domestic and industrial automation

«F&F»®

Products catalogue

2020

«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 Russia, Ukraine, 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 2020

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Legend

Momentary buttons

	single button
	single button with backlight
	double button

Setters

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

Temperature sensors

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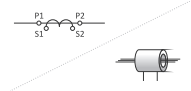
Other sensors

	brightness sensor
	wind sensor
	precipitation sensor
	shock sensor
	flood sensor

Signal outputs

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

Additional markings

	transformer
	switchboard

Power sources

	battery
9÷30 V DC	power supply

Receivers

	LED
	LED stripe
	1-Phase motor
	3-Phase motor
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	fan
	light bulb
	roller blind
	gate
	heater
	kettle
	iron
	washing machine
	oven
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	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.

Operation

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; length 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; length 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; length 0.8 m	surface-mounted	9
AZH-106 230 V	195÷253 V AC	16 A	1×NO	–	built-in	OMY 3×1 mm²; length 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; length 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; length 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; length 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; length 0.45 m	surface-mounted	9
AZH-LED	**195÷253 V AC**	**10 A**	**1×NO**	**–**	**built-in**	**OMY 3×0.75 mm²; length 0.8 m**	**surface-mounted**	**8**
AZH-S 230 V	195÷253 V AC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	surface-mounted	10
AZH-S 24 V	21÷27 V AC/DC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	surface-mounted	10
AZH-S 12 V	11÷14 V AC/DC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	surface-mounted	10
AZH-S PLUS	195÷253 V AC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	surface-mounted	10
AZH-S PLUS 24 V	21÷27 V AC/DC	16 A	1×NO	–	external probe PLUS	4.0 mm² screw terminals	surface-mounted	10
AZ-B 230 V	195÷253 V AC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B 24 V	21÷27 V AC/DC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B PLUS 230 V	195÷253 V AC	16 A	1×NO	–	external probe PLUS	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B UNI	12÷264 V AC/DC	16 A	1×NO	–	external probe ø10	4.0 mm² screw terminals	for TH-35 rail	10
AZ-B UNI PLUS	12÷264 V AC/DC	16 A	1×NO	–	external probe PLUS	4.0 mm² screw terminals	for TH-35 rail	10
AZ-112	195÷253 V AC	16 A	1×NO	●	external probe ø10	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 24 V	21÷27 V AC/DC	16 A	1×NO	●	external probe ø10	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 PLUS	195÷253 V AC	16 A	1×NO	●	external probe PLUS	2.5 mm² screw terminals	for TH-35 rail	11
AZ-112 PLUS 24 V	21÷27 V AC/DC	16 A	1×NO	●	external probe ø10	2.5 mm² screw terminals	for TH-35 rail	11

AZH-LED

Hermetically sealed.

Purpose

The AZH-LED is a twilight switch with a built-in light sensor, enclosed in a hermetically sealed housing and specially adapted to switch on the LED lighting. By using a switching element that guarantees correct operation with current pulses up to 160 A/20 ms and additional elements responsible for reducing surges, the AZH-LED module successfully manages to switch on and off the LED lighting, which despite its energy efficiency generates strong current surges at the moment of switching on, effectively destroying classic relays.
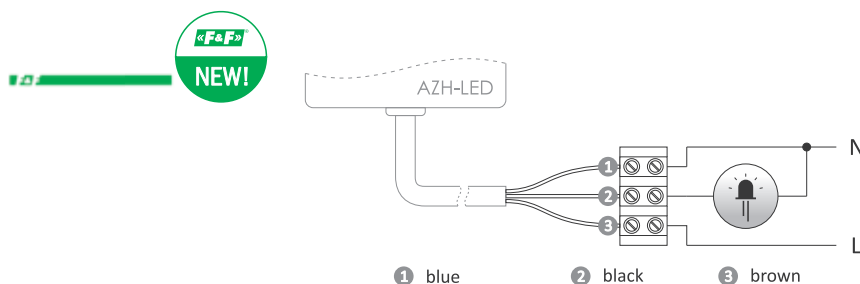
❶ blue ❷ black ❸ brown

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

AZH / AZH 12V / AZH 24V

Hermetically sealed.

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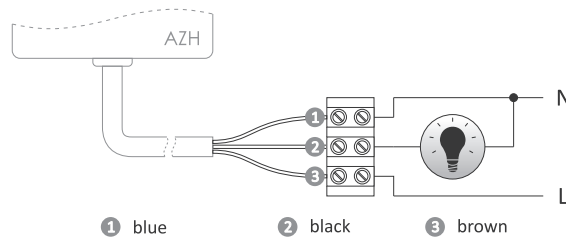
power supply	
AZH	195÷253 V AC
AZH 12 V	11÷14 V AC/DC
AZH 24 V	21÷27 V AC/DC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	OMY 3×0.75 mm², l=0.8 m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

AZH-106 / AZH-106 12V

Hermetically sealed.

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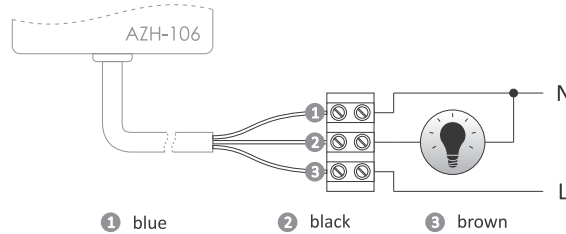
power supply	
AZH-106	195÷253 V AC
AZH-106 12 V	11÷14 V AC/DC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	OMY 3×1 mm², l=0.8 m
working temperature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

AZH-C / AZH-C 24V

Compact, hermetically sealed.

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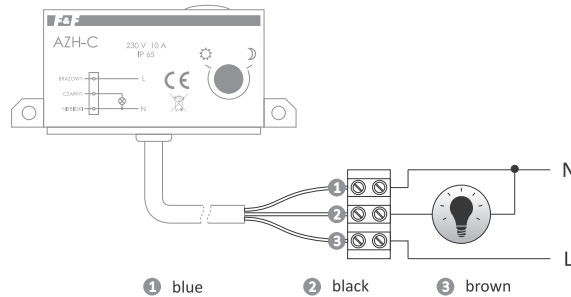
power supply	
AZH-C	195÷253 V AC
AZH-C 24 V	21÷27 V AC/DC
maximum load current (AC-1)	10 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	OMY 3×0.75 mm², l=0.45 m
working temperature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

AWZ / AWZ 24V

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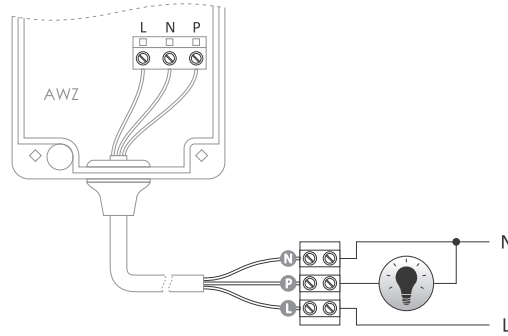
power supply	
AWZ	195÷253 V AC
AWZ 24 V	21÷27 V AC/DC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.8 W
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm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

