
supply voltage	
main line (terminals 1-2)	195÷265 V/50 Hz
generator (terminals 1-3)	195÷265 V/50 Hz
battery* (terminals 1-4)	10÷14.5 V DC
maximum allowable voltage (terminals 1-2, 1-3)	400 V
maximum switching current of internal contacts	16 A (AC-1)/250 V 3 A (AC-15)/250 V
contact	3×NO
voltage threshold**	
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

Wiring diagram

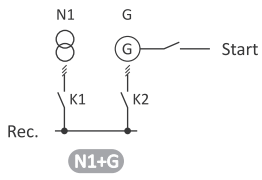


Connection at the current <16 A (AC-1)



Connection (with the contactors) at the current above 16 A (AC-1)

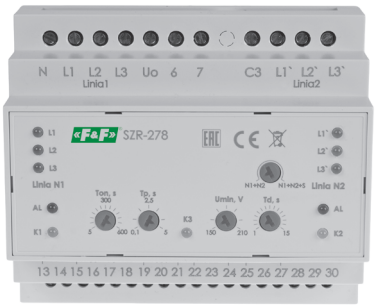
Work modes



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.

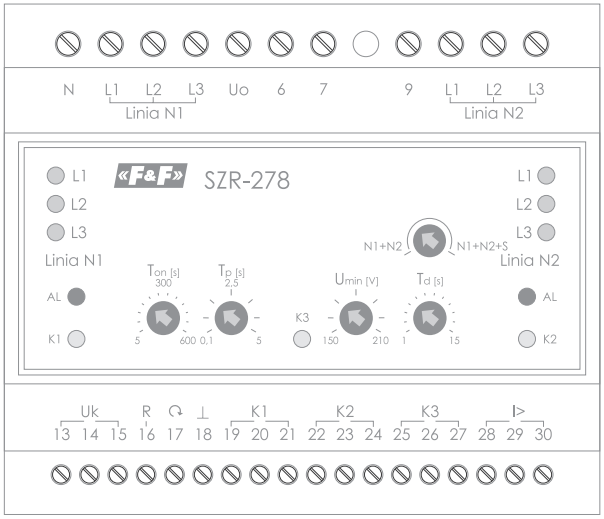


controlled lines	3×400V+N
supply voltage	24÷264 V AC
maximum voltage	450 V AC
frequency	45÷55 Hz
number of controlled lines	2
number of relay outputs	4×NO/NC
maximum coil current of contactor	2 A
lower voltage threshold	150÷210 V AC
upper voltage threshold	270 V AC
lower switch-off time	1÷15 s
upper 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

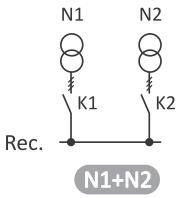
- Phase presence check;
- Phase sequence check;
- Phase asymmetry check;
- Monitoring of minimum and maximum phase voltage;
- Control of contactors or motorized switches;
- Status of the contactors check;
- Monitoring of overcurrent circuit breakers operation;
- Can be powered from an external power 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.

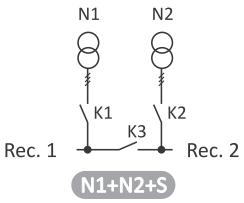
Wiring diagram



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

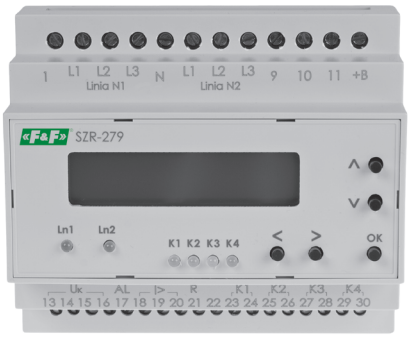




SZR-279

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.

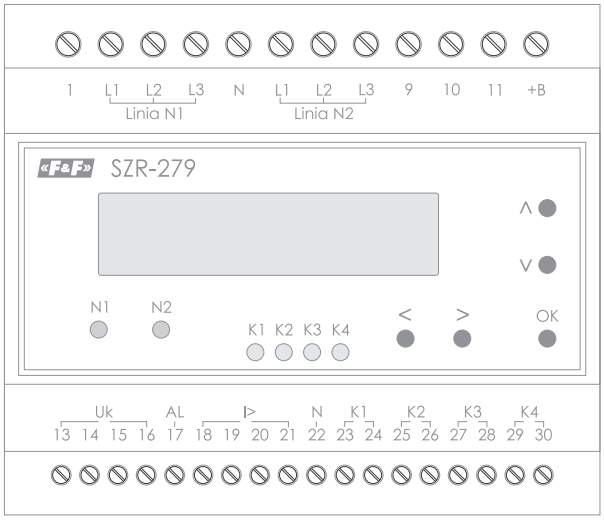


controlled lines	3×400V+N
supply voltage	24÷264 V AC
maximum voltage	450 V AC
frequency	45÷55 Hz
number of controlled lines	3
number of relay outputs	4×NO/NC, 1×NO
maximum coil current of contactor	2 A
lower voltage threshold	150÷210 V AC
upper voltage threshold	230÷300 V AC
lower switch-off time	2÷30 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

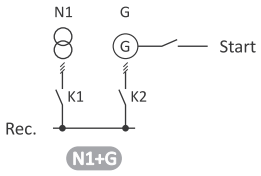
- Phase presence check;
- Phase sequence check;
- Phase asymmetry check;
- Monitoring of minimum and maximum phase voltage;
- Control of contactors or motorized switches;
- Status of the contactors check;
- Monitoring of overcurrent circuit breakers operation;
- Start signal of the generator;
- ALARM 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.

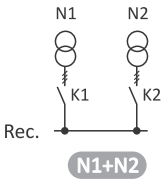
Wiring diagram

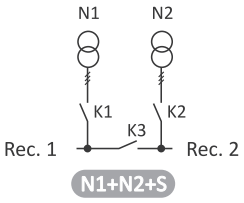


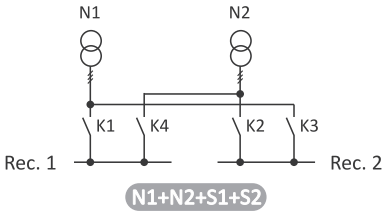
2-4	line N1
6-8	line N2
12	auxiliary power supply
13-15	voltage control
17	error indication
18-20	current control
21	safety switch
22-28	control of output devices
29-30	start-up of the generator

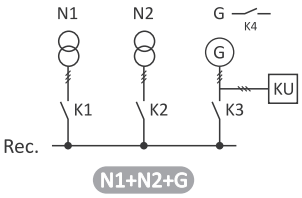
Work modes

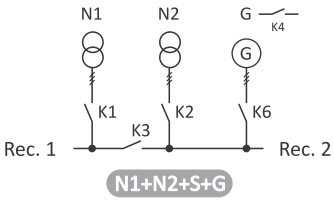












SZR-280 / SZR-280/12

Purpose

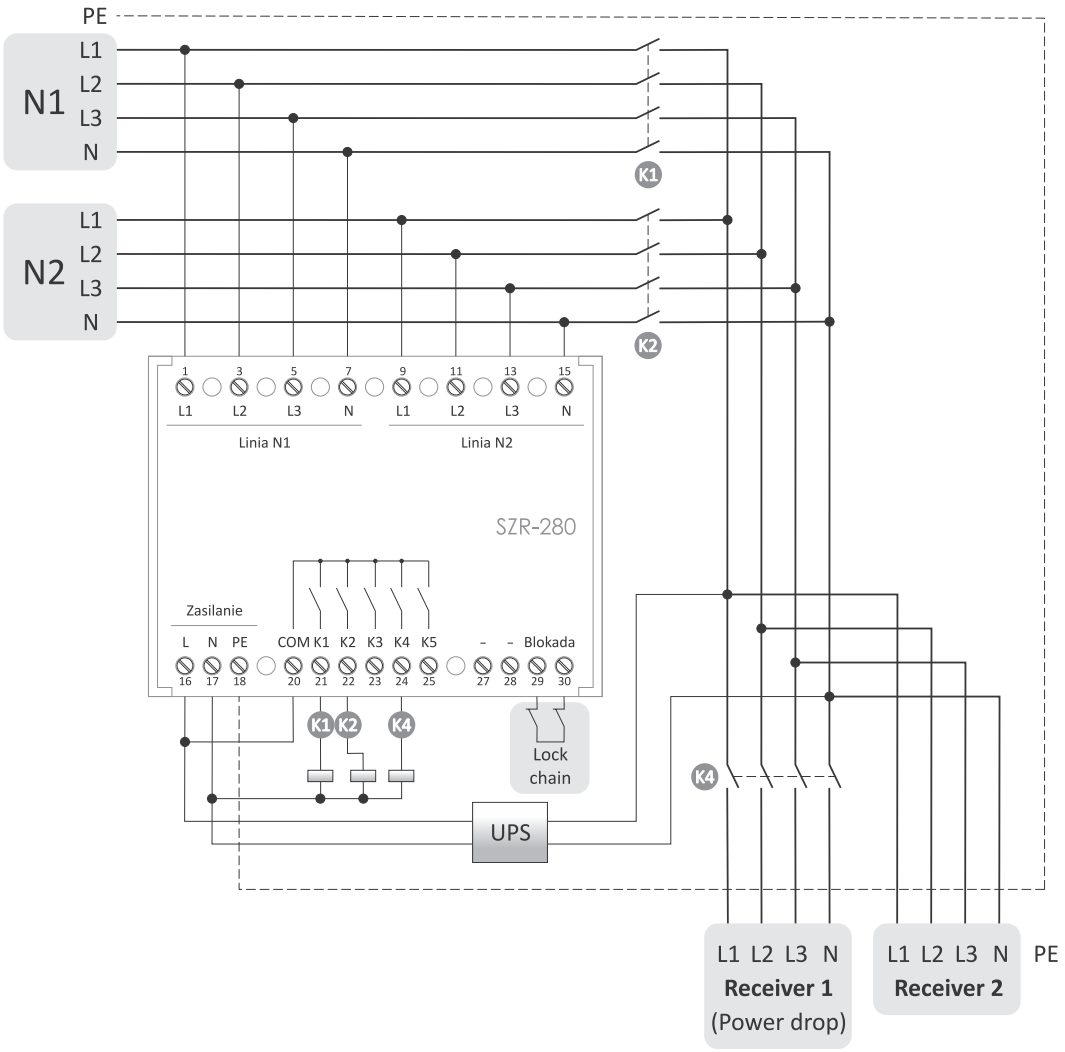
The SZR-280 automatic transfer switch is designed for automatic switching of power sources operating in the following configuration: N1+N2 or N1+G, with load shedding support and event recording. Configuration of the controller by means of a computer application.

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

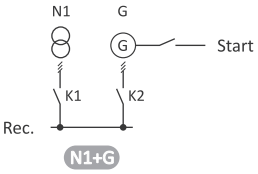
- Simultaneous control of two power lines;
- Measurement of True RMS values;
- Galvanic separation of measuring inputs of power supply lines for contactor control;
- Support for the emergency diesel generator;
- Automatic mode operation with the ability to set a priority line;
- The load shedding is 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.

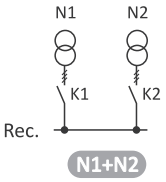
Wiring diagram



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

Work modes





Network-aggregate switches

Purpose

Modular network-aggregate modular switches implement a 1-0-2 switching program, so that it is possible, for example, to connect one of the two input lines to the output, or completely disconnect the circuits.

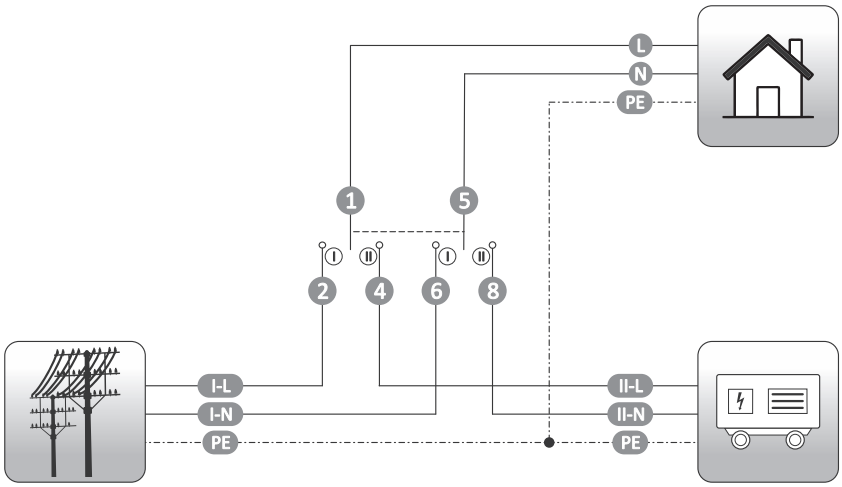
	PSA-263	PSA-440	PSA-463
Number of tracks	2P	4P	4P
Switching progam	1-0-2		
Rated voltage (AC)	230/400 V		
Rated frequency	50÷60 Hz		
Current capacity AC-21 (category B)	63 A	40 A	63 A
Current capacity AC-22 (category A)	63 A	40 A	63 A
Electrical strength	5.000 cycles		
Mechanical strength	15.000 cycles		
Working temperature	-20÷50°C		
Terminal	10 mm² screw terminals (cord) 16 mm² screw terminals (wire)		
Tightening torque	1.8 Nm		
Dimensions	2 modules (35 mm)	4 modules (70 mm)	4 modules (70 mm)
Mounting	on TH-35 rail		
Ingress protection	IP20		

Switches with lever

PSA-263 2-track, network-aggregate modular switch 63 A

rated voltage	230/400 V
rated current [AC-21B/AC-22A]	63 A
rated frequency	50÷60 Hz
number tracks	2P
switching program	1-0-2
electrical strength	5000 cycles
mechanical strength	15000 cycles
working temperature	-20÷50°C
terminal	10 mm² screw terminals (cord) 16 mm² screw terminals (wire)
tightening torque	1.8 Nm
dimensions	4 modules (70 mm)
mounting	for TH-35 rail
ingress protection	IP20

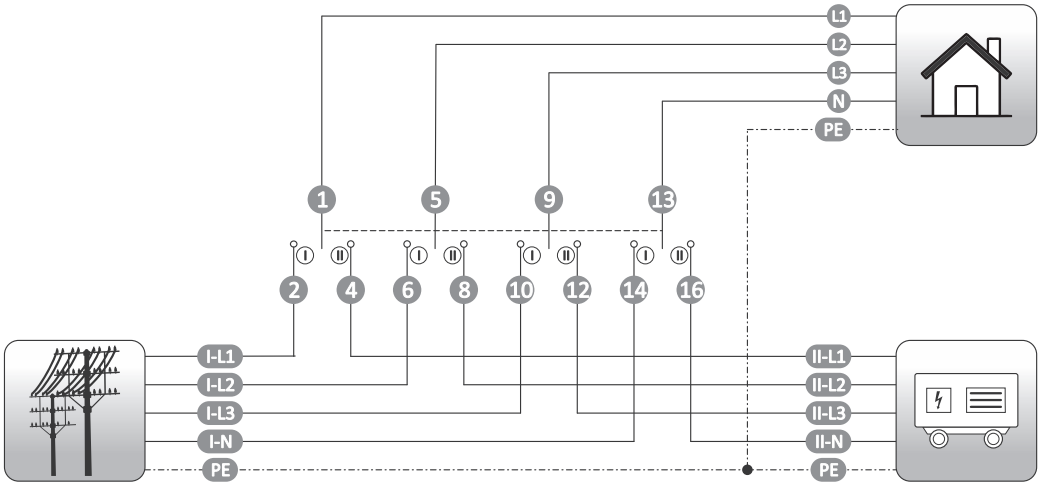
Wiring diagram



PSA-440 4-track, network-aggregate modular switch 40 A

rated voltage	230/400 V
rated current [AC-21B/AC-22A]	40 A
rated frequency	50÷60 Hz
number tracks	4P
switching program	1-0-2
electrical strength	5000 cycles
mechanical strength	15000 cycles
working temperature	-20÷50°C
terminal	10 mm² screw terminals (cord) 16 mm² screw terminals (wire)
tightening torque	1.8 Nm
dimensions	4 modules (70 mm)
mounting	for TH-35 rail
ingress protection	IP20

Wiring diagram



Chapter 27

Rotary switches

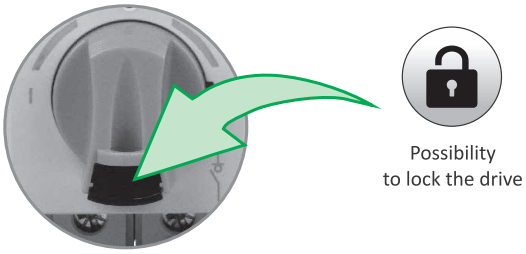
Purpose

Modular network-aggregate installation switches implement switching program I-0-II, so it is possible, for example, to connect them to the output of one of the two input lines, or completely disconnect the circuits. The contacts of the switch act as a disconnector, so it is possible to switch up to the rated load current.

PSR-440 4-track, rotary, modular network-aggregate switch 40 A

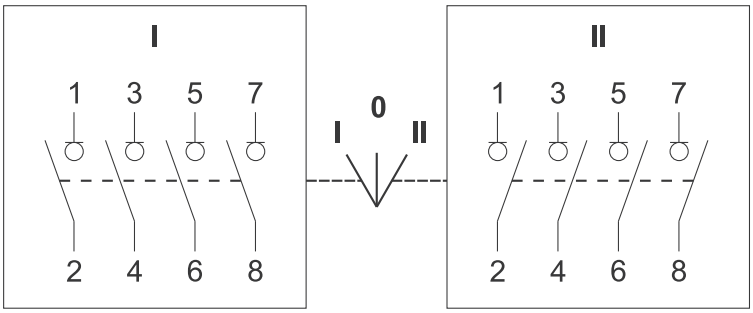
PSR-463 4-track, rotary, modular network-aggregate switch 63 A

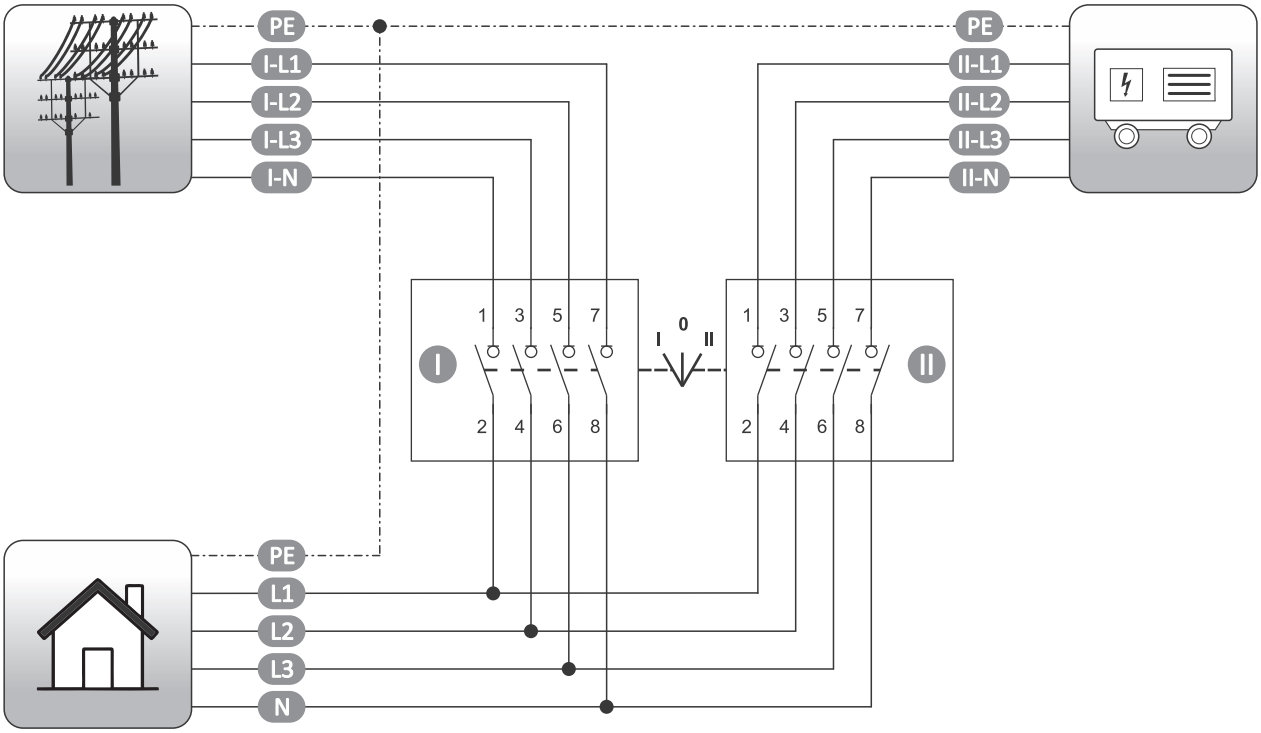
PSR-480 4-track, rotary, modular network-aggregate switch 80 A



Possibility
to lock the drive

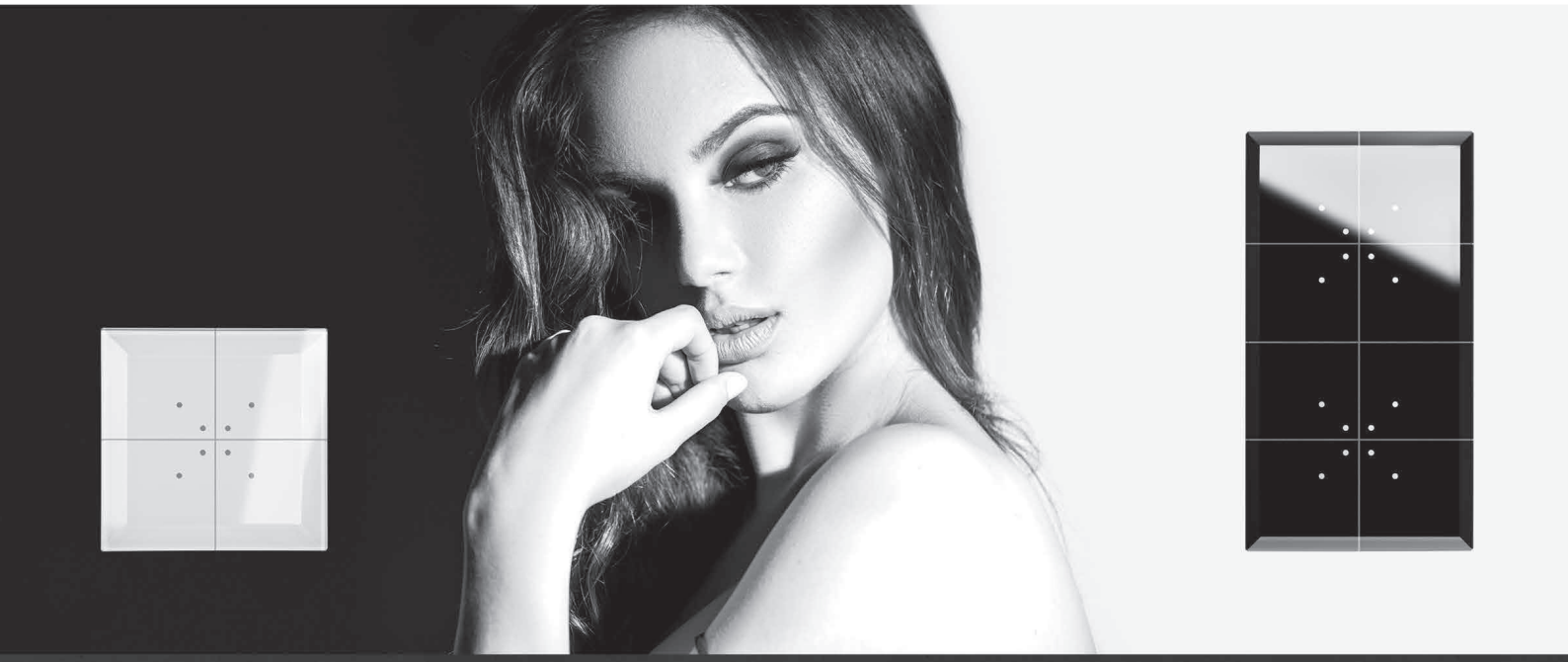
	PSR-440	PSR-463	PSR-480
Number of tracks		4P	
Rated voltage (AC)		415 V	
Insulation voltage		800 V	
Surge voltage		8 kV	
Rated frequency		50÷60 Hz	
Current capacity AC-21 (category A and B)	40 A	63 A	80 A
Current capacity AC-22 (category B)	40 A	63 A	80 A
Current capacity AC-23 (category B)	40 A	63 A	80 A
Switching power	26 kW	41 kW	52 kW
Mechanical strength		10.000 cycles	
Possibility of locking in 0 position		YES	
Power loss (for rated current)			
1 track	0.9 W	1.5 W	2.4 W
total	3.6 W	6.0 W	9.6 W
Working temperature		-25÷50°C	
Screw terminals			
minimum conductor diameter		2.5 mm²	
maximum conductor diameter		35 mm²	
Dimensions [S×W×G]		138×76×103 mm	
Mounting		on TH-35 rail/on the mounting plate	
Ingress protection		IP20	

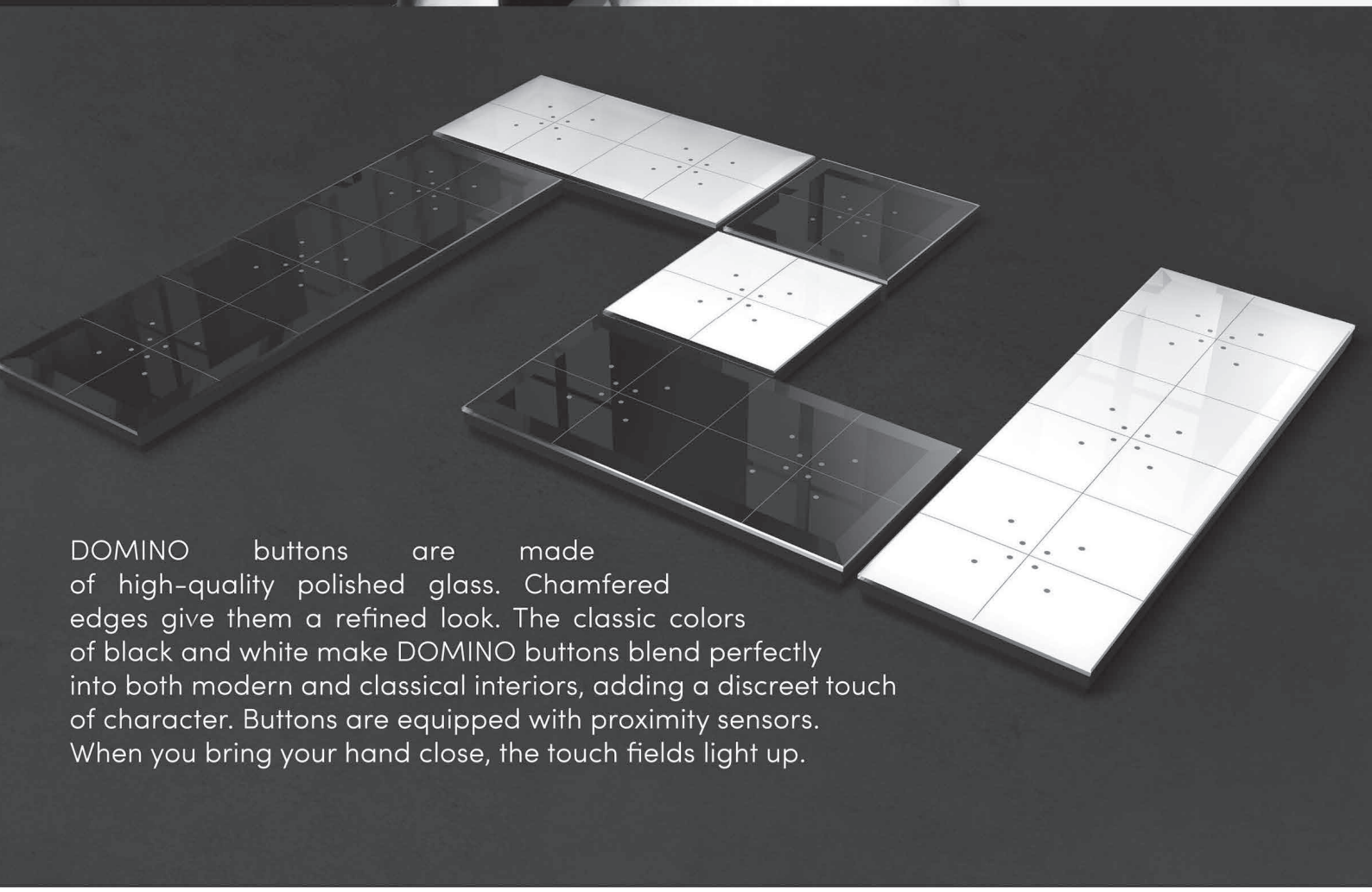

I
1 3 5 7
2 4 6 8
0
I II
II
1 3 5 7
2 4 6 8


PE
I-L1
I-L2
I-L3
I-N
PE
II-L1
II-L2
II-L3
II-N
1 3 5 7
I
2 4 6 8
0
I II
1 3 5 7
II
2 4 6 8
PE
L1
L2
L3
N

DOMINO

Glass touch buttons with proximity function





DOMINO buttons are made of high-quality polished glass. Chamfered edges give them a refined look. The classic colors of black and white make DOMINO buttons blend perfectly into both modern and classical interiors, adding a discreet touch of character. Buttons are equipped with proximity sensors. When you bring your hand close, the touch fields light up.

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Section VIII
Current protection

Power consumption limiters

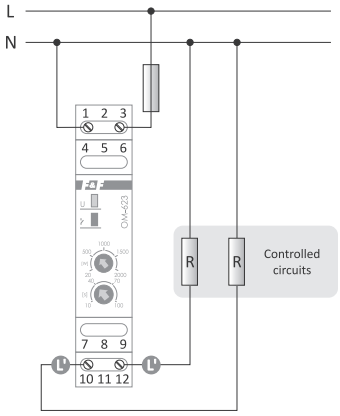
Purpose

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

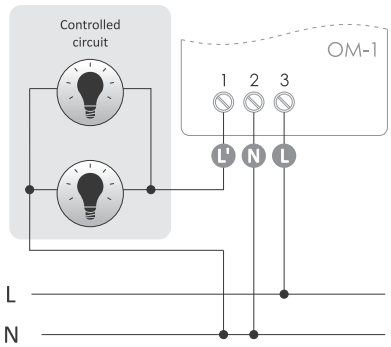
The power limiter allows you to power the circuit when the total power of the receivers in the controlled circuit is lower than the set power. Exceeding the set power consumption threshold in a controlled circuit results in the disconnection of the power supply to this circuit. The power supply will be restored automatically after a set time.

OM-623 with an adjustable return time, for circuits with current converters



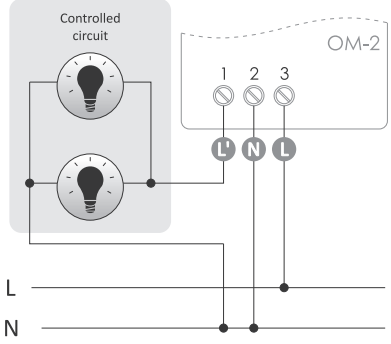
power supply	165÷265 V AC
maximum load current	
(AC-1)	16 A
(AC-3)	2 A
power limit (adjustable)	20÷2000 W
activation delay	2 s
return power supply time (adjustable)	10÷100 s
power consumption	<1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for 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 (adjustable)	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	50×67×26 mm
mounting	surface-mounted
ingress protection	IP20

OM-2 with an adjustable return time

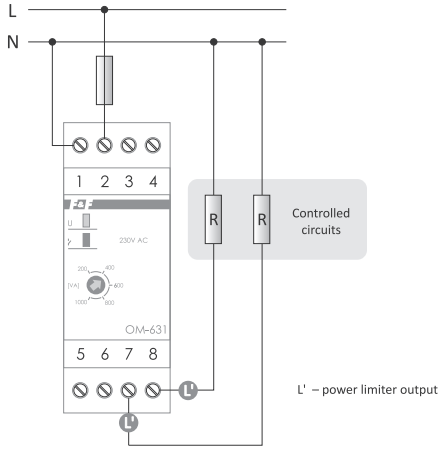


power supply	195÷253 V AC
maximum load current (AC-1)	16 A
power limit (adjustable	200÷2000 VA
activation delay	1.5÷2 s
return power supply hysteresis	2%
return power supply time (adjustable)	4÷150 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	50×67×26 mm
mounting	surface-mounted
ingress protection	IP20

OM-631 with a fixed return time

Purpose

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.



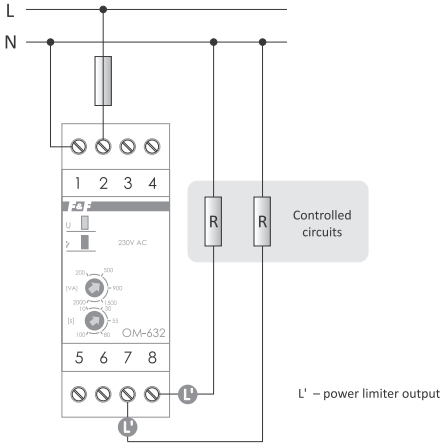
L' – power limiter output

power supply	195÷253 V AC
contact	1×NO
maximum load current (AC-1)	16 A
power limit (adjustable)	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

Purpose

This limiter is designed to protect any electrical circuits, including those with the current converters such as compact fluorescent lamps, electronic transformers.



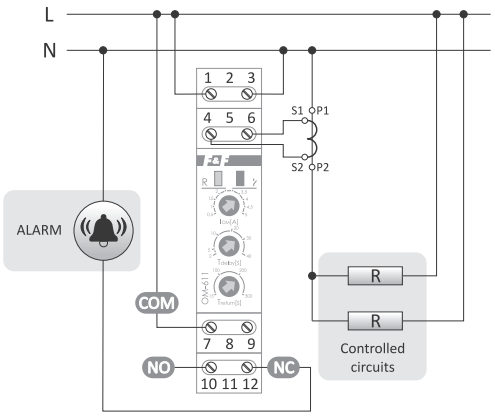
L' – power limiter output

power supply	195÷253 V AC
contact	1×NO
maximum load current	
AC-1	16 A
AC-3	4 A
power limit (adjustable)	200÷2000 VA
activation delay	1.5÷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

Purpose

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.

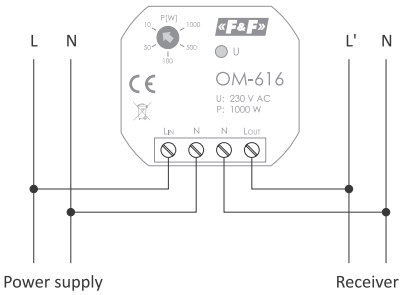


power supply	195÷253 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
activation threshold (adjustable)	0.5÷5 A
activation delay (adjustable)	2÷40 s
return power supply hysteresis	2%
return power supply time (adjustable)	15÷300 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	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

Purpose

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.



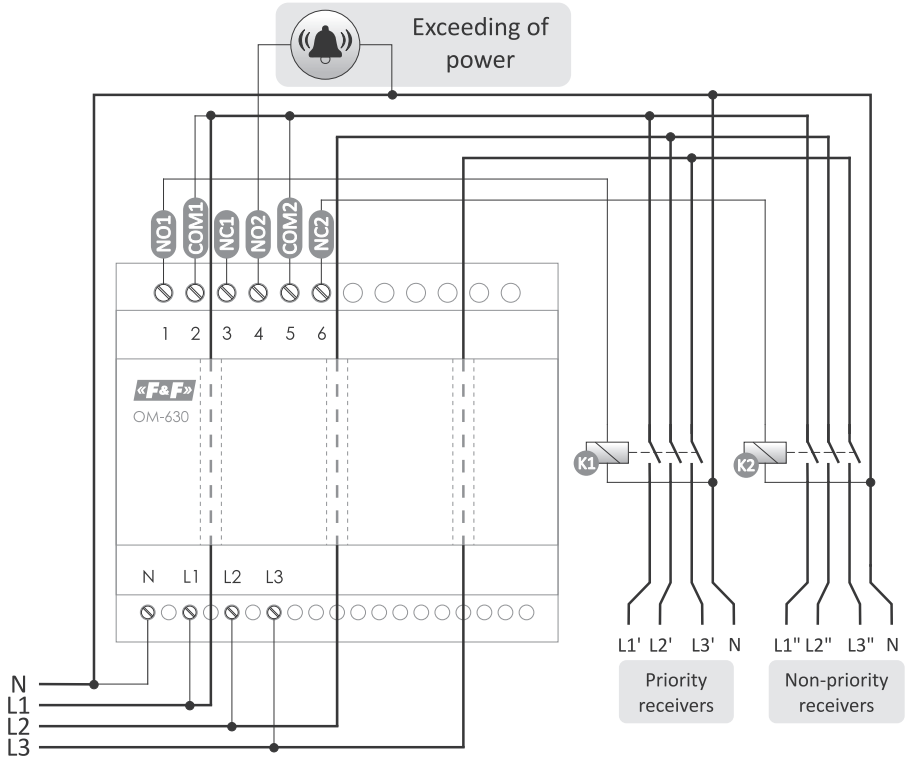
power supply	85÷265 V AC
contact	separated 1×NO
maximum load current (AC-1)	5 A
power	
power limit (adjustable)	10÷1000 W
activation time/return time	4 s/30 s
voltage	
lower activation threshold UL	150 V
upper activation threshold UH	270 V
lower activation time UL	10 s
upper activation time UH	0.3 s
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

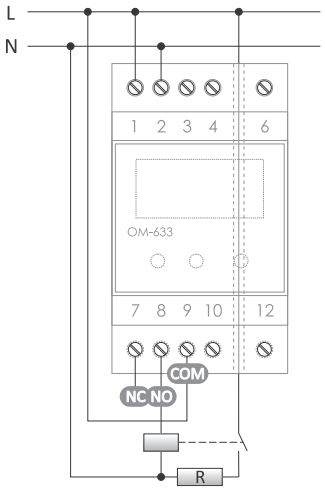
Functions

- 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 TOFF (adjustable)	1÷240 s
return time TON (adjustable)	2÷3600 s
voltage	
lower activation threshold UL	<160 V
upper activation threshold UH	>260 V
lower activation time UL	5 s
upper activation time UH	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

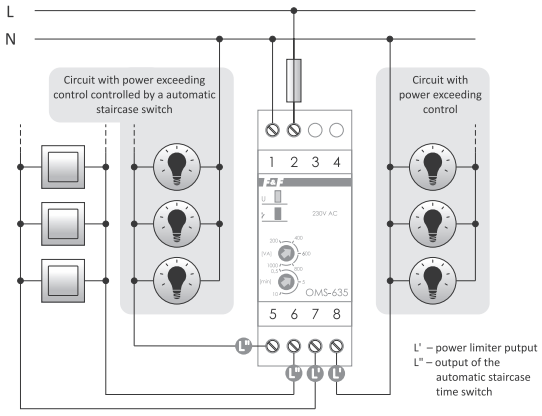
Functions

- 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.



power supply	195÷253 V AC
contact	separated 2×NO
maximum load current (AC-1)	16 A
power limit (adjustable)	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

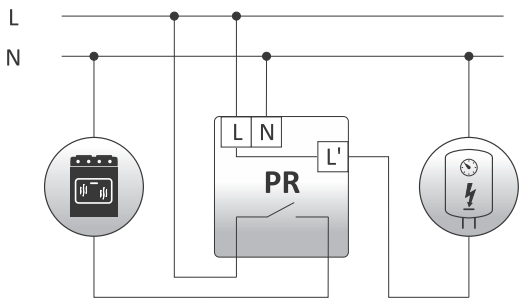
Priority relays

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.

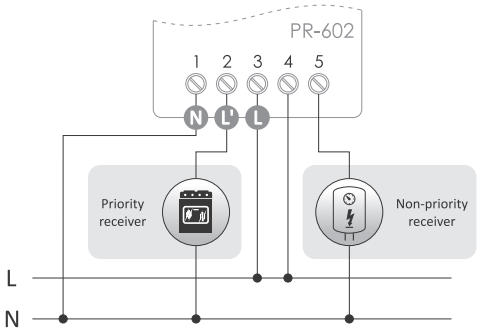
Functioning

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.

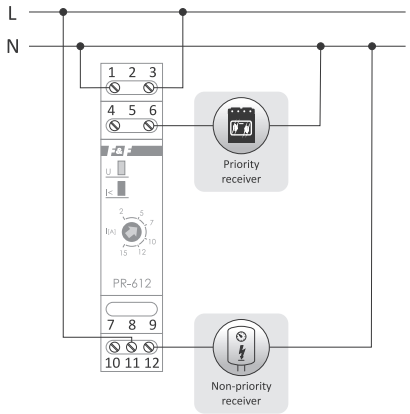
PR-602 adjustment range: 2÷15 A



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

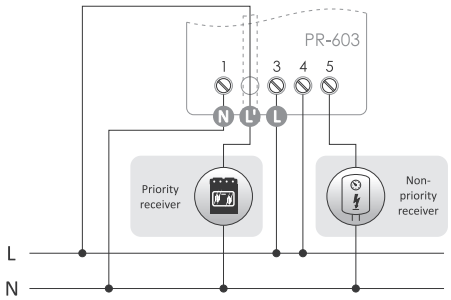
* a higher current requires an additional contactor

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.

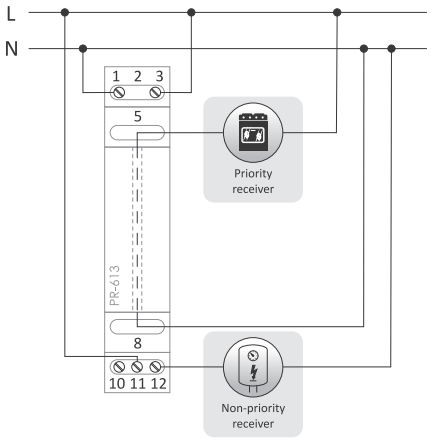
PR-603 adjustment range: 2÷15 A



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

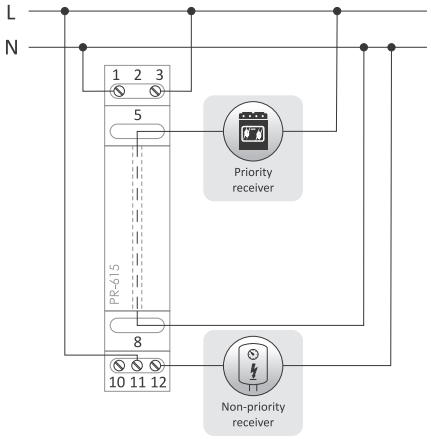
PR-613 adjustment range: 2÷15 A



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

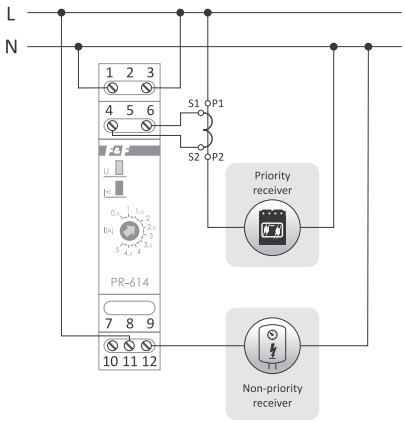
The priority receiver current can be greater than 15 A. It is limited only by the cross-section of the current cable of the receiver (separated from the measuring system), which is passed through the pass-through duct of the relay.