AWZ-30

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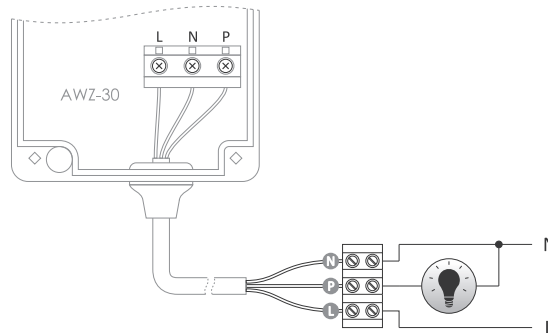
power supply	195÷253 V AC
maximum load current (AC-1)	30 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.8 W
terminal	6.0 mm² screw terminals
tightening torque	0.5 Nm
working temperature	-25÷50°C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

With an external hermetically sealed probe

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

External hermetically sealed probe ø10 (AZH-S, AZH-S 12 V, AZH-S 24 V) lub PLUS (AZH-S PLUS, AZH-S PLUS 24 V) included in the set (p. 11).
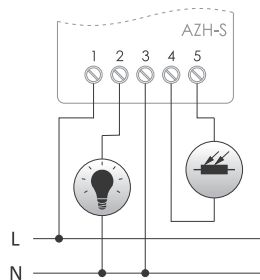
power supply	
AZH-S	195÷253 V AC
AZH-S 12 V	11÷14 V AC/DC
AZH-S 24 V/AZH-S PLUS 24 V	21÷27 V AC/DC
AZH-S PLUS	195÷253 V AC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	50×67×26 mm
installation	surface mounting
protection level	IP20

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

External hermetically sealed probe ø10 (AZ-B, AZ-B 24 V, AZ-B UNI) lub PLUS (AZ-B PLUS, AZ-B PLUS UNI) included in the set (p. 11).
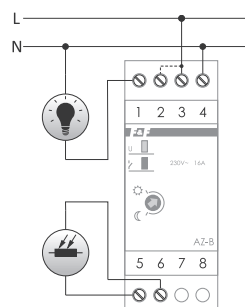
power supply	
AZ-B/AZ-B PLUS	195÷253 V AC
AZ-B 24 V	21÷27 V AC/DC
AZ-B UNI/AZ-B PLUS UNI	12÷264 V AC/DC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP20

AZ-112 / AZ-112 24V / AZ-112 PLUS / AZ-112 PLUS 24V

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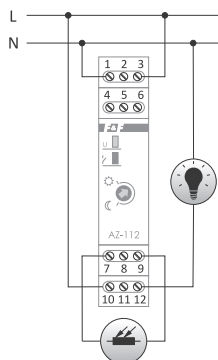
power supply	
AZ-112/AZ-112 PLUS	195÷253 V AC
AZ-112 24 V/AZ-112 PLUS 24 V	21÷27 V AC/DC
maximum load current (AC-1)	16 A
twilight activation (adjustable)	2÷1000 lx
hysteresis	approx. 15 lx
switching ON delay	approx. 10 s
switching OFF delay	approx. 20 s
power consumption	0.56 W
terminal	2.5 mm² screw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

External hermetically sealed probes

PLUS probe

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

63 mm
42 mm
PG7 cable gland
internal airtightening flange
30 mm
lid with silicone gasket
fixing hole to the ground
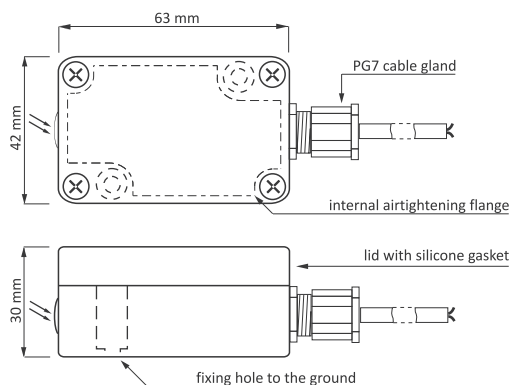
The photosensitive sensor in a special, small plastic box. Connected with round cable, max. ∅7 (such as 2×0.5 mm²), through the PG7 cable gland.
Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

∅10 probe

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

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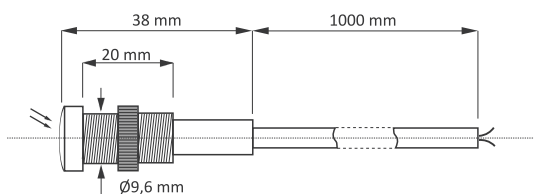
A small, easy to install photosensitive sensor, with 2×0.5 mm² 1-meter round cable that can be extended up to 10 m.

(!) 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.

Devices related to twilight switches

PCZ – Astronomical clocks

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

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

PCZ CONFIGURATOR app
Free app for Android phones and tablets equipped with NFC wireless communication module.

More information on p. 121

Android app

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

Transducer in special, compact-sized plastic box, connected through a PG7 cable gland with circular cables of any length, maximum ⌀7 (for example: 4×0.5 mm²). Box with a special sealing flange, fixed to the base by means of two screws, closed with a cover with silicone gasket using 4 screws.

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

More information on p. 270

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
installation	surface mounting
protection level	IP65

Interesting and practical
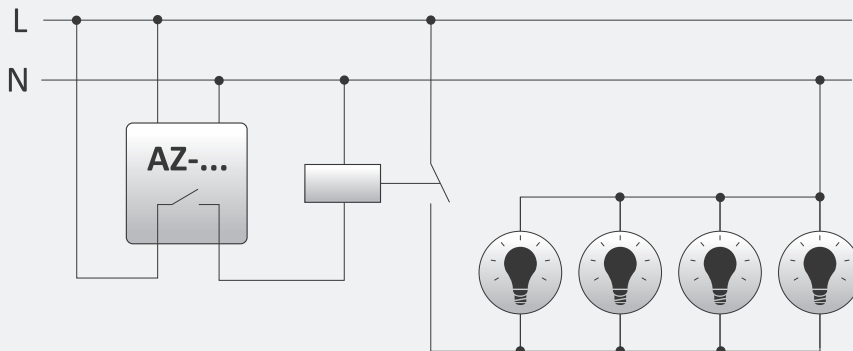
Control system of a contactor that switches on receivers with total current consumption exceeding the permissible contact load of a twilight switch
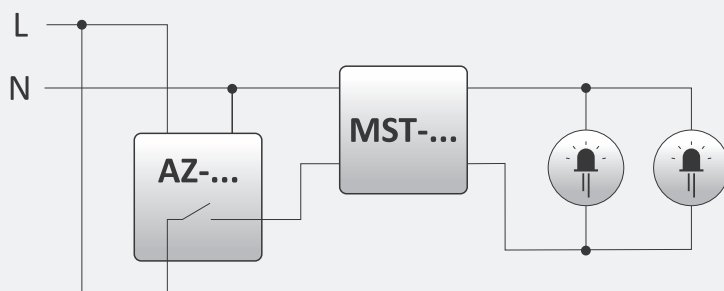
Application of MST-01/MST-02 limiters to reduce the current surge at the moment of switching on the LED lighting