For use with a current transformer

PR-614

Purpose

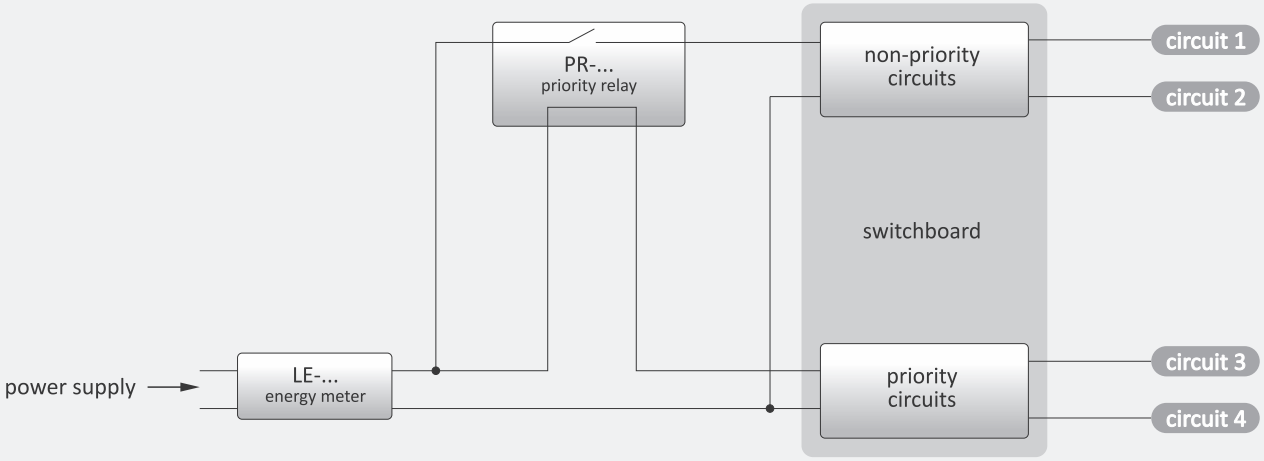
The relay is adapted to work with a current transformer with a secondary current of 5 A.
The primary circuit of the transformer is connected to the current circuit of the priority receiver and the secondary circuit to the measuring terminals of the relay.
Example: For a priority receiver with a maximum 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

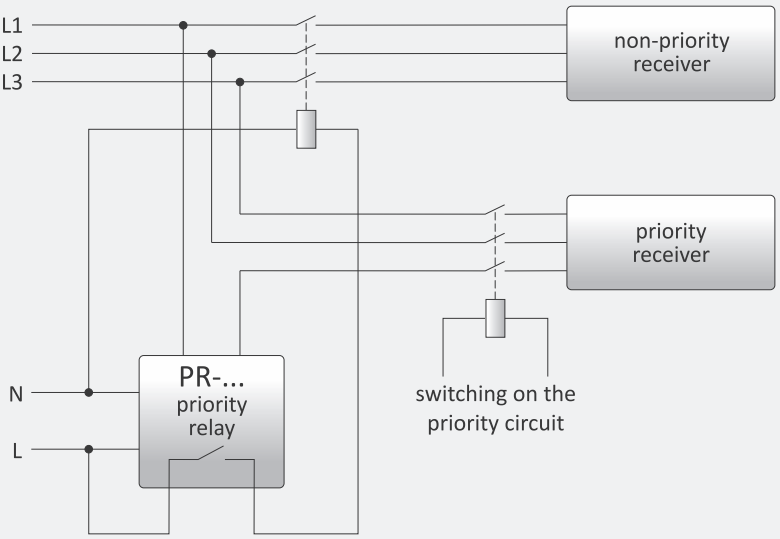
* a higher current requires an additional contactor

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

Purpose

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.

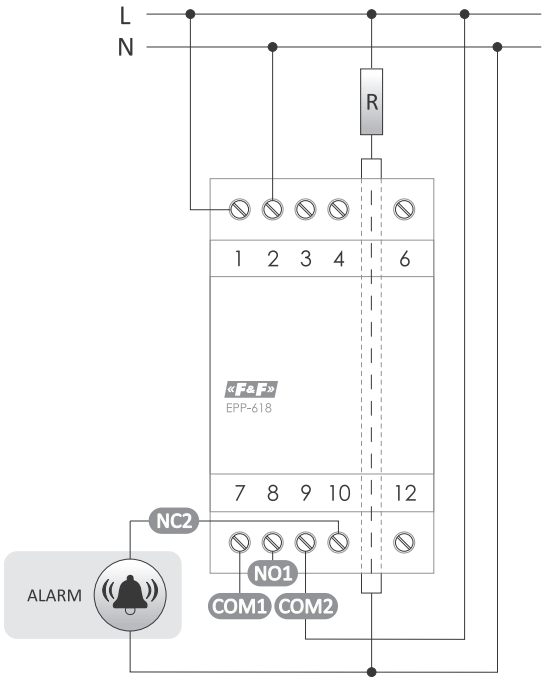
EPP-618 with LED display and a pass-through duct for a current cable of the measured circuit

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

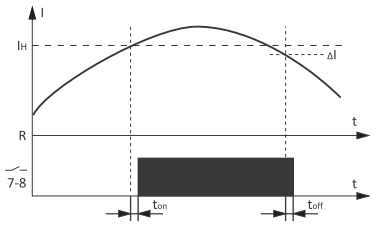
- Direct measurement of currents up to 50 A;
- Indirect measurement up to 999 A (using an external current transformer);
- 4 operating modes:
  – indication of exceeding the preset value of current;
  – indication of the current drop below the preset value;
  – indication of exceeding the preset current with programmable hysteresis;
  – indication of the current outside the specified range.



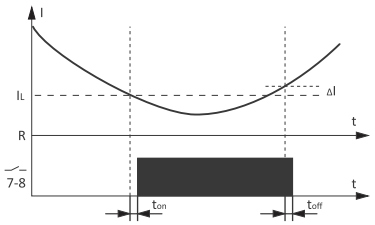
power supply	195÷253 V AC
contact	separated 1×NO, 1×NC
maximum load current (AC-1)	2×8 A
adjustment range for direct measurement	0.5÷50 A
ratio adjustment range	1÷999
activation time adjustment range	0.5÷60 s
deactivation time adjustment range	0.5÷60 s
constant hysteresis	10%
measurement error	<3%
diameter 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

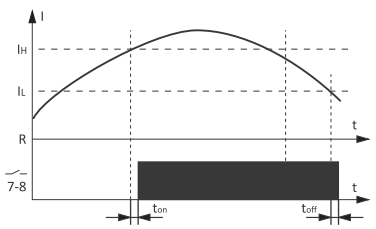
A



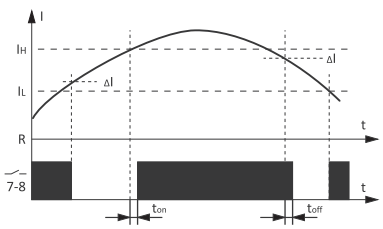
B



C



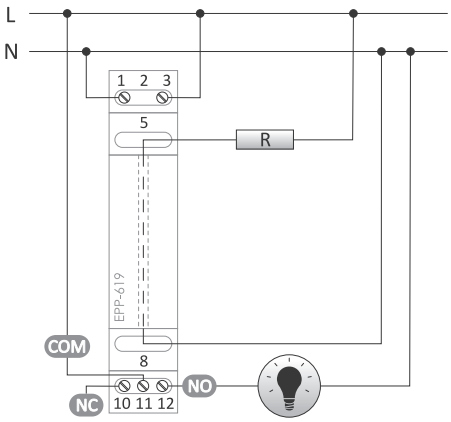
D



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).

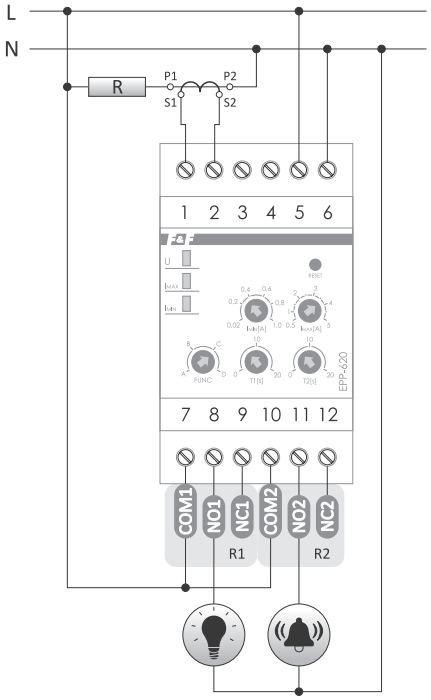


power supply	195÷253 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
current measuring circuit	limited by the cross-section of the cable
switching current (adjustable)	0,6÷16 A
return hysteresis	10%
activation delay (adjustable)	0.5÷10 s
return delay	0.5 s
power consumption	0.4 W
working 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

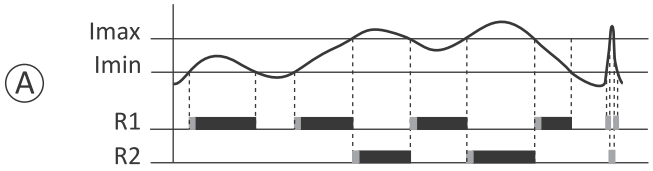
Functioning

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 "I_{min}" and upper "I_{max}". The FUNC knob allows you to select one of the four operation diagrams shown in the diagrams below.

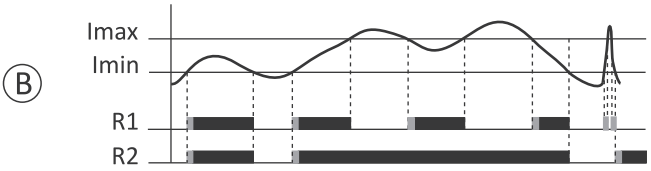


power supply	85÷264 V AC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
maximum current of the measuring input	5 A
current thresholds (adjustable)	
I_{min}	0.02÷1 A
I_{max}	0.5÷5 A
activation delay (adjustable)	0÷20 s
return hysteresis	10%
return time	0.5 s
power consumption	0.4 W
working 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

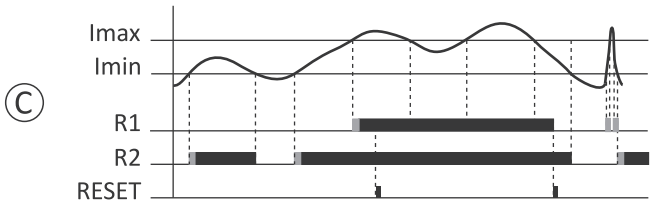
EPP-620: Work diagrams



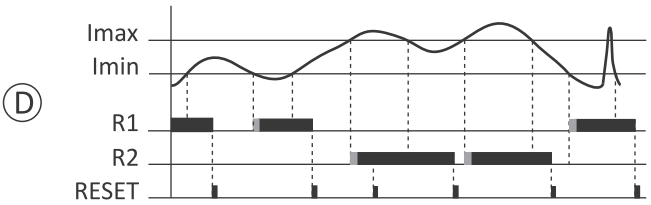
If "I_{min}" is exceeded, the contact R_1 is closed. After exceeding the "I_{max}" threshold, the contact R_2 will be closed and the contact R_1 will be open.



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 "Imin" is exceeded, the contact R_2 is closed. After exceeding the "Imax" threshold, the contact R_1 will be closed. The R_1 contact is locked until the RESET button is pressed. If the value exceeds "Imax", the contact R_1 does not react to RESET.



After the value drops below "Imin" the contact R_1 is closed. After exceeding the "Imax" 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 "Imax", the contact R_2 does not react to RESET.

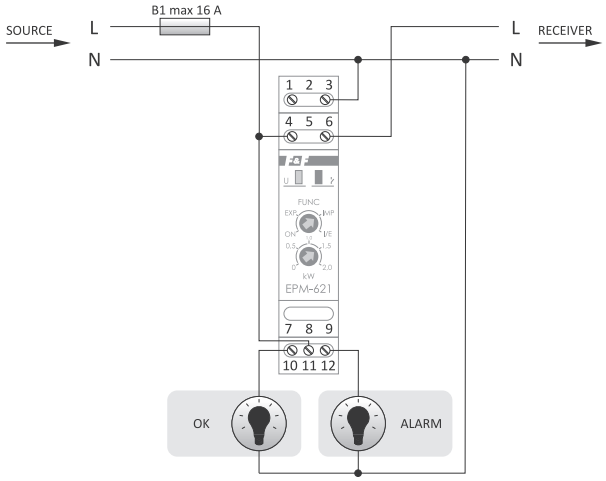
EPM-621 energy consumption direction relay (imported/exported)

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

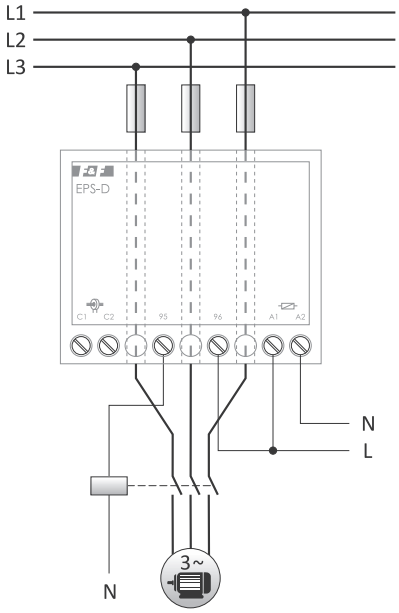
- Motor load preview;
- A message indicating the cause of the protection tripping;
- Heat memory of the motor.

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%.

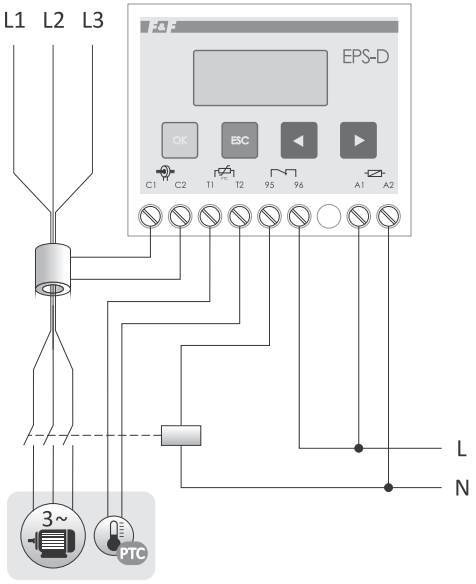
Execution	Setting range
5 A*	1÷5 A
20 A	5÷25 A
100 A	20÷100 A

* 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



Wiring diagram



Additional residual current and temperature protection

Fuse modules

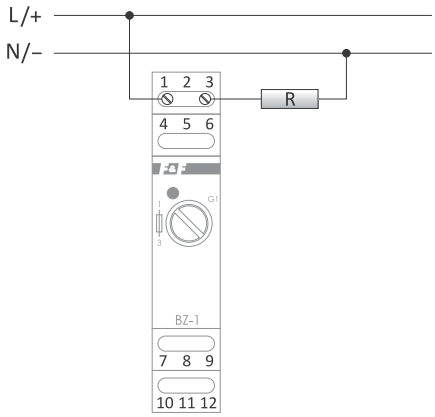
Purpose

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

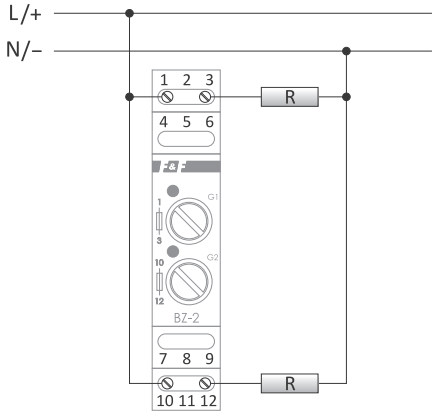
The fuse activation (fuse-link burnout) is indicated by the red LED.

BZ-1 1-socket



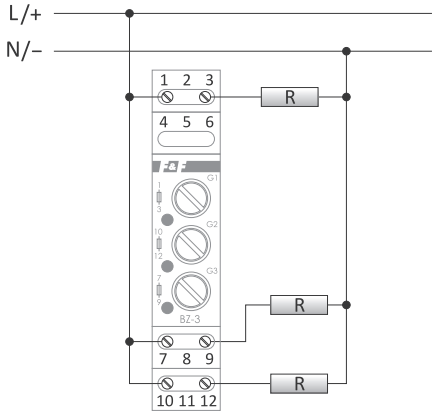
fuse	fuse link ø5×20 mm
maximum voltage	250 V AC
maximum load current	6.3 A
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	on TH-35 rail
ingress protection	IP20

BZ-2 2-sockets



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

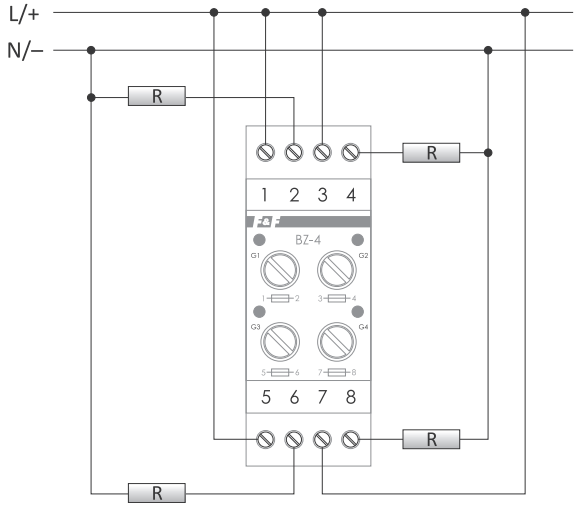
BZ-3 3-sockets



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.
For more information, see p. 194.

BZ-4 4-sockets



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

Chapter 33

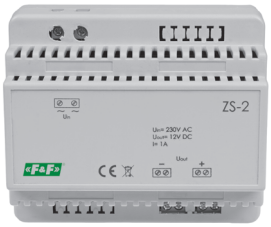
Power supplies and transformers

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
PIN-12-24	pulse power supply	12÷20 V DC	24 V DC	8.3 A	200 W	90×134×55 mm	201
PIN-60-24	pulse power supply	110÷240 V AC	24 V DC	2.5 A	60 W	40×160×35 mm	201
PIN-100-48	pulse power supply	110÷240 V AC	48 V DC	2.1 A	100 W	46×188×36 mm	201
PIN-300-48	pulse power supply	110÷240 V AC	48 V DC	6.3 A	300 W	69×223×40 mm	201
TR-08	mains transformer	230 V AC	8 V AC	1 A	8 VA	2 modules (35 mm)	202
TR-12	mains transformer	230 V AC	12 V AC	0.66 A	8 VA	3 modules (52.5 mm)	202
TR-24	mains transformer	230 V AC	24 V AC	0.5 A	12 VA	3 modules (52.5 mm)	202
ZI-1	pulse power supply	85÷264 V AC	5 V DC	10 A	50 W	6 modules (105 mm)	197
ZI-2	pulse power supply	85÷264 V AC	12 V DC	4 A	50 W	6 modules (105 mm)	197
ZI-3	pulse power supply	85÷264 V AC	18 V DC	3 A	50 W	6 modules (105 mm)	197
ZI-4	pulse power supply	85÷264 V AC	24 V DC	2 A	50 W	6 modules (105 mm)	197
ZI-5	pulse power supply	85÷264 V AC	15 V DC	3.3 A	50 W	6 modules (105 mm)	197
ZI-6	pulse power supply	85÷264 V AC	48 V DC	1 A	50 W	6 modules (105 mm)	197
ZI-10-12P	pulse power supply	180÷264 V AC	12 V DC	0.85 A	10 W	flush-mounted box ø60	200
ZI-20-12P	pulse power supply	180÷264 V AC	12 V DC	1.7 A	20 W	flush-mounted box ø60	200
ZI-11	pulse stabilizer	8÷28 V AC/ 12÷37 V DC	5 V DC	3 A	15 W	3 modules (52.5 mm)	200
ZI-12	pulse stabilizer	12÷28 V AC/ 16÷37 V DC	12 V DC	3 A	36 W	3 modules (52.5 mm)	200
ZI-13	pulse stabilizer	18÷28 V AC/ 22÷37 V DC	18 V DC	3 A	54 W	3 modules (52.5 mm)	200
ZI-14	pulse stabilizer	24÷28 V AC/ 28÷37 V DC	24 V DC	3 A	72 W	3 modules (52.5 mm)	200
ZI-15	pulse power supply	100÷264 V AC	15 V DC	0.8 A	12 W	1 module (18 mm)	197
ZI-16	pulse power supply	100÷264 V AC	13,5 V DC	0.9 A	12 W	1 module (18 mm)	197
ZI-17	pulse power supply	100÷264 V AC	14.5 V DC	0.8 A	12 W	1 module (18 mm)	197
ZI-20	pulse power supply	100÷264 V AC	12 V DC	1 A	12 W	1 module (18 mm)	197
ZI-21	pulse power supply	100÷264 V AC	24 V DC	0.5 A	12 W	1 module (18 mm)	197
ZI-22	pulse power supply	100÷264 V AC	12 V DC	2.5 A	30 W	3 modules (52.5 mm)	197
ZI-24	pulse power supply	100÷264 V AC	24 V DC	1.25 A	30 W	3 modules (52.5 mm)	197
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	199
ZI-61-12	pulse power supply	180÷264 V AC	12 V DC	5 A	60 W	4.5 modules (78 mm)	198
ZI-61-24	pulse power supply	180÷264 V AC	24 V DC	2.5 A	60 W	4.5 modules (78 mm)	198
ZI-75-12	pulse power supply	100÷240 V AC	12 V DC	6.25 A	75 W	130×57×115 mm	199
ZI-100-12	pulse power supply	180÷264 V AC	12 V DC	8.3 A	100 W	6 modules (100 mm)	198
ZI-100-24	pulse power supply	180÷264 V AC	24 V DC	4.15 A	100 W	6 modules (100 mm)	198
ZI-120-12	pulse power supply	100÷240 V AC	12 V DC	10 A	120 W	130×67×115 mm	199
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	199
ZI-240-12	pulse power supply	180÷264 V AC	12 V DC	20 A	240 W	130×127×115 mm	199
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	199
ZI-USB-5	USB power supply	12÷40 V DC	5 V DC	2.1 A	10.5 W	1 module (18 mm)	200
ZS-1	transformer power supply	195÷253 V AC	5 V DC	2 A	12 W	6 modules (105 mm)	197
ZS-2	transformer power supply	195÷253 V AC	12 V DC	1 A	12 W	6 modules (105 mm)	197
ZS-3	transformer power supply	195÷253 V AC	18 V DC	0.66 A	12 W	6 modules (105 mm)	197
ZS-4	transformer power supply	195÷253 V AC	24 V DC	0.5 A	12 W	6 modules (105 mm)	197
ZS-5	transformer power supply	195÷253 V AC	15 V DC	0.8 A	12 W	6 modules (105 mm)	197
ZS-6	transformer power supply	195÷253 V AC	48 V DC	0.25 A	12 W	6 modules (105 mm)	197

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

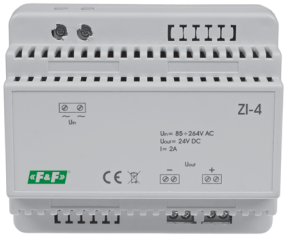
input voltage	100÷264 V AC
output power	12 W
current limit	110% Iout
working temperature	-10÷40°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
weight	80 g
mounting	for TH-35 rail
ingress protection	IP20

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

Type	Output voltage [V DC]	Current [A]
ZI-61-12	12	5
ZI-61-24	24	2.5

input voltage	180÷264 V AC
output power	60 W
efficiency	87%
starting current	40 A/20 ms
leakage current	1 mA
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% I_{out}/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

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

Type	Output voltage [V DC]	Current [A]
ZI-100-12	12	8.3
ZI-100-24	24	4.15

input voltage	180÷264 V AC
output power	100 W
efficiency	88%
starting current	40 A/20 ms
leakage current	1 mA
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% I_{out}/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

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 pulse power supply, flush-mounted box ø60

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
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

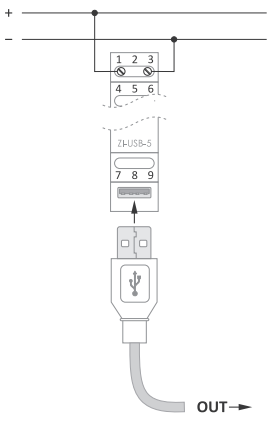
Type	Input voltage [V AC/V DC]	Output voltage [V DC]	Current [A]
ZI-11	8÷28/12÷37	5	3
ZI-12	12÷28/16÷37	12	3
ZI-13	18÷28/22÷37	18	3
ZI-14	24÷28/28÷37	24	3

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

PIN-12-24 24 V pulse power supply

Purpose

The PIN-12-24 V power supply is a pulsed 12÷20 V DC input voltage converter to a stabilized 24 V DC output voltage.

input voltage	12÷20 V DC
output voltage	24 V DC
power	200 W
frequency	50÷60 Hz
working temperature	-10÷60°C
terminal	4.0 mm² screw terminals
tightening torque	Nm
dimensions	100×89×54 mm
ingress protection	IP40

PIN-60-24 24 V pulse power supply

Purpose

The PIN-60-24 V power supply is a pulse converter of 110÷240 V AC input voltage to a stabilized 24 V DC output voltage.

input voltage	110÷240 V AC
output voltage	24 V DC
power	60 W
frequency	50÷60 Hz
working temperature	-10÷60°C
terminal	4.0 mm² screw terminals
tightening torque	1.2 Nm
dimensions	40×160×35 mm
ingress protection	IP20

PIN-100-48 48 V pulse power supply

Purpose

The PIN-100-48 V power supply is a pulsed 110÷240 V AC input voltage converter to a stabilized 48 V DC output voltage.

input voltage	110÷240 V AC
output voltage	48 V DC
power	100 W
frequency	50÷60 Hz
working temperature	-10÷60°C
terminal	4.0 mm² screw terminals
tightening torque	1.2 Nm
dimensions	46×188×36 mm
ingress protection	IP20

PIN-300-48 48 V pulse power supply

Purpose

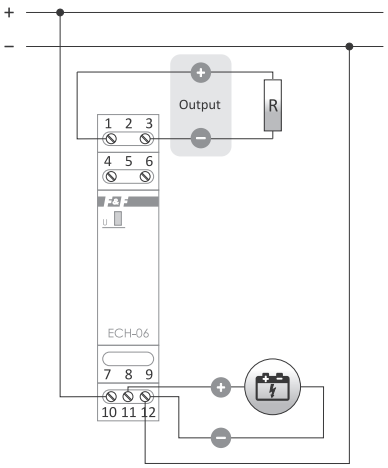
The PIN-300-48 V power supply is a pulsed 110÷240 V AC input voltage converter to a stabilized 48 V DC output voltage.

input voltage	110÷240 V AC
output voltage	48 V DC
power	300 W
frequency	50÷60 Hz
working temperature	-10÷60°C
terminal	4.0 mm² screw terminals
tightening torque	1.2 Nm
dimensions	69×223×40 mm
ingress protection	IP20

ECH-06 DC power reserve module, with battery charging function (1.3÷7.2 Ah)

Purpose

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.

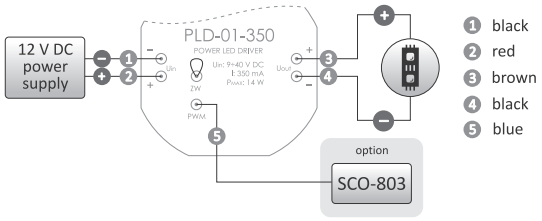


power supply/charging voltage	18÷30 V DC
output voltage Uout	Uin -0.5 V DC Uacu -0.5 V DC
current of the output load Uout	<3 A
supported battery capacity	1.3÷7.2 Ah
maximum battery voltage	13.8 V DC
charging current	<0.35 A
power supply cut-off threshold	<10.5 V DC
own power consumption	<1 W
working 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)

Purpose

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. 39) 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

TR-08 / TR-12 / TR-24 mains transformers

Purpose

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	–	–	206
DMA-1 TrueRMS	for TH-35 rail	ammeter 1-phase	–	–	●	–	–	–	–	–	●	100÷300 V AC	–	–	206
DMA-1 CT	for TH-35 rail	ammeter 1-phase	–	–	●	–	–	–	–	–	–	165÷265 V AC	–	–	207
DMA-1 CT TrueRMS	for TH-35 rail	ammeter 1-phase	–	–	●	–	–	–	–	–	●	165÷265 V AC	–	–	207
DMA-3	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	–	100÷300 V AC	–	–	206
DMA-3 TrueRMS	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	●	100÷300 V AC	–	–	206
DMA-3 CT	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	–	165÷265 V AC	–	–	207
DMA-3 CT TrueRMS	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	●	165÷265 V AC	–	–	207
DMA-1T	panel-mounted	ammeter 1-phase	–	–	●	–	–	–	–	–	–	195÷265 V AC	–	–	208
DMA-3T	panel-mounted	ammeter 3-phase	–	–	●	–	–	–	–	–	–	195÷265 V AC	–	–	208
DMM-1T	panel-mounted	multimeter 1-phase	●	–	●	●	–	–	–	–	–	195÷265 V AC	–	–	208
DMM-4T	panel-mounted	multimeter 3-phase	●	●	●	●	–	–	–	–	–	195÷265 V AC	–	–	209
DMM-5T-2	panel-mounted	analyzer 3-phase	●	●	●	●	●	●	●	●	●	85÷265 V AC/DC	●	–	210
DMM-5T-3	panel-mounted	analyzer 3-phase	●	●	●	●	●	●	●	●	●	85÷265 V AC/DC	●	●	209
DMV-1	for TH-35 rail	voltmeter 1-phase	●	–	–	–	–	–	–	–	–	100÷300 V AC	–	–	204
DMV-1 TrueRMS	for TH-35 rail	voltmeter 1-phase	●	–	–	–	–	–	–	–	●	100÷300 V AC	–	–	204
DMV-3	for TH-35 rail	voltmeter 3-phase	●	–	–	–	–	–	–	–	–	100÷300 V AC	–	–	204
DMV-3 TrueRMS	for TH-35 rail	voltmeter 3-phase	●	–	–	–	–	–	–	–	●	100÷300 V AC	–	–	204
DMV-1T	panel-mounted	voltmeter 1-phase	●	–	–	–	–	–	–	–	–	195÷265 V AC	–	–	204
DMV-3T	panel-mounted	voltmeter 3-phase	●	–	–	–	–	–	–	–	–	195÷265 V AC	–	–	204
DMV-1AC-MBT	panel-mounted	AC relay voltage	●	–	–	–	–	–	–	–	●	80÷265 V AC	●	●	205
WN-711	for TH-35 rail	voltage indicator 1-phase	●	–	–	–	–	–	–	–	–	85÷265 V AC	–	–	212
WN-711S	for TH-35 rail	voltage indicator 1-phase with blanks the screen	●	–	–	–	–	–	–	–	–	85÷265 V AC	–	–	212
WN-723	for TH-35 rail	voltage indicator 3-phase	●	–	–	–	–	–	–	–	–	85÷265 V AC	–	–	212
WN-723S	for TH-35 rail	voltage indicator 3-phase with blanks the screen	●	–	–	–	–	–	–	–	–	85÷265 V AC	–	–	213
WNC-1	for TH-35 rail	digital voltage indicator 1-phase	●	–	–	–	–	–	–	–	–	80÷500 V AC	–	–	211
WNC-3	for TH-35 rail	digital voltage indicator 3-phase	●	–	–	–	–	–	–	–	–	80÷500 V AC	–	–	211

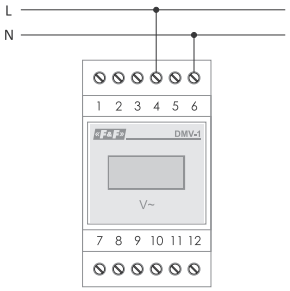
Digital

DMV-1 / DMV-1 True RMS 1-phase
DMV-3 / DMV-3 True RMS 3-phase

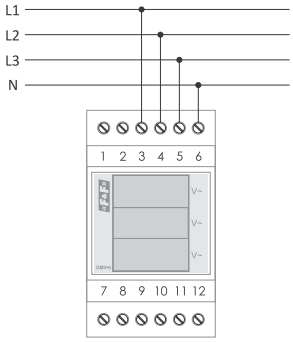
power supply	100÷300 V AC
supply frequency	45÷55 Hz
indication range	100÷300 V
indication accuracy	
DMV-1	1%
DMV-3	1%
DMV-1 True RMS	0.5%
DMV-3 True RMS	0.5%
display for one phase	3×digital LED 10×6 mm
power consumption	4 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² 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

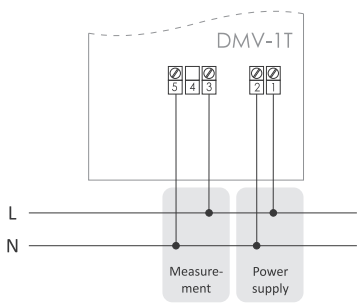


DMV-3/DMV-3 TrueRMS

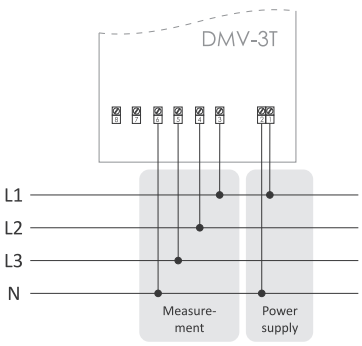
Digital (panel)

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



DMV-1T



DMV-3T

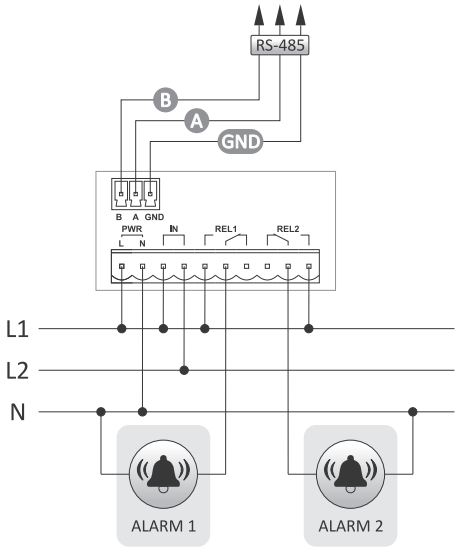
DMV-1AC-MBT panel-mounted AC voltage relay

Purpose

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

Current intensity indicators

Purpose

The indicators are used for continuous reading of the current flowing in 1-phase or 3-phase network circuits.

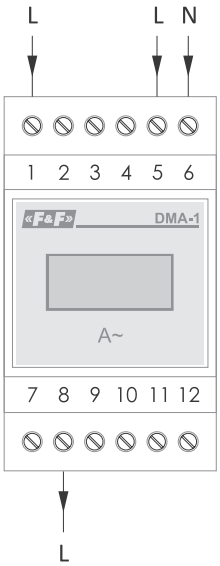
Digital, for direct measurement (DIN rail mounting)

DMA-1 / DMA-1 True RMS 1-phase
DMA-3 / DMA-3 True RMS 3-phase

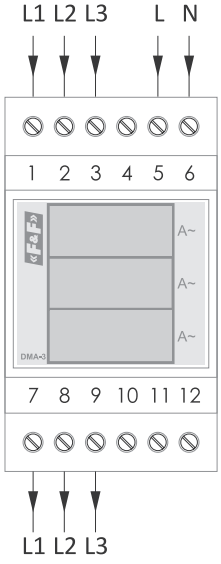
Functions

- Direct measurement:
- DMA-1/DMA-3 – AC rms value;
- DMA-1 TrueRMS/DMA-3 TrueRMS – the true rms value of AC current (TrueRMS measurement ensures correct reading also in case of distorted current waveforms);
- Direct measurement of currents up to 20 A;
- Independent measurement for one (DMA-1/DMA-1 TrueRMS) or three (DMA-3/DMA-3 TrueRMS) current circuits;
- LED display, 10 mm character height;
- High measurement accuracy.

power supply	165÷265 V AC/DC
measurement	direct
number of measurement channels	
DMA-1/DMA-1 True RMS	1
DMA-3/DMA-3 True RMS	3
measured value	
DMA-1/DMA-3	value of the AC current (RMS)
DMA-1 True RMS/DMA-3 True RMS	actual value of the AC current (True RMS)
maximum current	25 A
frequency	45÷55 Hz
measurement range	0÷20 A
maximum instantaneous overload	40 A/1 s
indication accuracy	
DMA-1/DMA-3	1%
DMA-1 True RMS/DMA-3 True RMS	0.5%
reading accuracy	0.1 A
display	
DMA-1/DMA-1 True RMS	3-digit LED, digit 6×10 mm
DMA-3/DMA-3 True RMS	3-row, 3-digit LED, digit 6×10 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



DMA-1



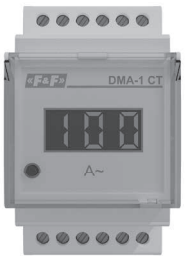
DMA-3

Digital, for semi-direct measurement (DIN rail mounting)

DMA-1 CT / DMA-1 CT True RMS 1-phase
DMA-3 CT / DMA-3 CT True RMS 3-phase

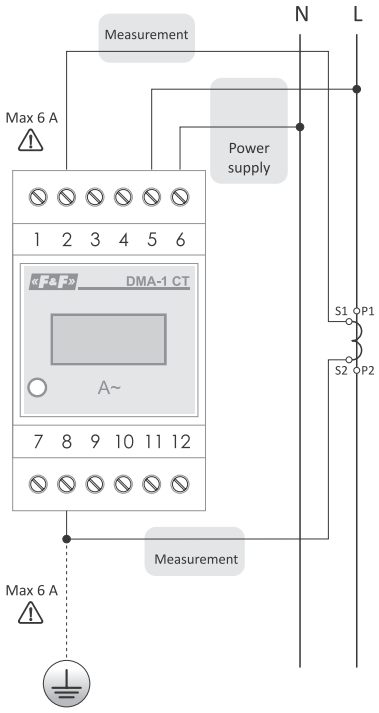
Functions

- Semi-direct measurement:
- DMA-1 CT/DMA-3 CT– AC rms value;
- DMA-1 CT True RMS/DMA-3 CT True RMS - the actual rms value of AC current (True RMS measurement ensures correct reading also in case of distorted current waveforms);
- Indirect current measurement (5 A transformers);
- Independent measurement for one (DMA-1/DMA-1 TrueRMS) or three (DMA-3/DMA-3 TrueRMS) current circuits;
- LED display, 10 mm character height;
- High measurement accuracy.

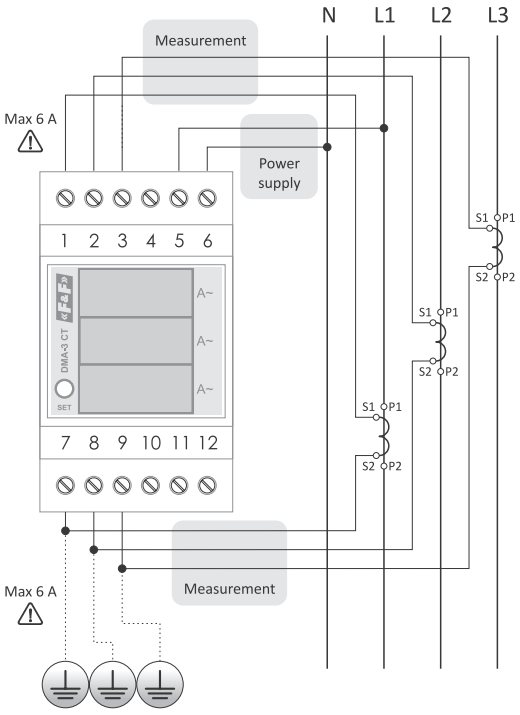


power supply	165÷265 V AC/DC
measurement	semi-direct (transformer 5 A)
number of measurement channels	
DMA-1 CT/DMA-1 CT True RMS	1
DMA-3 CT/DMA-3 CT True RMS	3
measured value	
DMA-1 CT/DMA-3 CT	value of the AC current (RMS)
DMA-1 CT True RMS/DMA-3 CT True RMS	actual value of the AC current (True RMS)
maximum current	6 A
frequency	45÷55 Hz
measurement range	0÷5 A
maximum instantaneous overload	20 A/1 s
indication accuracy	
DMA-1 CT/DMA-3 CT	1%
DMA-1 CT True RMS/DMA-3 CT True RMS	0.5%
reading accuracy	
measurement range <100 A	0.1 A
measurement range ≥100 A	1 A
display	
DMA-1 CT/DMA-1 CT True RMS	3-digit LED, digit 6×10 mm
DMA-3 CT/DMA-3 CT True RMS	3-row, 3-digit LED, digit 6×10 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

The DMA-1 CT/DMA-3 CT indicator is adapted for use with current transformers with 5 A secondary and primary current: 20, 25, 30, 40, 50, 70, 75, 80, 100, 120, 125, 150, 160, 200, 250, 300, 400, 500, 600, 700, 750, 800, 900, 1000 A.



DMA-1 CT



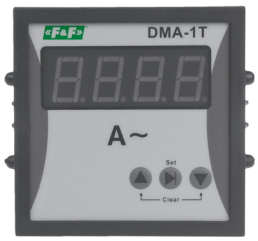
DMA-3 CT

Digital (panel)

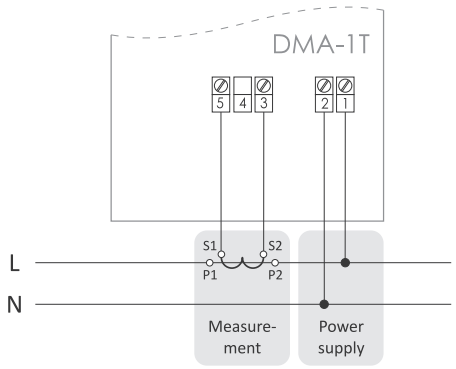
DMA-1T 1-phase
DMA-3T 3-phase

Functions

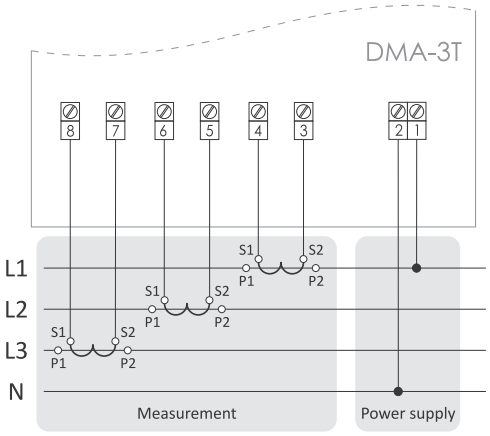
- Direct measurement in the range of 0÷5 A;
- Indirect measurement with the use of current transformers;
- Scaling the indicator to the appropriate values of the transformer by means of three buttons on the front of the indicator;
- Indirect measurement with the use of current transformers in standard 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



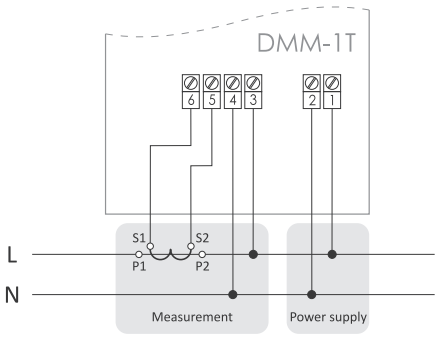
DMA-1T



DMA-3T

Multifunctional digital indicators for network parameters

DMM-1T 1-phase

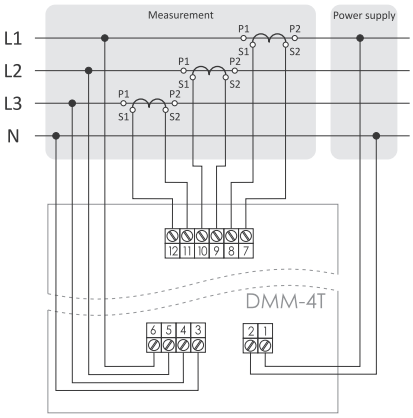


power supply	195÷265 V AC
current indication range	
direct measurement	0÷5 A
indirect measurement	0÷ primary current of the transformer
current ratio	1÷9000/5 A
range of voltage indications	12÷400 V AC
range of frequency indications	10÷100 Hz
indication accuracy	1% ±1 digit
display	3×(4-digit LED 8×14 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



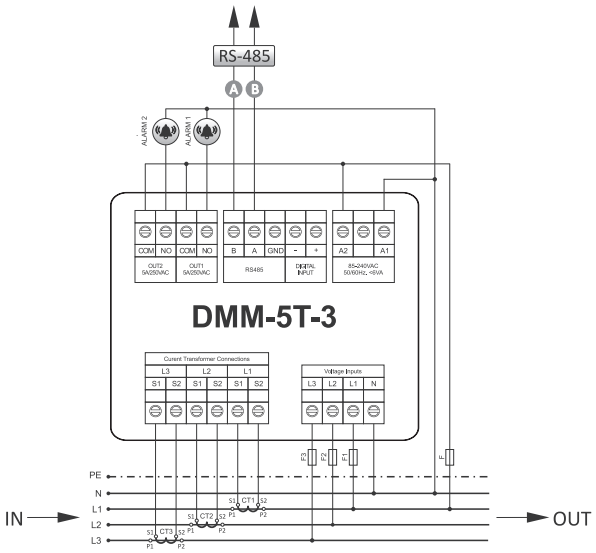
power supply	195÷265 V AC
current indication range	
direct measurement	0÷5 A
indirect measurement	0÷ primary current of the transformer
current ratio	1÷9000/5 A
range of voltage indications	12÷400 V AC
range of frequency indications	10÷100 Hz
indication accuracy	1% ±1 digit
display	4-digit LED 5×9 mm
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**

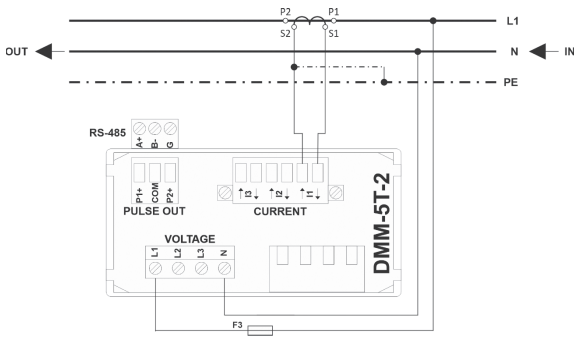
according	MID Directive 2014/32/EU
measuring system	
network	1P2W – 1-phase, 2-wire 3P3W – 3-phase, 3-wire 3P4W – 3-phase, 4-wire
current measurement	
rated current In	0.25÷5 (6) A*
power consumption	0.5 VA/phase
voltage mesurement	
measurement range	58÷276 V AC (phase voltage L-N) 100÷480 V AC (interphase 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

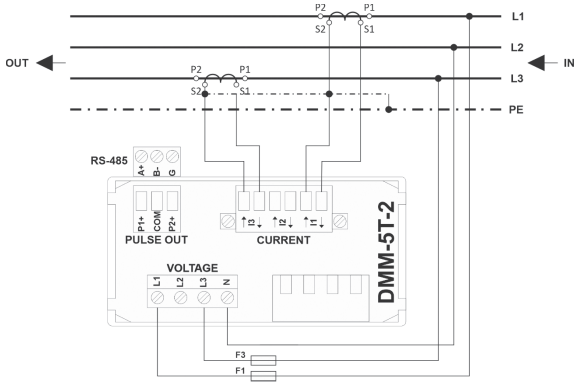
Selected functions

- 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.