Chapter 2
Automatic staircase lighting time switches

Purpose

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

Operation

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

Product	Supply voltage	Maximum current load(AC-1)	Configuration of the contacts	Separation of the contact	Anti-lock	Signalization of switching	Cooperation with backlit buttons	Installation	Page
AS-B 24	21÷27 V AC/DC	16 A	1×NO	–	–	–	–	for TH-35 rail	15
AS-B 42	38÷46 V AC	16 A	1×NO	–	–	–	–	for TH-35 rail	15
AS-B 110	100÷120 V AC	16 A	1×NO	–	–	–	–	for TH-35 rail	15
AS-B 220	195÷253 V AC	16 A	1×NO	–	–	–	●	for TH-35 rail	15
AS-212	195÷253 V AC	16 A	1×NO	–	–	–	●	for TH-35 rail	15
AS-214	21÷27 V AC/DC	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	195÷253 V AC	16 A	1×NO	●	●	–	●	for TH-35 rail	15
AS-224	21÷27 V AC/DC	16 A	1×NO	●	●	–	–	for TH-35 rail	15
AS-225	9÷30 V DC	4 A	OC (transistor)	–	–	–	–	in flush mounted	17
ASO-24	21÷27 V AC/DC	10 A	1×NO	–	–	–	–	surface-mounted	14
ASO-42	38÷46 V AC/DC	1.5 A	1×NO	–	–	–	–	surface-mounted	14
ASO-110	100÷120 V AC	10 A	1×NO	–	–	–	–	surface-mounted	14
ASO-201	195÷253 V AC	16 A	1×NO	–	–	–	●	surface-mounted	14
ASO-202	195÷253 V AC	16 A	1×NO	–	●	–	●	surface-mounted	15
ASO-203	21÷27 V AC/DC	16 A	1×NO	–	●	–	–	surface-mounted	15
ASO-204	21÷27 V AC/DC	16 A	1×NO	–	–	–	–	surface-mounted	14
ASO-205	195÷253 V AC	10 A	1×NO	–	–	–	●	in flush mounted	14
ASO-220	195÷253 V AC	10 A	1×NO	–	–	–	●	surface-mounted	14

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

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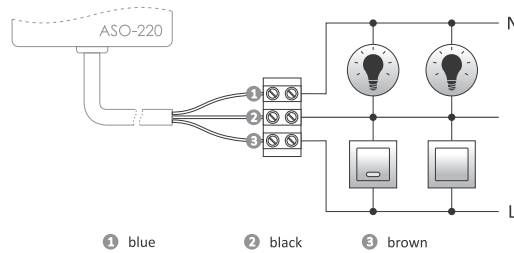
power supply	
ASO-220	195÷253 V AC
ASO-110	100÷120 V AC
ASO-42	38÷46 V AC/DC
ASO-24	21÷27 V AC/DC
maximum load current (AC-1)	
ASO-220/ASO-110	10 A
ASO-42	1.5 A
ASO-24	10 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	OMY 3×0.75 mm², l= 0.45 m
working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

❶ blue　　❷ black　　❸ brown

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

ASO-201 / ASO-204

With screw terminals.
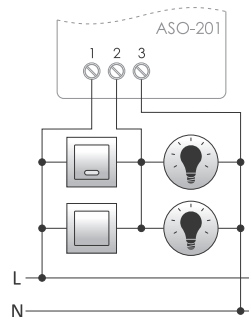
power supply	
ASO-201	195÷253 V AC
ASO-204	21÷27 V AC/DC
maximum load current (AC-1)	
ASO-201/ASO-204	16 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	50×67×26 mm
installation	surface mounting
protection level	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)	10 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.4 W
terminal	3×DY 1 mm², l= 10 cm
working temperature	-25÷50°C
dimensions	Ø55, h= 13 mm
installation	in flush mounted box Ø60
protection level	IP20

❶ black　　❷ blue　　❸ brown

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

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

3-wire installation

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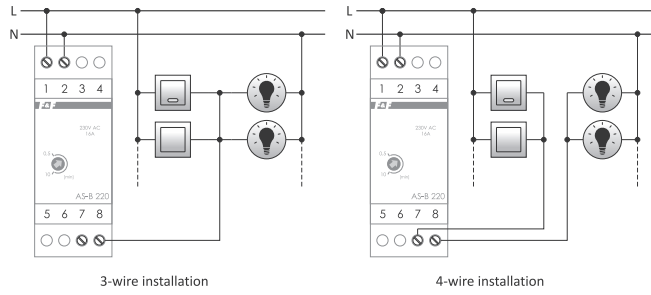
power supply	
AS-B 220	195÷253 V AC
AS-B 110	100÷120 V AC
AS-B 42	38÷46 V AC
AS-B 24	21÷27 V AC/DC
maximum load current (AC-1)	16 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	1.2 W
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening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

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

AS-212 / AS-214

3-wire installation

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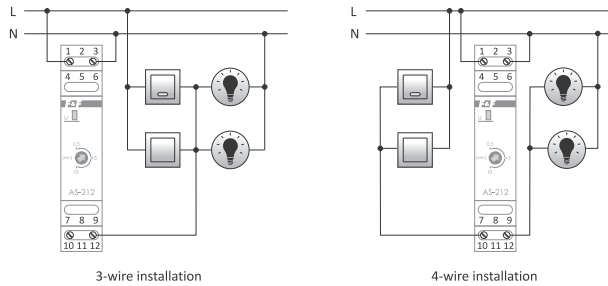
power supply	
AS-212	195÷253 V AC
AS-214	21÷27 V AC/DC
maximum load current (AC-1)	16 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation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

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

With anti-lock feature

Operation

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

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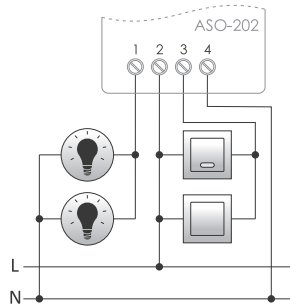
power supply	
ASO-202	195÷253 V AC
ASO-203	21÷27 V AC/DC
maximum load current (AC-1)	16 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C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

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

AS-223 / AS-224

control pulse: N

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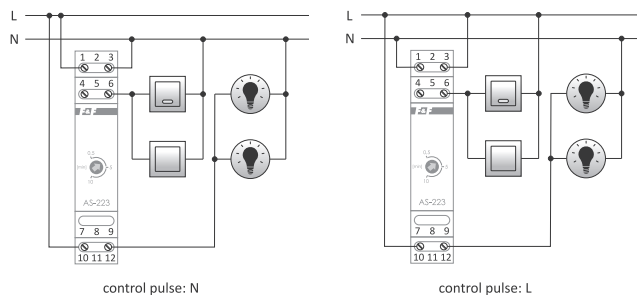
power supply	
AS-223	195÷253 V AC
AS-224	21÷27 V AC/DC
maximum load current (AC-1)	16 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
power consumption	0.56 W
terminal	2.5 mm² screw terminals
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation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

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

With signalling of light switch-off feature

AS-221T

Operation

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

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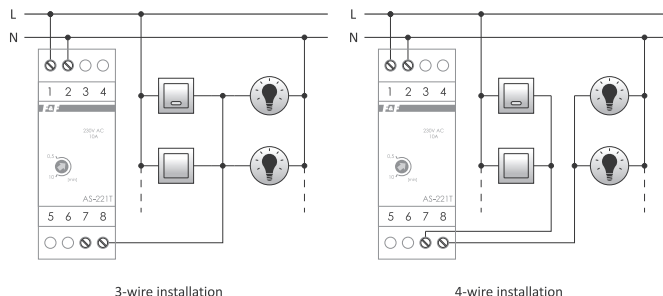
power supply	195÷253 V AC
maximum load current	10 A
operation delay	<1 s
switching OFF delay (adjustable)	0.5÷10 min.
time of reduced brightnes	30 s
power consumption	0.8 W
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions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

Operation

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

3-wire installation   4-wire installation

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

With "cascade" sequential switching function

AS-225 group
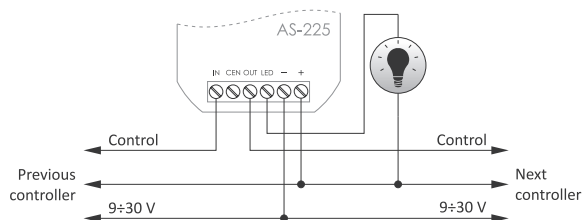
power supply	9÷30 V DC
output	
type	transistor OC (open collector)
maximum load current	4 A
maximum voltage	30 V DC
input type	potential-free
operation delay	<1 s
switching OFF delay Ton (adjustable)	10÷90s
switching ON delay TΔ (adjustable)	0÷100% Ton
power consumption	
standby	0.3 W
ON mode	0.5 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-15÷50°C
dimensions	Ø54 (size 48×43 mm), h= 20 mm
installation	in flush mounted box Ø60
protection level	IP20

Purpose

The AS-225 automatic switch is a controller for building a multipoint staircase lighting control system. Each relay manages one lighting point, and when combined into a group and with connected actuators (bell button, motion sensor, pressure sensor, optical barrier), the effect of light moving along the stairs can be achieved.

Operation

Pressing the DOWN button will switch on the lamp number 1. After the TΔ time set on the first controller, the lamp number 2 will start to light up gently. When the switch-on time Ton of the lamp number 1 has elapsed, the lamp will start to gradually switch off. The transition from lamp 2 to lamp 3, from lamp 3 to lamp 4, etc., will take place in the same way. In case of descent from stairs (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.

(!) DRL-12 sensors are dedicated to AS -225 staircase automatic unit. More information on p. 41.
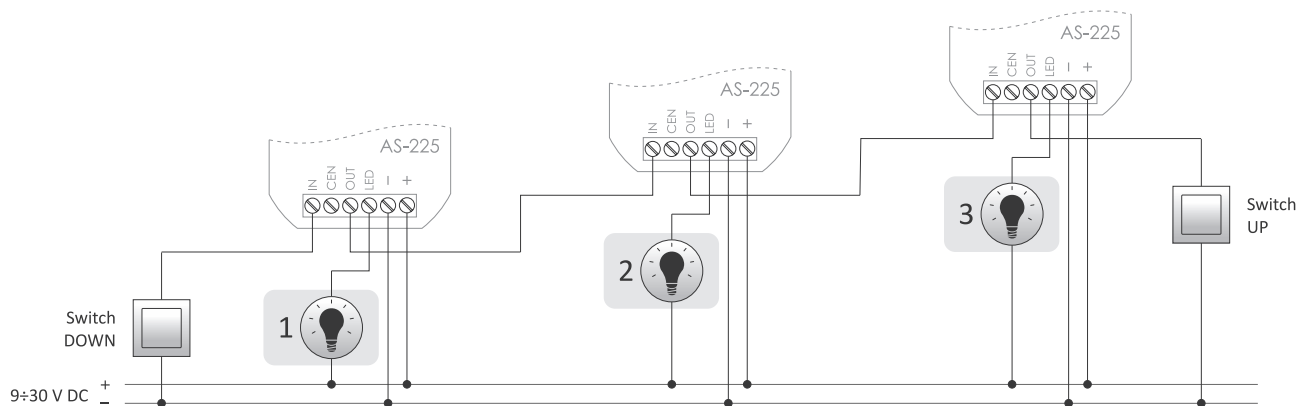
Functions

- 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).

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

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

power supply	195÷253 V AC
maximum load current (AC-1)	16 A
switch-on time lighting (adjustable)	0.5÷10 min.
power limit	200÷1000 VA
operation delay	1.5÷ 2 s
return supply hysteresis	2%
return supply time	30
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)
installation	for TH-35 rail
protection level	IP20

Chapter 3
LED staircase lights

Purpose

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

Operation

LED staircase lights have dimming feature - change of the power supply voltage causes the change of lighting brightness. This feature combined with dedicated automatic control systems such as AS-225 staircase sequential controller (p. 17) or selected F&Wave radio control elements (p. 64) allows you to adjust the brightness and achieve a smooth brightening and dimming effect.

INGA

With dimming feature.

white

satin

anthracite

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

LINA

With dimming feature.

white

satin

anthracite

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

MAYA

With dimming feature.

white

satin

anthracite

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

VIKA

With dimming feature.
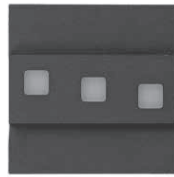
white

satin

anthracite

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

Summary of product symbol designations

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

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

Related devices

AS-225   with sequential switching function

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

More information on p. 17

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. 41

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 bi-directional relays, roller shutter controllers, 230 V LED lighting controllers, F&Wave remote control transmitters, and integrated with F&Home and F&Home Radio smart systems.

Common

GP panels are available in white and black, in the following sizes:
• single (81×81×12 mm), integrated with one control module;
• double (162×81×12 mm), allowing the connection of any two control modules;
• triple (243×81×12 mm), allowing the connection of any three control modules.

Single panels, along with executive modules, are installed in standard ⌀60 mm installation boxes.