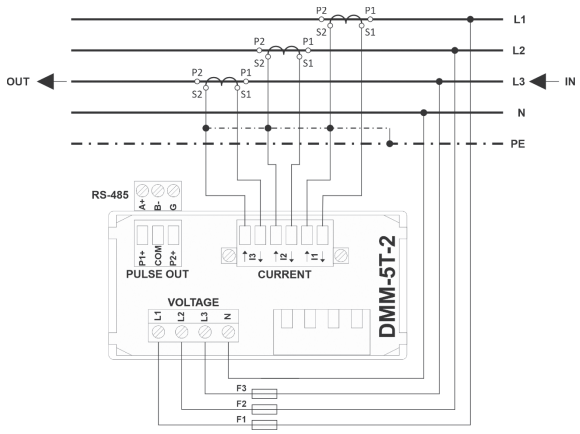
Wiring diagrams



1-phase, 2-wire network (1P2W)



3-phase, 3-wire network (3P3W)



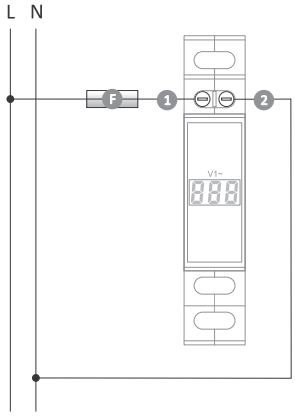
3-phase, 4-network (3P4W)

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.

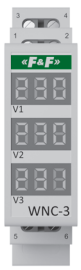


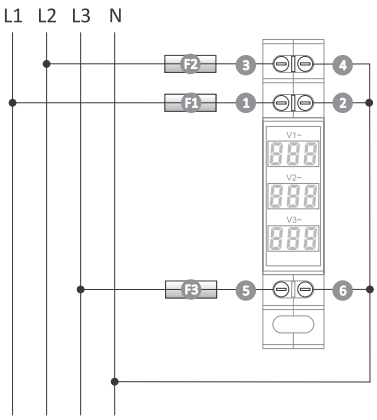
power supply	80÷500 V AC
frequency	50÷60 Hz
voltage indicator	3-digit, 7-segment LED
digit height	7 mm
measurement resolution	1 V
measurement accuracy	1% (±1 digit)
power consumption	<5 VA, <1 W
working temperature	-5÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

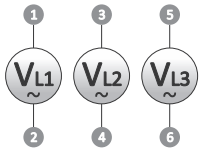
WNC-3 3-phase

Purpose

Indicator is designed to measure and indicate the value of 3-phase alternating voltage in the range of 80÷500 V AC.







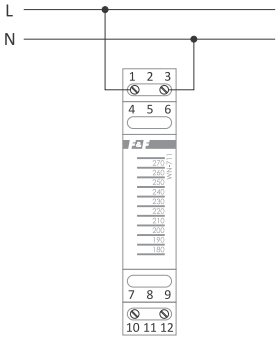
power supply	80÷500 V AC
frequency	50÷60 Hz
voltage indicator	3× (3-digit, 7-segment LED)
digit height	7 mm
measurement resolution	1 V
measurement accuracy	1% (±1 digit)
power consumption	<5 VA, <1 W
working temperature	-5÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Analog power supply indicators

WN-711 1-phase, bar

Purpose

Voltage indicator WN-711 is designed for continuous reading of voltage values in a 1-phase network.

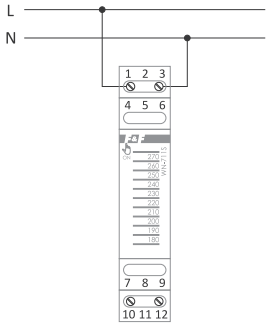


power supply	85÷265 V AC
voltage indicator	10×LED
indication range	180÷270 V
measurement error	<2%
reading accuracy	10 V
display time of the triggered value	10 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

WN-711S 1-phase, bar, with blanks the screen

Purpose

Voltage indicator WN-711S is designed for continuous reading of voltage values in a 1-phase network.
Blanks the screen when idle. The indicator is activated by a touch button.

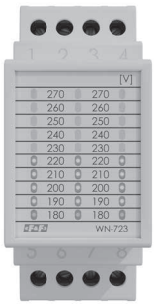


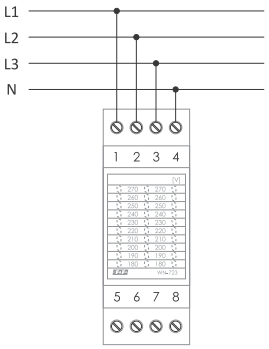
power supply	85÷265 V AC
voltage indicator	10×LED
indication range	180÷270 V
measurement error	<2%
reading accuracy	10 V
display switch-off	10 seconds after triggering
display time of the triggered value	10 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

WN-723 3-phase, bar

Purpose

Voltage indicator WN-723 is designed for continuous reading of voltage values in a 3-phase network.



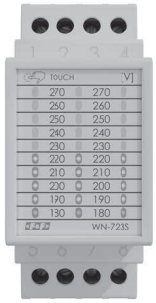


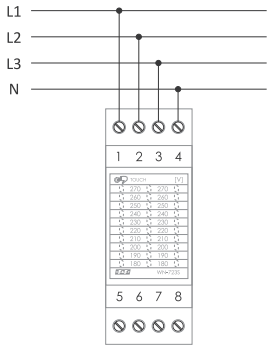
power supply	85÷265 V AC/DC
wskaźnik napięcia	3×(10×LED)
indication range	180÷270 V
measurement error	<2%
reading accuracy	10 V
display time of the triggered value	10 s
power consumption	1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

WN-723S 3-phase, bar, with blanks the screen

Purpose

Voltage indicator WN-723S is designed for continuous reading of voltage values in a 3-phase network.
Blanks the screen when idle. The indicator is activated by a touch button.





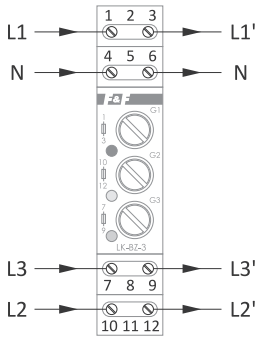
power supply	85÷265 V AC
voltage indicator	3×(10×LED)
indication range	180÷270 V
measurement error	<2%
reading accuracy	10 V
display switch-off	10 seconds after triggering
display time of the triggered value	10 s
power consumption	1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP20

Signal lights

LK-BZ-3G/LK-BZ-3K 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

The LK-BZ-3 set includes 0.5 A delayed fuse links.
F&F's product range includes fast (S) and time-delay (T) fuse links with values from 0.1 A÷6.3 A.
See page 194 for more information.

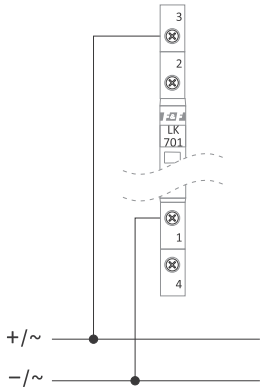
Overview of indicator lamp symbols

Index		Operating voltage	1× red	1× green	1× yellow	1× blue	1× green 1× red	3× red	3× green	3× yellow	1× red 1× yellow 1× green	Housing	Page
LK-701	LK-701R-230V	230 V AC	•									1/3 module (6.2 mm)	215
	LK-701G-230V	230 V AC		•									215
	LK-701Y-230V	230 V AC			•								215
	LK-701R-110V	110 V AC	•										215
	LK-701G-110V	110 V AC		•									215
	LK-701Y-110V	110 V AC			•								215
	LK-701R-24V	12÷60 V DC / 12÷48 V AC	•										215
	LK-701G-24V	12÷60 V DC / 12÷48 V AC		•									215
	LK-701Y-24V	12÷60 V DC / 12÷48 V AC			•								215
LK-702	LK-702-230V	230 V AC					•						215
	LK-702-110V	110 V AC					•						215
	LK-702-24V	12÷60 V DC / 12÷48 V AC					•						215
LK-703	LK-703R-230V	230 V AC						•					215
	LK-703G-230V	230 V AC							•				215
	LK-703Y-230V	230 V AC								•			215
	LK-703K-230V	230 V AC									•		215
LK-712	LK-712R 130÷260 V	130÷260 V AC/DC	•									1 module (18 mm)	216
	LK-712G 130÷260 V	130÷260 V AC/DC		•									216
	LK-712Y 130÷260 V	130÷260 V AC/DC			•								216
	LK-712B 130÷260 V	130÷260 V AC/DC				•							216
	LK-712R 30÷130 V	30÷130 V AC/DC	•										216
	LK-712G 30÷130 V	30÷130 V AC/DC		•									216
	LK-712Y 30÷130 V	30÷130 V AC/DC			•								216
	LK-712B 30÷130 V	30÷130 V AC/DC				•							216
	LK-712R 10÷30 V	10÷30 V AC/DC	•										216
	LK-712G 10÷30 V	10÷30 V AC/DC		•									216
	LK-712Y 10÷30 V	10÷30 V AC/DC			•								216
	LK-712B 10÷30 V	10÷30 V AC/DC				•							216
	LK-712R 5÷10 V	5÷10 V AC/DC	•										216
	LK-712G 5÷10 V	5÷10 V AC/DC		•									216
	LK-712Y 5÷10 V	5÷10 V AC/DC			•								216
	LK-712B 5÷10 V	5÷10 V AC/DC				•							216
LK-713	LK-713R 230 V	230 V AC						•					216
	LK-713G 230 V	230 V AC							•				216
	LK-713Y 230 V	230 V AC								•			216
	LK-713K 230 V	230 V AC									•		216
LK-714	LK-714 130÷260 V	130÷260 V AC/DC					•						216
	LK-714 30÷130 V	30÷130 V AC/DC					•						216
	LK-714 10÷30 V	10÷30 V AC/DC					•						216
	LK-714 5÷10 V	5÷10 V AC/DC					•						216

LK-701 1-phase

Purpose

The LK-701 indicator lamp is used to visually signal the presence of voltage in an electrical circuit.
The small size of the housing (width 6.2 mm) allows to save space in the switchgear.



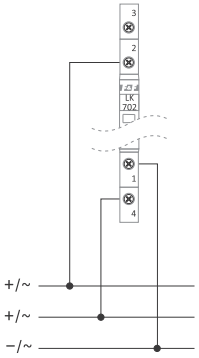
power supply (single-range performances only)	230 V AC
	110 V AC
	12÷60 V DC / 12÷48 V AC
rated current	<1 mA/channel
activation indication	1×LED
power consumption	<0.15 W/channel
working temperature	-30÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1/3 modules (6.2 mm)
mounting	for TH-35 rail
ingress protection	IP20

Type	LED color
LK-701R	1× red
LK-701G	1× green
LK-701Y	1× yellow

LK-702 2-state

Purpose

The LK-702 indicator lamp is used to visually signal the presence of voltage in an electrical circuit.
The small size of the housing (width 6.2 mm) allows to save space in the switchgear.

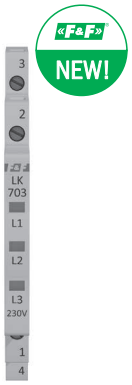


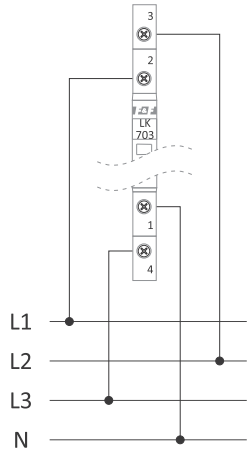
power supply (single-range performances only)	
	3×230V+N
	3×110V+N
	3×24V
rated current	<1 mA/channel
activation indication	1×LED
power consumption	<0.15 W/channel
working temperature	-30÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1/3 modules (6.2 mm)
mounting	for TH-35 rail
ingress protection	IP20

LK-703 3-phase

Purpose

The LK-703 indicator lamp is used to visually signal the presence of voltage in an electrical circuit.
The small size of the housing (width 6.2 mm) allows to save space in the switchgear.





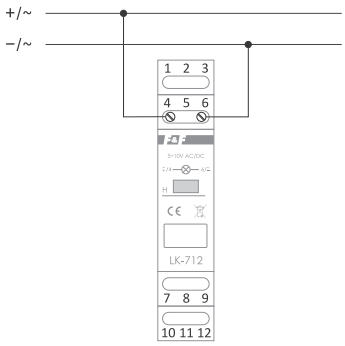
power supply (single-range performances only)	3×230V+N
rated current	<1 mA/channel
activation indication	3×LED
power consumption	<0.15 W/channel
working temperature	-30÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1/3 modules (6.2 mm)
mounting	for TH-35 rail
ingress protection	IP20

Type	LED color
LK-703R	3× red
LK-703G	3× green
LK-703Y	3× yellow
LK-703K	3× color (red-yellow-green)

LK-712 1-phase

Purpose

The LK-712 control lamp is designed for the optical indication of the presence of voltage in an electrical circuit.



power supply (single-range performances only)	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

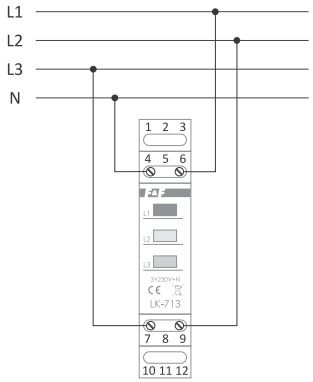
Type	LED color
LK-712 B	1× blue
LK-712 G	1× green
LK-712 R	1× red
LK-712 Y	1× yellow

Example of marking when placing an order: LK-712 B 30÷130 V⎓ supply voltage color

LK-713 3-phase

Purpose

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

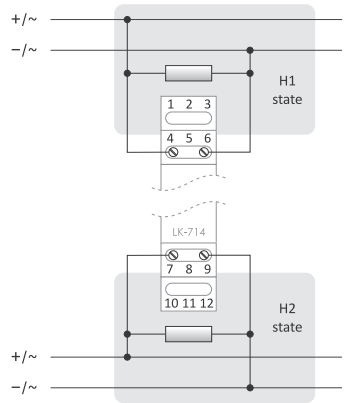
Type	LED color
LK-713 G	3× green
LK-713 K	red-yellow-green
LK-713 R	3× red
LK-713 Y	3× yellow

Example of marking when placing an order: LK-713 K⎓ color

LK-714 2-state

Purpose

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 (single-range performances only)	5÷10 V AC/DC
	10÷30 V AC/DC
	30÷130 V AC/DC
	130÷260 V AC/DC
state indication	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

Photovoltaic inverters

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.

FPV3 series

Functions

- 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.

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).

Reliability

- Multiple safety features;
- 10 year warranty;
- The highest quality of components used to minimize the risk of damage.

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.

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			

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.

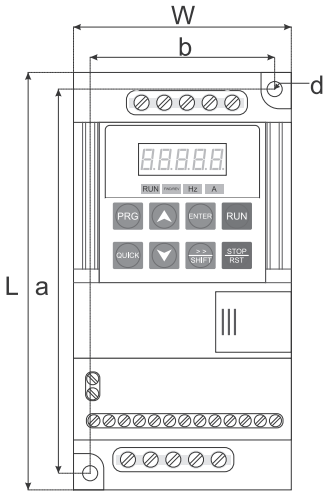
FA-1LS / FA-3HS

The most important functions

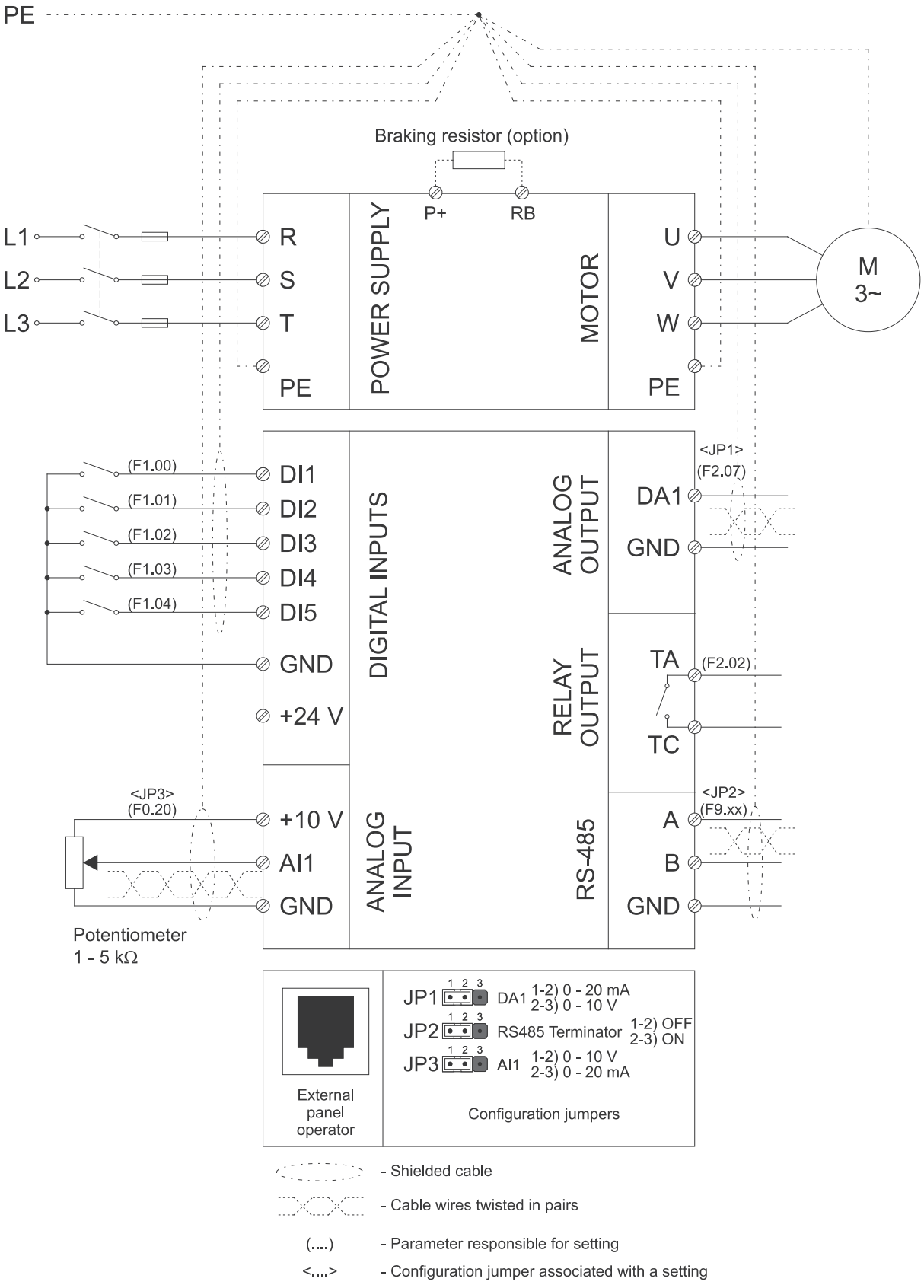
- Miniature size, weight and DIN rail mounting capability;
- Sensorless motor vector control and control based on freely programmable V/F characteristic;
- Overload capacity up to 150% for a period of one minute;
- PLC mode with up to 16 programmable steps (speed, acceleration and deceleration time, 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	72	138	123.5
FA-1LS-007	1×230	8.2	3×230	4.0	0.7			
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		138	123.5
FA-3HS-015	3×400	5.0	3×400	3.8	1.5			
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
L2
L3
R
S
T
PE
POWER SUPPLY
MOTOR
U
V
W
PE
M
3~
(F1.00)
(F1.01)
(F1.02)
(F1.03)
(F1.04)
DI1
DI2
DI3
DI4
DI5
GND
+24 V
DIGITAL INPUTS
ANALOG OUTPUT
<JP1>
(F2.07)
DA1
GND
RELAY OUTPUT
TA
(F2.02)
TC
<JP3>
(F0.20)
+10 V
AI1
GND
ANALOG INPUT
RS-485
<JP2>
(F9.xx)
A
B
GND
Potentiometer
1 - 5 kΩ
External panel operator
JP1 DA1 1-2) 0 - 20 mA 2-3) 0 - 10 V
JP2 RS485 Terminator 1-2) OFF 2-3) ON
JP3 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

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) 0,00÷300,0 Hz (vector control)
	V/F control characteristics	1) Constant torque characteristics 2) Characteristics with reduced torque 3) Torque characteristics set by the user 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. Maximum acceleration and braking time - 6500 s.
	Frequency setting accuracy	Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz); Analog accuracy setting: 1% of maximum frequency
	Overload	1) 150% of the rated current for 1 minute 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 2) Against exceeding the maximum current 3) Against too high load 4) Against the loss of speed loss and stall of a motor 5) Against the current leakage to mass 6) Against overheating of the inverter 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 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. 2) Freely programmed functions, such as forward and reverse run, forward and reverse test run, reset, multi-stage speed control, motor potentiometer, acceleration and 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). The range of 4÷20 mA can also be set. 2) The analog inputs can be used, among other things, for setting the frequency and 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). 2) The analog outputs can be programmed for signaling of the following values: a) preset and present frequency; b) rotation speed; c) output current voltage; d) voltage in the DC circuit; e) setpoint monitoring; f) power and output torque; g) motor rotation speed; h) driving torque.

continued from the previous page

Functions		Technical data
I/O	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 40 different states of the inverter): a) work; b) ready to work; c) failure; d) overload; 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. 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; 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

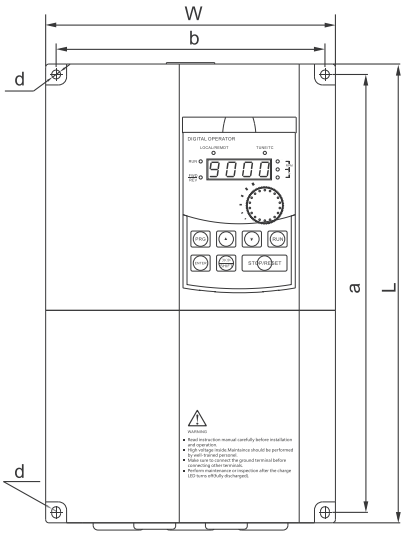
FA-1LX / FA-3HX

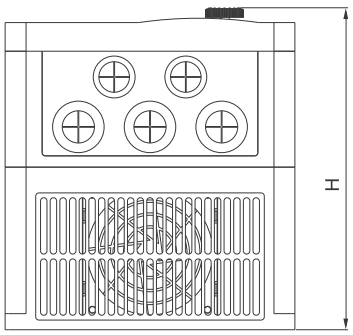
The most important functions

- 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

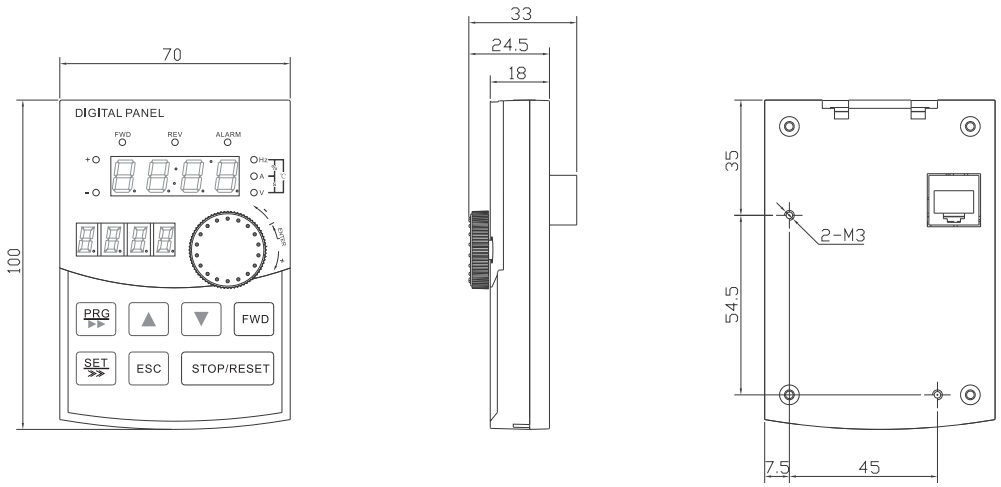
Type of inverter	Voltage input [V]	Current input [A]	Voltage output [V]	Current output [A]	Maximum motor power [kW]	Width (W) [mm]	Length (L) [mm]	Height (H) [mm]
FA-1LX007	1×230	8.2	3×230	4	0.75	120	185	165
FA-1LX015	1×230	14.0	3×230	7	1.5	120	185	165
FA-1LX022	1×230	23.0	3×230	10	2.2	150	220	182
FA-1LX040	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



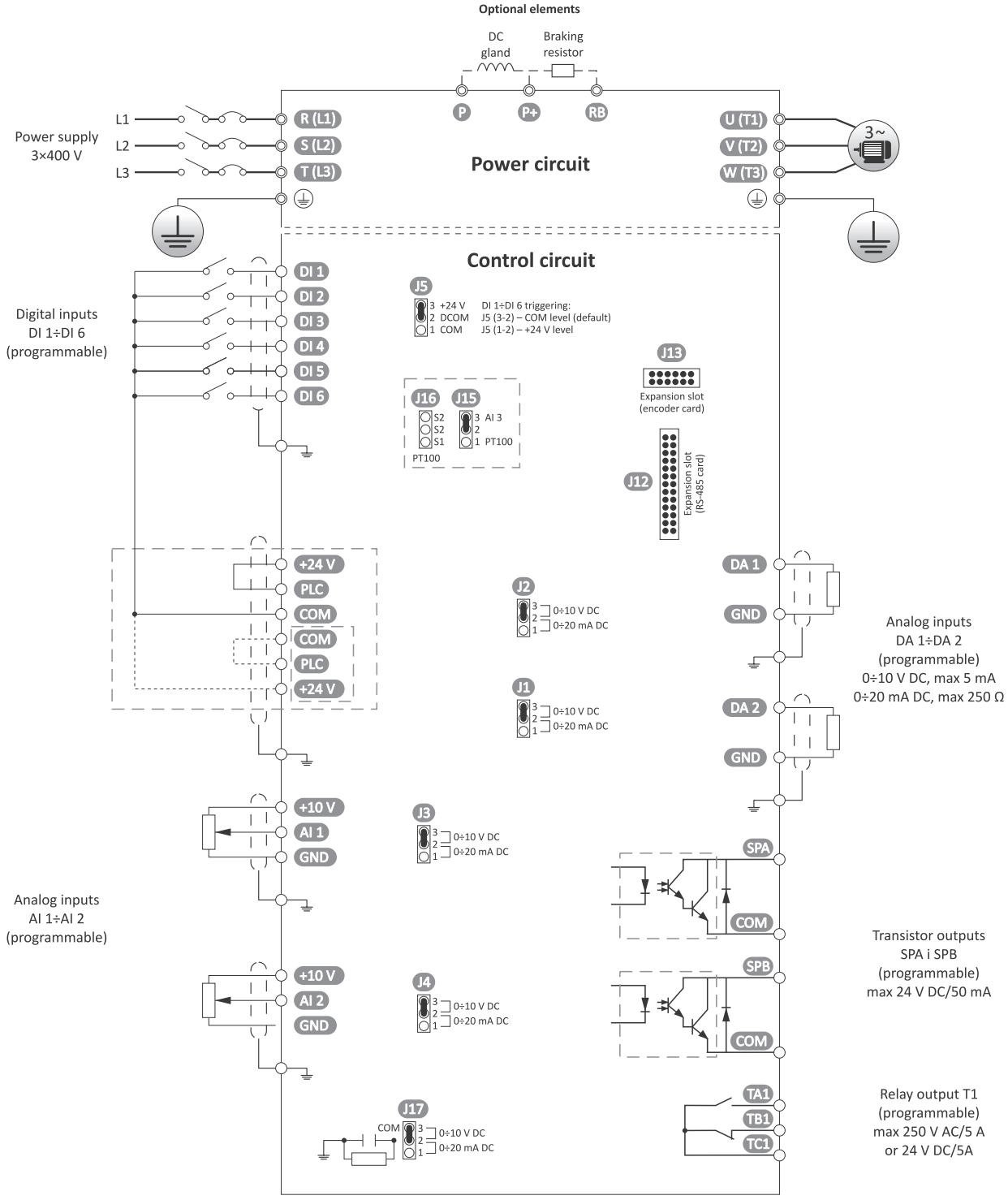


Chapter 36

Control panel



Description of inputs and outputs



Functions		Technical data
Power supply	**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) 0.00÷300.0 Hz (vector control)
	V/F control characteristics	1) Constant torque characteristics 2) Characteristics with reduced torque 3) Torque characteristics set by the user 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. Maximum acceleration and braking time - 6500 s.
	Frequency setting accuracy	Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz); Analog accuracy setting: 1% of maximum frequency
	Overload	1) 150% of the rated current for 1 minute 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 2) Against exceeding the maximum current 3) Against too high load 4) Against the loss of speed loss and stall of a motor 5) Against the current leakage to mass 6) Against overheating of the inverter 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 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. 2) Freely programmed functions, such as forward and reverse run, forward and reverse test run, reset, multi-stage speed control, motor potentiometer, acceleration and 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). The range of 4÷20 mA can also be set. 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). 2) The analog outputs can be programmed for signaling of the following values: a) preset frequency; b) output current voltage; c) voltage in the DC circuit; d) temperature of the IGBT power output stage; e) output power; f) motor speed; g) driving torque.

continued from the previous page

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

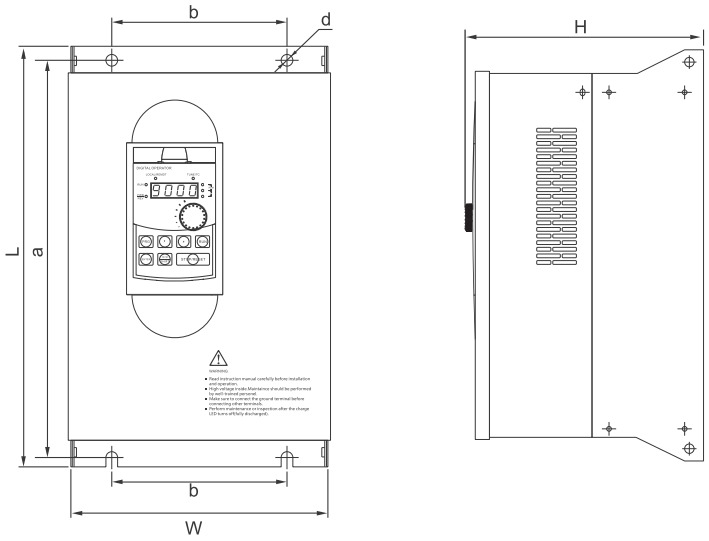
FA-3X

The most important functions

- 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;
- 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 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.

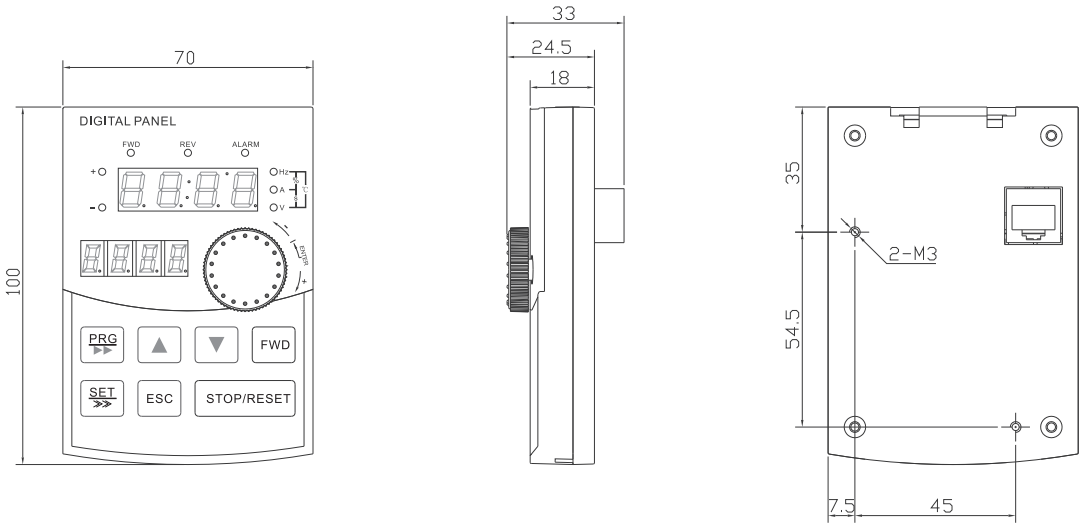
Types of devices

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.



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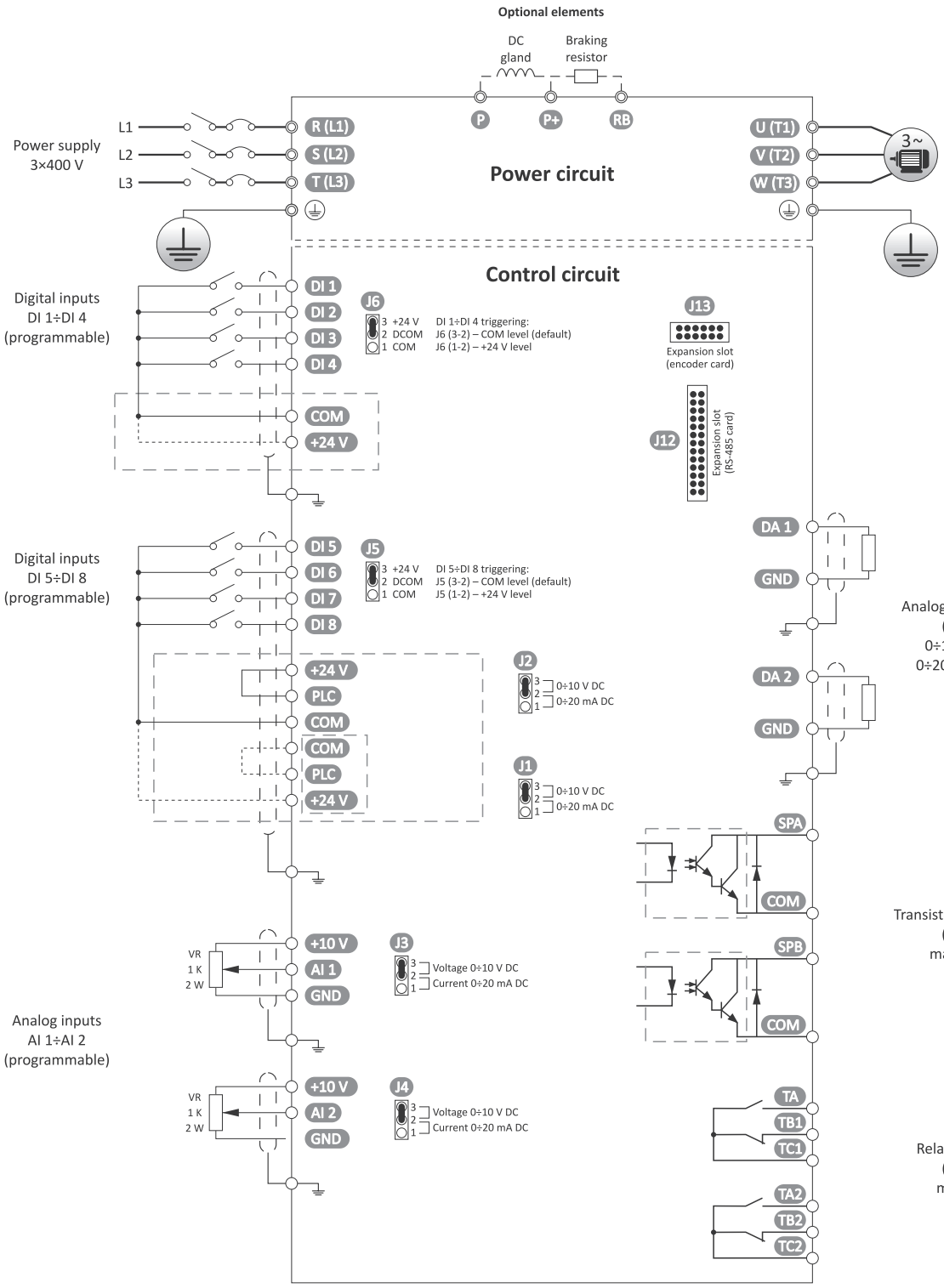
Optional elements
DC gland
Braking resistor
P
P+
RB
Power supply 3×400 V
L1
L2
L3
R (L1)
S (L2)
T (L3)
Power circuit
U (T1)
V (T2)
W (T3)
3~
Control circuit
Digital inputs DI 1÷DI 4 (programmable)
DI 1
DI 2
DI 3
DI 4
J6
3 +24 V
2 DCOM
1 COM
DI 1÷DI 4 triggering:
J6 (3-2) – COM level (default)
J6 (1-2) – +24 V level
J13
Expansion slot (encoder card)
J12
Expansion slot (RS-485 card)
COM
+24 V
Digital inputs DI 5÷DI 8 (programmable)
DI 5
DI 6
DI 7
DI 8
J5
3 +24 V
2 DCOM
1 COM
DI 5÷DI 8 triggering:
J5 (3-2) – COM level (default)
J5 (1-2) – +24 V level
+24 V
PLC
COM
COM
PLC
+24 V
J2
0÷10 V DC
0÷20 mA DC
J1
0÷10 V DC
0÷20 mA DC
DA 1
GND
DA 2
GND
Analog inputs DA 1 and DA 2 (programmable)
0÷10 V DC, max 5 mA
0÷20 mA DC, max 250 Ω
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
Voltage 0÷10 V DC
Current 0÷20 mA DC
VR
1 K
2 W
+10 V
AI 2
GND
J4
Voltage 0÷10 V DC
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

	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) 0.00÷300 Hz (vector control)
	V/F control characteristics	1) Constant torque characteristics 2) Characteristics with reduced torque 3) Torque characteristics set by the user 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. Maximum acceleration and braking time: 6500 s.
	Frequency setting accuracy	Digital accuracy setting: 0.01 Hz (f≤100 Hz), 0.1 Hz (>100 Hz); Analog accuracy setting: 1% of maximum frequency
	Overload	1) 150% of the rated current for 1 minute 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 2) Against exceeding the maximum current 3) Against too high load 4) Against the loss of speed loss and stall of a motor 5) Against the current leakage to mass 6) Against overheating of the inverter 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. 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. 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). 2) The analog outputs can be programmed for signaling of the following values: a) preset and current frequency b) output current voltage c) voltage in the DC circuit d) temperature of the IGBT power output stage e) output power f) motor speed g) driving torque

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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 1-phase motors

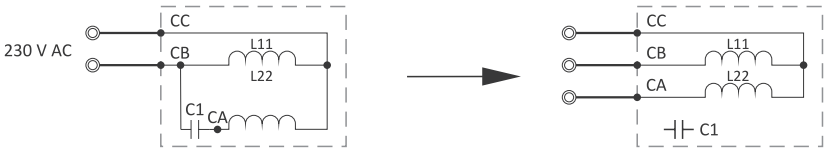
Purpose

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.

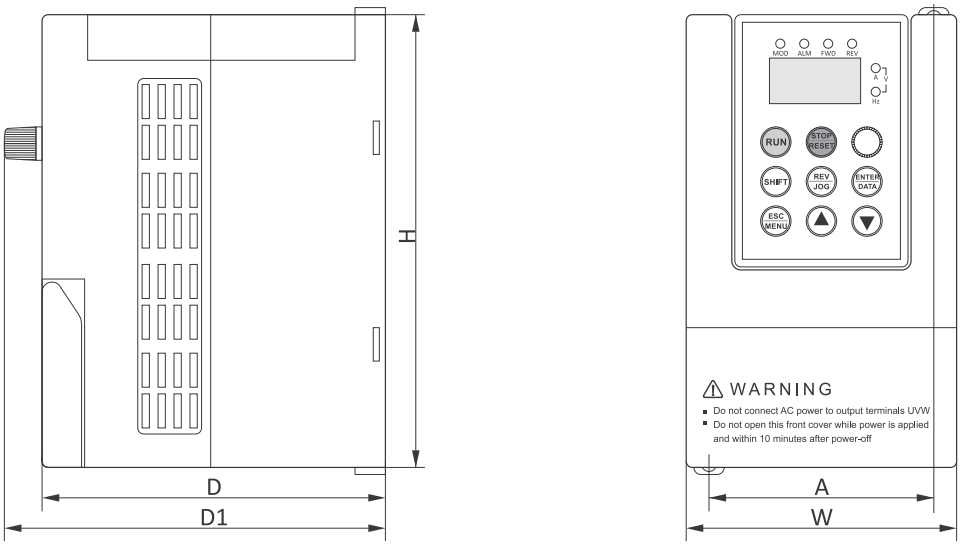


Typical single-phase motor diagram with starting capacitor

A modified system of the motor connections

Types of devices

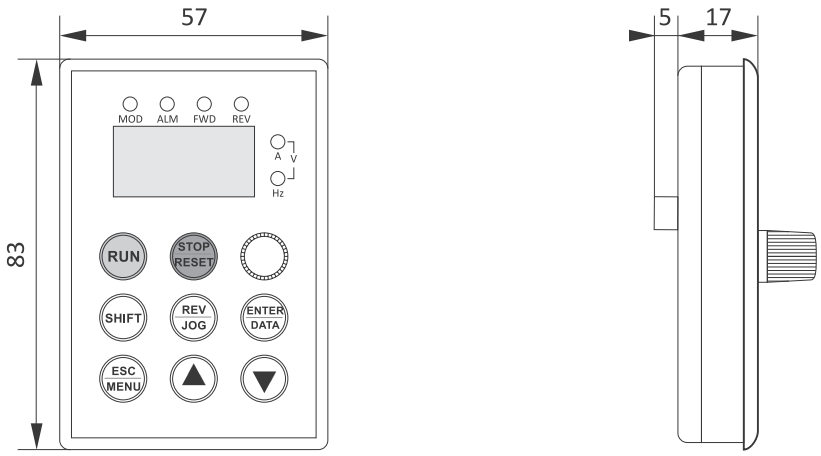
Type of inverter	Voltage Input [V]	Power Input [kVA]	Voltage Output [V]	Current Output [A]	Maximum motor power [kW]	Width (W) [mm]	Height (H) [mm]	Depth (D) [mm]
FA-1F004	1×230	1.1	1×230	3	0.4	89	149	113
FA-1F007	1×230	1.8	1×230	4.7	0.7	89	149	113
FA-1F015	1×230	2.8	1×230	7.5	1.5	89	149	113
FA-1F022	1×230	3.8	1×230	10	2.2	155	230	155



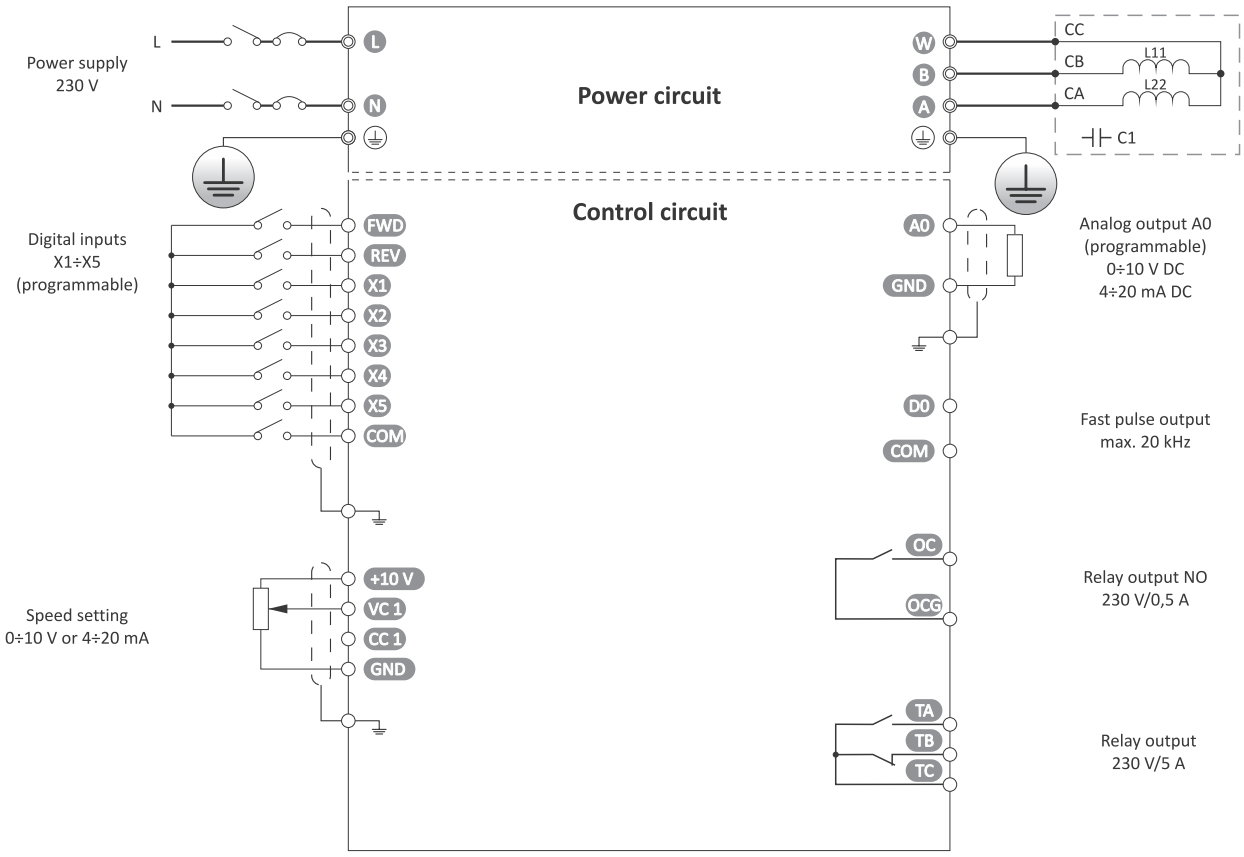
FA-1F004 FA-1F004, FA-1F007, FA-1F015 inverters

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 2) Characteristics with reduced torque 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 Analog accuracy setting: 1% of maximum frequency
	Overload	1) 150% of the rated current for 1 minute 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 2) Against exceeding the maximum current 3) Against too high load 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. 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. 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. 2) Selection is made using the switch on the inverter mainboard. a) preset and current frequency b) output current voltage c) voltage in the DC circuit d) temperature of the IGBT power output stage e) set value of the PID controller f) PID controller feedback value
	1 high-speed transistor output	1) High-speed pulse outputs (max. frequency 20 kHz). Available indication: a) preset and current frequency b) value of output current and voltage c) voltage in the DC circuit d) temperature of the IGBT power output stage e) set value of the PID controller f) PID controller feedback value 2) Transistor load - max. 20 mA/27 V

continued from the previous page

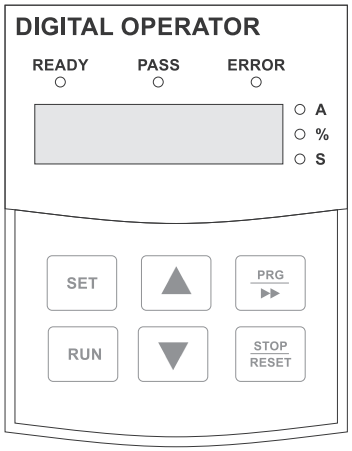
	Functions	Technical data
I/O	2 relay outputs 5 A	1) Relay output intended to indicate the error of the inverter. 2) Contact load capacity 5A/250 V AC or 5A/30 V DC.
	2 relay outputs	1) Universal programmable relay output for signalling of, among others: a) drive operation; b) drive readiness for operation; c) reaching the set frequency; d) inverter error; e) external error report; f) operation in PLC mode; g) other: – contact load capacity T - 5 A/250 V AC – 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. 2) Multistage speed - 16 different speeds and 8 acceleration/braking times can be entered. 3) 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 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 input; 3) Digital input; 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



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

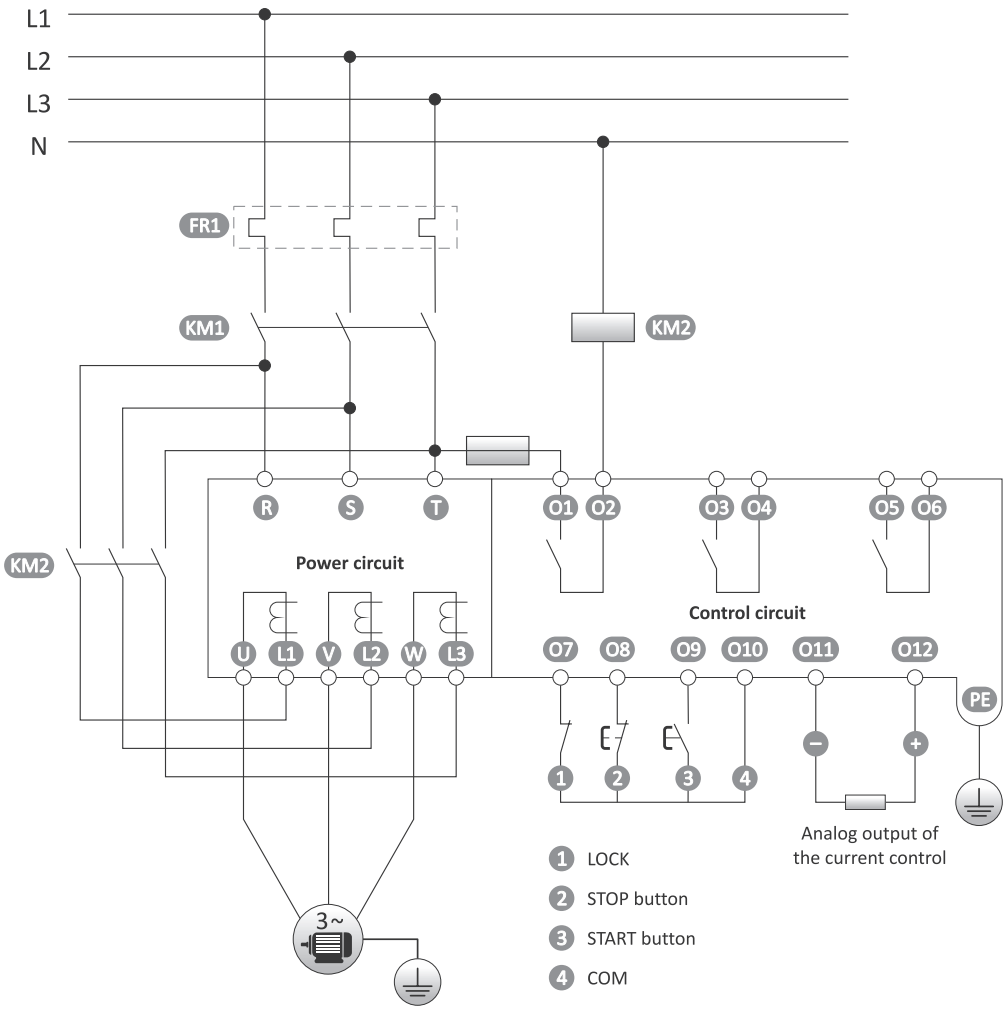
- Full three-phase control;
- Six types of start-up characteristics;
- Control of torque, current, and power during both start-up and operation;
- Electronic protection against motor overload;
- Protection against underload of the motor;
- Over-voltage and under-voltage protection;
- Control panel with keypad and LED display;
- An analogue output of current control;
- Programmable relay outputs;
- Error memory;
- A motor can start automatically.

Types of devices

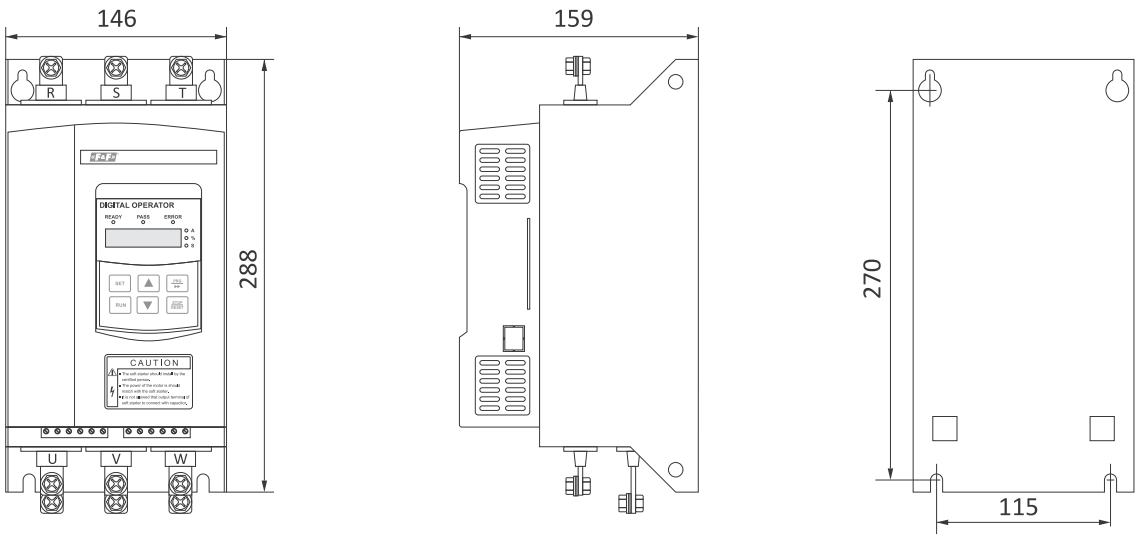
Type	Input voltage [V]	Input current [A]	Maximum motor power [kW]
SF-110	3×400	22	11
SF-150	3×400	30	15
SF-180	3×400	37	18
SF-220	3×400	44	22
SF-300	3×400	60	30
SF-370	3×400	74	37
SF-450	3×400	90	45
SF-550	3×400	110	55

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



Dimensions



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 Operation - external bypass contactor required	
Start-up	1) With the maximum current limitation 2) Linear voltage increase 3) Rapid start and then with maximum current limitation 4) Rapid start and then with linear voltage increase 5) Linear current increase 6) Double control of voltage and current	
Braking	1) Soft braking 2) Coasting	
Protection	1) Temperature soft start 2) Supply voltage loss 3) Thermal protection of the motor 4) Over-voltage and under-voltage protection 5) Short-circuit protection 6) Protection against too low load	
Additional functions	1) Automatic motor start-up 2) Automatic restart in case of an error 3) Automatic multiple start-ups	
Inputs	Potential-free control, relative to the COM level 1) Start 2) Stop 3) Lock	
Relay outputs	1) Power supply for bypass-free contactor 2) Error indication 3) Programming - available functions: a) operation readiness b) motor start c) switching on the bypass contactor d) beginning of the braking e) motor stop f) error - drive lock 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: a) soft start programming b) signaling of the operating status c) displaying of current, power and motor overload information d) displaying error messages 2) Keypad for controlling the motor and configuring the soft starter 3) Ability to block or limit the change of settings	
Operating conditions	Operating environment	– free from dust and dirt (especially conductive) – ensuring proper ventilation of the device – protected against unauthorized access
	Temperature	-25÷40˚C
	Humidity	below 90% (no moisture condensation)
	Vibrations	below 0.5 G
	Operating altitude	below 3 000 m a.s.l.

Section X

Electricity consumption meters

Electricity consumption meters

Purpose

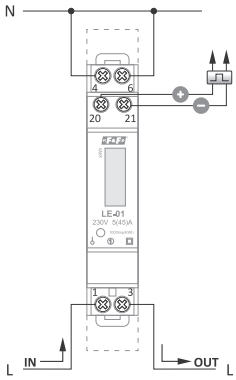
Electricity consumption meters are static (electronic), calibrated measuring devices, used as sub-meters to indicate the consumed electric energy of active/reactive 1-phase and 3-phase alternating current.

Product	Type	MID	Cooperation with current transformers (semi-direct measurement)	2-directional	Measurement of additional parameters											Communication		Backlighting counter	Erasable	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 1-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	239
LE-01d	meter 1-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	239
LE-01DC	meter 1-phase	–	shunt	●	●	●	–	–	–	–	–	●	●	–	–	●	–	●	–	258
LE-01M	meter 1-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	●	–	–	–	246
LE-01MB	meter 1-phase	●	–	●	●	●	–	●	●	●	●	●	●	●	●	–	●	●	–	255
LE-01MQ	meter 1-phase	●	–	●	●	●	–	●	●	●	●	●	●	●	●	●	–	●	–	253
LE-01MR	meter 1-phase	●	–	●	●	–	●	–	–	●	–	●	●	●	●	●	–	●	●	248
LE-01MW	meter 1-phase	●	–	●	●	–	●	–	–	●	–	●	●	●	●	●	–	●	●	250
LE-02d	meter 3-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	●	–	240
LE-02d CT	meter 3-phase	–	●	–	●	–	–	–	–	–	–	–	–	–	–	–	–	●	–	242
LE-03	meter 3-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	240
LE-03d	meter 3-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	241
LE-03d CT200	meter 3-phase	–	●	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	242
LE-03d CT400	meter 3-phase	–	●	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	242
LE-03 FPV-RST	meter 3-phase	●	–	●	●	●	–	–	–	●	–	–	–	–	–	–	–	●	●	244
LE-03M	meter 3-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	●	–	–	–	247
LE-03M CT	meter 3-phase	–	●	–	●	–	–	–	–	–	–	–	–	–	–	●	–	–	–	247
LE-03MB	meter 3-phase	●	–	●	●	●	–	●	●	●	●	●	●	●	●	–	●	●	–	255
LE-03MB CT	meter 3-phase	–	●	●	●	●	–	●	●	●	●	●	●	●	●	–	●	●	–	256
LE-03MP	meter 3-phase	–	–	●	●	–	●	–	–	●	–	●	●	●	–	●	–	–	–	249
LE-03MQ	meter 3-phase	●	–	●	●	●	–	●	●	●	●	●	●	●	●	●	–	●	–	253
LE-03MQ CT	meter 3-phase	●	●	●	●	●	–	●	●	●	●	●	●	●	●	●	–	●	–	254
LE-03MW	meter 3-phase	●	–	●	●	●	●	●	●	●	●	●	●	●	●	●	–	–	●	251
LE-03MW CT	meter 3-phase	–	●	●	●	●	●	●	●	●	●	●	●	●	●	●	–	–	●	252
LE-04d	meter 3-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	243
LE-05d	meter 3-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	243
WZE-1	meter 1-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	241
WZE-1-RST	meter 1-phase	–	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	●	●	245
WZE-3	meter 3-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	–	241
WZE-3-RST	meter 3-phase	●	–	–	●	–	–	–	–	–	–	–	–	–	–	–	–	–	●	245

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

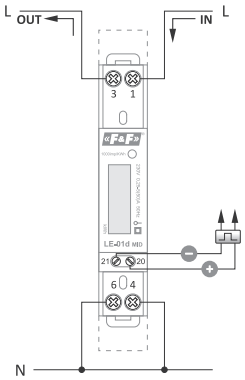


reference voltage	230 V
base current	5 A
maximum current	45 A
minimum detection current	0.02 A
measurement accuracy (IEC62052:11, 62053:21)	1st class
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.9 kWh
meter constant	1000 pulses/kWh
read-out indication	red LED
pulse output	
type	open collector
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



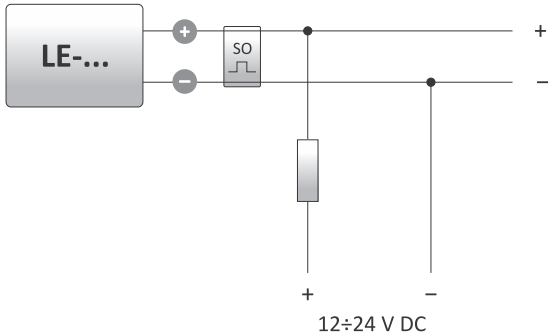
compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	0.25÷5 A
maximum current	50 A
minimum detection current	0.02 A
measurement accuracy (EN50470-1/3)	B class
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.9 kWh
meter constant	1000 pulses/kWh
read-out indication	red 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

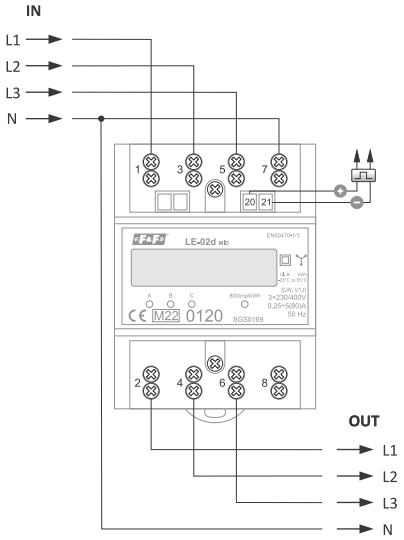
- 1-phase;
- Direct measurement 50 A;
- MID compliance;
- LCD display;
- SO pulse output.

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.



LE-02d 3-phase, with LCD display, MID certificate

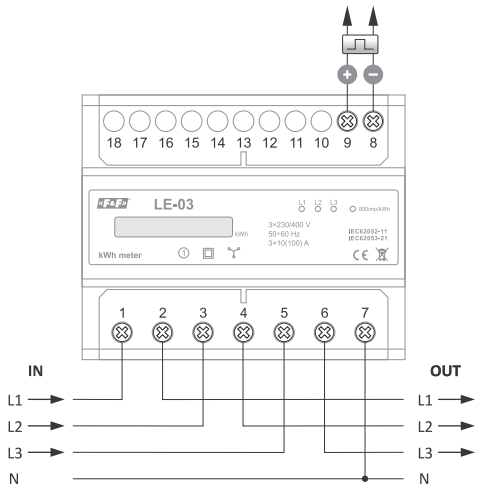


compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×5 A
maximum current	3×80 A
minimum detection current	0.04 A
measurement accuracy (EN50470-1/3)	B class
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant	800 pulses/kWh
current conumption 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

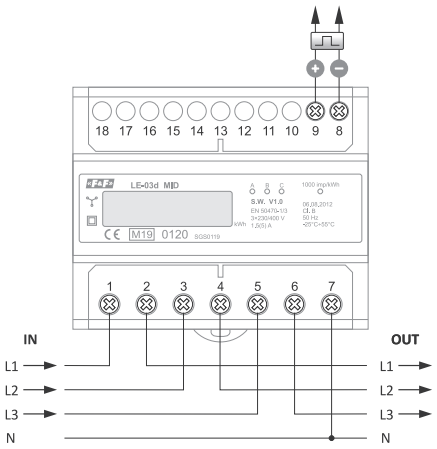


reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
measurement accuracy (IEC62052:11, 62053:21)	1st class
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	800 pulses/kWh
current conumption indication	3×red LED
read-out 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

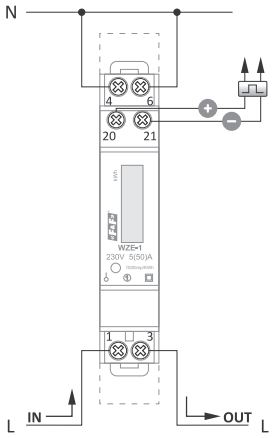


compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
measurement accuracy (EN50470-1/3)	B class
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	1000 pulses/kWh
current consumption 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

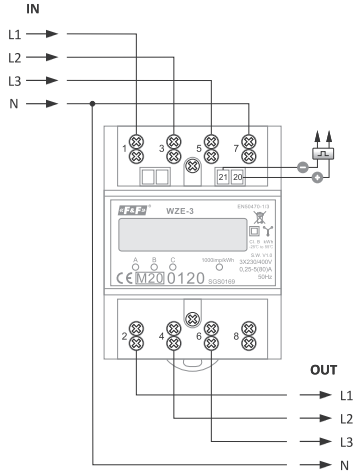


compliance	MID Directive 2014/32/EU
reference voltage	230 V AC
base current	0.25÷5 A
maximum current	50 A
minimum detection current	0.02 A
measurement accuracy (EN50470-1/3)	B class
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.99 kWh
meter constant	1000 pulses/kWh
read-out indication	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	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.

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 (EN50470-1/3)	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

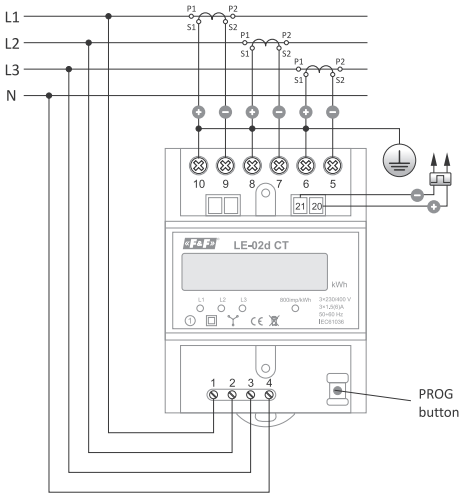
Purpose

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. 327)

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 (IEC62052:11, 62053:21)	1st class
own power consumption	<10 VA; <2 W
indication range	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

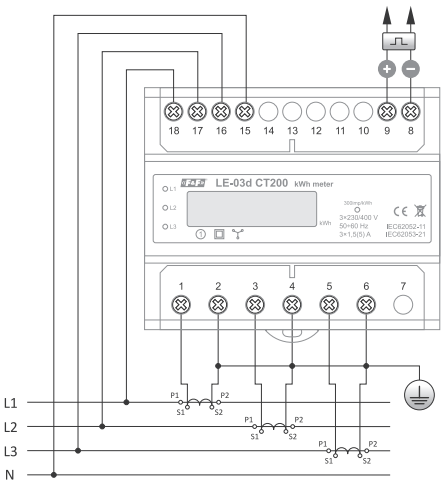
- 3-phase;
- Semi-indirect measurement 3×6 A;
- Transformers 5÷6000/5 A;
- The ratio is set once by pressing the button;
- LVD compliance;
- SO pulse output.

LE-03d CT200 (300 pulses/kWh) / LE-03d CT400 (150 pulses/kWh)

for use to 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 (IEC62052:11, 62053:21)	1st class
own power consumption	<10 VA; <2 W
number of abacus digits	8
indication range	0÷9999999 kWh
meter constant (CT200/CT400)	300 pulses/kWh / 150 pulses/kWh
current consumption 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 CT200	300 pulses/kWh
pulse constant CT400	150 pulses/kWh
pulse time	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.

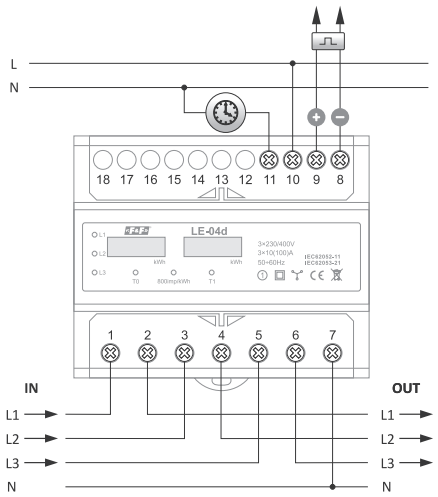
LE-04d 3-phase, 2-tariff

Purpose

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 (IEC62052:11, 62053:21)	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

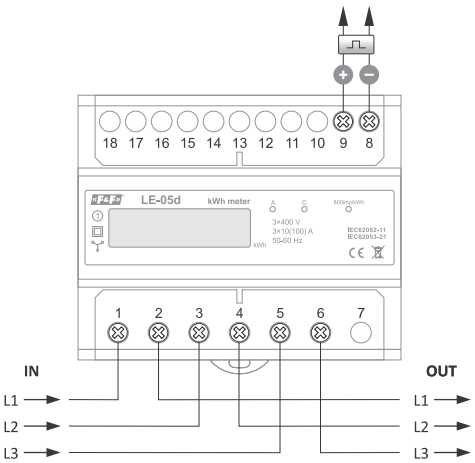
Functions

- 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 (IEC62052:11, 62053:21)	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

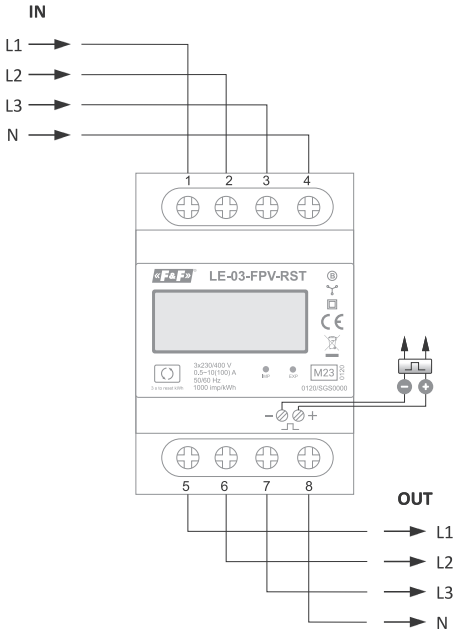
- 3-phase;
- Reference voltage 3×400 V;
- Direct measurement 3×100 A;
- Measurement in the Aron circuit;
- LVD compliance;
- SO pulse output.

Erasable meters

Erasable energy consumption meters are equipped with auxiliary energy meters that can be reset by the user.
In this situation, the main energy consumption meter continues counting energy and the auxiliary meter starts counting from zero.

Product	Type	MID	Cooperation with current transformers (semi-direct measurement)	2-directional	Measurement of additional parameters										Communication		Backlighting counter	Erasable	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-01MR	meter 1-phase	•	–	•	•	–	•	–	–	•	–	•	•	•	•	•	–	•	•	248
LE-01MW	meter 1-phase	•	–	•	•	–	•	–	–	•	–	•	•	•	•	•	–	•	•	250
LE-03-FPV-RST	meter 3-phase	•	–	•	•	•	–	–	–	•	–	–	–	–	–	–	–	•	•	244
LE-03MW	meter 3-phase	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	–	–	•	251
LE-03MW CT	meter 3-phase	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	–	–	•	252
WZE-1-RST	meter 1-phase	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	•	•	245
WZE-3-RST	meter 3-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	–	•	245

LE-03-FPV-RST 3-phase, 2-way, MID certificate, for photovoltaic systems

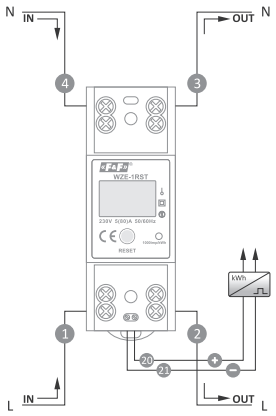


compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
frequency	50÷60 Hz
measurement accuracy (EN50470-1/3)	B class
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	1000 pulses/kWh
read-out indication	2×red LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1000 pulses/kWh
pulse duration	60 ms
working temperature	-40÷70°C
terminal	25 mm² screw terminals
dimensions	4 modules (72 mm)
mounting	for TH-35 rail
ingress protection	(indoors) IP51

Functions

- 3-phase;
- 2-way active energy and active power measurement (perfect for monitoring and billing photovoltaic installations);
- MID compliance;
- Direct measurement 100 A;
- Erasable auxiliary energy consumption meter;;
- Easy resetting of the auxiliary meter;
- Backlit LCD display (6+1 character);
- SO pulse output.

WZE-1-RST 1-phase, with LCD display

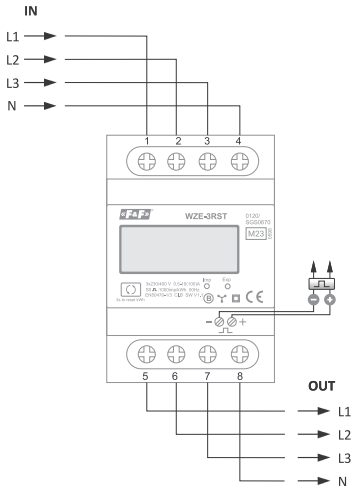


reference voltage	230 V AC
base current	5 A
maximum current	80 A
minimum detection current	0.02 A
frequency	50÷60 Hz
measurement accuracy (IEC62052:11, 62053:21)	1st class
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.9 kWh
meter constant	1000 pulses/kWh
read-out indication	red LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	20 mA
pulse constant	1000 pulses/kWh
pulse duration	90 ms
working temperature	-20÷65°C
terminal	16 mm² screw terminals
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	(indoors) IP51

Functions

- 1-phase;
- Direct measurement 80 A;
- Active energy measurement;
- Compliance with IEC62052-11 and IEC62053-21;
- Erasable auxiliary energy consumption meter;
- Easy resetting of the auxiliary meter;
- 2-row, backlit LCD display (5+1 character);
- Simultaneous display of global and erasable meter;
- SO pulse output.

WZE-3-RST 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	0.02 A
frequency	50÷60 Hz
measurement accuracy (EN50470-1/3)	B class
own power consumption	<8 VA; <0.4 W
indication range	0÷999999.99 kWh
meter constant	1000 pulses/kWh
read-out indication	red LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	20 mA
pulse constant	1000 pulses/kWh
pulse duration	35 ms
working temperature	-40÷70°C
terminal	16 mm² screw terminals
dimensions	4.5 modules (75/76 mm)
mounting	for TH-35 rail
ingress protection	(indoors) IP51

Functions

- 3-phase;
- Direct measurement 3×80 A;
- Active energy measurement;
- MID compliance;
- Erasable auxiliary energy consumption meter;
- Easy resetting of the auxiliary meter;
- LCD display (6+2 characters);
- SO pulse output.

Devices related with erasable meters

LE-01MR 1-phase, 2-way, 4-tariff electricity meter

More information p. 248

LE-01MW 1-phase electricity meter

More information p. 258

LE-03MW 3-phase, 2-way, 4-tariff electricity meter

More information p. 251

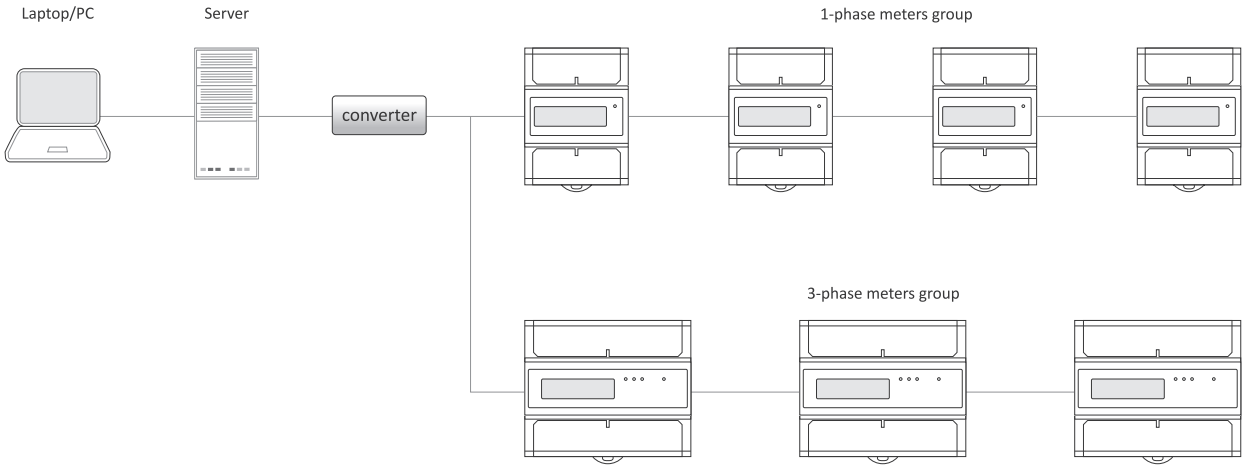
LE-03MWCT 3-phase, 2-way, 4-tariff electricity meter

More information p. 252

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.



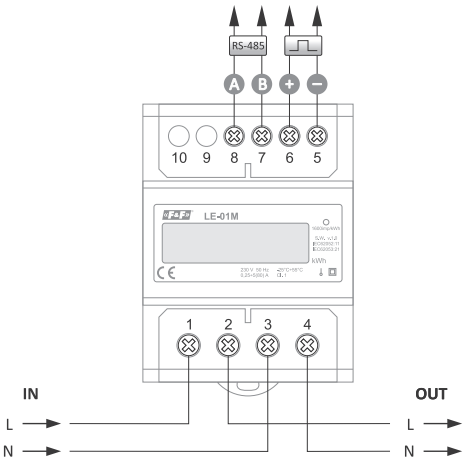
Functioning

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.

MeternetPRO remote reading system, more information on p. 259

Active energy meters with Modbus RTU communication

LE-01M 1-phase



reference voltage	230 V
base current	5 A
maximum current	80 A
minimum detection current	0.04 A
measurement accuracy (IEC62052:11, 62053:21)	1st 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;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

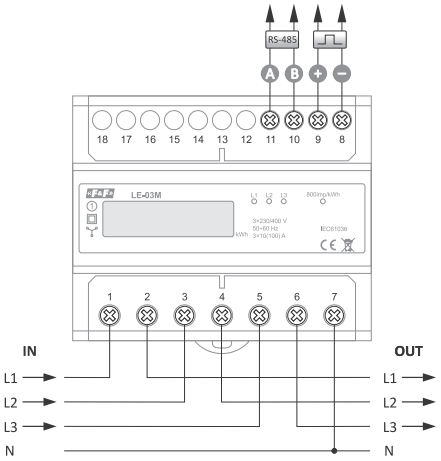
CN-LEM-3 data format converter

Designed for meters: LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.

Due to the peculiarities of writing data in the registers of M-series counters (1 B in a single register), some programmes do not have the function to assemble a read group of registers into the correct result. The converter allows the registers to be reformatted. The output from the converter to the Master is in the standardised LONG or FLOAT format.

More information on p. 265

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
measurement accuracy (IEC62052:11, 62053:21)	1st class
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

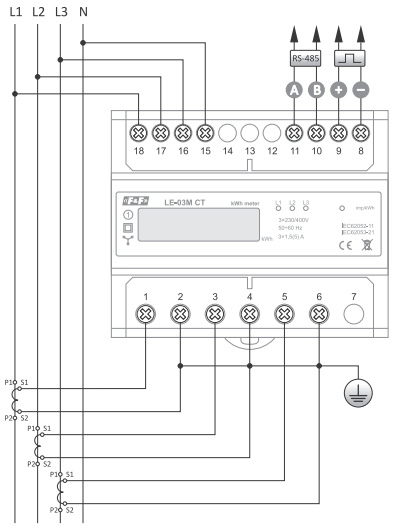
Functions

- 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
measurement accuracy (IEC62052:11, 62053:21)	1st class
own power consumption	<10 VA; <2 W
number of abacus 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.

CN-LEM-3 data format converter

Designed for meters: LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.
Due to the peculiarities of writing data in the registers of M-series counters (1 B in a single register), some programmes do not have the function to assemble a read group of registers into the correct result. The converter allows the registers to be reformatted. The output from the converter to the Master is in the standardised LONG or FLOAT format.

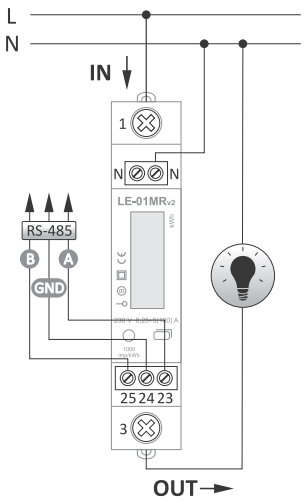
More information on p. 265

Active/reactive energy meters with network parameters measurement

Functioning

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 (EN50470-1/3)	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;
- 2-way, 4-quadrant energy measurement (active energy imported, active energy exported, reactive energy imported, reactive energy exported)*;
- Direct measurement of currents up to 100 A;
- Measurement of network parameters (voltage, current, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand*;
- Auxiliary, erasable active and reactive energy consumption meters*;
- MID compliance;
- RS-485 port with Modbus RTU protocol;
- Backlit LCD display;
- Possibility to configure the meter manually (without connecting a computer)*;
- Protection of settings by PIN number*;
- DIN rail mounting (1 module).

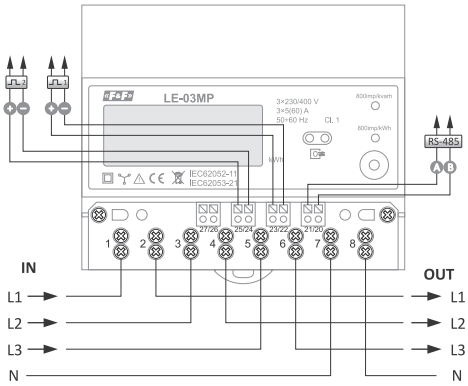
Functions marked with (*) available from version (v.2) of the device.

CN-LEM-3 data format converter

Designed for meters:
LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.
The converter allows the operation on a single bus of many different types of meters which have different and non-settable transmission attributes. The converter swaps attributes depending on the operating parameters of the Master.

More information on p. 265

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 (IEC62052:11, 62053:21)	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 L_1, L_2, L_3;
- 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].

CN-LEM-3 data format converter

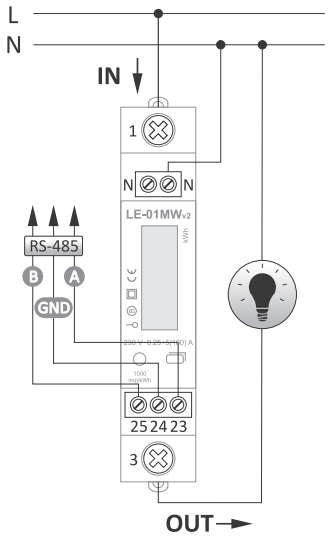
Designed for meters:
LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.
The converter allows the operation on a single bus of many different types of meters which have different and non-settable transmission attributes. The converter swaps attributes depending on the operating parameters of the Master.

More information on p. 265

LE-01MW 1-phase, 2-way, 4-tariff electricity meter, MID certificate

Purpose

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 (EN50470-1/3)	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;
- 2-way, 4-quadrant energy measurement (active energy imported, active energy exported, reactive energy imported, reactive energy exported);
- Direct measurement of currents up to 100 A;
- Energy measurement in 4 tariff zones;
- Possibility to set separate tariff plans for weekdays, weekends and set holidays*;
- Possibility to define up to 100 customised holidays*;
- Measurement of network parameters (voltage, current, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand*;
- Auxiliary, erasable active and reactive energy consumption meters*;
- MID compliance;
- RS-485 port with Modbus RTU protocol;
- Backlit LCD display;
- Possibility to configure the meter manually (without connecting a computer)*;
- Protection of settings by PIN number*;
- DIN rail mounting (1 module).

Functions marked with (*) available from version (v.2) of the device.

CN-RTC-4 RTC clock synchroniser

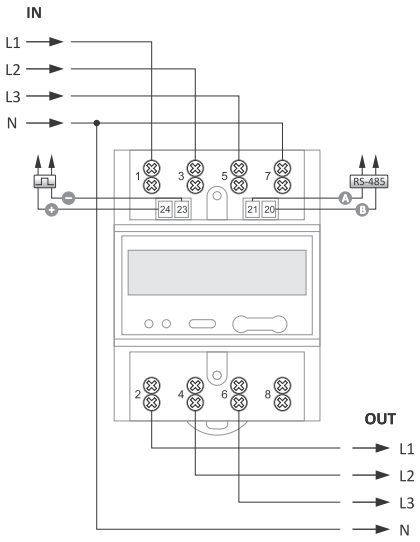
Designed for meters: LE-01MW, LE-03MW, LE-03MW-CT.
The synchroniser operates on an RS-485 serial bus with supported counters. It synchronises date and time and automatically changes from summer to winter time and vice versa. The synchroniser can operate in a system with or without a Modbus master.

More information on p. 265

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 (EN50470-1/3)	B class
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant (kWh)	1000 pulses/kWh
meter constant (kvarh)	1000 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, 10,100, 1000 pulses/kWh
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.

CN-RTC-4 RTC clock synchroniser

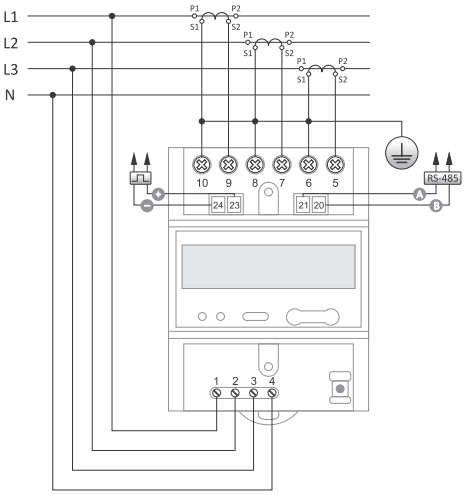
Designed for meters: LE-01MW, LE-03MW, LE-03MW-CT.
The synchroniser operates on an RS-485 serial bus with supported counters. It synchronises date and time and automatically changes from summer to winter time and vice versa. The synchroniser can operate in a system with or without a Modbus master.

More information on p. 265

LE-03MW-CT 3-phase, 4-tariff, 2-way electricity meter

Purpose

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 (IEC62052:11, 62053:21)	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	4.0 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.

CN-RTC-4 RTC clock synchroniser

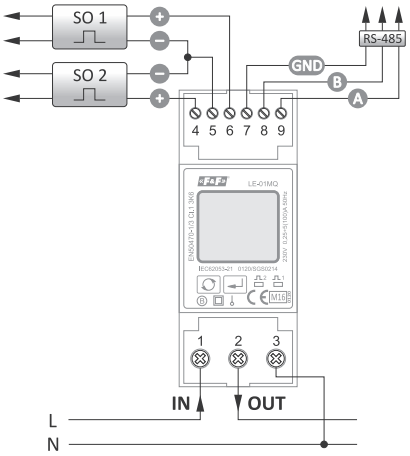
Designed for meters: LE-01MW, LE-03MW, LE-03MW-CT.
The synchroniser operates on an RS-485 serial bus with supported counters. It synchronises date and time and automatically changes from summer to winter time and vice versa. The synchroniser can operate in a system with or without a Modbus master.

More information on p. 265

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 (EN50470-1/3)	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× SO pulse output;
- 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 (EN50470-1/3)	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× SO pulse output;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

Measuring systems for the LE-03MQ meter can be found on page 257.