Larger panels are installed accordingly: in double and triple installation boxes supplied with the panel.

Double and triple panels are available in both vertical and horizontal versions.

Configuration of the buttons

Panel size

3

Triple panel

2

Double panel

GP3-424-V-W

Panel orientation

H

Horizontal

V

Vertical

Button color

B

Black

W

White
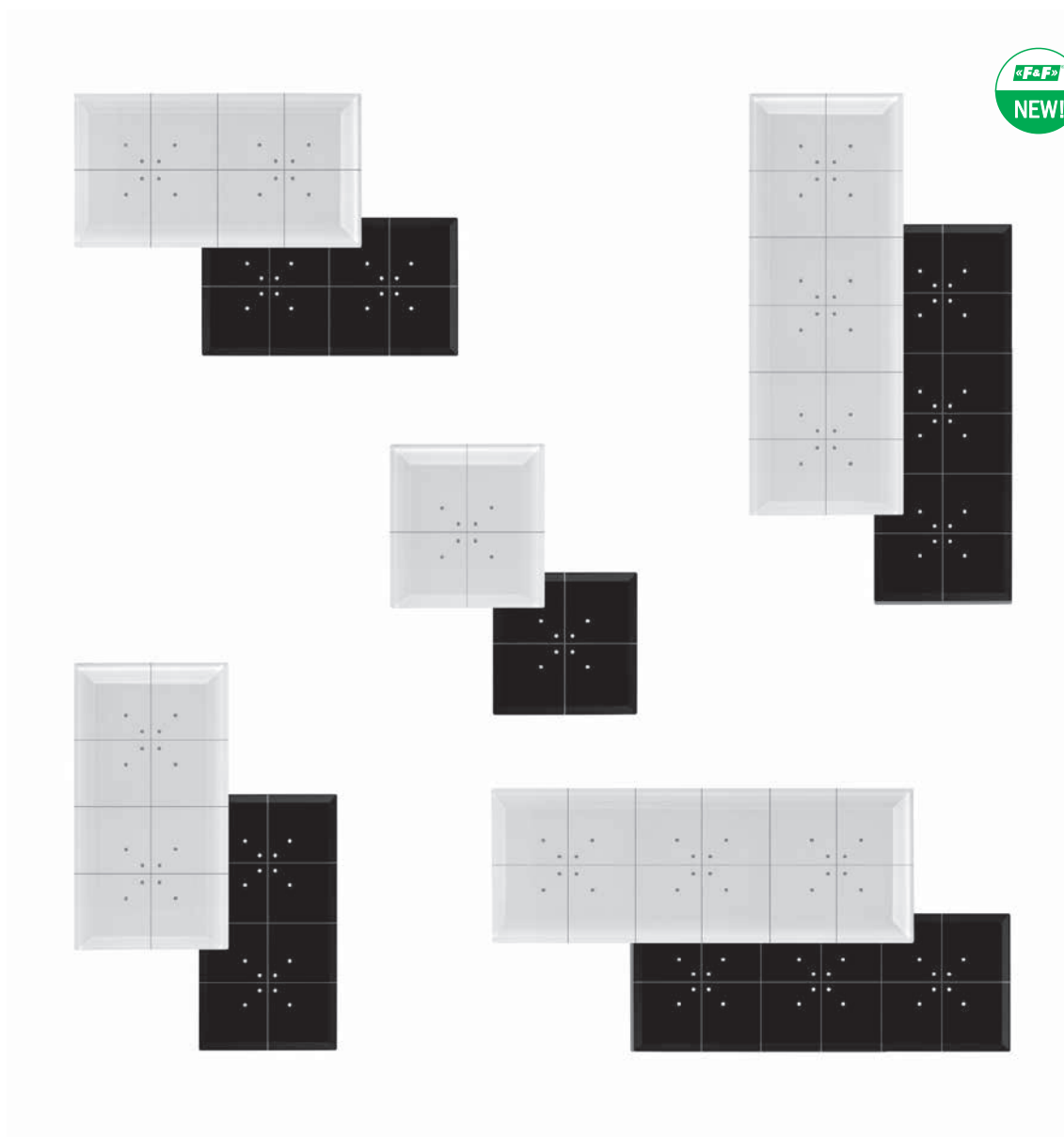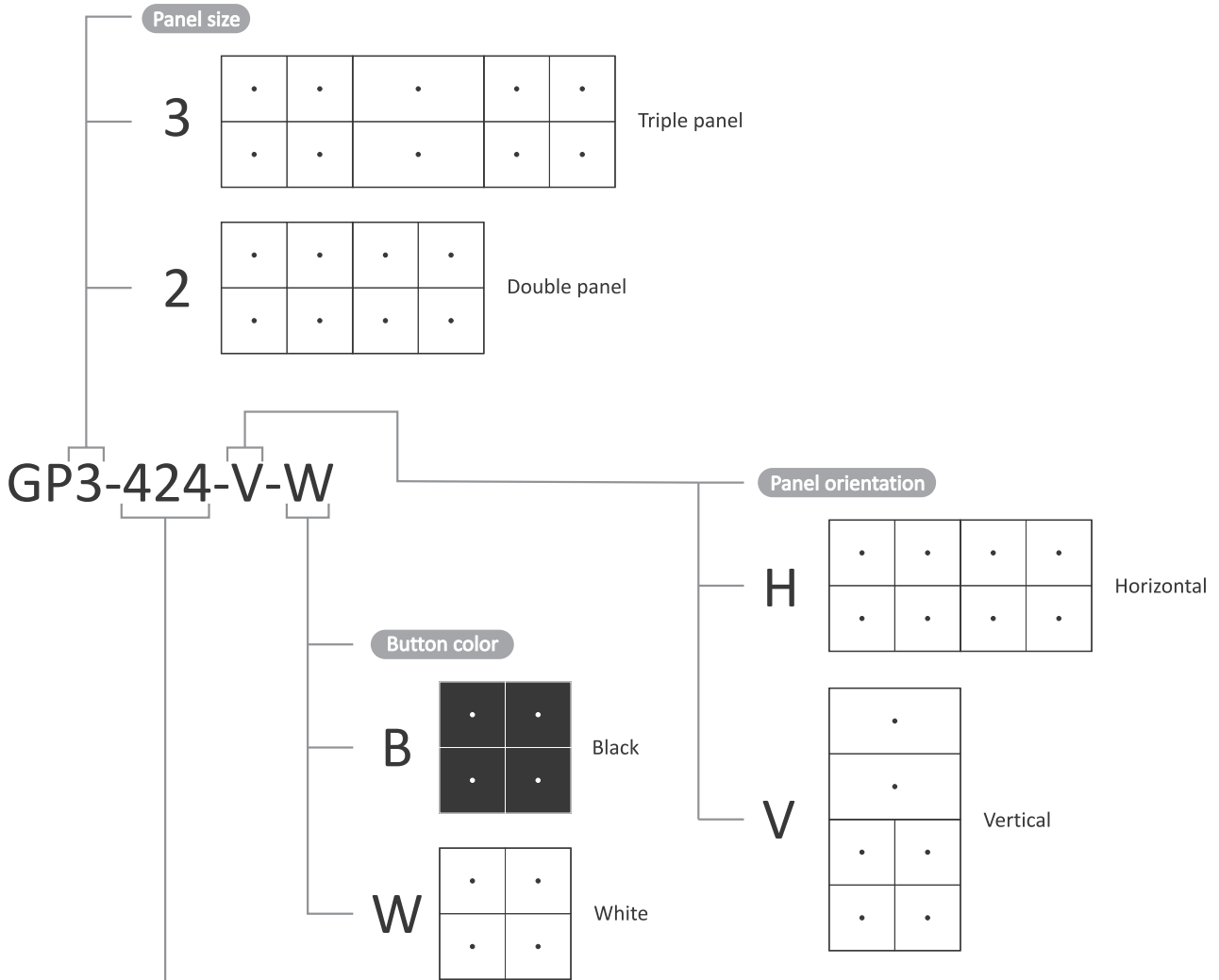
Button organization