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 (EN50470-1/3)	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	4.0 mm² screw terminals
dimensions	4 modules (72 mm)
mounting	for TH-35 rail
ingress protection	IP51

Functions

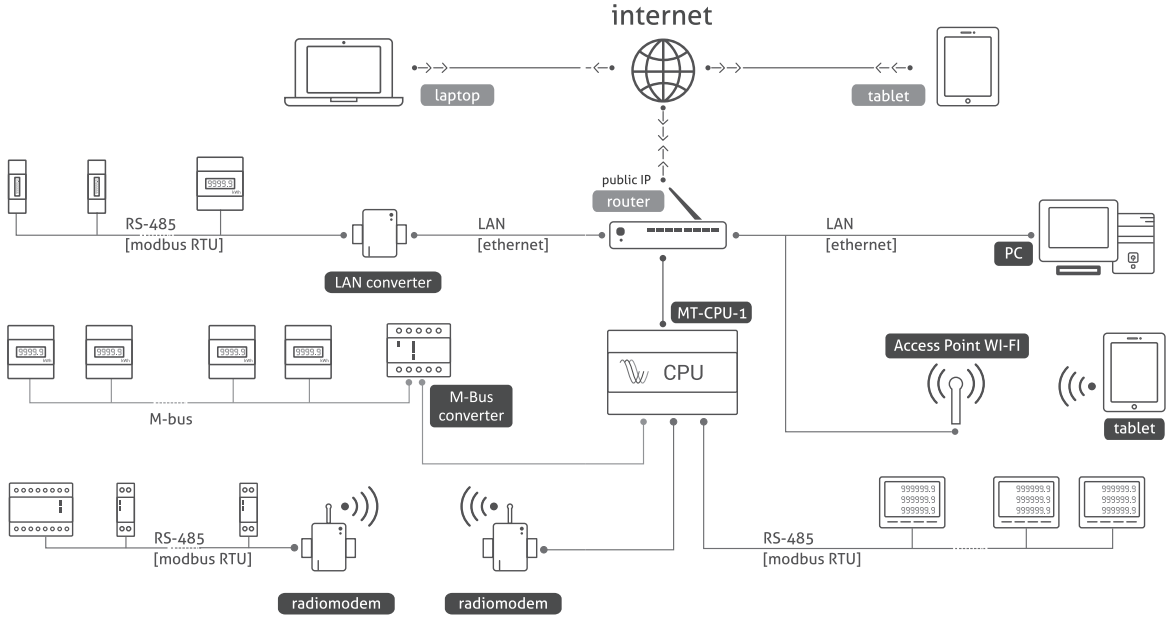
- 3-phase;
- 2-way (4-quadrant);
- 1 A or 5 A transformers;
- Current ratio 1÷9999;
- Adjustable measuring voltage 100÷500 V;
- Voltage ratio 1÷9999;
- Ratio set according to Modbus RTU;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- 2× SO pulse output;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

Measuring systems for the LE-03MQ CT meter can be found on page 257.

MeternetPRO network parameter recording system

Purpose

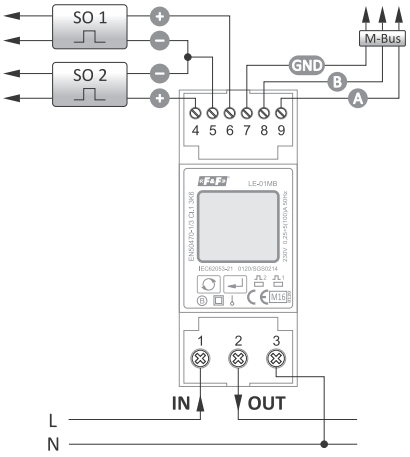
The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or 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. 259

With M-Bus port and protocol

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 (EN50470-1/3)	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× SO pulse output;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

LE-03MB 3-phase, 2-way, 4-quadrant electricity meter, MID certificate

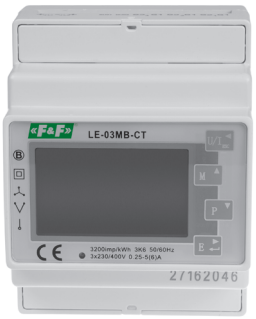
compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
measurement accuracy (EN50470-1/3)	B class
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant (kWh)	0.01; 0.1; 1; 10; 100 pulses/kWh
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× SO pulse output;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

Measuring systems for the LE-03MB meter can be found on page 256.

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
measurement accuracy (IEC62052:11, 62053:21)	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

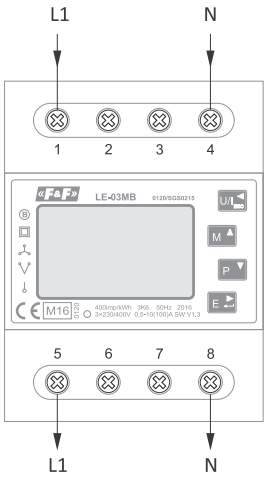
Functions

- 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× SO pulse output;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

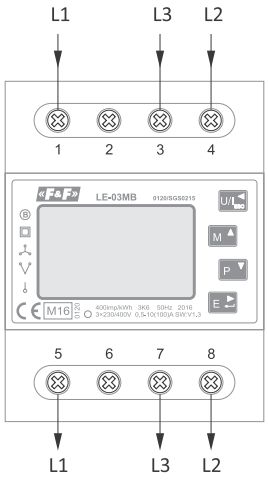
Measuring systems for the LE-03MB CT meter can be found on page 257.

Measuring systems for meters: LE-03MB, LE-03MB CT, LE-03MQ, LE-03MQ CT

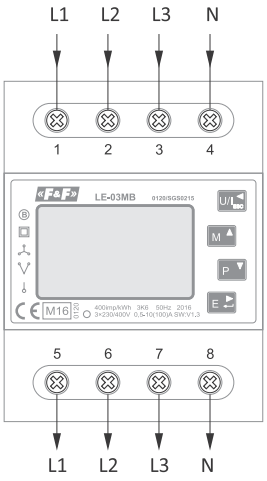
LE-03MB



230 V AC
1-phase 2-wire installation



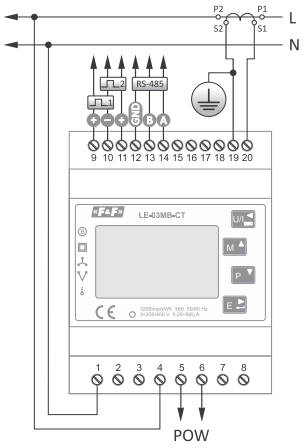
3×400 V
3-phase 3-wire installation
(without neutral wire)



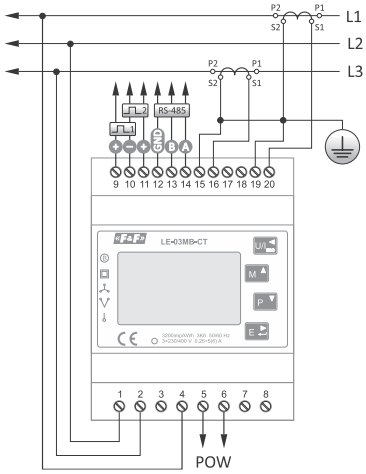
3×400 V
3-phase 3-wire installation
(without neutral wire)

continued on next page

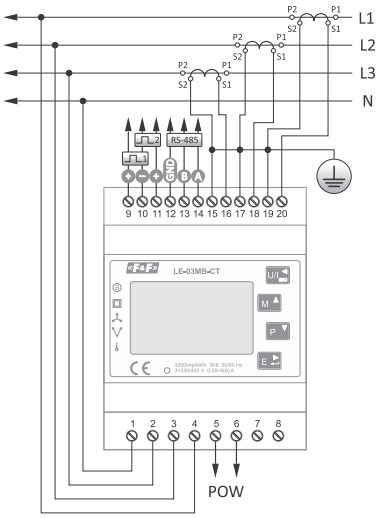
LE-03MB CT 3-phase, 2-way, 4-quadrant electricity meter



230 V AC
1-phase 2-wire installation

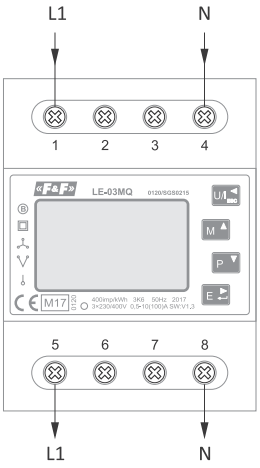


3×400 V
3-phase 3-wire inst. (without neutral wire)

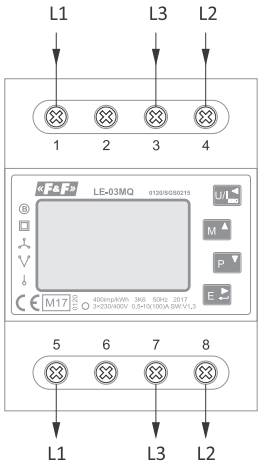


3×230 V+N
3-phase 4-wire installation

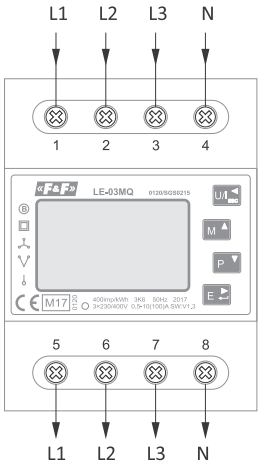
LE-03MQ 3-phase, 2-way, 4-quadrant electricity meter, MID certificate



230 V AC
1-phase 2-wire installation

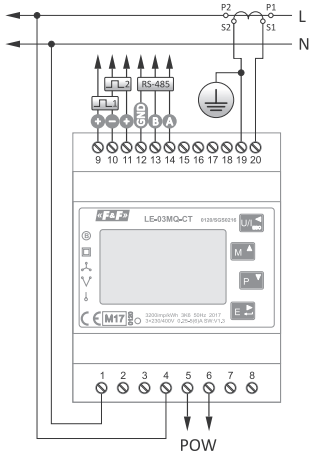


3×400 V
3-phase 3-wire inst. (without neutral wire)

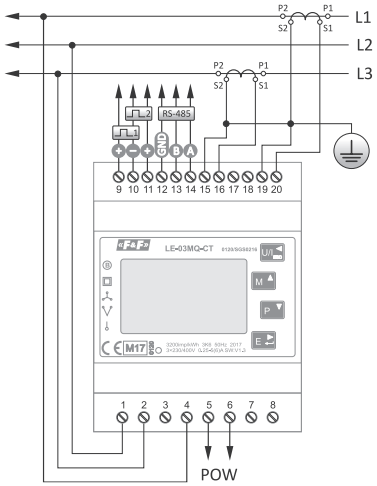


3×230 V+N
3-phase 4-wire installation

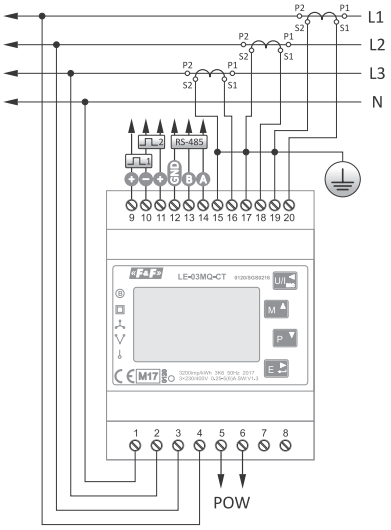
LE-03MQ CT 3-phase, 2-way, 4-quadrant electricity meter, MID certificate



230 V AC
1-phase 2-wire installation



3×400 V
3-phase 3-wire inst. (without neutral wire)



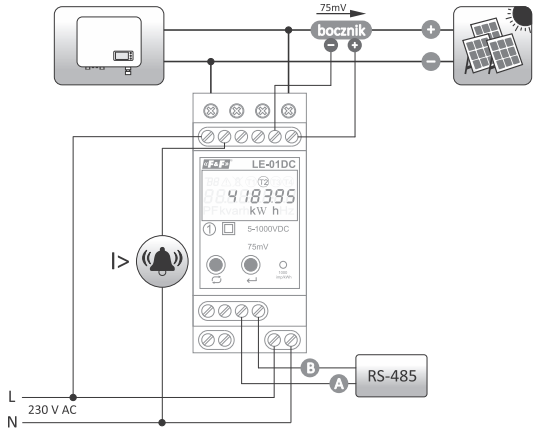
3×230 V+N
3-phase 4-wire installation

DC electricity meters

Purpose

A meter designed to monitor parameters and measure energy consumption in DC circuits (photovoltaic installations, car charging stations, etc.).

LE-01DC 1-phase, 2-way, 4-quadrant electricity meter



power supply	
voltage	85÷300 V AC
power consumption	<8 VA, 0.4 W
measurement inputs	
voltage	5÷1000 V DC
current	external measuring shunt
secondary side	75 mV
primary side	up to 2000 A
accuracy class	
voltage	0.5 %
current	0.5 %
active power	1.0 %
active energy	1st class
meter constant	1000 pulses/kWh
display	LCD backlit display, 8 characters
auxiliary relay	
function	current overload indication
contact	1×NO
maximum load current (AC-1)	1 A
working voltage	250 V AC
isolation	4.4 kV (1 min.) / 6.4 kV (1,2 µs)
communication	
port	RS-485
communication protocol	Modbus RTU
working temperature	-25÷70°C
terminal	
DC+, DC- terminals	2.5 mm²
other	1.5 mm²
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
mounting	for TH-35 rail
ingress protection	IP40

Functions

- DC voltage measurement in the range of 5÷1000 V DC;
- DC current measurement with measuring shunts up to 2000 A and secondary voltage of 75mV;
- Power supply of the meter with 230 V AC voltage;
- 4-tariff, 2-way active energy measurement;
- Additional, cashable energy consumption meter;
- Measurement of instantaneous DC network parameters: voltage, current and power;
- RS-485 interface and Modbus RTU protocol support;
- Alarm function – signaling the current overload of the meter;
- Built-in relay with alarm signaling capability;
- Backlit LCD display;
- Built-in clock with battery backup for tariff zone operation;
- DIN rail mounting, 2S housing.

Devices related with LE-01DC

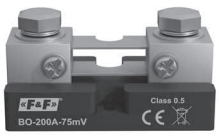
Purpose

The measuring shunt is designed to extend the measuring range of current meters.

BO-100-75 100 A current shunt

More information p. 331

BO-200-75 200 A current shunt

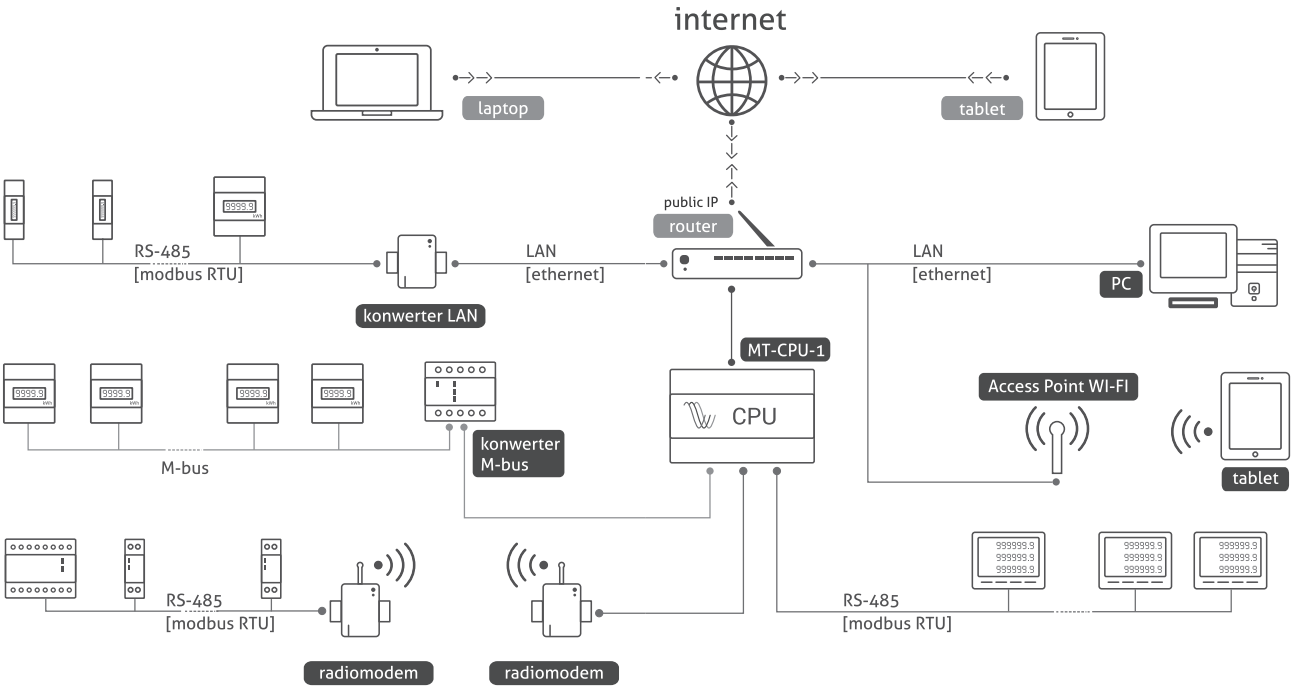


More information p. 331

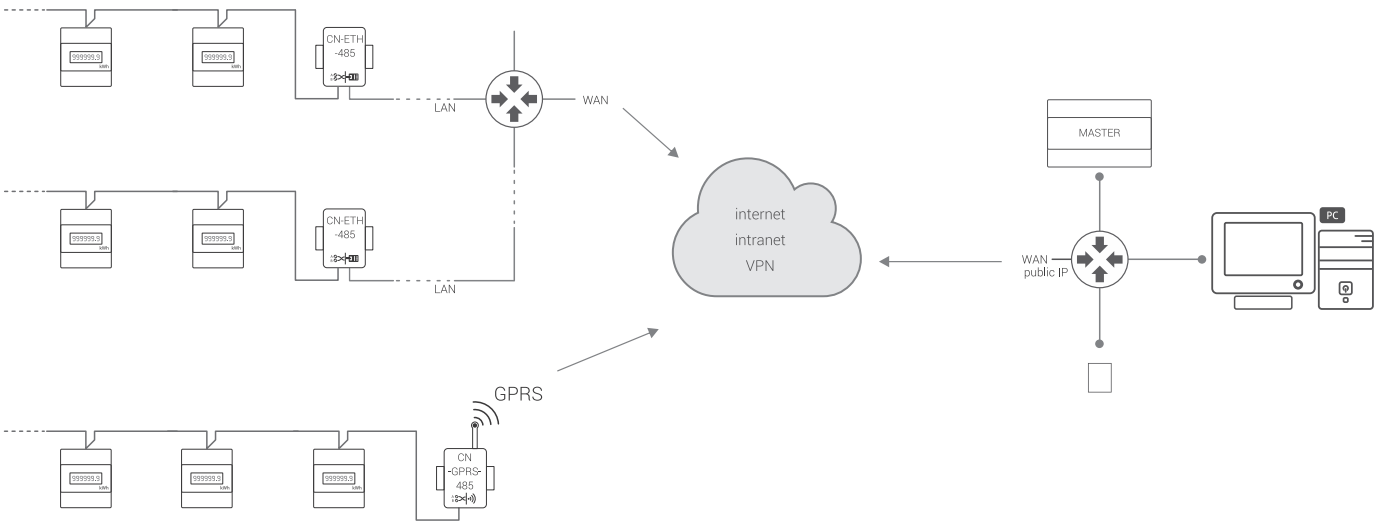
Meternet PRO – remote reading system

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.



Local system



Headquarter-satellite system

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.

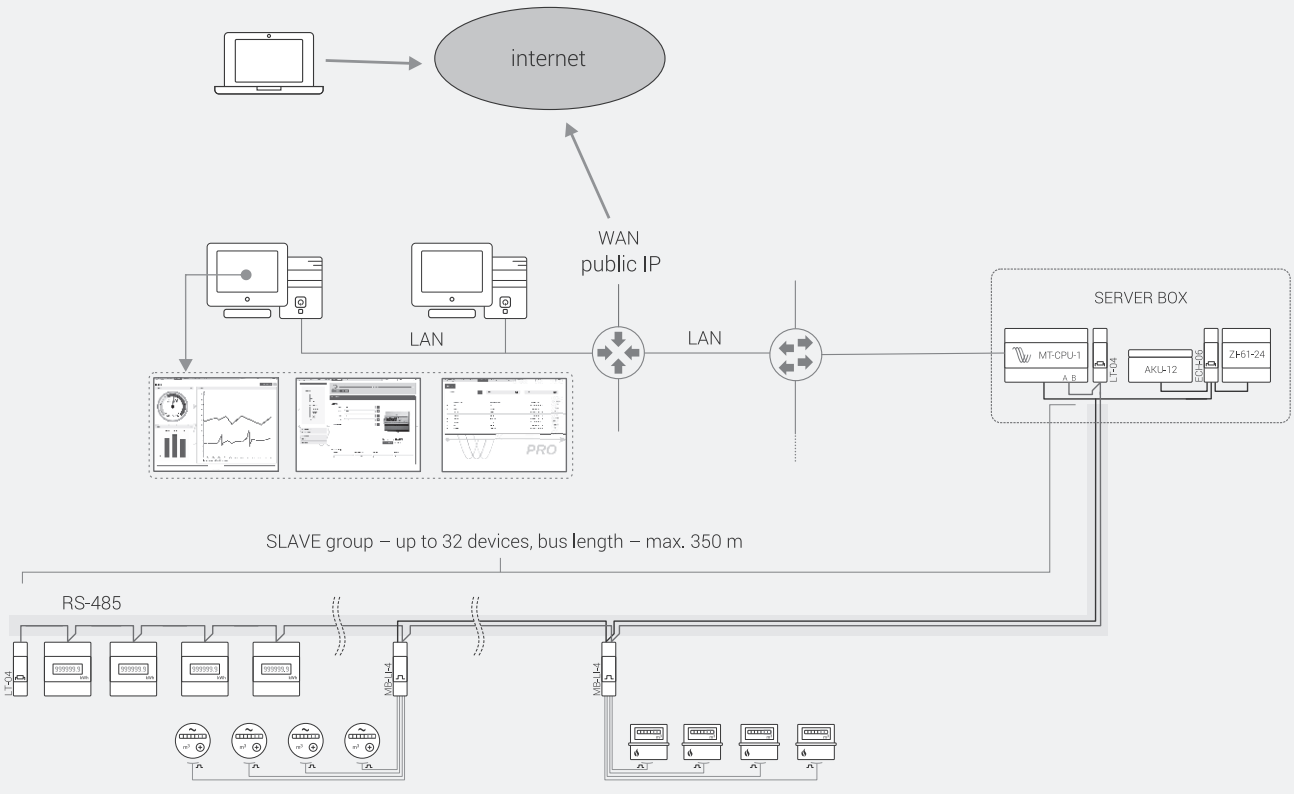
Frequent applications

- 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.

Interesting and practical applications

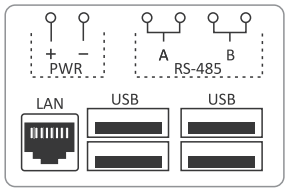


Example application of an integration system for electricity, water, and gas consumption readings

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.



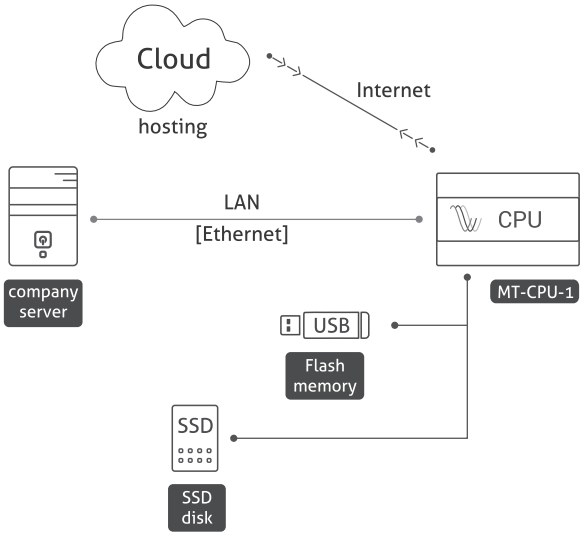
supply voltage	9÷30 V DC
ports	
LAN	RJ-45
USB	2.0
RS-485	Modbus RTU
working status indication	5×LED
RTC clock	YES
system memory	8 GB
battery type	2032 (lithium)
battery life	6 years*
power consumption	0.8 W
working temperature	-25÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.3 Nm
dimensions	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

SSD240 240 GB USB flash memory / SSD280 280 GB USB flash memory

Purpose

External memory to work with the MT-CPU-1 hardware server for the MeternetPRO system archive.

Accessories included with the memory stick:

- Y-type connection cable USB MicroB – USB Ax2
- USB power supply 5V (type ZI-USB-5)

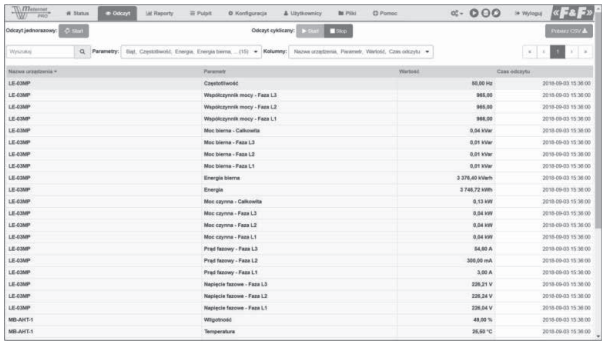
memory type	SSD
interface	USB 3.0
read speed	430 MB/s
write speed	400 MB/s
power consumption	
standby	0.35 W
on	1.1 W
terminal	USB Micro-B
dimensions	63×18×50 mm
mounting	for TH-35 rail
ingress protection	IP20

MeternetPRO system app

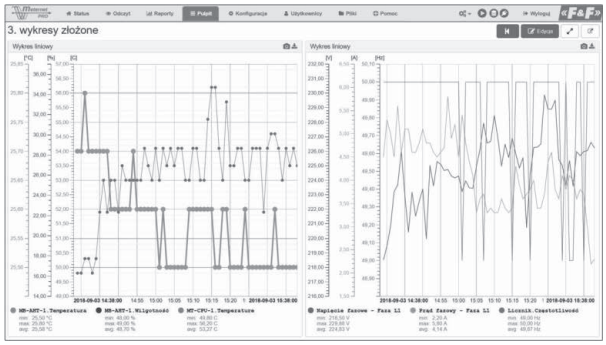
Functioning

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).

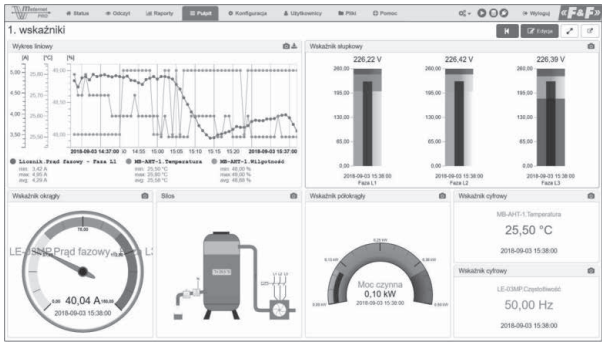
Interface



Screenshot from the "Reading" section - results table



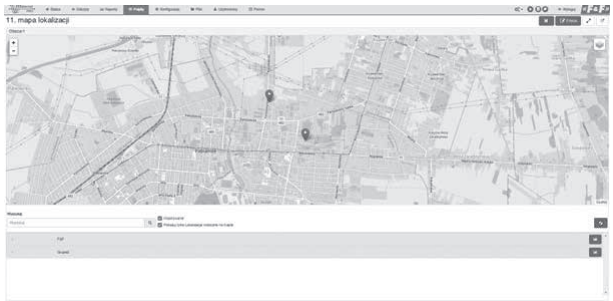
Screenshot from the "Dashboard" section - time course



Screenshot from the "Dashboard" section - graphic indicators

Screenshot from the "Configuration" section

Screenshot from the "Dashboard" section - photovoltaic



Screenshot from the "Dashboard" section - geolocalisation

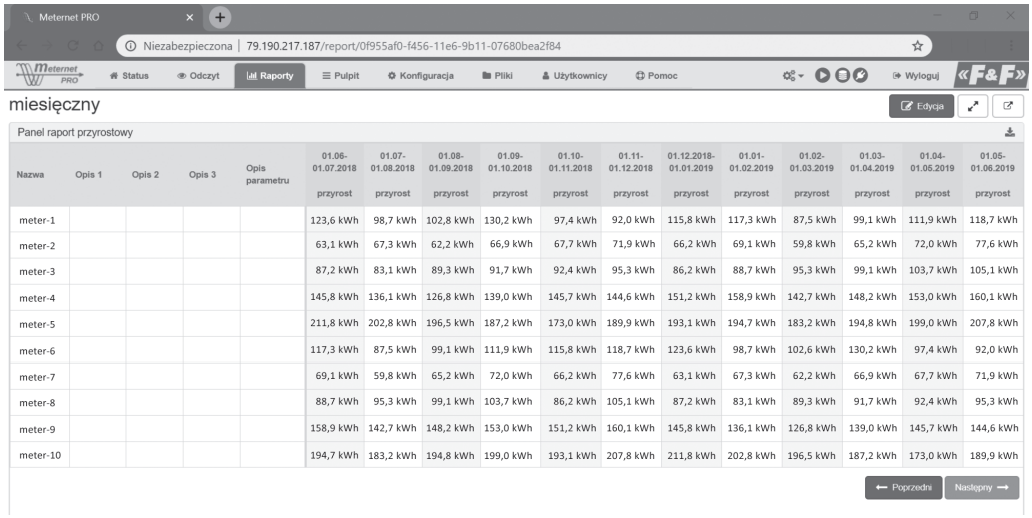
Licences and software modules

Licences

- **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-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.

Software modules

- **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).



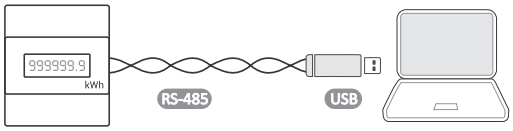
Nazwa	Opis 1	Opis 2	Opis 3	Opis parametru	01.06-01.07.2018 przyrost	01.07-01.08.2018 przyrost	01.08-01.09.2018 przyrost	01.09-01.10.2018 przyrost	01.10-01.11.2018 przyrost	01.11-01.12.2018 przyrost	01.12.2018-01.01.2019 przyrost	01.01-01.02.2019 przyrost	01.02-01.03.2019 przyrost	01.03-01.04.2019 przyrost	01.04-01.05.2019 przyrost	01.05-01.06.2019 przyrost
meter-1					123,6 kWh	98,7 kWh	102,8 kWh	130,2 kWh	97,4 kWh	92,0 kWh	115,8 kWh	117,3 kWh	87,5 kWh	99,1 kWh	111,9 kWh	118,7 kWh
meter-2					63,1 kWh	67,3 kWh	62,2 kWh	66,9 kWh	67,7 kWh	71,9 kWh	66,2 kWh	69,1 kWh	59,8 kWh	65,2 kWh	72,0 kWh	77,6 kWh
meter-3					87,2 kWh	83,1 kWh	89,3 kWh	91,7 kWh	92,4 kWh	95,3 kWh	86,2 kWh	88,7 kWh	95,3 kWh	99,1 kWh	103,7 kWh	105,1 kWh
meter-4					145,8 kWh	136,1 kWh	126,8 kWh	139,0 kWh	145,7 kWh	144,6 kWh	151,2 kWh	158,9 kWh	142,7 kWh	148,2 kWh	153,0 kWh	160,1 kWh
meter-5					211,8 kWh	202,8 kWh	196,5 kWh	187,2 kWh	173,0 kWh	189,9 kWh	193,1 kWh	194,7 kWh	183,2 kWh	194,8 kWh	199,0 kWh	207,8 kWh
meter-6					117,3 kWh	87,5 kWh	99,1 kWh	111,9 kWh	115,8 kWh	118,7 kWh	123,6 kWh	98,7 kWh	102,6 kWh	130,2 kWh	97,4 kWh	92,0 kWh
meter-7					69,1 kWh	59,8 kWh	65,2 kWh	72,0 kWh	66,2 kWh	77,6 kWh	63,1 kWh	67,3 kWh	62,2 kWh	66,9 kWh	67,7 kWh	71,9 kWh
meter-8					88,7 kWh	95,3 kWh	99,1 kWh	103,7 kWh	86,2 kWh	105,1 kWh	87,2 kWh	83,1 kWh	89,3 kWh	91,7 kWh	92,4 kWh	95,3 kWh
meter-9					158,9 kWh	142,7 kWh	148,2 kWh	153,0 kWh	151,2 kWh	160,1 kWh	145,8 kWh	136,1 kWh	126,8 kWh	139,0 kWh	145,7 kWh	144,6 kWh
meter-10					194,7 kWh	183,2 kWh	194,8 kWh	199,0 kWh	193,1 kWh	207,8 kWh	211,8 kWh	202,8 kWh	196,5 kWh	187,2 kWh	173,0 kWh	189,9 kWh

Poprzedni Następny

- **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.

CN-USB-485 RS-485 <-> USB converter

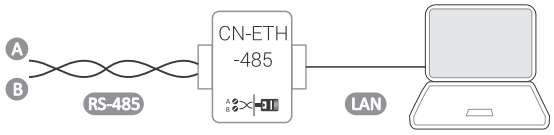
The converter enables access to the RS-485 port from any PC or other Master-type device equipped with a USB interface.



wire length	1.8 m
terminal RS-485	2×0.34 mm²

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.

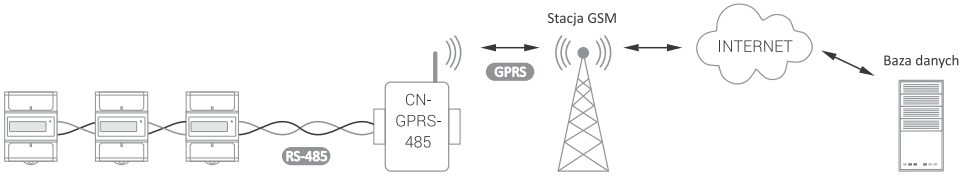


power	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	86×100×26 mm
mounting	surface

CN-GPRS-485 RS-485 <-> sieć GSM/GPRS 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.

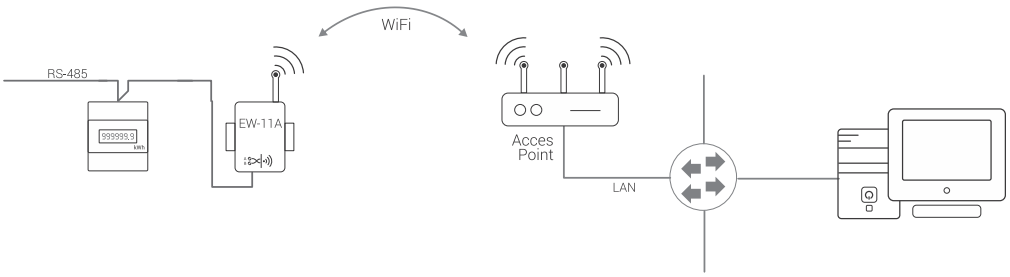
power	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	86×100×26 mm
mounting	surface



EW-11A RS-485 <-> TCP/UDP/Telnet/ModbusTCP converter

The EW-11A converter is used for 2-way transparent data transmission from the RS-485 serial port to the LAN in Wi-Fi standard wireless communication. Communication takes place via TCP/UDP/Telnet/ModbusTCP protocols.

power supply	5÷36 V DC
power consumption	0,7 W
dimensions	61×26×18 mm
mounting	surface

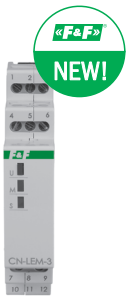


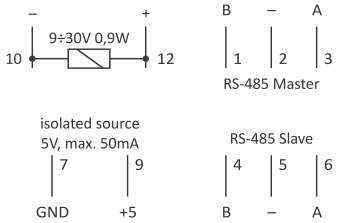
CN-LEM-3 data format converter

Purpose

Designed for meters: LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.

The converter allows the operation on a single bus of many different types of meters which have different and non-settable transmission attributes. The converter swaps attributes depending on the operating parameters of the Master.





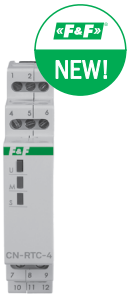
power supply	9÷30 V DC
port	2× RS-485
communication protocol	Modbus RTU
activation indication	green LED
communication indication	2× yellow LED
communication parameters	
baud rate (adjustable)	1200/2400/4800/9600 bit/s
data bits	8
stop bits	1/2
parity bits	EVEN/ODD/NONE
address	1÷247
power consumption	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

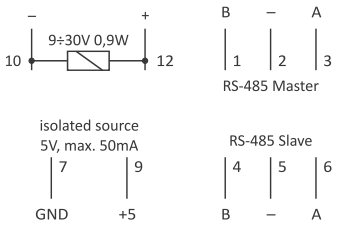
CN-RTC-4 RTC clock synchroniser

Purpose

Designed for meters: LE-01MW, LE-03MW, LE-03MW-CT.

The synchroniser operates on an RS-485 serial bus with supported counters. It synchronises date and time and automatically changes from summer to winter time and vice versa. The synchroniser can operate in a system with or without a Modbus master.





power supply	9÷30 V DC
port	2× RS-485
communication protocol	Modbus RTU
activation indication	green LED
communication indication	2× yellow LED
communication parameters	
baud rate (adjustable)	1200/2400/4800/9600 bit/s
data bits	8
stop bits	1/2
parity bits	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

System measurement devices

Type	Description	Page
DMM-5T-2	Multimeter, indirect 4-quadrant measurement 5÷9000 A, measurement of U, I, F, AE, RE, P, Q, cos	210
DMM-5T-3	Multimeter, indirect 4-quadrant measurement 1 mA÷25000 A, measurement of U, I, F, AE, RE, P, Q, cos	209
LE-01M	1-phase direct energy meter 100 A	246
LE-03M	3-phase direct energy meter 100 A	247
LE-03M CT	3-phase direct energy meter 5÷6000 A	247
LE-01MR	Energy meter, direct 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, T	248
LE-03MP	Energy meter, direct 3-phase 60 A, measurement of U, I, F, AE, RE, P, Q, cos, T, Prepaid	255
LE-01MQ	Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos	253
LE-03MQ	Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos	253
LE-03MQ CT	Energy meter, semi-indirect 2-way 1-phase 5 A, measurement of U, I, F, AE, RE, P, Q, cos	254
LE-01MB	Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus	255
LE-03MB	Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus	255
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	256
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	251
LE-03MW CT	Energy meter, semi-indirect 2-way 3-phase 5A, measurement of U, I, F, AE, RE, P, Q, cos; Modbus	252
MB-1U-1	1-phase measuring transducer for AC/DC voltage	311
MB-3U-1	3-phase measuring transducer for AC/DC voltage	311
MB-1I-1	1-phase measuring transducer for AC/DC intensity	311
MB-3I-1	3-phase measuring transducer for AC/DC intensity	311
MB-AHT-1	Humidity and temperature transducer	316
MB-DS-2	Temperature measuring transmitter, DS sensor (×2), range -50÷130°C	313
MB-PT-100	Temperature measuring transducer, PT-100 sensor, range -100÷400°C	314
MB-TC-1	Temperature transducer for use with thermocouples	314
MB-LI-4	4-channel pulse counter	315
MB-LG-4	4-channel operating time counter	315
MR-DIO-1	Digital I/O expansion module (×6)	317
MR-DI-4	Digital I/O expansion module (×4)	317
MR-RO-1	16 A relay output expansion module (×1)	318
MR-RO-4	16 A relay output expansion module (×4)	318
MR-AI-1	Analog input expansion module 4÷20 mA/0÷10 V (×4)	319
MR-AO-1	0÷10 V relay output expansion module (×4)	319

It is possible to read device registers from outside the F&F range.
This requires individual programme configuration according to user requirements.

www.fif.com.pl

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«F&F»

Section XI

Status monitoring, measurement and regulation

Chapter 39

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	269
CLI-02	pulse meter	● (menu)	●	for TH-35 rail	●	8	–	●	10÷264 V AC/DC	24÷264 V AC/DC	270
CLI-11T 24 V	pulse meter	–	–	panel-mounted	●	8	–	●	4÷30 V DC	internal battery	269
CLI-11T 230 V	pulse meter	–	–	panel-mounted	●	8	–	●	110÷240 V AC/DC	internal battery	269
CLG-03	operating time meter	● (menu)	not applicable	for TH-35 rail	●	6+1	–	●	10÷264 V AC/DC	24÷264 V AC/DC	272
CLG-04	operating time meter	–	not applicable	for TH-35 rail	●	6+2	–	–	100÷240 V AC/DC	internal battery	272
CLG-13T 24 V	operating time meter	–	not applicable	panel-mounted	●	5+1	–	●*	4÷30 V DC	internal battery	271
CLG-13T 230 V	operating time meter	–	not applicable	panel-mounted	●	5+1	–	●*	110÷240 V AC/DC	internal battery	271
CLG-14T	operating time meter	–	not applicable	panel-mounted	●	6+2	–	●	110÷240 V AC/DC	internal battery	271
CLG-15T	electromechanical operating time meter	–	not applicable	panel-mounted	–	5+2	–	–	230 V AC/DC	230 V AC/DC	271
MB-LI-4 Lo	4-channel pulse meter	●	●	for TH-35 rail	–	not applicable	●	–	6÷30 V AC/DC	9÷30 V DC	270
MB-LI-4 Hi	4-channel pulse meter	●	●	for TH-35 rail	–	not applicable	●	–	160÷265 V AC/DC	9÷30 V DC	270
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	315
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	315

* The reset of indications is done by holding the button on the front of the device

Pulse meters

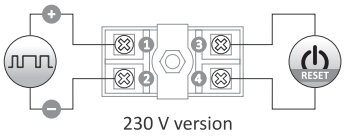
Purpose

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.

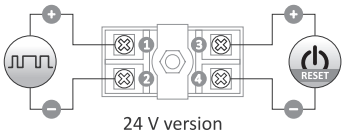
CLI-11T panel-mounted

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

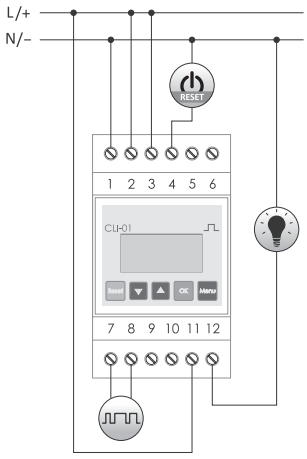
power supply	internal battery
battery life	10 years*
counting input voltage	
CLI-11T 230 V	110÷240 V AC/DC
CLI-11T 24 V	4÷30 V DC
maximum counting frequency	200 Hz
display	8 characters/H= 6.7 mm
indication accuracy	1%(±1 digit)
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening 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

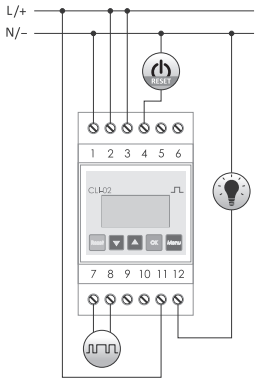
Functions

- 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.

CLI-02 programmable

Functioning

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.

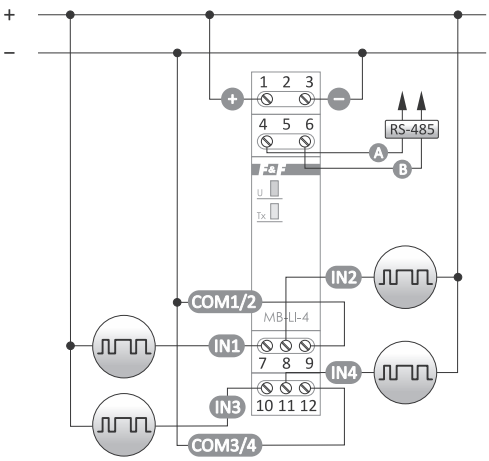


supply voltage	24÷264 V AC/DC
counting input	
voltage: low state	0÷5 V AC/DC
voltage: high state	10÷264 V AC/DC
frequency for DC signal	<5 kHz
frequency for AC signal	<50 Hz
resetting input	
voltage	24÷264 V AC/DC
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
power consumption	1.5 W
working 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-4Lo / MB-LI-4Hi 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

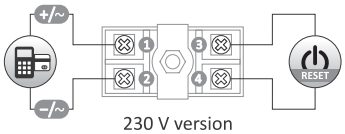
Purpose

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.).

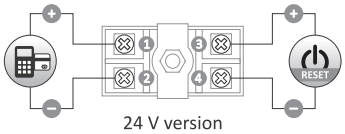
CLG-13T panel-mounted, with the RESET button on the housing

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

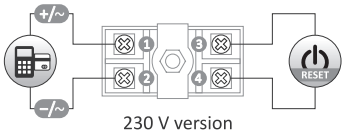
power supply	internal battery
battery life	10 years*
counting input voltage	
CLG-13T 230 V	110÷240 V AC/DC
CLG-13T 24 V	4÷30 V DC
display	6 characters/H= 6.7 mm
indication accuracy	0.1 h (6 min.)
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×52 mm
mounting hole	45×23 mm
ingress protection	IP20

* battery life depends on weather conditions

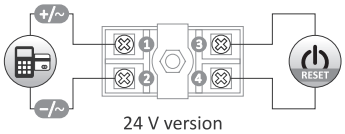
CLG-14T panel-mounted, with the RESET button on the housing

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

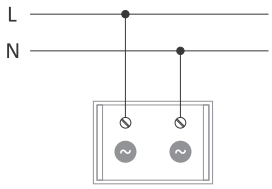
power supply	internal battery
battery life	10 years*
counting input voltage	
CLG-14T 230 V	110÷240 V AC/DC
CLG-14T 24 V	5÷60 V AC/DC
display	8 characters/H= 6.7 mm
indication accuracy	1 min.
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×52 mm
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.

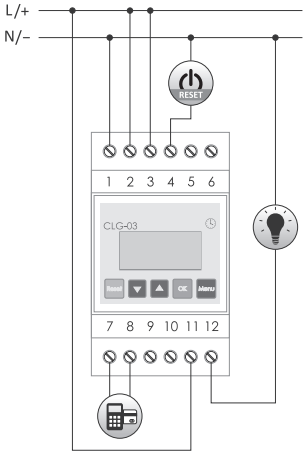


power supply	230 V AC
voltage tolerance	
indication accuracy	0.01 h (36 s)
working temperature	-25÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×60 mm
mounting hole	32×22 mm
ingress protection	IP20

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

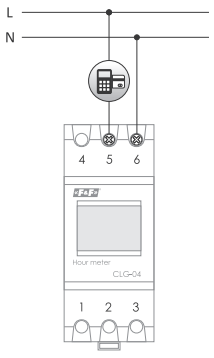
Functions

- 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

Purpose

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	Sensitivity range	Detection rainwater	Page
PZ-828	1	1	1×NO/NC	•	–	60 kΩ	–	273
PZ-828-RC / PZ-828-RC-24	1	1	1×NO/NC	•	•	1÷100 kΩ	–	274
PZ-828-RC-WD / PZ-828-RC-WD-24	1	1	1×NO/NC	•	•	1÷820 kΩ	•	275
PZ-829	2	3	2×NO/NC	•	–	60 kΩ	–	276
PZ-829-RC / PZ-829-RC-24	2	3	2×NO/NC	•	•	1÷100 kΩ	–	277
PZ-829-RC-WD / PZ-829-RC-WD-24	2	3	2×NO/NC	•	•	1÷820 kΩ	•	278
PZ-831-RC	3	4	3×NO	•	•	1÷180 kΩ	–	280
PZ-832-RC	4 (2+2 alarm)	5	4×NO/NC	•	•	1÷100 kΩ	–	279

Single-state

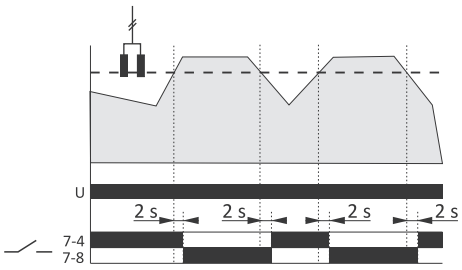
PZ-828 +1 PZ probe

Functioning

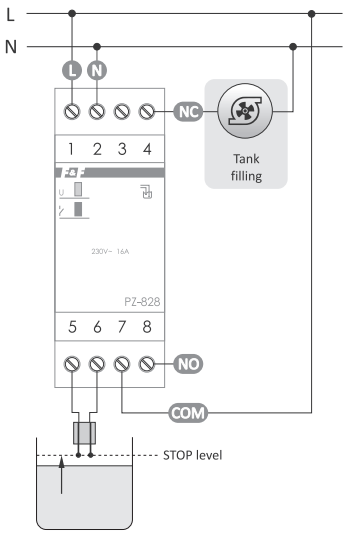
The PZ-828 is a liquid level control relay that operates on the principle of detecting the presence or absence of conductive liquid.
The relay can operate in two modes:

- 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;

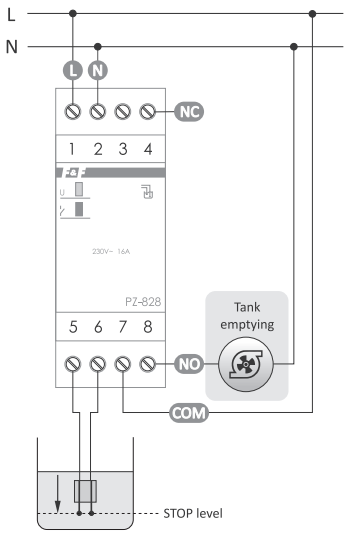
Examples of liquid resistances are shown in the table on page 274; for rainwater detection, the WD version of the relay is recommended.



power supply	230 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
sensitivity	60 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

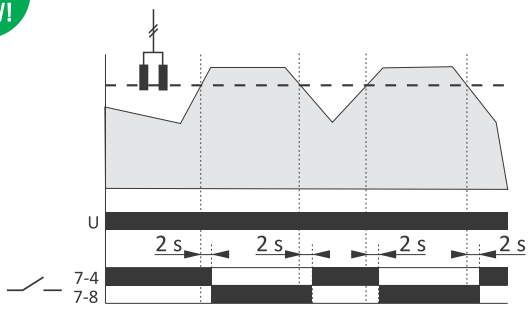
PZ-828-RC with sensitivity adjustment + 1 PZ probe
PZ-828-RC-24 with sensitivity adjustment + 1 PZ probe, NEW

Functioning

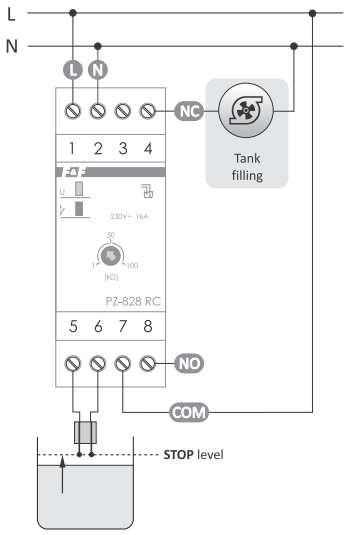
The PZ-828-RC is a liquid level control relay that operates on the principle of detecting the presence or absence of conductive liquid.
The relay can operate in two modes:

- 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;

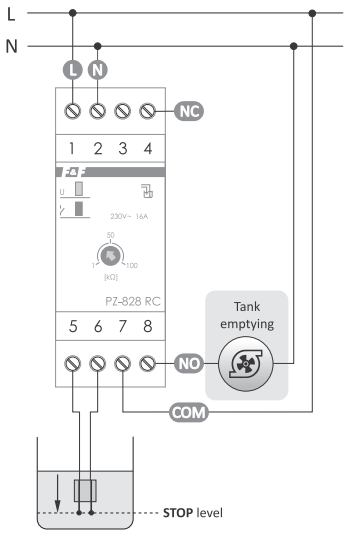
The PZ-828-RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table below; for rainwater detection, the WD version of the relay is recommended.



power supply	
PZ-828-RC	230 V AC
PZ-828-RC-24	24 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
sensitivity (adjustable)	1÷100 kΩ
output voltage measurement	<6 V
activation indication	green LED
work status indication	red LED
rainwater detection	no
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

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÷250 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

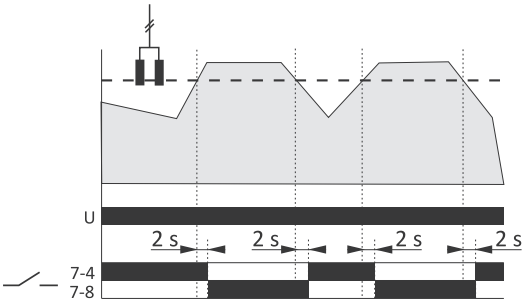
PZ-828-RC-WD with sensitivity adjustment + 1 PZ probe, for rainwater level control
PZ-828-RC-WD-24 with sensitivity adjustment + 1 PZ probe, for rainwater level control

Functioning

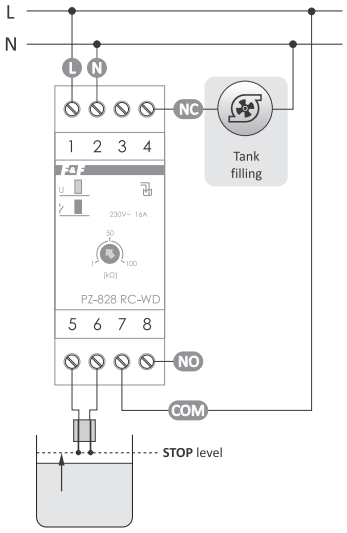
The PZ-828-RC-WD is a liquid level control relay that operates on the principle of detecting the presence or absence of conductive liquid.
The relay can operate in two modes:

- 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;

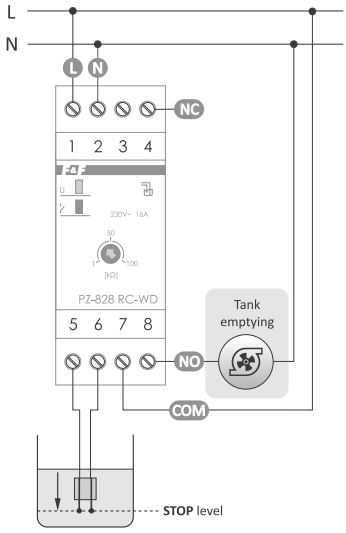
The PZ-828-RC-WD additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table below.



power supply	
PZ-828-RC-WD	230 V AC
PZ-828-RC-WD-24	24 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
sensitivity (adjustable)	1÷820 kΩ
output voltage measurement	<6 V
activation indication	green LED
work status indication	red LED
rainwater detection	yes
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

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÷250 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

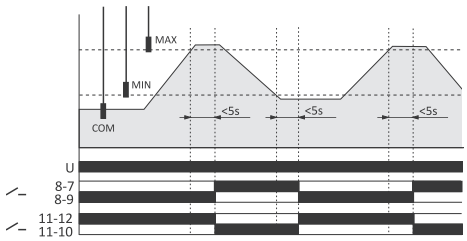
PZ-829 + 3 PZ2 probes

Functioning

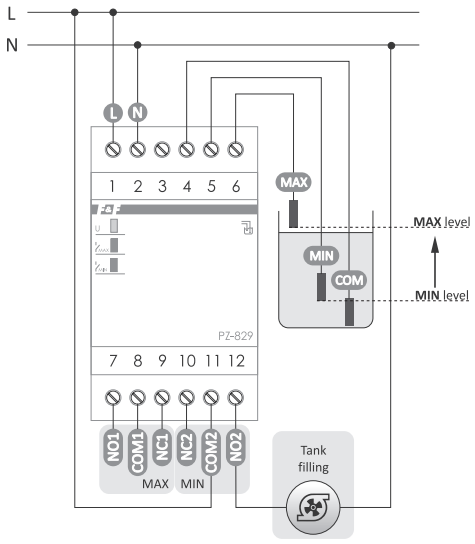
The PZ-829 is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value.
The relay can operate in two modes:

- 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.

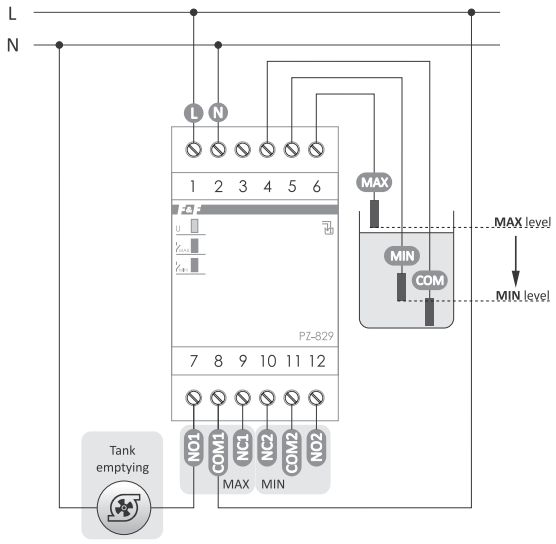
Examples of liquid resistances are shown in the table below; for rainwater detection, the WD version of the relay is recommended.



power supply	230 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO/NC
sensitivity	60 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÷250 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

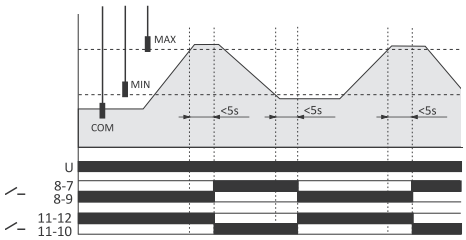
PZ-829-RC with sensitivity adjustment + 3 PZ2 probes
PZ-829-RC-24 with sensitivity adjustment + 3 PZ2 probes, NEW

Functioning

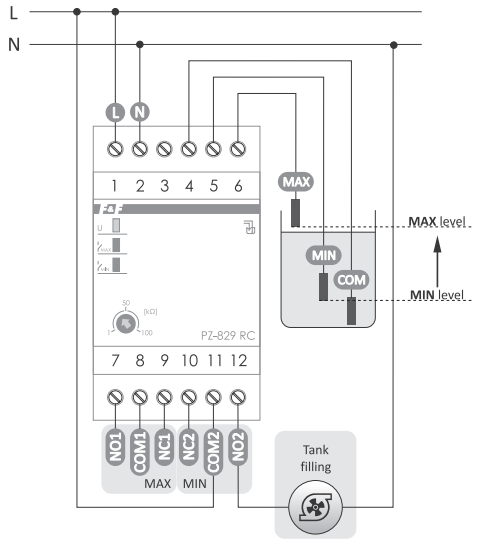
The PZ-829-RC is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value.
The relay can operate in two modes:

- 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.

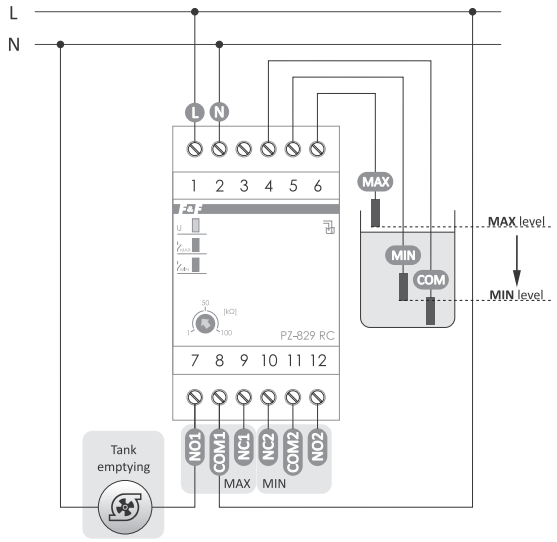
The PZ-829-RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table below; for rainwater detection, the WD version of the relay is recommended.



power supply	
PZ-829-RC	230 V AC
PZ-829-RC-24	24 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO/NC
sensitivity (adjustable)	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÷250 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

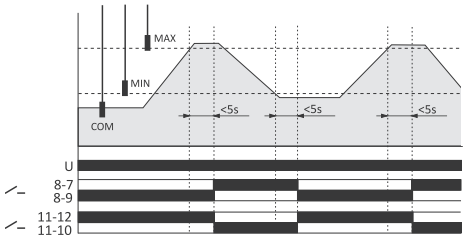
PZ-829-RC-WD with sensitivity adjustment + 3 PZ2 probes, for rainwater level control
PZ-829-RC-WD-24 with sensitivity adjustment + 3 PZ2 probes, for rainwater level control

Functioning

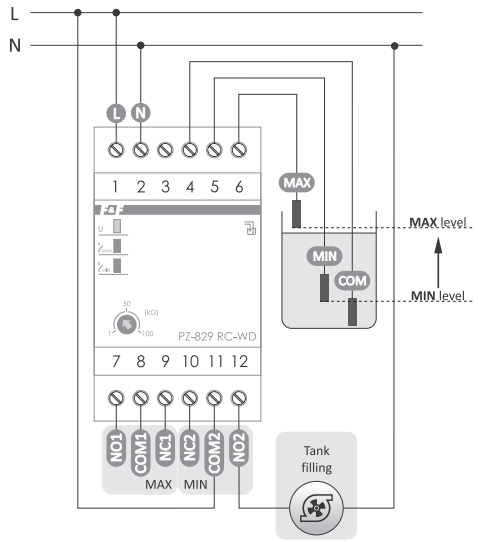
The PZ-829-RC-WD is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value.
The relay can operate in two modes:

- filling the tank (diagram 1). 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.
- emptying the tank (diagram 2). 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.

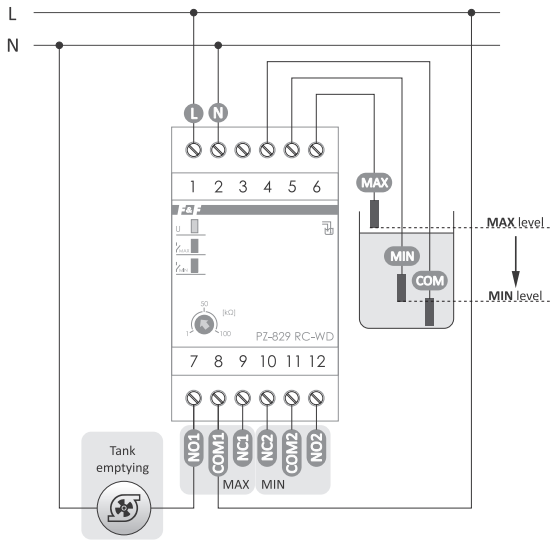
PZ-829-RC-WD additionally enables adjustment of the sensitivity level of the relay, thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table below.



power supply	
PZ-828-RC-WD	230 V AC
PZ-828-RC-WD-24	24 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO/NC
sensitivity (adjustable)	1÷820 kΩ
contacts switching delay	
for MIN point	1÷2 s
for MAX point	<5 s
output voltage measurement	<6 V
activation 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÷250 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

Functioning

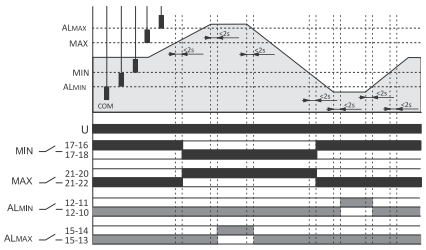
The PZ-832-RC is a liquid level control relay designed to work in systems where it is required to maintain the liquid (carrying current) level between a set minimum and maximum value. The relay can operate in two modes:

- 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.

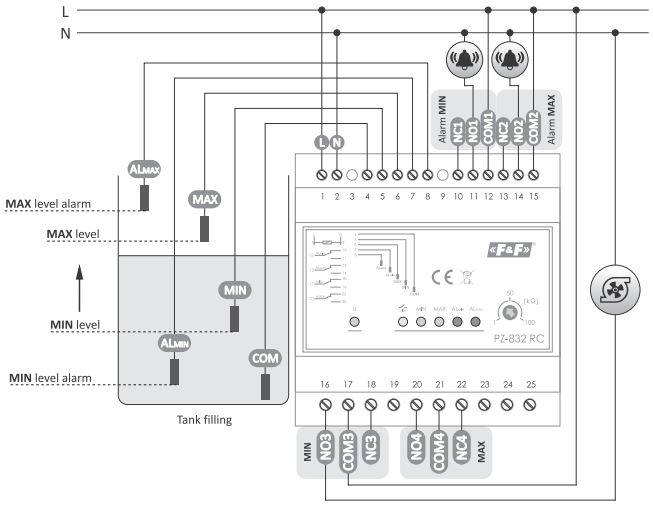
The PZ-832-RC relay is additionally equipped with 2 alarm low and alarm high-level probes. This doubles the protection for minimum and maximum levels and protects the installation from dry-running or overfilling.

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.

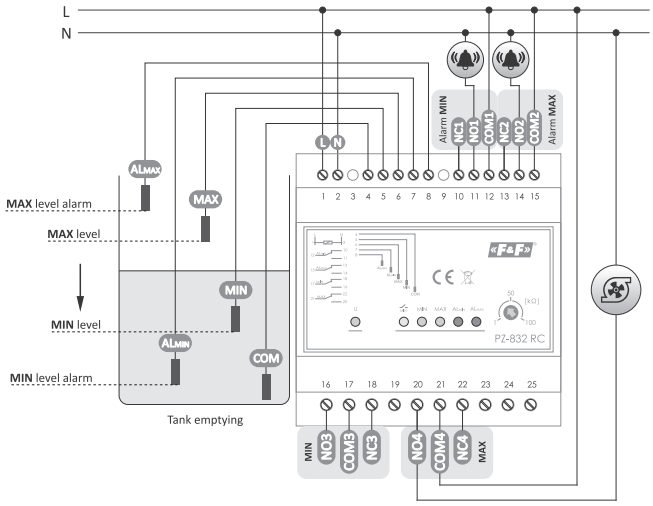
Examples of liquid resistances are shown in the table below; for rainwater detection, the WD version of the relay is recommended.



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

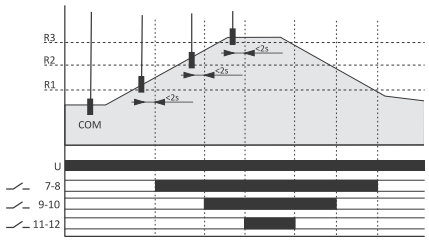
Type of liquid	Specific resistance
Drinking water	5÷10 kΩ
Well water	2÷5 kΩ
River water	2÷15 kΩ
Rainwater	15÷250 kΩ
Sewage water	0.5÷2 kΩ
Sea water	0.03 kΩ
Natural hardness water	5 kΩ
Chlorinated water	5 kΩ
Distilled water	no detection

Tri-state

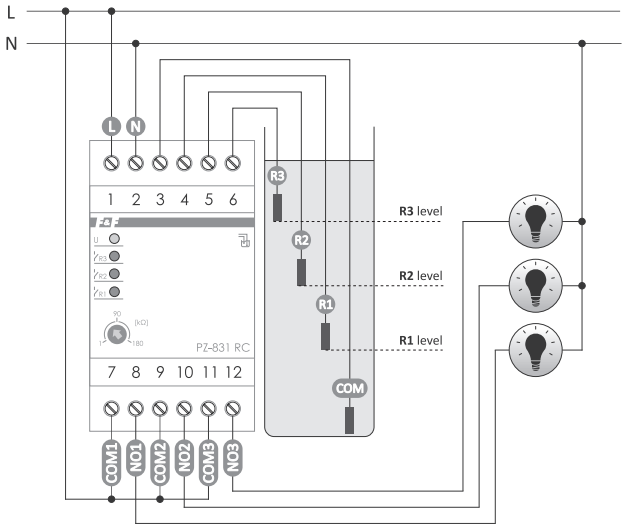
PZ-831 RC + 4 PZ2 probes

Functioning

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; for rainwater detection, the WD version of the relay is recommended.



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

PZP-830 submersible pump control relay

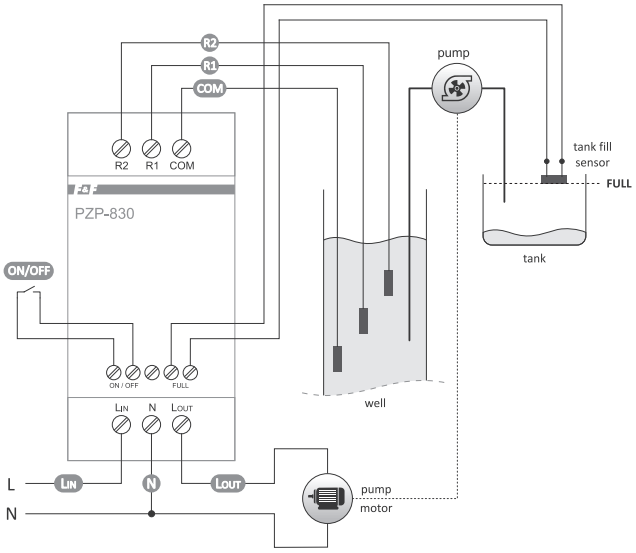
Functioning

The controller is designed to work with 2 (or 3) probes submerged in a well and a sensor (e.g., a float) with a contact output signalling the overflow of the filled tank.

Functions

- Water level control in the well;
- Protection against overflow of the filled tank;
- Power supply voltage correctness control;
- Detection of high motor operating current (overload);
- Detection of low motor operating current (dry-running);
- Motor startup control.

power supply	150÷270 V AC
maximum load current	
resistive load (AC-1)	30 A / 250 V AC
motor inductive load (AC-3)	10 A / 250 V AC
contact	1×NO
current measuring range	1÷30 A
sensitivity	50 kΩ
LED indication	water level, pump operation, device status
display	2× 3-digit LED (voltage and current indication, configuration)
power consumption	6 VA
working temperature	-20÷55°C
terminal	
power supply and motor	10 mm² screw terminals
control inputs	2.5 mm² screw terminals
dimensions	60×115×94 mm)
mounting	for TH-35 rail/panel-mounted
external probe	
float	PZP
submersible	PZ2



The probes are not included in the set with the PZP-830 relay. The selected probe/probes should be ordered separately.

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÷250 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

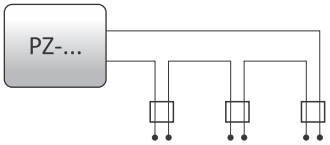
flood probe	electrode
probe dimensions	30×25×5 mm
wire length	1.5 m
length of the electrodes	30 mm
spacing of the electrodes	5 mm
voltage sensor	6 V
probe current	<0.13 mA
extension cord length	<100 m

Connection of the probe

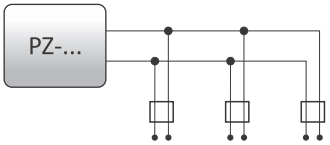
The design of the probe allows it to be mounted on a flat horizontal ground such as on the floor in a room with hydro-valves, flow pipes or in the laundry room, which allows quick detection of a failure and flooding of the room with liquid, with simultaneous switching off of electrical circuits or activation 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

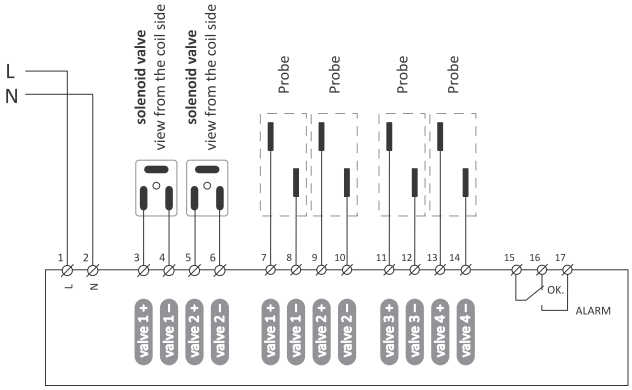
PZ2 probe for PZ-829, PZ-829-RC, PZ-831-RC, PZ-832-RC

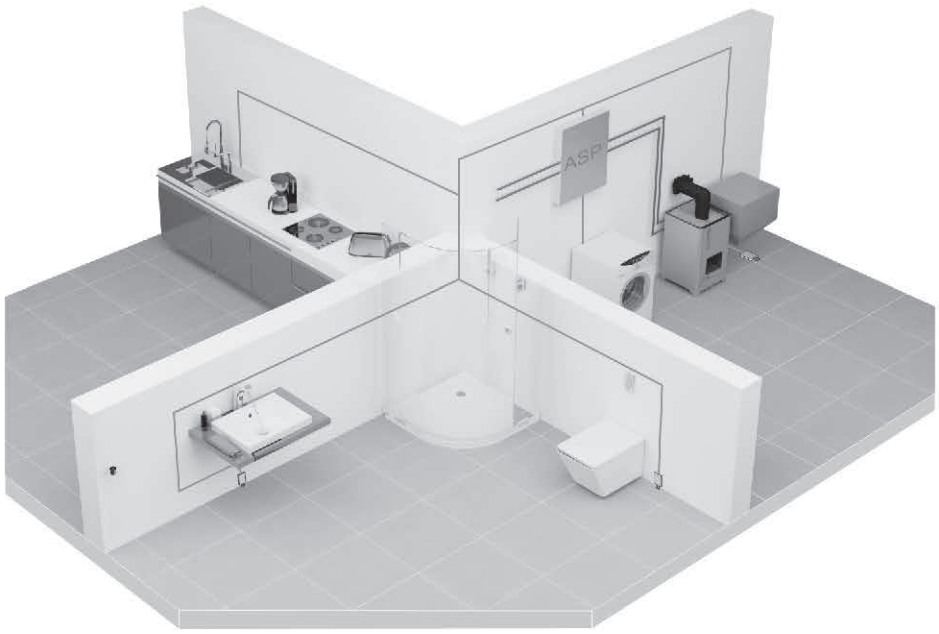
maximum liquid temperature	85°C
flood sensor	stainless steel electrode +plastic casing for the electrode +PG9 gland
probe dimensions	ø15, L= 9.5 cm
probe voltage	<6 V
probe current	<0.13 mA
connecting cable	for example, DY 1 mm²
length of the connecting cable	<100 m

Automatic Anti-flood System (ASP)

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
(surface mounting)

SON-M
Flood probe
(flush-mounted)

Chapter 41

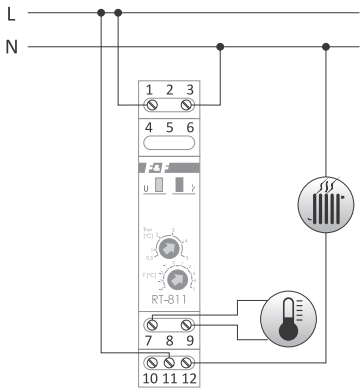
Temperature controllers

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 current (AC-1)	Contact configuration	Contact separation	Range of adjustment of temperature	Hysteresis	Type of probe	Probe included	Page
CRT-04	for DIN rail	with the weekly programmer	display, keyboard	•	relay	16 A	1×NO/NC	•	0÷60°C	0÷10°C	DS1820	•	288
CRT-05	for DIN rail	2-function (heating, cooling)	display, keyboard	–	relay	16 A	1×NO/NC	•	-100÷400°C	0÷10°C	PT100	–	289
CRT-06	for DIN rail	2-channel, 10-function	display, keyboard	–	relay	16 A	2×NO	•	-100÷400°C	0÷10°C	PT100	–	289
CRT-15T	panel-mounted	PID control	display, keyboard	–	relay	3 A	1×NO/NC	•	0÷400°C	–	PT100	•	291
RT-811	for DIN rail	anti-icing systems	potentiometers		relay	16 A	1×NO/NC	•	-4÷5°C	0.5÷5°C	KTY81-210	•	285
RT-820	for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	4÷30°C	0.5÷3°C	KTY81-210	•	286
RT-821	for DIN rail	anti-icing systems	potentiometers	–	relay	16 A	1×NO/NC	•	-4÷5°C	0.5÷3°C	KTY81-210	•	286
RT-822	for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	30÷60°C	0.5÷3°C	KTY81-210	•	286
RT-823	for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	60÷95°C	0.5÷3°C	KTY81-210	•	286
RT-824	wall-mounted	mechanical	potentiometer	–	relay	16 A	1×NO	–	5÷35°C	3°C	NTC	•	287
RT-825	wall-mounted	with the weekly programmer and display	display, keyboard	•	relay	16 A	1×NO	–	5÷60°C	1°C	NTC	•	287
RT-826	for DIN rail	general	display, keyboard	–	relay	16 A	1×NO	•	-25÷130°C	1÷30°C	KTY81-210	–	286
RT-827	for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	0÷99°C	0.5÷5°C	KTY81-210	–	285
RT-833	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	–	291
CR-810	for DIN rail	protection of electrical equipment (e.g. motors), cooperation with PTC thermistors	not	–	relay	16 A	1×NO/NC	•	not applicable	not applicable	PTC	–	292

RT-811 + RT probe, temperature range -4÷5°C, anti-freeze



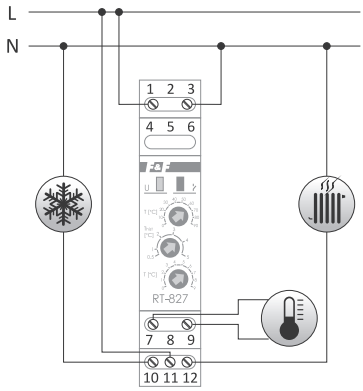
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO/NC
temperature adjustment range	-4÷5°C
hysteresis (adjustable)	0.5÷5°C
setting accuracy	1°C
measurement accuracy	±1°C
power indication	green LED
work status indication	red LED
power consumption	1.1 W
working temperature	-25÷50°C
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Controller functions

- Control of devices in anti-icing systems, which prevent gutters, stairs, driveways, etc. from freezing.
- Cooperation with RT probe.

The parameters of the dedicated RT probe can be found in the table on page 288. The probe is included.

RT-827 temperature range 0÷99°C (no probe included)



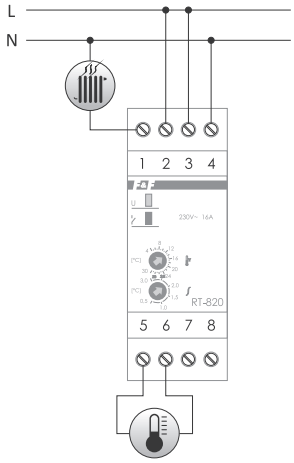
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO/NC
temperature adjustment range	0÷99°C
hysteresis (adjustable)	0.5÷5°C
setting accuracy	1°C
measurement accuracy	±1°C
power indication	green LED
work status indication	red LED
power consumption	1.1 W
working temperature	-25÷50°C
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20

Controller functions

- Control of heating and ventilation equipment.
- Assists in maintaining a specific, constant ambient temperature.
- Compatible with RT or RT2 probes.

The parameters of the dedicated RT or RT2 probe can be found in the table on page 288. The probe is not included.

RT-820 + RT probe, temperature range 4÷30°C
RT-821 + RT probe, temperature range -4÷5°C, **for heating anti-icing systems**
RT-822 + RT probe, temperature range 30÷60°C
RT-823 + RT2 probe, temperature range 60÷95°C



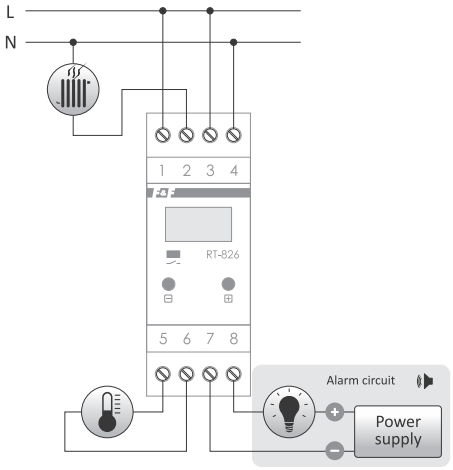
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
temperature adjustment range	
RT-820	4÷30°C
RT-821	-4÷5°C
RT-822	30÷60°C
RT-823	60÷95°C
hysteresis (adjustable)	0.5÷3°C
setting accuracy	1°C
measurement accuracy	±1°C
temperature sensor type	RT/RT2
power indication	green 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

Controller functions

- Control of heating and ventilation equipment.
- Assists in maintaining a specific, constant ambient temperature.
- Compatible with RT or RT2 probes.

The parameters of the dedicated RT or RT2 probe can be found in the table on page 288. The probe is included.

RT-826 digital, temperature range -25÷130°C (no probe included)



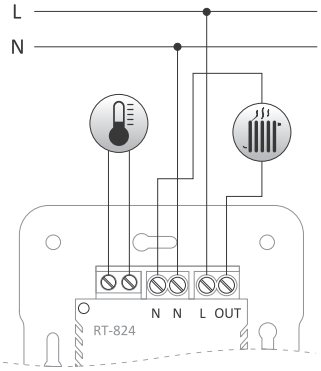
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO
temperature adjustment range	-25÷130°C
hysteresis (adjustable)	1÷30°C
setting accuracy	1°C
measurement accuracy	±1°C
alarm indication	
audible	
volume	80 dB
frequency	2.4 kHz
control output	
type	open collector
maximum voltage	24 V
maximum 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 mode: 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 288. The probe is not included.

RT-824 + RT45 probe, temperature range 5÷35°C



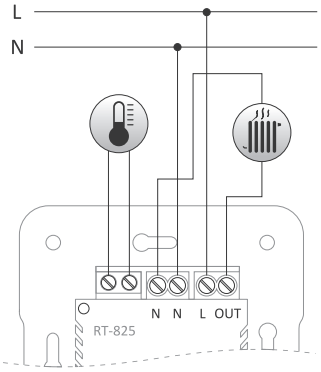
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO
temperature adjustment range	5÷35°C
hysteresis	3°C
setting accuracy	1°C
measurement accuracy	±1°C
internal temperature sensor	NTC
power consumption	0.8 W
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	
front	83.5×83.5 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 288. The probe is included.

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

Functions regulatora

- 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 288. The probe is included.

Digital, programmable

Purpose

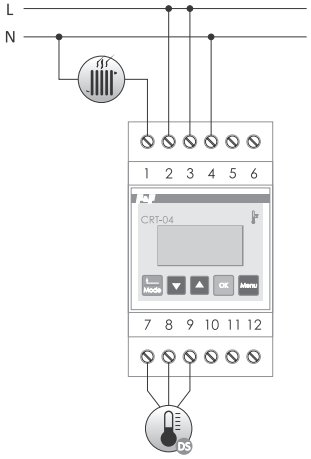
CRTs are programmable, multifunctional electronic controllers, designed for control of heating or cooling devices, in order to maintain constant room temperature, control the ambient temperature and the temperature of substances in industrial conditions with the ability to control technological processes.

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

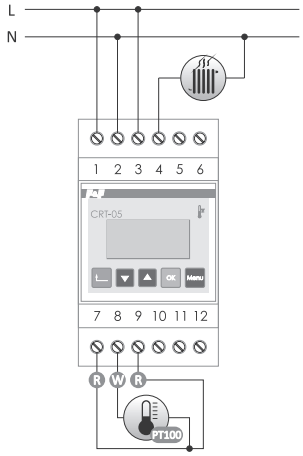
- A control panel that allows you to program and monitor the operation of the device;
- **Heating** and **Cooling** modes of operation – maintaining the set temperature according to the programmed hours and days of the week;
- **Continuous** mode of operation – maintaining one preset temperature, executed 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)



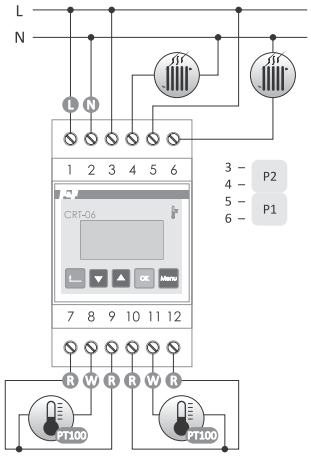
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
temperature adjustment range	-100÷400°C
hysteresis (adjustable)	0÷10°C
setting accuracy	1°C
indication correction	±20°C
temperature sensor type	RT56 (PT100)
power consumption	1.5 W
working temperature	-20÷40°C
terminal	2.5 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 288. The probe is not included.

CRT-06 10-function, temperature range -100÷400°C (probe not included)



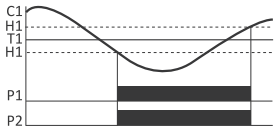
power supply	230 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO
temperature adjustment range	-100÷400°C
hysteresis (adjustable)	0÷100°C
setting accuracy	1°C
indication correction	±20°C
switch-on time lighting (adjustable)	0÷45 min.
sampling rate (adjustable)	1÷120 samples /1 min.
temperature 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.

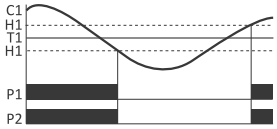
The parameters of the dedicated RT56 probe can be found in the table on page 288. The probe is not included.

①



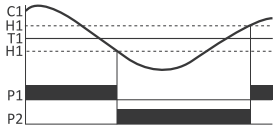
Heating mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

②



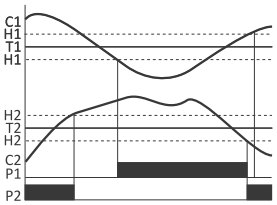
Cooling mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

③



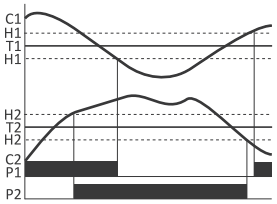
Heating/Cooling mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– alternating contact operation: P1 – cooling; P2 – heating;
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)

④



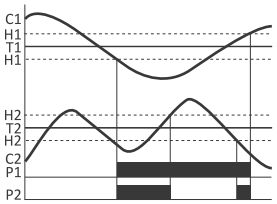
Heating mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – heating; P2 – heating;
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

⑤



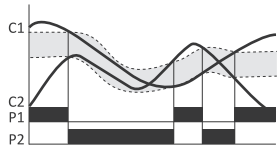
Cooling mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – cooling; P2 – cooling
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

⑥



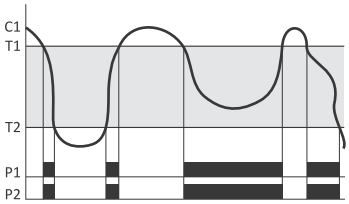
Heating mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor;
P2 contact dependent on the C2 and C1 sensor (switched on only if the P1 contact is closed).
– 2 sensors: C1 and C2
– dependent contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2

⑦



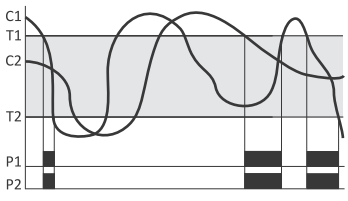
Differential mode.
P1 contact is switched on at a temperature difference greater than the setting.
P2 contact switches on in the opposite situation to the P1 contact - at a difference less than the setting.
– 2 sensors: C1 and C2
– alternating contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting

⑧



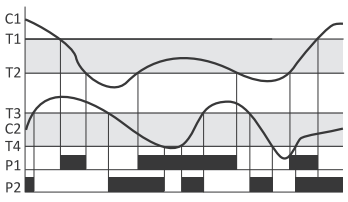
Window mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 1 sensor: C1
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no hysteresis setting: H1 and H2

⑨



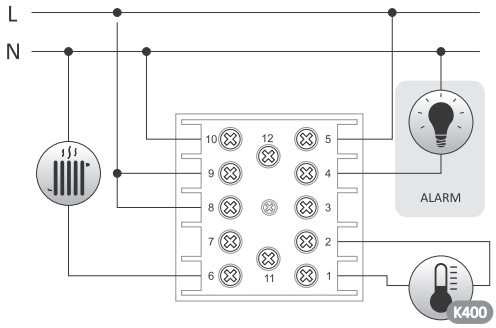
Window mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 2 sensors: C1 and C2
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting

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

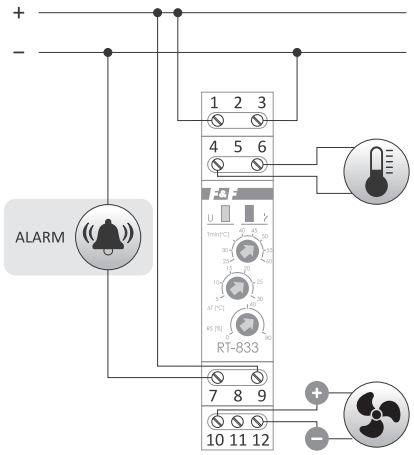
- A control panel that allows you to program and monitor the operation of the device;
- PID controller (proportional-integral-differentiating) + automatic tuning of the PID regulator;
- Adjustable alarm temperature threshold;
- Display of the set and current temperature;
- Output 1×NO/NC contact;
- Additional ALARM output contact 1×NO.

The parameters of the dedicated K400 probe can be found in the table on page 288. 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 288. The probe is not included.