One digit describes one button field, which means two digits for double panels (GP2)
and three digits for triple panels (GP3).
List of available combinations on the next page.

2
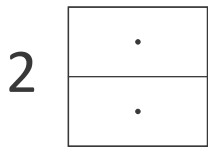
Double button, for actuator controls:
G2S-AC-R – Double bistable relay for high power circuits
GS2-STR-3 – 230 V roller shutter controller

4
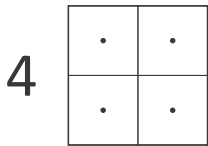
Quadruple button for executive controllers:
GS4-DC – low-voltage home automation controller
GS4-AC-T – quadruple bistable relay for low power circuits
FW-GS-230 – quadruple F&Wave transmitter, 230 V power supply
FW-GS-24 – quadruple F&Wave transmitter, 24 V power supply
rH-S4L4-230 – quadruple F&Home Radio transmitter, 230 V power supply
rH-S4L4-24 – quadruple F&Home Radio transmitter, 24 V power supply

Warning!
The organization of buttons should be adjusted to the actuator controllers that will be connected
to the panel. Executive controllers must be ordered together with the glass panel.

Configuration of the glass panels/buttons

Double glass panels (GP2): horizontal arrangement (left column), vertical arrangement (middle and the right column)

model **22H**

model **24H**

model **42H**

model **44H**

model **22V**

model **44V**

model **24V**

model **42V**
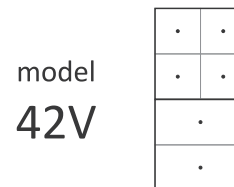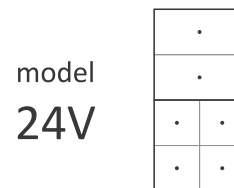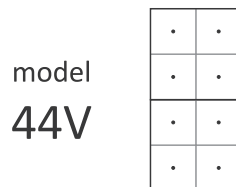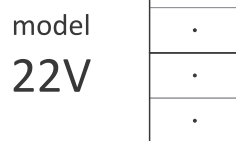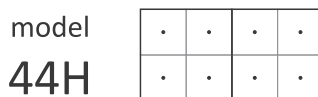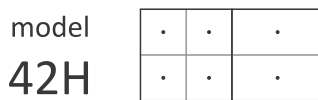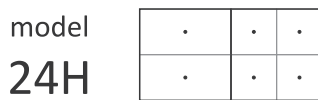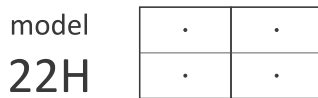
Triple glass panels (GP3): horizontal arrangement (left column), vertical arrangement (middle and the right column)

model **222H**

model **242H**

model **424H**

model **444H**

model **222V**

model **424V**

model **242V**

model **444V**
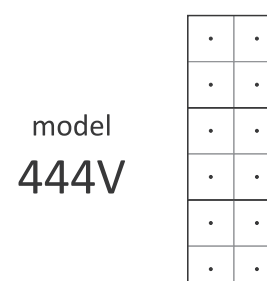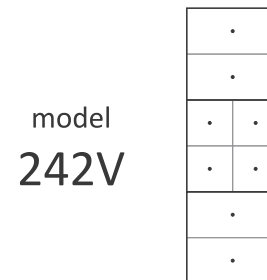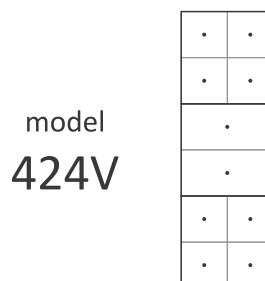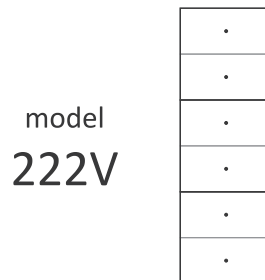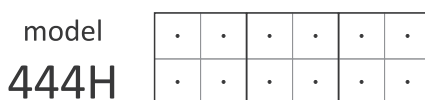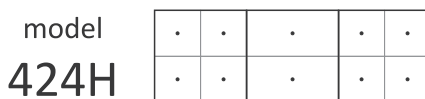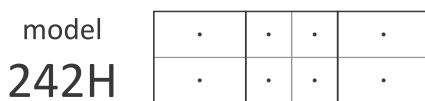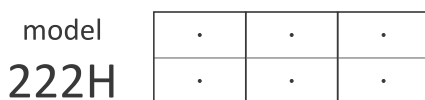
Actuator modules for glass panels

Type	Description	Page
GS4-DC	4-button controller for low-voltage home automation	23
GS2-AC-R	Double bistable relay for 230 V high power circuits	24
GS4-AC-T	Quadruple bistable relay for 230 V low power circuits	24
GS2-STR-3	230 V roller shutter controller	24
FW-GS-230-B/W	F&Wave quadruple radio transmitter, 230 V power supply, black or white	70
FW-GS-24-B/W	F&Wave quadruple radio transmitter, 24 V power supply, black or white	70
rH-S4L4-B/W-230	Quadruple F&Home Radio system connector, 230 V power supply, black or white	60
rH-S4L4-B/W-24	Quadruple F&Home Radio system connector, 24 V power supply, black or white	60

⚠ For double and triple glazing panels, the actuator modules must be ordered separately.
When assembling the order, keep in mind that the number of buttons on the panel and the controllers are must match.

GS4-DC   quadruple glass button for low-voltage home automation

Purpose

Button designed for integration with any home automation system powered with low-voltage DC. For each button, you can independently select operating mode: bistable or monostable and the type of output control signal: voltage or potential-free output (open collector).