Resistance relay

CR-810 DUO for use with PTC thermistor temperature sensors (probe not included)

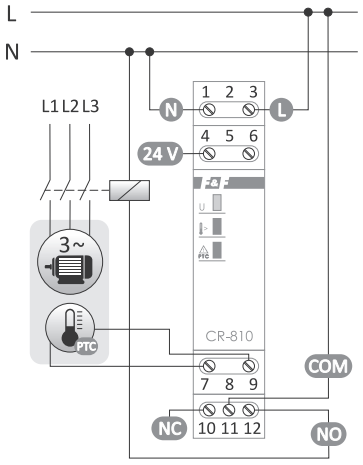
Purpose

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.

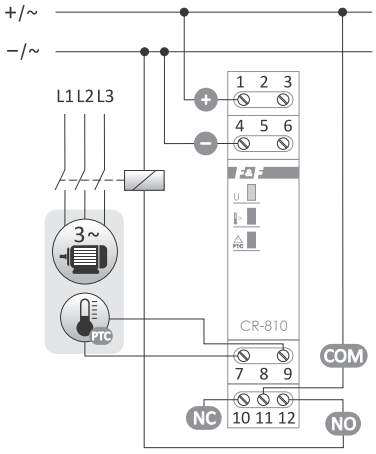
Functioning

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

Chapter 41

Dedicated probes for temperature controllers

K400 probe
for CRT-15T

measurement range	0÷400°C
temperature sensor	K400
sensor dimensions	M6 thread; H= 15 mm
sensor insulation	steel
wire length	OMY 2×0.34 mm², L= 1 m, (in metal braid)
working temperature	0÷400°C

RT probe
for RT-820/821/822/826/833

measurement range	-50÷130°C
temperature sensor	KTY81-210
sensor dimensions	ø5; H= 20 mm
sensor insulation	shrink sleeve
wire length	OMY 2×0.34 mm², L= 2.5 m
working temperature	-50÷65°C

RT2 probe
for RT-823, RT-826

measurement range	-50÷130°C
temperature sensor	KTY81-210
sensor dimensions	ø8; H= 40 mm
sensor insulation	metal sleeve
wire length	SIHF heat resistant 2×0.5 mm², L= 2.5 m
working temperature	-50÷130°C

RT4 probe
for CRT-04

measurement range	-55÷125°C
temperature sensor	DS18B20
sensor dimensions	ø5; H= 30 mm
sensor insulation	shrink sleeve
wire length	UYY 3×0.34 mm², L= 2.5 m
working temperature	-30÷65°C

RT45 probe
for RT-824, RT-825

measurement range	5÷60°C
temperature sensor	NTC
sensor dimensions	ø7; H= 25 mm
sensor insulation	PC sleeve
wire length	PC 2×0.34 mm², L= 3 m
working temperature	-50÷65°C

RT56 probe
for CRT-05, CRT-06

measurement range	-100÷400°C
temperature sensor	PT100
sensor dimensions	ø4; H= 85 mm
sensor insulation	tuleja metalowa
wire length	PC 3×0.34 mm², L= 1.5 m (in metal braid)
working temperature	-100÷400°C

SDS1 probe
for AT-1I-DS, AT-1U-DS, MB-DS-2/10/30

measurement range	-55÷125°C
temperature sensor	DS18B20
sensor dimensions	ø5; H= 30 mm
sensor insulation	shrink sleeve
cable length (with plug)	LiYY 3×0.14 mm², L= 22 cm
working temperature	-30÷65°C

SDS2 probe
for AT-1I-DS, AT-1U-DS, MB-DS-2/10/30

measurement range	-55÷125°C
temperature sensor	DS18B20
sensor dimensions	ø12 (osłona plastikowa); H= 53 mm
sensor insulation	tuleja metalowa
cable length (with plug)	UYY 3×0.13 mm², L= 20 cm
working temperature	-25÷85°C

Control timers Astronomical and programmable

Astronomical timers are advanced devices that turn lighting and other electrical systems on and off, adjusting to the rhythm of sunrises and sunsets.

An ideal solution for lighting streets and parks, as well as private homes.

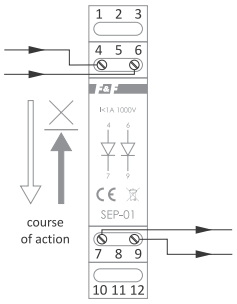
Section XII
Measuring transducers and signal converters

Control signal separators and electrical signal converters

Purpose

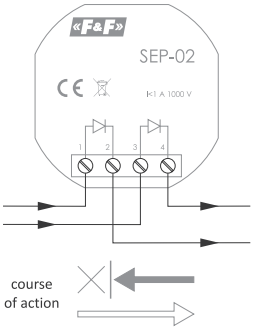
Control signal separators are used for separation in automation systems with separate control subgroups and central control.
The control signal is passed in one direction. In the opposite direction, the signal is blocked.

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

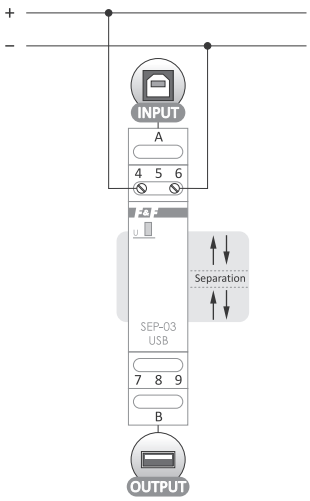


maximum voltage	250 V
maximum load current (AC-1)	1 A
working temperature	-25÷40°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	ø55, H= 13 mm
mounting	in flush-mounted ø60
ingress protection	IP20

SEP-03 USB USB line amplifier/separator

Purpose

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.

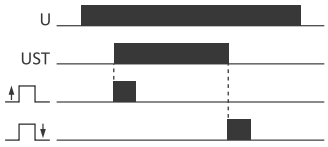


power supply	
via a USB port (input)	5 V DC
external Uopt	12÷30 V DC
maximum load current (output)	
for USB power supply	0.4 A
for Uopt power supply	1 A
USB standard	1.1/2.0
speed	Low speed 1.5 Mbps/Full speed 12 Mbps
separation	
input <-> output	galvanic 5 kV
U_{USB} <-> output	resistance
U_{USB} <-> 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

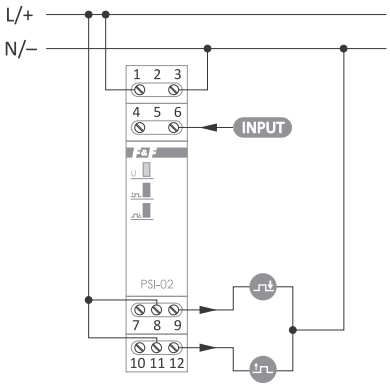
"Continuous/pulse" – type signal transducers

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).

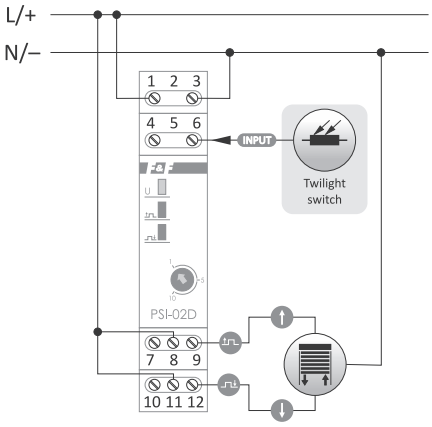


PSI-02 for DIN rail



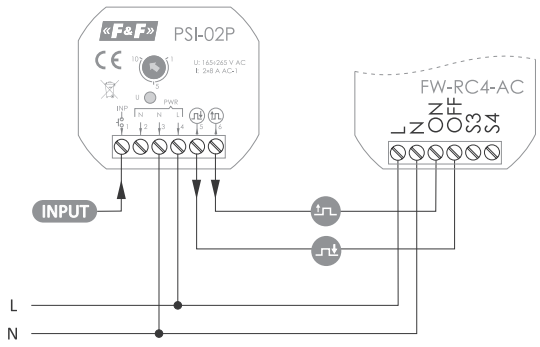
power supply	
PSI-02 230 V	165÷265 V AC
PSI-02 24 V	21÷27 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO/NC
input signal	
PSI-02 230 V	230 V AC
PSI-02 24 V	24 V AC/DC
output pulses time	1 s
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	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/NC
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

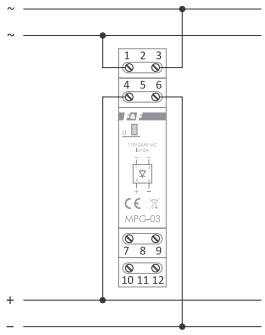


power supply	165÷265 V AC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO/NC
input signal	165÷265 V AC
output pulse time (adjustable)	1÷10 s
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	48×43×20 mm
mounting	in flush-mounted ø60
ingress protection	IP20

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.

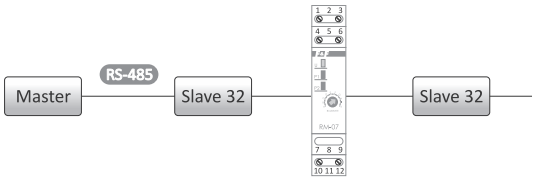
RS-485 network components

RM-07 RS-485 network amplifier/separator

Purpose

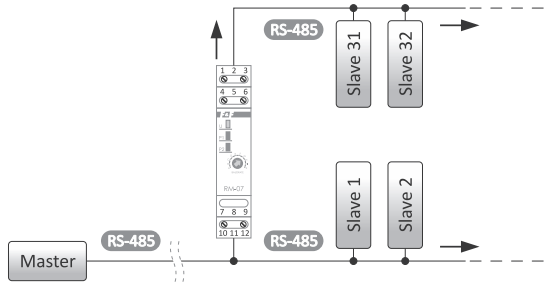
The RM-07 module serves as a signal amplifier for Modbus RTU transmission and as a galvanic separator for RS-485 networks. It amplifies the signal to extend the bus range and connect more devices. It can also be used for branching out lines and protecting them against electromagnetic interference. The 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



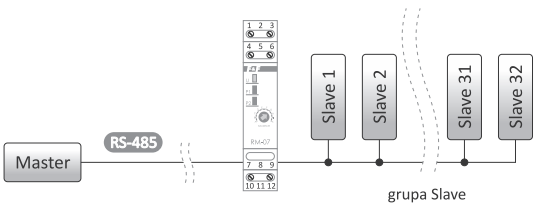
Extension

To extend the bus by another group of 32 receivers.
Extendable up to 4 groups for baud speed of 9600.



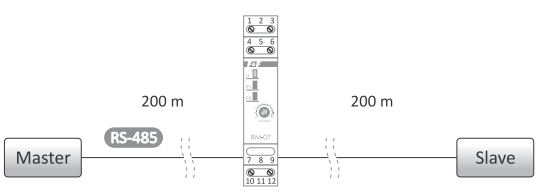
Branch

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.

LT-04 RS-485 network termination and polarization module

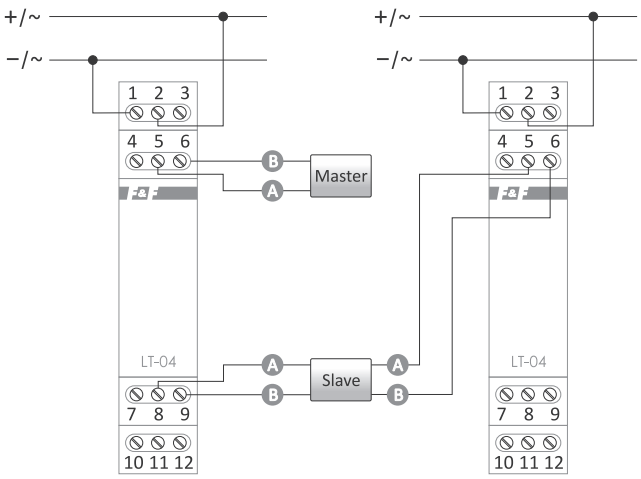
Purpose

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.

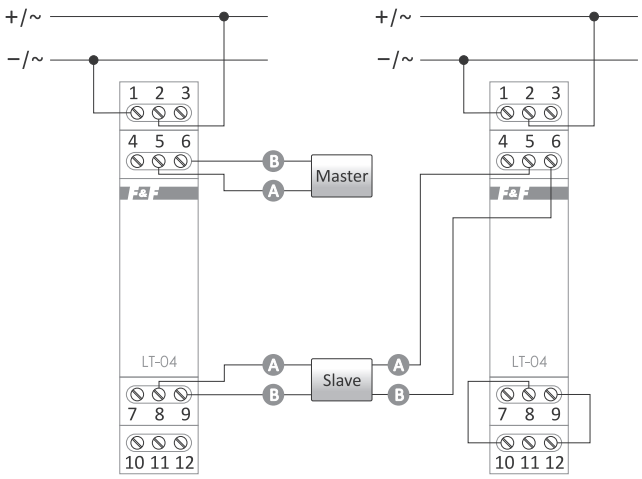
Functioning

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.

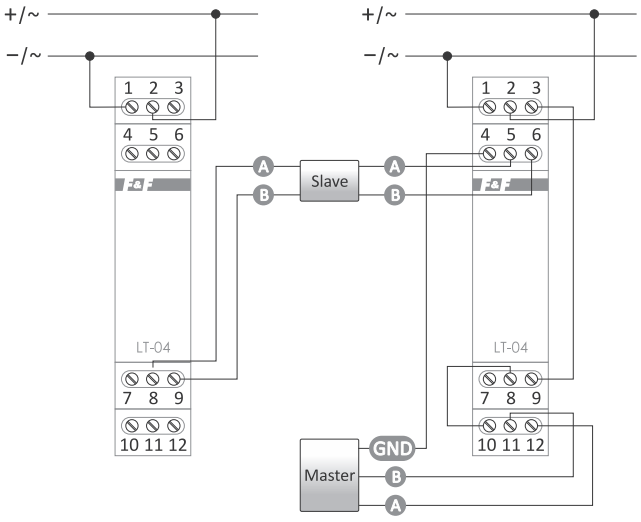
power supply	15÷30 V DC
system current	<10 mA
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
mounting	for TH-35 rail
ingress protection	IP20



Network termination system



Network polarization system with termination



Network polarization system (with termination)
for Slave-type devices without GND

Signal converters

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

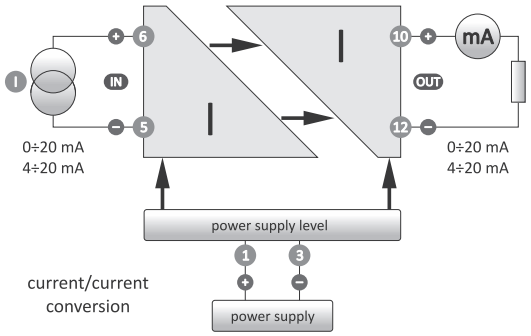
Functions

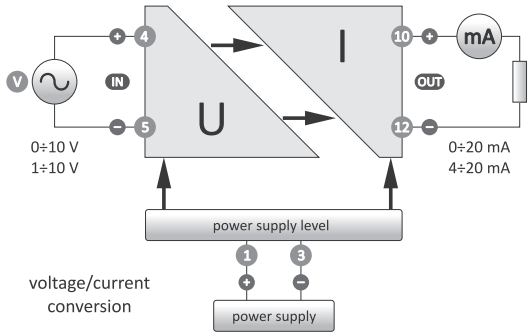
- Analog input signal to analog output signal convertion (mA→V, V→mA, mA→mA, V→V);
- High processing speed – the ability to carry signals up to 100 Hz;
- Galvanic separation (min. 1 kV) between analog input, output and power supply;
- Visual validation of input and output signals.

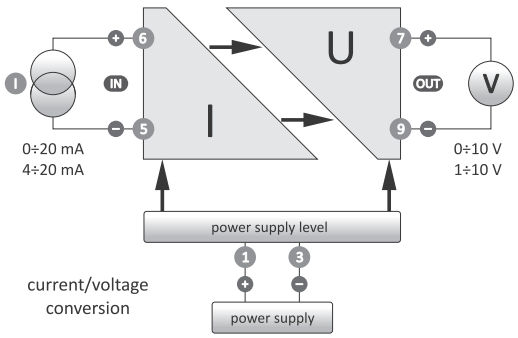
Application

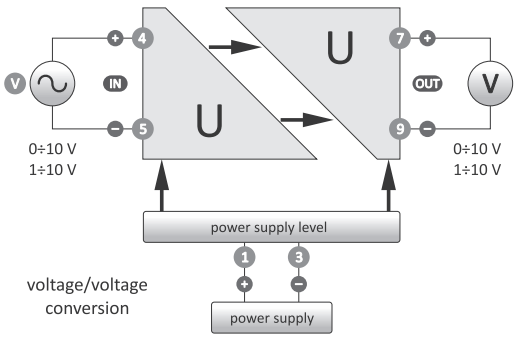
- Protection of expensive automation elements (PLCs, inverters, regulators, etc.) from overvoltages that may appear on the signal wires.
- Adjustment of analog signal levels to the capabilities of controllers or regulators, for example, it is possible to connect a sensor with current output to a PLC 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





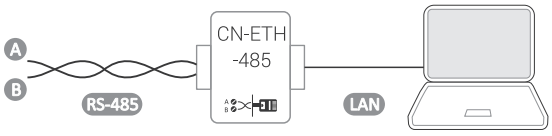




CN-ETH-485 RS-485 -> TCP/IP converter

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.



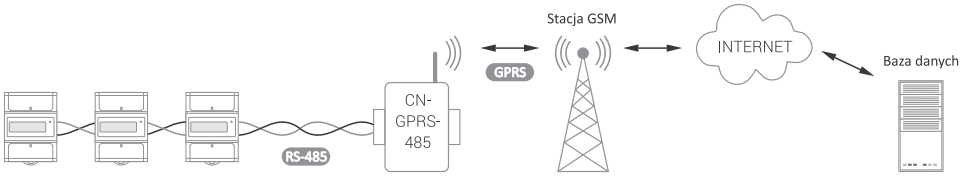
power supply	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	86×100×26 mm
mounting	surface

CN-GPRS-485 RS-485 <-> GSM network/GPRS 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.

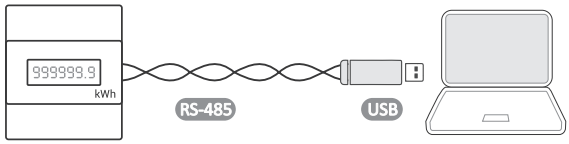
power supply	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	83×86×24 mm
mounting	surface



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

CN-LEM-3 data format converter

the converter allows many different types of counters to operate on one bus: **LE-01M, LE-01MR, LE-01MW, LE-03M, LE-03M-CT, LE-03MP, LE-03MW, LE-03MW-CT.**

More information on p. 265

CN-RTC-4 RTC clock synchroniser

The synchroniser operates on an RS-485 serial bus with supported counters: **LE-01MW, LE-03MW, LE-03MW-CT.**

More information on p. 265

EW-11A RS-485 <-> TCP/UDP/Telnet/ModbusTCP converter

The EW-11A converter is used for 2-way transparent data transmission from the RS-485 serial port to the LAN.

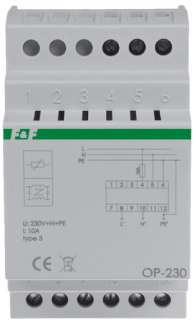
More information on p. 264

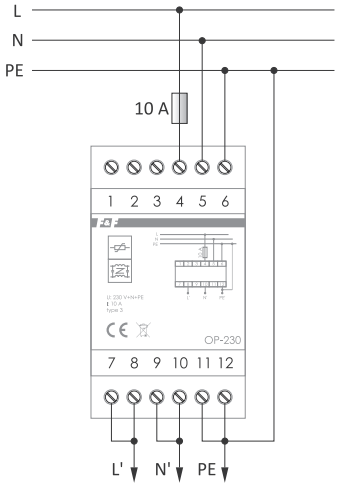
Power supply for automation systems

OP-230 anti-interference filter with surge protection system

Purpose

It is used to protect electronic devices such as computers, PLCs, microprocessor systems, etc. against radio interference and overvoltage from the electrical system.



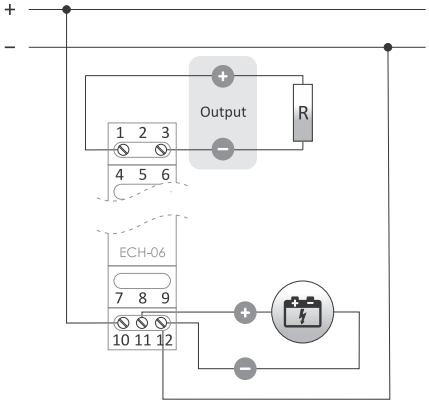


norm No.	IEC 61643-1:2001
surge arrester class	III
rated voltage	230 V AC
rated current	10 A
highest permanent operating voltage	255 V
voltage protection level L→N (measured)	<1 kV
tripping time	<25 ns
additional protection	10 A gL/gG or C10 A
system inductance	1 mH/track
leakage current	0.5 mA
system 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

ECH-06 DC power reserve module, with battery charging function (1.3÷7.2 Ah)

Purpose

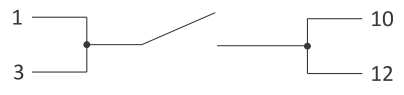
The ECH-06 module along with an external gel battery with a nominal voltage of 12 V constitutes a backup power supply system for receivers with a supply voltage of 9÷30 V DC.



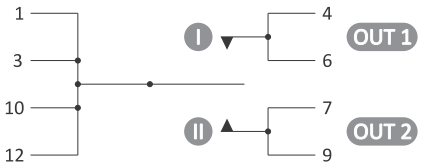
power supply Uin	18÷30 V DC
output voltage Uout	Uin -0.5 V DC Uacu -0.5 V DC
maximum load current output Uout (AC-1)	3 A
supported battery capacity	1.3÷7.2 Ah
maximum voltage battery Uacu	13.8 V DC
the maximum charging current	<0.35 A
power supply cut-off threshold	<10.5 V DC
power consumption	<1 W
working 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

WB-1G / WB-1Y / WB-1R 2-position switch with indicator light

WB-2 3-position switch



WB-1



WB-2

Type	Description
WB-1G	green switch
WB-1Y	yellow switch
WB-1R	red switch

maximum load current (AC-1)	
WB-1	16 A/250 V
WB-2	15 A/250 V 20 A/125 V
contact	
WB-1	OFF-ON
WB-2	ON-OFF-ON
contact resistance	max 35 mΩ
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

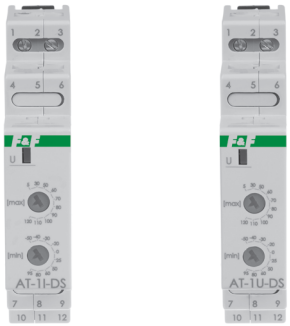
Purpose

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).



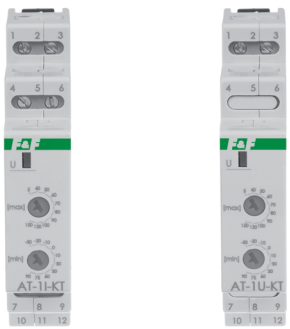
power supply	
AT-1I-DS	9÷30 V DC
AT-1U-DS	12÷30 V DC
measuring range	-50÷120°C
setting range	
minimum temperature	-50÷95°C
maximum temperature	5÷120°C
output signal	
AT-1I-DS	4÷20 mA
AT-1U-DS	0÷10 V
processing error	±0.25°C
signal cable	
AT-1I-DS	<300 m
AT-1U-DS	<20 m
sensor wire	<50 m
temperature probe	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 306.

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 288.

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 306.

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 288.

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 306.

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 288.

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÷130°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 307.

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 288.

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 307.

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 288.

AT-3I for use with PT-100 temperature sensor

Product available until stocks run out

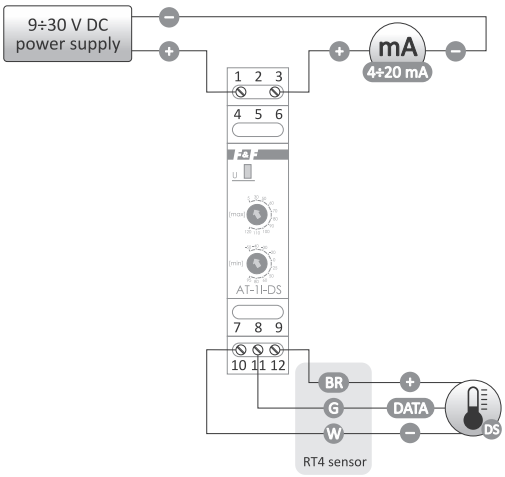
Transducer with 4÷20 mA current output.

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

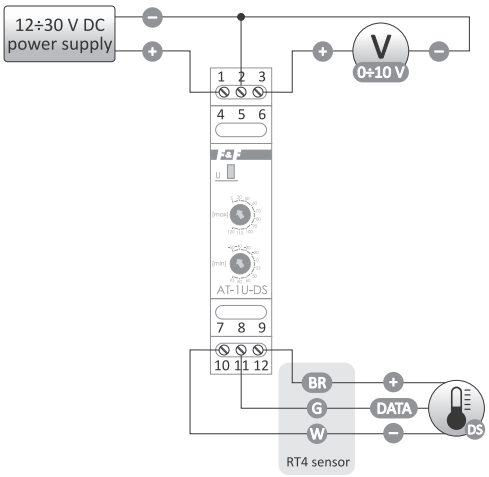
The connection diagram for the AT-3I transducer can be found on page 307.

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 288.

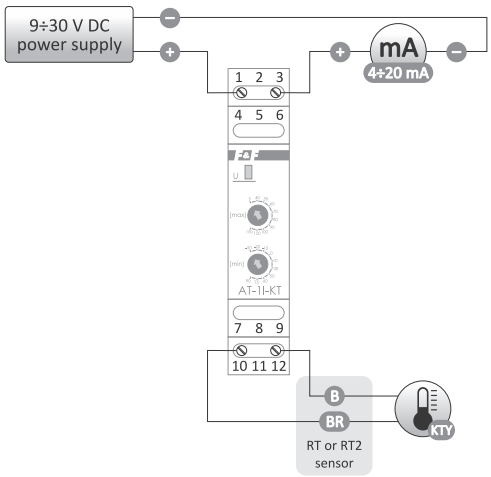
Connection diagrams for temperature sensors



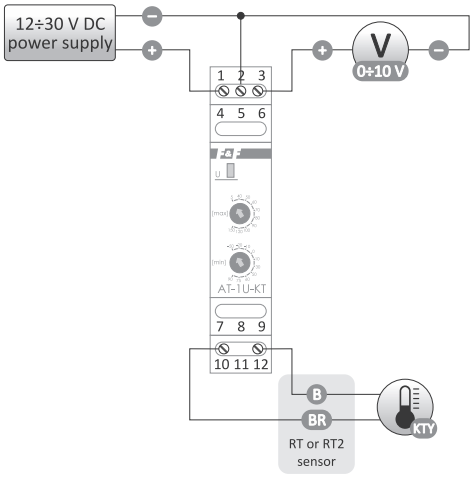
AT-1I-DS



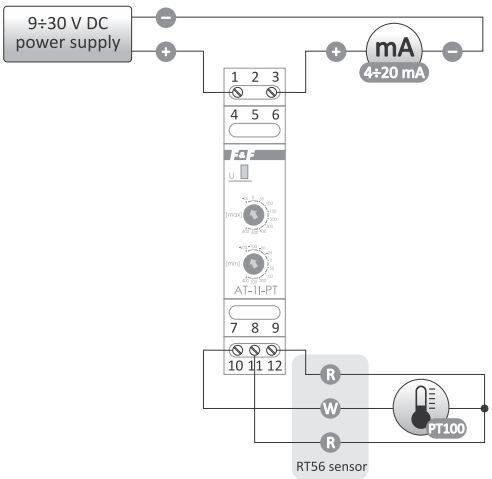
AT-1U-DS



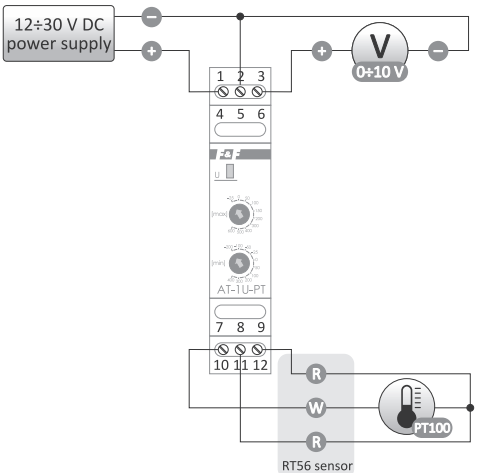
AT-1I-KT



AT-1U-KT

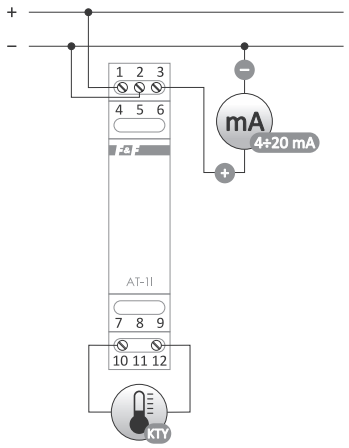


AT-1I-PT

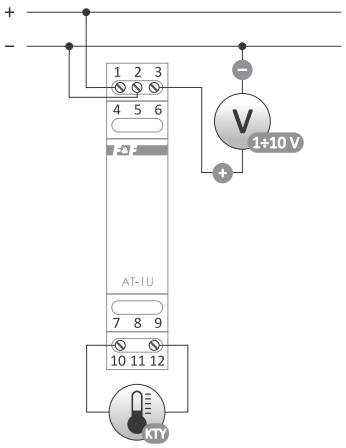


AT-1U-PT

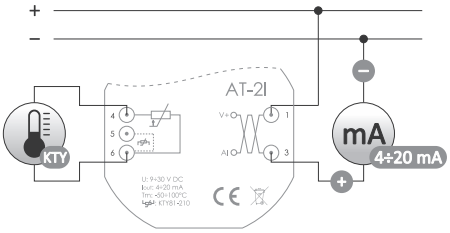
Connection diagrams for temperature sensors cont.



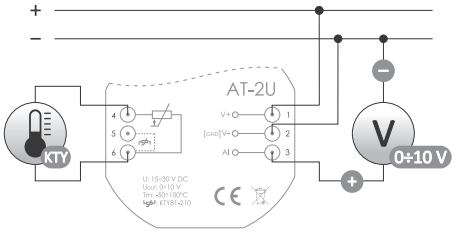
AT-1I



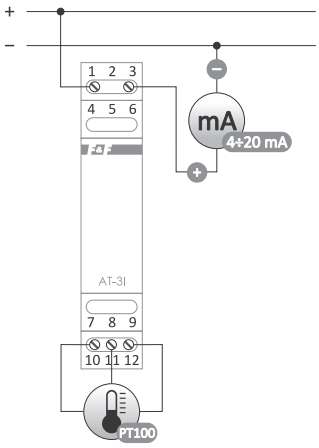
AT-1U



AT-2I



AT-2U



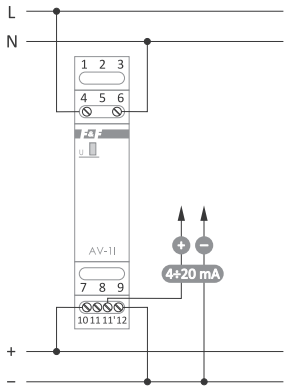
AT-3I

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.



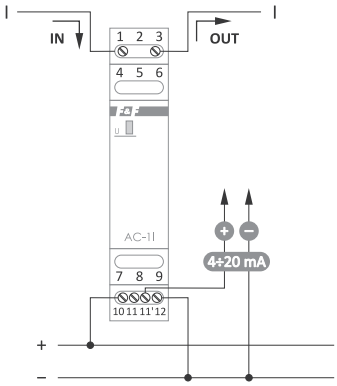
power supply	9÷30 V DC
measuring range (True RMS)	
AC alternating voltage	0÷285 V
DC constant voltage	0÷400 V
maximum voltage at the measuring input	320 V AC
	450 V DC
maximum measurement error	±1 V
output signal	4÷20 mA
maximum length of shielded signal cable	300 m
overvoltage IN->OUT	3 kV
power consumption	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

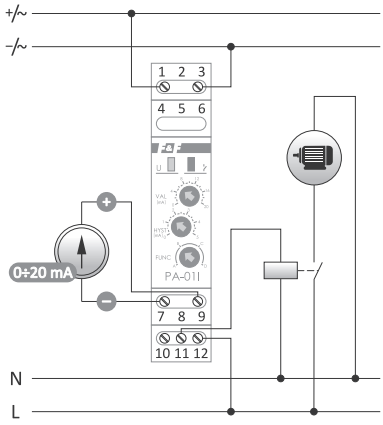
The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or 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.

More information on p. 259

PA-01I analog relay with the current input

Purpose

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.

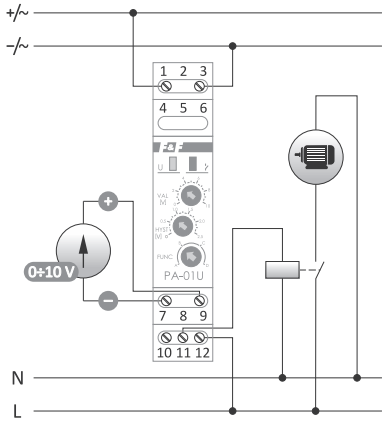


power supply	9÷30 V DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
maximum current consumption	100 mA
range of input signals	0÷ 20 mA
hysteresis setting range	0÷5 mA
input resistance	150 Ω ±0.1 %
measurement resolution	5 µA
measurement error	1%
hysteresis in the "window" mode	200 µA
working 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

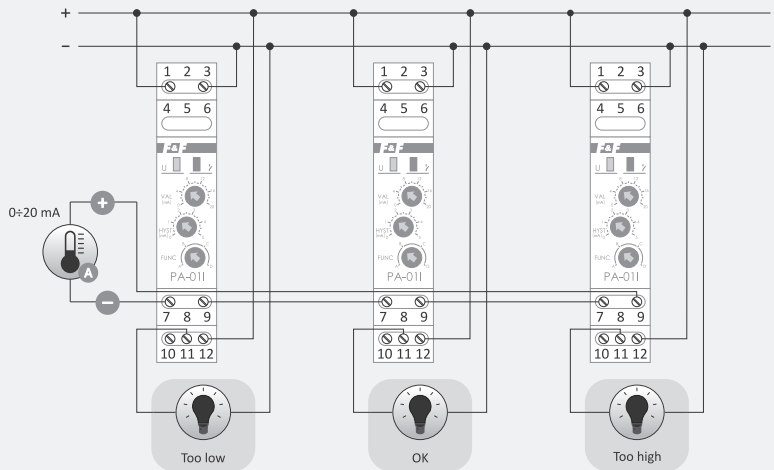
Purpose

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

PA-02-MBT analog panel relay 0÷20 mA/0÷10 V with display

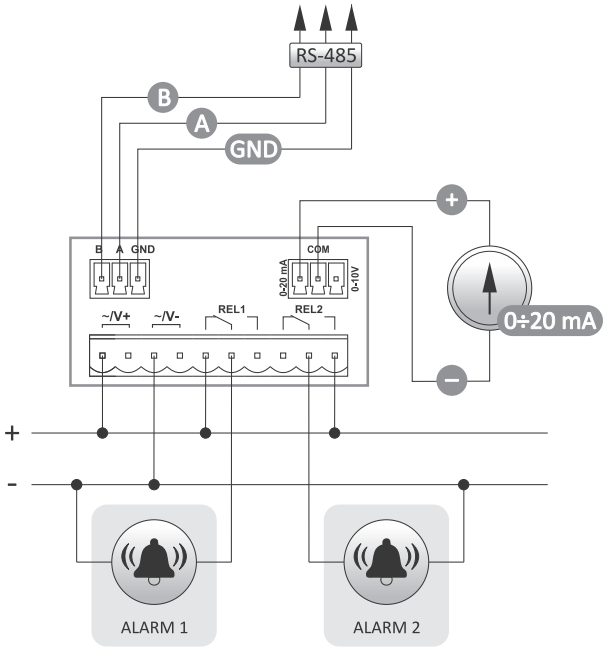
Purpose

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.

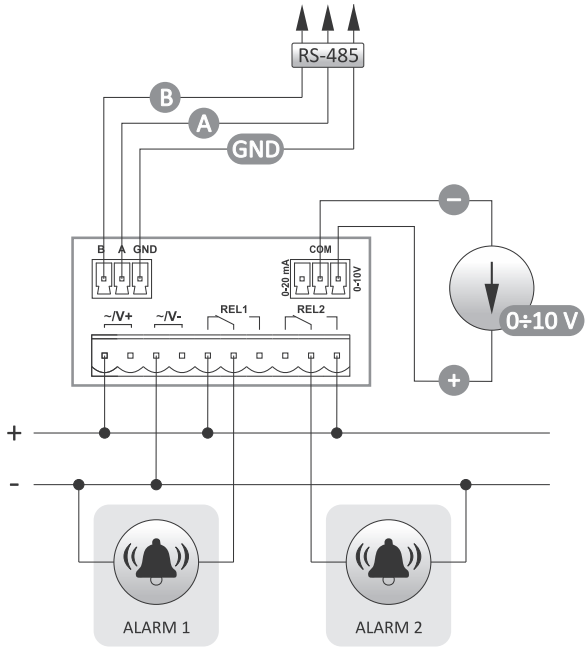
Selected functions

- 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

The connection diagrams for the MB-1I-1 and MB-3I-1 transmitters can be found on page 312.

Voltage transducers

MB-1U-1 1-phase
MB-3U-1 3-phase

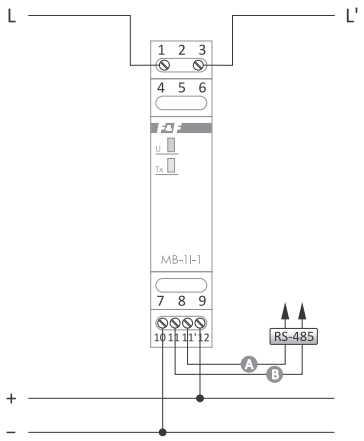
Purpose

The transducer is designed for AC/DC voltage (True RMS) measurement with communication output RS-485 (Modbus RTU).

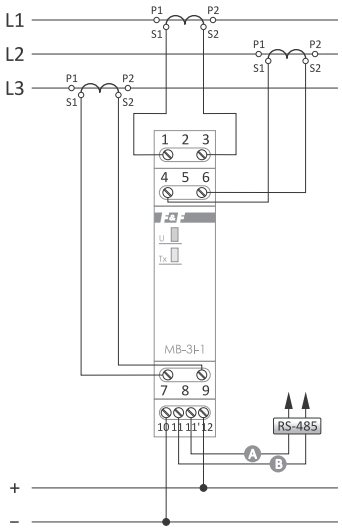
power supply	9÷30 V DC
measuring range (True RMS)	
AC voltage	0÷285 V
DC voltage	0÷400 V
maximum measurement error	±0.5%
reading registry precision	1 V
overvoltage IN->OUT	3 kV
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow 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

The connection diagrams for the MB-1U-1 and MB-3U-1 transmitters can be found on page 312.

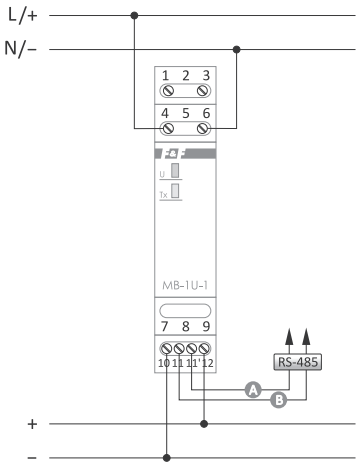
Connection diagrams for measuring transducers



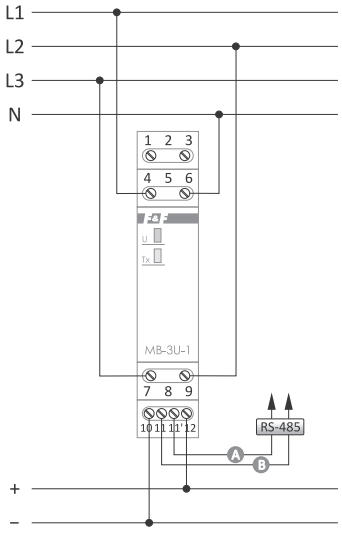
MB-1I-1 5A/MB-1I-1 15A
direct measurement



MB-3i-1 5A/MB-3i-1 15A
half indirect measurement



MB-1U-1

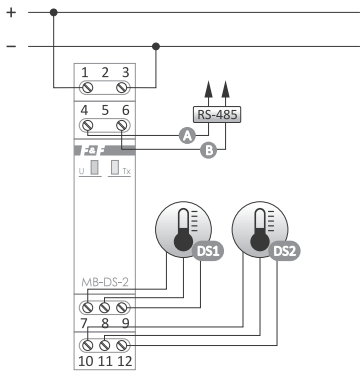


MB-3U-1

MB-DS-2 for use with DS1820 digital temperature sensor

Functioning

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 288.

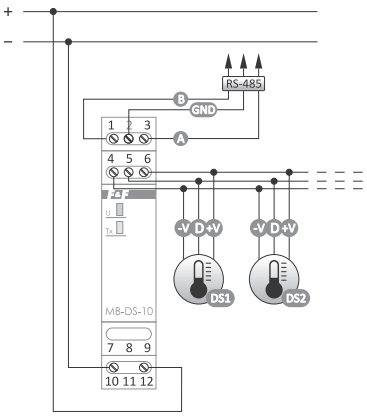


power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820/DS18B20/DS18S20
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow LED
communication parameters	
baud rate (adjustable)	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.)

Functioning

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 288.

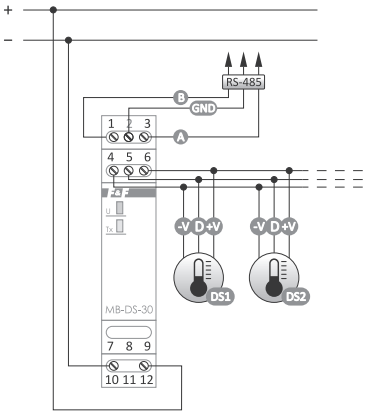


power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820/DS18B20/DS18S20
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow LED
communication parameters	
baud rate (adjustable)	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.)

Functioning

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 288.

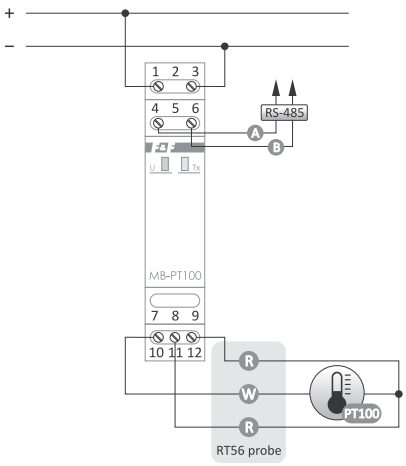


power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820/DS18B20/DS18S20
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow LED
communication parameters	
baud rate (adjustable)	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

Functioning

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 288.

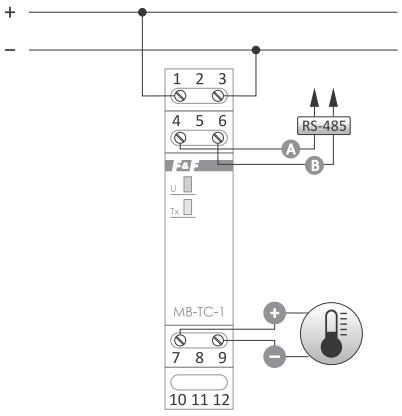


power supply	9÷30 V DC
measuring range	-100÷400°C
maximum measurement error	±1°C
overvoltage IN->OUT	2.1 kV
temperature sensor type	PT100
power indication	green LED
communication indication	yellow LED
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
baud rate (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

MB-TC-1 for use with K, J, E, N, T, S, R, B thermocouples

Functioning

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.

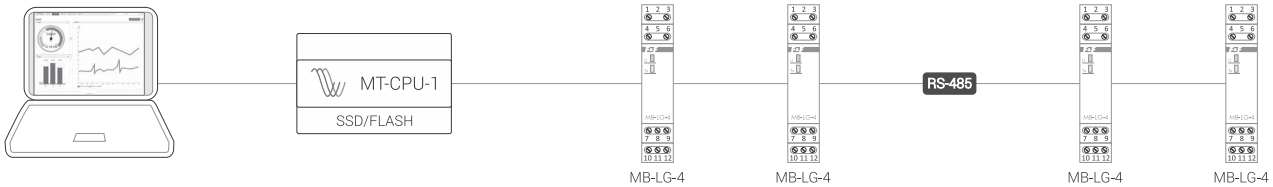


power supply	9÷30 V DC
measurement range	dependent on the type of sensor
maximum measurement error	±2°C
temperature sensor type	K, J, E, N, T, S, R, B
power indication	green LED
communication indication	yellow LED
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
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

MeternetPRO network parameter recording system

Purpose

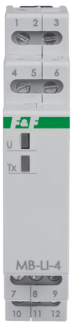
The MeternetPRO application enables remote reading of states and indications of meters, multimeters, measuring transducers, I/O extension modules and other measuring devices communicating according to Modbus RTU and M-Bus protocols. Data exchange between the devices is carried out via RS-485, M-Bus or LAN local networks.

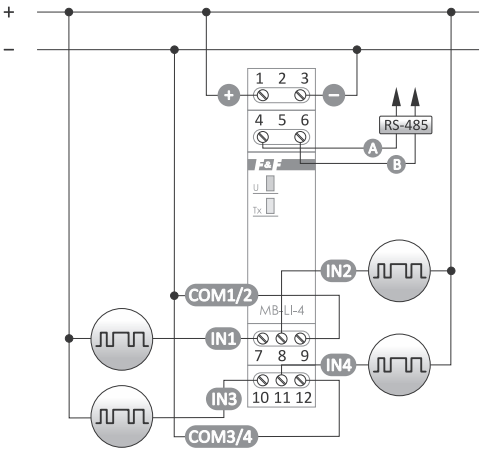


More information on p. 259

Pulse meter (4-channels)

MB-LI-4 Lo low-voltage counting inputs
MB-LI-4 Hi high-voltage counting inputs





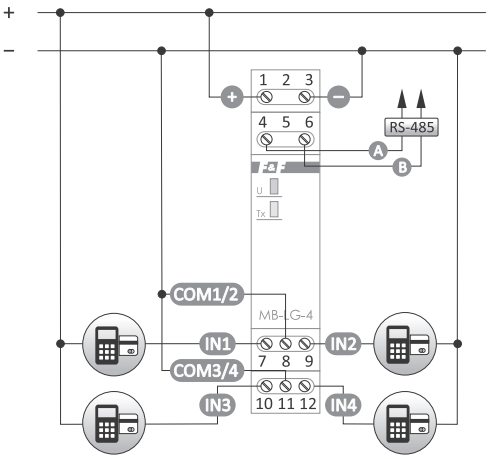
power supply	9÷30 V DC
number of counting inputs	4
counting input voltage	
MB-LI-4 Lo	6÷30 V AC/DC
MB-LI-4 Hi	160÷265 V AC/DC
maximum counting frequency	100 Hz
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow LED
communication 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

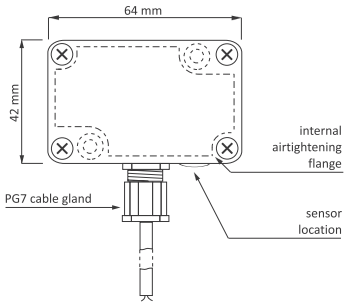
- 4 independent counters;
- Overall results in FLOAT (floating point) values for hours and INT (integer) values broken down into seconds, minutes, hours, days (4 registers per 1 counter);
- Counter input suitable for AC/DC signals;
- Selection of the state trigger option 1: high or low voltage level;
- 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 ø7 (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.



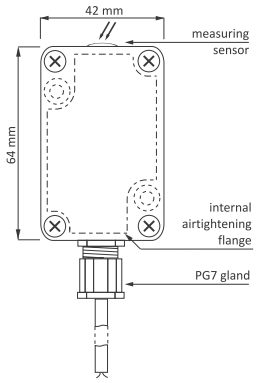
power supply	9÷30 V DC
measuring range	0÷100% RH/-40÷70°C
maximum measurement error of temperature	±1°C
maximum measurement error of humidity	±4.5% (0÷80 RH) ±6.5% (80÷100 RH)
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
baud rate (adjustable)	1200÷115200 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 ø7 (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

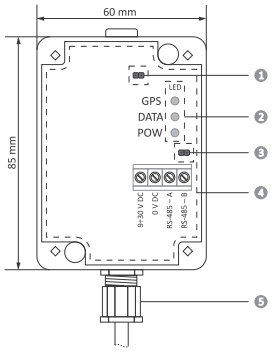
MB-GPS-1 GPS location converter

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 ø7 (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.



1. factory reset jumper
2. signal lights
3. 120 Ω terminator jumper
4. internal airtightening flange
5. 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

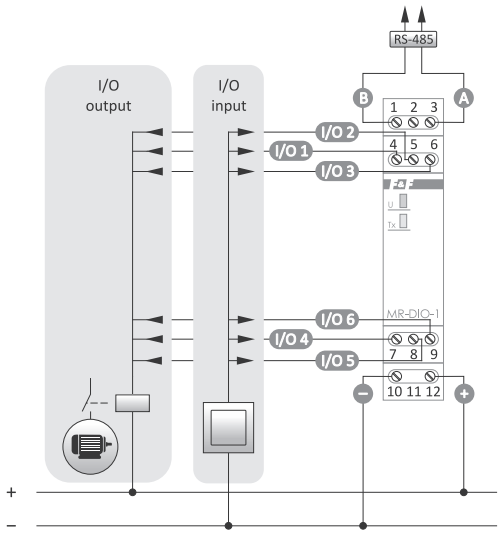
Purpose

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.

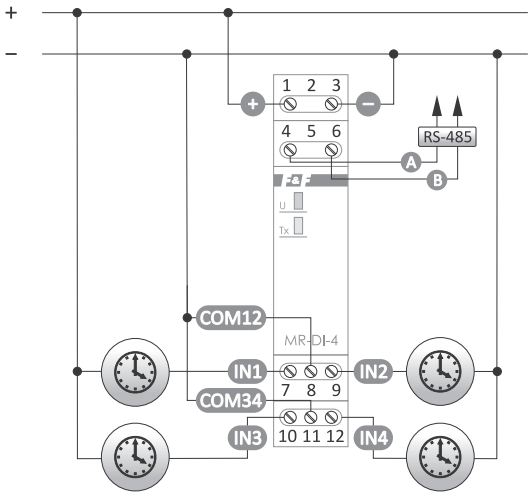


power supply	9÷30 V DC
number of I/O lines	6
maximum voltage on the I/O line	<50 V
the maximum current of the I/O line	
constant	100 mA
pulse (20%)	200 mA
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow LED
communication parameters	
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

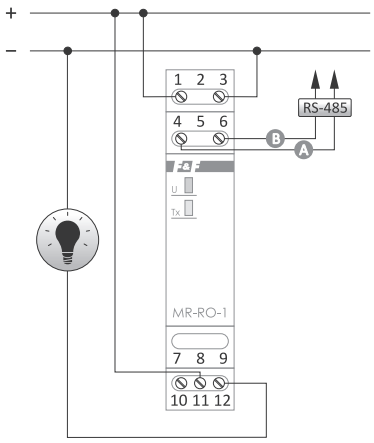
Functions

- 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

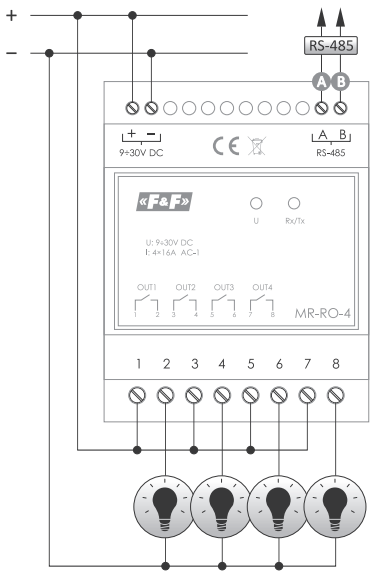
Functions

- 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	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	4 modules (70 mm)
mounting	for TH-35 rail
ingress protection	IP20

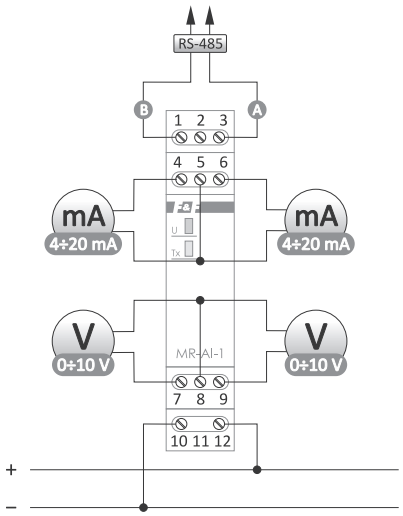
Functions

- 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.

MR-AI-1 analog inputs (AI) module

Functioning

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.

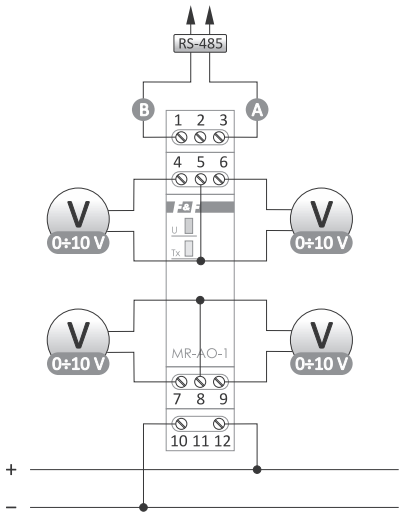


power supply	9÷30 V DC
number of analog inputs	4
current inputs	4÷20 mA
voltage inpputs	0÷10 V
current input resistance	47 Ω
voltage input resistance	110 Ω
measurement error	1%
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	green LED
communication indication	yellow 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

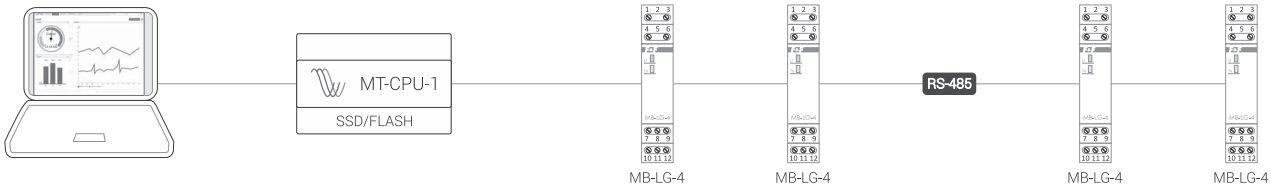
Functioning

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

MeternetPRO network parameter recording system

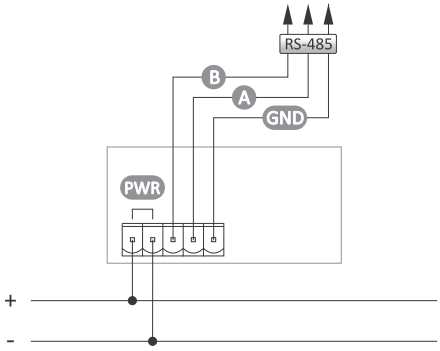


More information on p. 259

MR-LED-T panel display with buttons and Modbus RTU communication

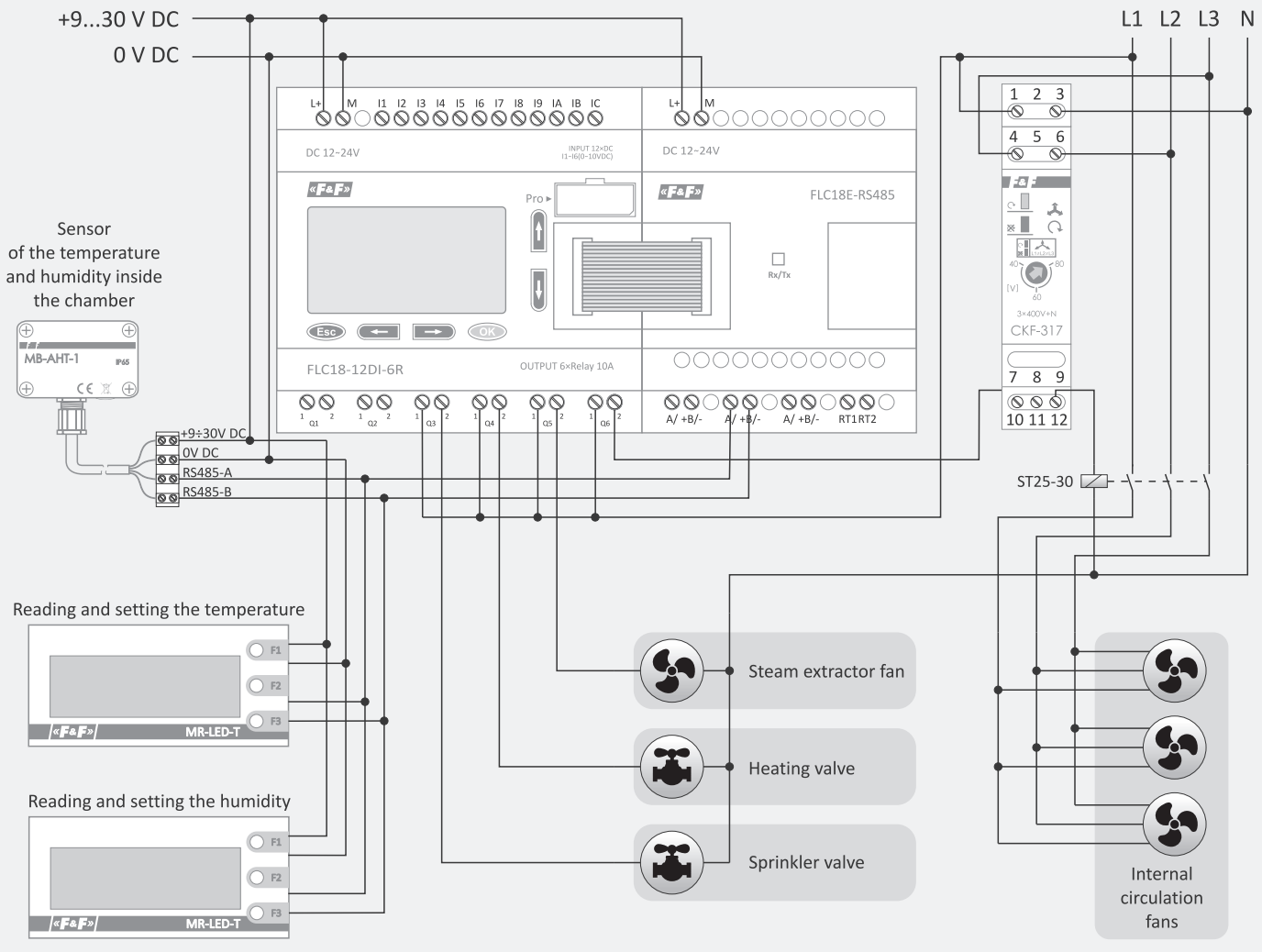
Purpose

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

Chapter 43

Electromagnetic modular contactors

Purpose

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

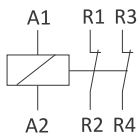
Type of the device	Contacts	Current of main current circuit [A]	Total power AC-1 230 V [kW]	Total power AC-3 230 V [kW]	Voltage of power supply of the coil	Power consum. [W]	Dimen-sions [module]	Weight [g]	Screw terminals [mm²]
ST20-20	2×NO	20	3,2	1,0	230 V AC	1,2	1	118	4
ST25-02-24 DC	2×NC	25	4	1,3	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

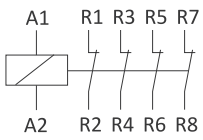
norm No.	IEC 61095
service life of the electrical connection	1×10^5
service life of the mechanical connection	1×10^6
insulation voltage	4.0 kV

working temperature	-25÷50°C
mounting	for TH-35 rail
ingress protection	IP20

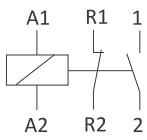
ST63 / ST63-...-M



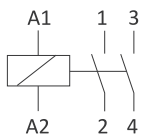
ST25-02



ST25-04
ST40-04

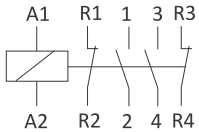


ST25-11

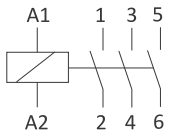


ST20-20
ST25-20
ST100-20

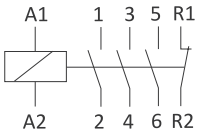
ST100



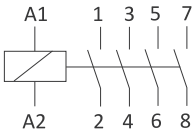
ST25-22
ST40-22



ST25-30



ST25-31
ST40-31
ST63-31



ST25-40
ST40-40
ST63-40
ST100-40

Electromagnetic relays

Functioning

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.

Product	Power supply voltage	Maximum load current (AC-1)	Contacts	Resistance of the working contact against surge currents	Housing	Mounting	Page
PK-1P 230V	230 V AC	16 A	1× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-1P 110V	110 V AC/DC	16 A	1× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-1P 48V	48 V AC/DC	16 A	1× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-1P 24V	24 V AC/DC	16 A	1× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-1P 12V	12 V AC/DC	16 A	1× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-1Z-LED 230V	230 V AC	16 A (120 A/20 ms)	1× NO	•	1 module (18 mm)	for TH-35 rail	323
PK-1Z-LED 24V	24 V AC/DC	16 A (120 A/20 ms)	2× NO	•	1 module (18 mm)	for TH-35 rail	323
PK-2P 230V	230 V AC	2× 8 A	2× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-2P 110V	110 V AC/DC	2× 8 A	2× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-2P 48V	48 V AC/DC	2× 8 A	2× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-2P 24V	24 V AC/DC	2× 8 A	2× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-2P 12V	12 V AC/DC	2× 8 A	2× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-2Z-LED 230V	230 V AC	2× 16 A (120 A/20 ms)	2× NO	•	1 module (18 mm)	for TH-35 rail	323
PK-2Z-LED 24V	24 V AC/DC	2× 16 A (120 A/20 ms)	2× NO	•	1 module (18 mm)	for TH-35 rail	323
PK-3P 230V	230V AC	3× 8 A	3× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-3P 110V	110V AC/DC	3× 8 A	3× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-3P 48V	48 V AC/DC	3× 8 A	3× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-3P 24V	24 V AC/DC	3× 8 A	3× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-3P 12V	12 V AC/DC	3× 8 A	3× NO/NC	–	1 module (18 mm)	for TH-35 rail	323
PK-4PZ 230V	230 V AC	4× 8 A	2× NO/NC, 2× NO	–	1 module (18 mm)	for TH-35 rail	323
PK-4PZ 110V	110 V AC/DC	4× 8 A	2× NO/NC, 2× NO	–	1 module (18 mm)	for TH-35 rail	323
PK-4PZ 48V	48 V AC/DC	4× 8 A	2× NO/NC, 2× NO	–	1 module (18 mm)	for TH-35 rail	323
PK-4PZ 24V	24 V AC/DC	4× 8 A	2× NO/NC, 2× NO	–	1 module (18 mm)	for TH-35 rail	323
PK-4PZ 12V	12 V AC/DC	4× 8 A	2× NO/NC, 2× NO	–	1 module (18 mm)	for TH-35 rail	323
PK-4PR 230V	230V AC	4× 8 A	2× NO/NC, 2× NC	–	1 module (18 mm)	for TH-35 rail	323
PK-4PR 110V	110V AC/DC	4× 8 A	2× NO/NC, 2× NC	–	1 module (18 mm)	for TH-35 rail	323
PK-4PR 48V	48V AC/DC	4× 8 A	2× NO/NC, 2× NC	–	1 module (18 mm)	for TH-35 rail	323
PK-4PR 24V	24V AC/DC	4× 8 A	2× NO/NC, 2× NC	–	1 module (18 mm)	for TH-35 rail	323
PK-4PR 12V	12V AC/DC	4× 8 A	2× NO/NC, 2× NC	–	1 module (18 mm)	for TH-35 rail	323
PKI-1R-230	230 V AC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1R-110	110 V AC/DC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1R-48	48 V AC/DC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1R-24	24 V AC/DC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1R-12	12 V AC/DC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1R-5	5 V DC	6 A	1× NC	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-230	230 V AC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-110	110 V AC/DC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-48	48 V AC/DC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-24	24 V AC/DC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-12	12 V AC/DC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PKI-1Z-5	5 V DC	6 A	1× NO	–	1/3 modules (6.2 mm)	for TH-35 rail	325
PP-1P 230V	100÷265 V AC	16 A	1× NO/NC	–	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-1P 24V	7÷30 V AC / 9÷40 V DC	16 A	1× NO/NC	–	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-1Z-LED 230V	230 V AC	16 A (160 A/20 ms)	1× NO	•	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-1Z-LED 24V	24 V AC/DC	16 A (160 A/20 ms)	1× NO	•	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-2Z 230V	100÷265 V AC	2× 16 A	2× NO	–	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-2Z 24V	7÷30 V AC / 9÷40V DC	2× 16 A	2× NO	–	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-2Z-LED 230V	230 V AC	2× 16 A (160 A/20 ms)	2× NO	•	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-2Z-LED 24V	24 V AC/DC	2× 16 A (160 A/20 ms)	2× NO	•	ø54 (48×43 mm), h: 25 mm	in flush-mounted box ø60	324
PP-1P Pico	100÷265 V AC	16 A	1× NO/NC	–	miniature, 35×36×19 mm	in flush-mounted box ø60	324
PP-1Z-LED Pico	100÷265 V AC/DC	16 A (120 A/20 ms)	1× NO	•	miniature, 35×36×19 mm	in flush-mounted box ø60	324

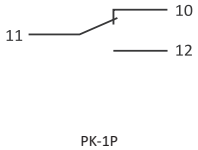
Modular for TH-35 rail

PK-1P 1× NO/NC contact (<16 A)
PK-1Z-LED 1× NO contact (<16 A)
PK-2P 2× NO/NC contact (2×8 A)
PK-2Z-LED 2× NO contact (2×16 A)
PK-3P 3× NO/NC contact (3×8 A)
PK-4PZ 2× NO/NC contact (2×8 A) + 2× NO contact (2×8 A)
PK-4PR 2× NO/NC contact (2×8 A) + 2× NC contact (2×8 A)

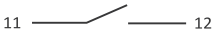
Example of marking when placing an order:
PK-2P 48 V supply voltage

power supply	
PK-...P... 230 V/PK-...Z-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-...Z-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-2Z-LED	2×NO / 2×16 A (120 A/20 ms) 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. 5×10^6 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

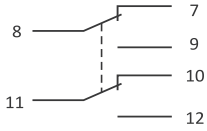
Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.



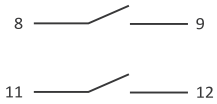
PK-1P



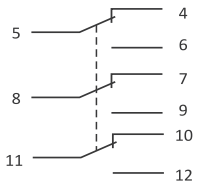
PK-1Z-LED



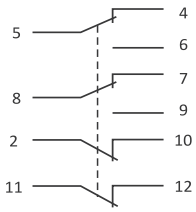
PK-2P



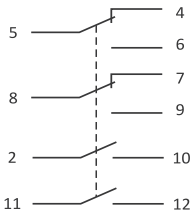
PK-2Z-LED



PK-3P



PK-4PR



PK-4PZ

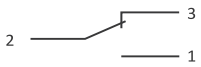
Flush-mounted box ø60

PP-1P
PP-1Z-LED
PP-2Z
PP-2Z-LED

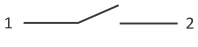
1× NO/NC contact <16 A 250 V AC
1× NO contact <16 A (120 A/20 ms) 250 V AC
2× NO contact <16 A 250 V AC
2× NO contact <16 A (120 A/20 ms) 250 V AC

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
contacts/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	ø54 (48×43 mm), H= 25 mm
mounting	in flush-mounted box ø60
ingress protection	IP20

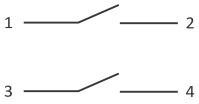
Version with the "LED" index has a contact adapted to work with receivers with high starting current, such as LED lamps, ESL fluorescent lamps, electronic transformers, discharge lamps, etc.



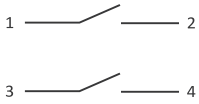
PP-1P



PP-1Z-LED



PP-2Z



PP-2Z-LED

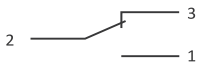
Miniature, flush-mounted box ø60

PP-1P Pico
PP-1Z-LED Pico

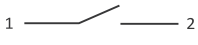
1× NO/NC contact <16 A 250 V AC
1× NO contact <16 A (120 A/20 ms) 250 V AC

power supply	
PP-1P Pico	100÷265 V AC/DC
PP-1Z-LED Pico	100÷265 V AC/DC
contacts/maximum load current (AC-1)	
PP-1P Pico	1×NO/NC / <16 A 250 V AC
PP-1Z-LED Pico	1×NO / <16 A (120 A/20 ms) 250 V AC
mechanical durability	min. 5×10⁶ cycles
electrical durability	min. 1×10⁵ cycles
power consumption	0,6 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	35×36×19 mm
mounting	in flush-mounted box ø60
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 Pico



PP-1Z-LED Pico

Interface relays

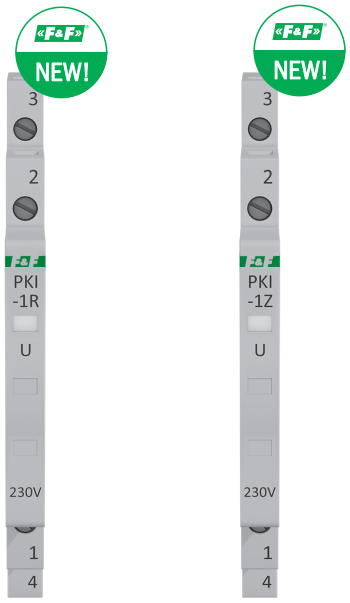
Functioning

PKI-1R-..: Applying supply voltage to the coil of the relay will open contacts 2-3.
This state is signalled by the illumination of the LED diode. After the supply voltage is lost the contacts will be closed.
PKI-1Z-...: Applying the supply voltage to the relay coil will cause the contacts 2-3 to close.
This state is signalled by the illumination of the LED diode. After the supply voltage decays the contacts will be opened.

Modular for TH-35 rail, 1/3 S housing

PKI-1R-230	1× NC contact
PKI-1R-110	1× NC contact
PKI-1R-48	1× NC contact
PKI-1R-24	1× NC contact
PKI-1R-12	1× NC contact
PKI-1R-5	1× NC contact

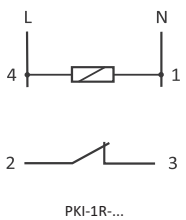
PKI-1Z-230	1× NO contact
PKI-1Z-110	1× NO contact
PKI-1Z-48	1× NO contact
PKI-1Z-24	1× NO contact
PKI-1Z-12	1× NO contact
PKI-1Z-5	1× NO contact



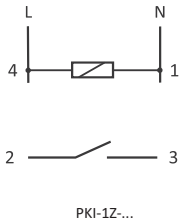
Example of marking when placing an order:
PKI-1[X]-V
X – contact type:
R – NC contact
Z – NO contact
V – voltage

power supply	
PKI-1R-230/PKI-1Z-230	230 V AC
PKI-1R-110/PKI-1Z-110	110 V AC/DC
PKI-1R-48/PKI-1Z-48	48 V AC/DC
PKI-1R-24/PKI-1Z-24	24 V AC/DC
PKI-1R-12/PKI-1Z-12	12 V AC/DC
PKI-1R-5/PKI-1Z-5	5 V DC
contact/maximum load current (AC-1)	
PKI-1R-...	1×NC/6 A*
PKI-1Z-...	1×NO/6 A*
mechanical durability	min. 5×10^7 cycles
electrical durability	min. 5×10^4 cycles
current consumption	
230 V	<4 mA
110 V	<6 mA
48 V	6 mA
24 V	9 mA
12 V	15 mA
5 V	40 mA
power consumption	
230 V	<1 W
110 V	<0,75 W
48 V	<0,3 W
24 V	<0.25 W
12 V	<0,2 W
5 V	0,2 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1/3 modules (6.2 mm)
mounting	for TH-35 rail
ingress protection	IP20

* Load of a resistive nature [AC-1]. For loads of a different nature (e.g. LED lighting), the maximum load current may be significantly lower. Further information: www.fif.com.pl/pl/content/24-wskazowki



PKI-1R-...



PKI-1Z-...

Solid-state relays

Purpose

Solid-state relays are designed to control low-power AC circuits.

Modular for TH-35 rail

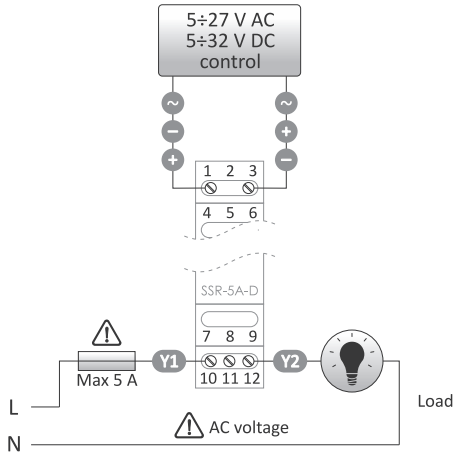
SSR-5A-D Modular solid-state relay 5 A

Functioning

Applying supply voltage to the contactor coil will switch the contact. The activation status of the contactor is indicated by a red marker in the window. After loss of supply voltage, the contacts return to their original position.

Cechy

- Load switching at "zero" – reducing current surge when switching a circuit (e.g. LED lighting);
- Built-in thermal protection and operation indication;
- Silent operation;
- Switching on without sparking or vibration of contacts;
- Unlimited number of switching operations;



input	
power supply	
AC	5÷27 V AC
DC	5÷32 V DC
power consumption	0.2 W
output	
rated voltage	230 V AC
rated current	5 A
contacts	1×NO
maximum activation current	150 A/10 ms
activation delay	<20 ms
power loss (for 5 A)	4 W
actuator	triak
IN/OUT isolation	3 kV
thermal protection	100°C
power indication	green LED
over temperature indication	red LED
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

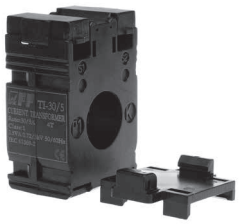
* Limit temperature depends on load current and ventilation conditions

Measuring current transformers

Purpose

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

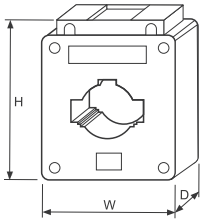
Type	Transformer Ip/Is	Class	Power [VA]	P1/P2 hole dimensions [mm]	Dimensions [mm]	Weight [kg]
TI-30*	30/5	1	2.5	ø22	44×67×30	0,135
TI-40	40/5	1	1,0	ø22	44×67×30	0,135
TI-50	50/5	1	1,5	ø22	44×67×30	0,135
TI-60	60/5	1	1,5	ø22	44×67×30	0,135
TI-75	75/5	1	1,5	ø22	44×67×30	0,135
TI-80	80/5	1	1,5	ø22	44×67×30	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.

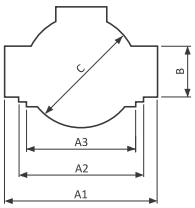
TI-100/.../TI-1600 1-phase closed-core transformers

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

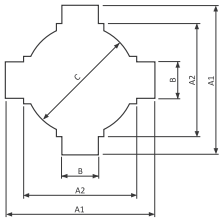
Type	Transformer Ip/Is	Class	Power [VA]	P1/P2 hole dimensions A1/A2/A3×B; C [mm]	Dimensions [mm]	Weight [kg]
TI-100	100/5	0.5	2.5	30/25/20×10; ø22	61×80×37	0,235
TI-125	125/5	0.5	2.5	30/25/20×10; ø22	61×80×37	0,235
TI-150	150/5	0.5	2.5	30/25/20×10; ø22	61×80×37	0,235
TI-200	200/5	0.5	5,0	30/25/20×10; 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-500	500/5	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
TI-1000	1000/5	0.5	10	62/52/38×21; ø46	126×102×62	0,550
TI-1250	1250/5	0.5	10	62/52/38×21; ø46	126×102×62	0,550
TI-1600	1600/5	0.5	10	62/52/38×21; ø46	126×102×62	0,550



Dimensions



P1/P2 hole
TI-100; TI-125, TI-150;
TI-200; TI-250; TI-300



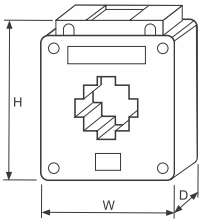
P1/P2 hole
TI-400; TI-500, TI-600

TI-100-5-02S/.../TI-600-5-02S

precision 1-phase closed-core transformers

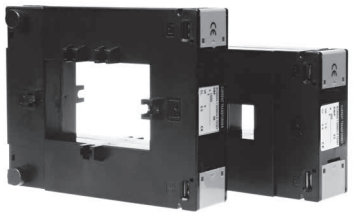
norm No.	PN-EN 61869-2:2013-06
nominal secondary current Is	5 A
frequency	50/60 Hz
working voltage	0.66/0.72 kV
test voltage	3 kV
insulation class	E
continuous thermal current	1.2×In
short term thermal current	60×In
dynamic current	2.5×Ith
safety factor	FS≤5
working temperature	-50÷85°C
ingress protection	IP67

Type	Ip/Is transformer	Class	Power [VA]	Hole dimensions P1/P2 [mm]	Dimensions [mm]	Weight [kg]
TI-100-5-02S	100/5	0.2S	1.5	32×32	75×98×42	0.5
TI-150-5-02S	150/5	0.2S	1.5	32×32	75×98×42	0.5
TI-200-5-02S	200/5	0.2S	2.5	32×32	75×98×42	0.5
TI-250-5-02S	250/5	0.2S	2.5	32×32	75×98×42	0.5
TI-400-5-02S	400/5	0.2S	3.75	32×32	75×98×42	0.5
TI-600-5-02S	600/5	0.2S	3.75	32×32	75×98×42	0.5



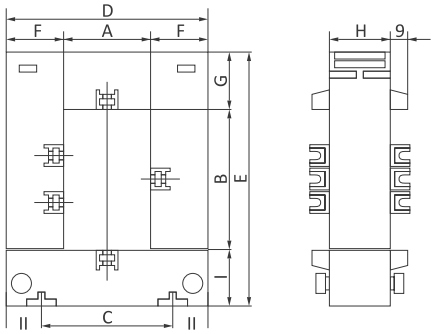
TO-100/.../TO-4000

1-phase open-core transformers



norm No.	PN-EN 61869-2:2013-06
nominal seondary current Is	5 A
rated voltage	0.66 kV AC
insulation breakdown voltage	3 kV/1 min.
frequency	50/60 Hz
safety factor	FS<5
working temperature	-15÷50°C
S1/S2 terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
mounting	board
position	vertical/horizontal
ingress protection	IP20

Type	Ip/Is transformer	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	1.5	50	80	78	116	146	33	33	35	33	0.90
TO-500	500/5	0.5	1.5	50	80	78	116	146	33	33	35	33	0.90
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
TO-1250	1250/5	0.5	5,0	80	121	-	145	196	33	-	70	-	-
TO-1600	1600/5	0.5	7,5	80	121	-	145	196	33	-	70	-	-
TO-2000	2000/5	0.5	10,0	80	121	-	145	196	33	-	70	-	-
TO-4000	4000/5	0.5	10,0	80	121	-	145	196	33	-	70	-	-



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-40-03 / .../ TOM-400-03

Fox dedicated transformers

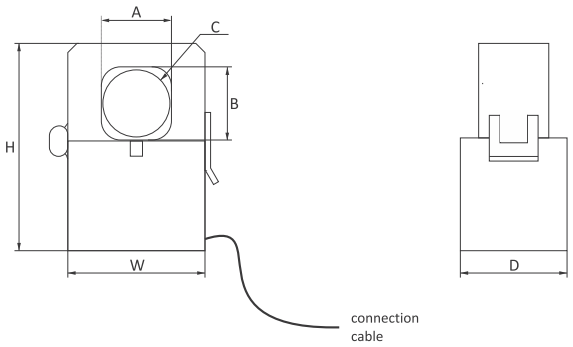
TOM-40-03

TOM-100-03

TOM-200-03

norm No.	PN-EN 61869-2:2013-06
nominal secondary current Is	30 mA
accuracy class	0.5
protection category	CAT III
rated voltage	0.66 kV AC
insulation breakdown voltage	2 kV/1 min.
working temperature	-20÷50°C
S1/S2 temrinal	2×0.51 mm², L= 100 cm

Type	Ip/Is transformer	Class	Dimensions [mm]				
			W	H	D	A	B
TOM-40-03	40 A/30 mA	0.5	24	41	27	9	10
TOM-100-03	100 A/30 mA	0.5	30	46	30	15	16
TOM-200-03	200 A/30 mA	0.5	45	69	34	23	25
TOM-400-03	400 A/30 mA	0.5	56	87	42	37	35

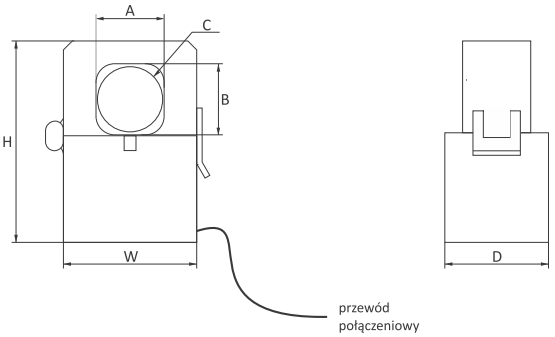


TOM-100 / ... / TOM-600

miniature 1-phase open-core transformers

norm No.	PN-EN 61869-2:2013-06
nominal secondary current Is	5 A
rated voltage	0.66 kV AC
insulation breakdown voltage	2 kV/1 min.
frequency	50/60 Hz
safety factor	FS≤2
working temperature	-15÷45°C
S1/S2 terminal	cable
tightening torque	not applicable
mounting	szyna/przewód
position	vertical/horizontal
ingress protection	IP20

Type	Ip/Is transformer	Class	Power [VA]	Dimensions [mm]					
				W	H	D	A	B	C
TOM-100	100	1	1.5	45	67	35	23	24	ø22
TOM-125	125	1	1.5	45	67	35	23	24	ø22
TOM-150	150	1	1.5	45	67	35	23	24	ø22
TOM-200	200	1	1.5	45	67	35	23	24	ø22
TOM-250	250	1	1.5	45	67	35	23	24	ø22
TOM-300	300	1	1.5	45	67	35	23	24	ø22
TOM-400	400	1	1.5	58	86	43	34	36	ø32
TOM-500	500	1	1.5	58	86	43	34	36	ø32
TOM-600	600	1	1.5	58	86	43	34	36	ø32



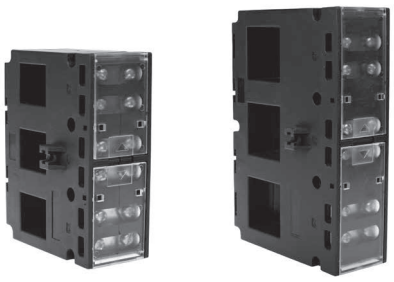
Grounding of the S2 terminal is recommended. Do not turn off the secondary system while the transformer is running (high voltage may cause injury to people or damage to the device).

3-phase

Purpose

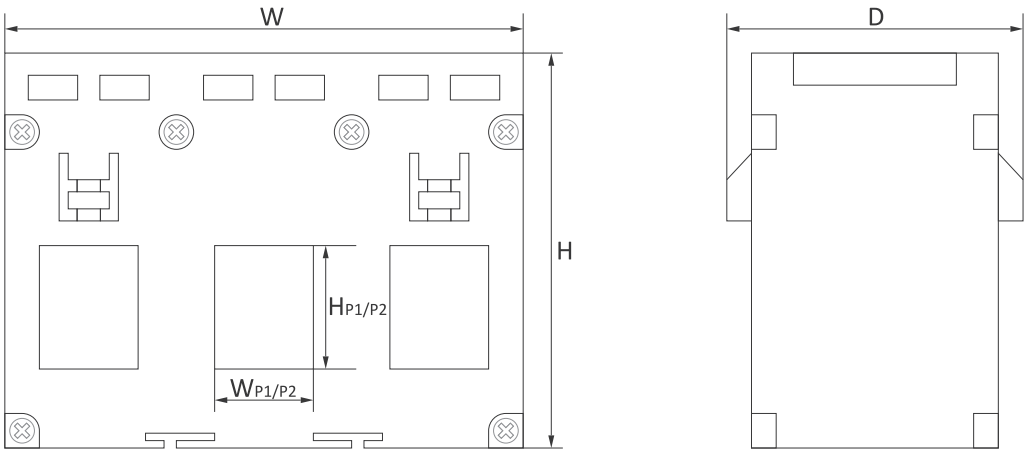
The 3-phase (3 in 1) current transformer is used for indirect measurements of 3-phase currents. Its design allows it to be mounted directly on the outputs of the cut-off switches (ABB Isomax series, Merlin Gerlin NS series and similar) saving assembly time and space in the switchgear.

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	Ip/Is transformer	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



Current shunts

Purpose

The measuring shunts is designed to extend the measuring range of current meters.

BO-100-75 current shunt 100 A

Functioning

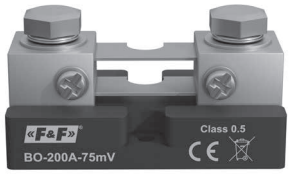
The voltage drop between the terminals of the measuring shunt is proportional to the current flowing. For the rated current of the shunt, the voltage drop is 75 mV. The shunts can be used in conjunction with dedicated energy meters (e.g. LE-01D), or other current meters (electronic or magneto-electric).

rated current	100 A
output voltage	75 mV
measurement accuracy	0.5
current overload capacity	
continuous	120% In
short term (5 s)	500% In
test voltage	5 kV
terminals	
current	2× M6 screw×15
voltage	2× M4 screw×8
dimensions	50×32×42 mm
mounting	board, 2× screw 5 mm
ingress protection	IP20

BO-200-75 current shunt 200 A

Functioning

The voltage drop between the terminals of the measuring shunt is proportional to the current flowing. For the rated current of the shunt, the voltage drop is 75 mV. The shunts can be used in conjunction with dedicated energy meters (e.g. LE-01D), or other current meters (electronic or magneto-electric).

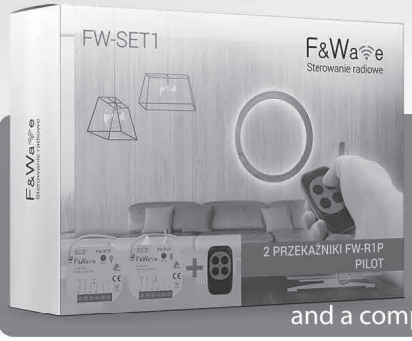


rated current	200 A
output voltage	75 mV
measurement accuracy	0.5
current overload capacity	
continuous	120% In
short term (5 s)	500% In
test voltage	5 kV
terminals	
current	2× M10 screw×15
voltage	2× M5 screw×8
dimensions	82×44×43 mm
mounting	board, 2× screw 5 mm
ingress protection	IP20

F&Wave
Radio control

Radio control systems

Programmed and ready to use sets



FW - SET1

Promotional set that includes
2 FW-R1P bistable relays
and a complimentary FW-KEY remote control.

FREE REMOTE CONTROL!

FW - SET2

Set that includes the FW-R1P-P multifunction relay
and FW-WSO2 double battery button.

FW - SET3

Promotional set that includes 2 FW-TO1S1 gate controller
and 2 complimentary FW-KEY remote controls.

«F&F»®

Section XIII
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Chapter 46

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«F&F»

FOX

ENERGY 3

WI-MEF-3

Access to data directly from the application level or through any web browser.

ELECTRICITY CONSUMPTION METER

Monitoring all relevant parameters of the electric network.

- Monitoring energy consumption in home installations;
- Current measurement of power consumption and values of currents and voltages;
- Use of registered measurements to detect overruns of voltage levels or power consumption;
- Control of energy production in photovoltaic installations;
- Heat pump metering.

three-phase
in versions:
40 A
100 A
200 A
400 A

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