NEW!
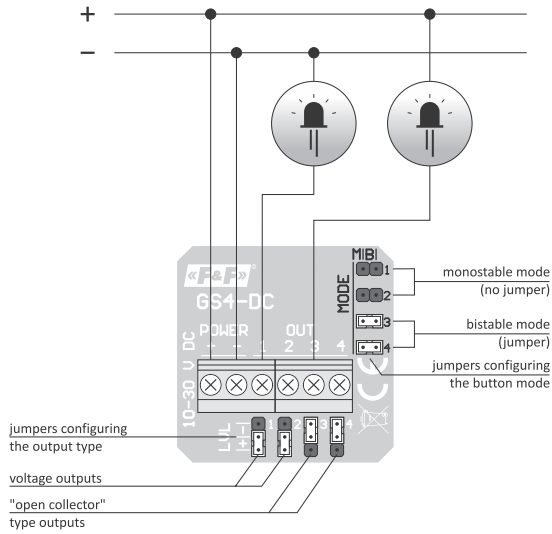
power supply	9÷30 V DC
working mode	monostable or bistable
actuator	transistor
control	
number of channels	4
voltage	as the power supply voltage
potential-free	open collector
load capacity	30 mA/channel
power consumption	
standby	<0.1 W
ON mode	0.5 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	81×81×12 mm
installation	in flush mounted box ø60
protection level	
front	IP50
back	IP20

monostable mode (no jumper)

bistable mode (jumper)

jumpers configuring the button mode

jumpers configuring the output type

voltage outputs

"open collector" type outputs

GS4-DC-B   touch button, black
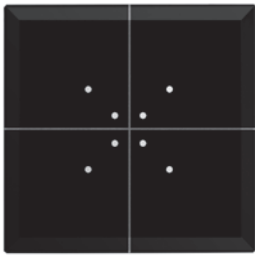
GS4-DC-W   touch button, white

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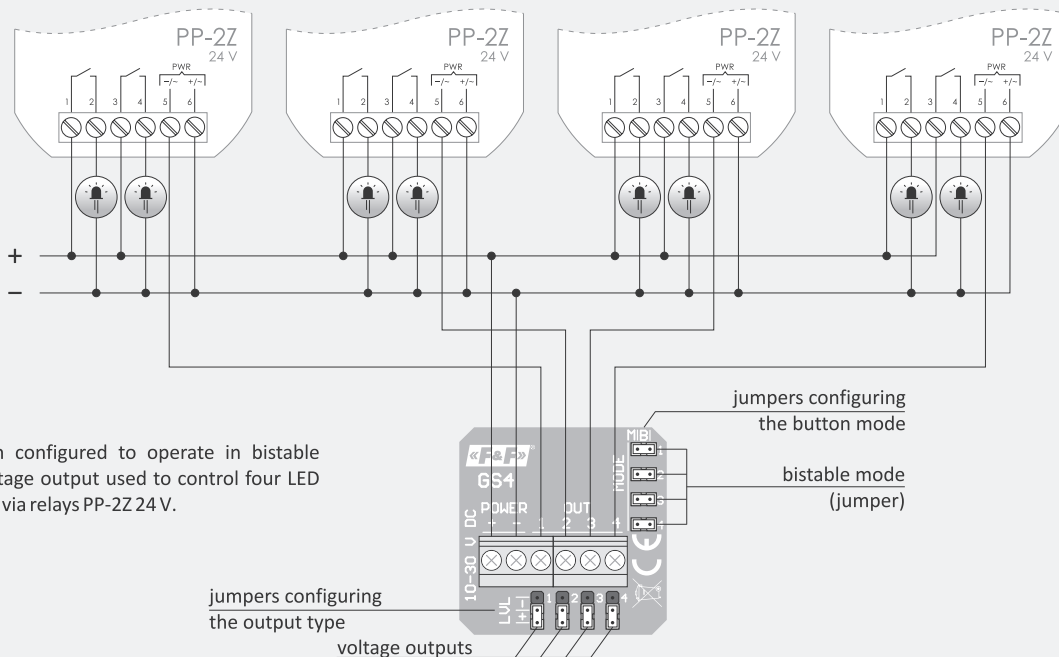
GS-4DC button configured to operate in bistable mode with voltage output used to control four LED lighting circuits via relays PP-2Z 24 V.

jumpers configuring the button mode

bistable mode (jumper)

jumpers configuring the output type

voltage outputs

GS2-AC-R   Two-way glass button integrated with 2-channel bistable relay

Purpose

The GS2-AC-R is a double glass button integrated with a 2-channel bistable relay for direct control of 230 V receivers with loads up to 16 A (AC-1). The buttons perform the following function:
• switch on/switch off channel 1;
• switch on/switch off channel 2;
• switch on everything;
• switch off everything.

NEW!
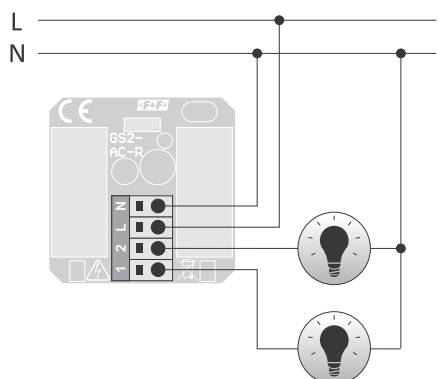
power supply	85÷265 V AC
working mode	bistable
actuator	relay
load capacity (AC-1)	
single channel	16 A/250 V AC
total (2 channels)	20 A/250 V AC
power consumption	
standby	<0.15 W
ON mode	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	81×81×12 mm
installation	in flush mounted box ø60
protection level	
front	IP50
back	IP10

GS4-AC-T   Four-way glass button integrated with 4-channel bistable relay

Purpose

The GS4-AC-T is a quadruple glass button with a built-in 4-channel bistable controller, designed to control low power circuits powered by 230 V AC voltage (such as LED lighting). Each button switches on/off one output channel of the controller. Each button switches on/off one output channel of the controller.

NEW!
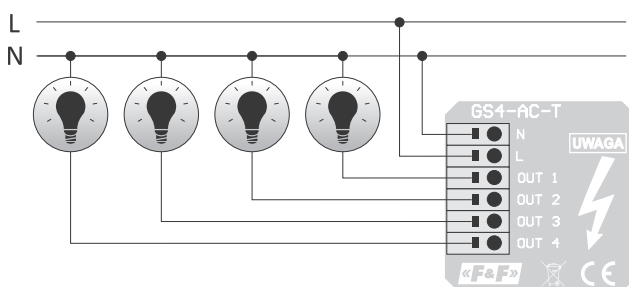
power supply	85÷265 V AC
working mode	bistable
actuator	symistor
load capacity	
single channel	100 W/250 V AC
total (4 channels)	250 W/250 V AC
power consumption	
standby	<0.15 W
ON mode	0.5 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	81×81×12 mm
installation	in flush mounted box ø60
protection level	
front	IP50
back	IP10

GS2-STR3   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.

NEW!
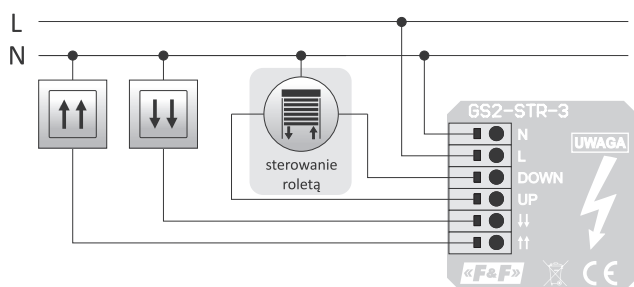
power supply	100÷265 V AC
load capacity	
AC-1	8 A
AC-3	320 W
power consumption	
standby	<0.15 W
ON mode	<0.8 W
control	
local	buttons on the glass housing
central	triggered with N level
switch-on time (adjustable)	1s÷15 min.
working temperature	-25÷50°C
terminal	spring terminals, cable 0.5÷2.5 mm²
dimensions	
external (glass frame)	81×81×12 mm
internal (box)	ø58.5 mm, depth 15 mm
installation	in flush mounted box ø60
protection level	
front	IP50
back	IP20

Touch glass buttons designed for F&Wave system

FW-GS-24-B / FW-GS-230-B
FW-GS-24-W / FW-GS-230-W
4-channel, radio touch button with proximity feature
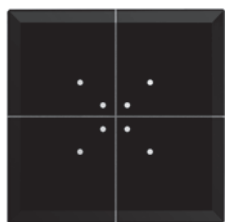
Works with system **F&Wave**

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

More information on p. 70

Glass touch buttons designed for the FHome RADIO system

rH-S4L4-B-24 / rH-S4L4-B-230
rH-S4L4-W-24 / rH-S4L4-W-230
4-channel, radio touch button with proximity feature

«F&F» **NEW!**

Works with system **F&Home RADIO**

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

More information on p. 57

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	Cooperation with backlit buttons	Status memory after power failure	Function "Switch on for a time"	Central control dedicated inputs	Installation	Page
BIS-402	165÷265 V AC	10 A	1×NO/NC	●	–	1	on/off	–	–	–	–	in flush mounted	27
BIS-403	195÷253 V AC	10 A	1×NO	–	–	1	on/off[1]	–	–	●	–	in flush mounted	29
BIS-404	165÷265 V AC	2×8 A	2×NO	–	–	2	gang (light) switch	●	–	–	–	in flush mounted	31
BIS-408	165÷265 V AC	16 A	1×NO	–	–	1	on/off	●	–	–	–	in flush mounted	27
BIS-408i	165÷265 V AC	16 A (160 A/20 ms)	1×NO	–	●	1	on/off	●	–	–	–	in flush mounted	27
BIS-409	165÷265 V AC	2×8 A	2×NO	–	–	2	sequential	●	–	–	–	in flush mounted	32
BIS-410 230 V	165÷265 V AC	16 A	1×NO	–	–	1	on/off[1]	●	–	●	–	in flush mounted	29
BIS-410 24 V	9÷30 V AC/DC	16 A	1×NO	–	–	1	on/off[1]	–	–	●	–	in flush mounted	29
BIS-410i 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	–	●	1	on/off[1]	●	–	●	–	in flush mounted	29
BIS-410i 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off[1]	–	–	●	–	in flush mounted	29
BIS-411 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	on/off	●	–	–	–	for TH-35 rail	28
BIS-411 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	on/off	–	–	–	–	for TH-35 rail	28
BIS-411i 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off	●	–	–	–	for TH-35 rail	28
BIS-411i 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off	–	–	–	–	for TH-35 rail	28
BIS-411M 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	on/off	●	●	–	–	for TH-35 rail	28
BIS-411M 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	on/off	–	●	–	–	for TH-35 rail	28
BIS-411Mi 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off	●	●	–	–	for TH-35 rail	28
BIS-411Mi 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off	–	●	–	–	for TH-35 rail	28
BIS-411 1R1Z 230 V	165÷265 V AC	2×8 A	1×NO, 1×NC	●	–	1	on/off	●	–	–	–	for TH-35 rail	28
BIS-411 1R1Z 24 V	9÷30 V AC/DC	2×8 A	1×NO, 1×NC	●	–	1	on/off	●	–	–	–	for TH-35 rail	28
BIS-411 2Z 230 V	165÷265 V AC	2×8 A	2×NO	●	–	1	on/off	●	–	–	–	for TH-35 rail	28
BIS-411 2Z 24 V	9÷30 V AC/DC	2×8 A	2×NO	●	–	1	on/off	–	–	–	–	for TH-35 rail	28
BIS-412 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	group (hotel)	●	–	–	●	for TH-35 rail	30
BIS-412 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	group (hotel)	–	–	–	●	for TH-35 rail	30
BIS-412i 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	group (hotel)	●	–	–	●	for TH-35 rail	30
BIS-412i 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	group (hotel)	–	–	–	●	for TH-35 rail	30
BIS-412M 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	group (hotel)	●	●	–	●	for TH-35 rail	30
BIS-412M 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	group (hotel)	–	●	–	●	for TH-35 rail	30
BIS-412Mi 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	group (hotel)	●	●	–	●	for TH-35 rail	30
BIS-412Mi 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	group (hotel)	–	●	–	●	for TH-35 rail	30
BIS-412P 230 V	165÷265 V AC	16 A	1×NO	–	–	1	group (hotel)	●	–	–	●	in flush mounted	30
BIS-413 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	on/off[1]	●	–	●	–	for TH-35 rail	29
BIS-413 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	on/off[1]	–	–	●	–	for TH-35 rail	29
BIS-413i 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off[1]	●	–	●	–	for TH-35 rail	29
BIS-413i 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off[1]	–	–	●	–	for TH-35 rail	29
BIS-413M 230 V	165÷265 V AC	16 A	1×NO/NC	●	–	1	on/off[1]	●	●	●	–	for TH-35 rail	29
BIS-413M 24 V	9÷30 V AC/DC	16 A	1×NO/NC	●	–	1	on/off[1]	–	●	●	–	for TH-35 rail	29
BIS-413Mi 230 V	165÷265 V AC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off[1]	●	●	●	–	for TH-35 rail	29
BIS-413Mi 24 V	9÷30 V AC/DC	16 A (160 A/20 ms)	1×NO	●	●	1	on/off[1]	–	●	●	–	for TH-35 rail	29
BIS-414 230 V	165÷265 V AC	2×16 A	2×NO/NC	●	–	2	gang (light) switch	●	–	–	–	for TH-35 rail	31
BIS-414 24 V	9÷30 V AC/DC	2×16 A	2×NO/NC	●	–	2	gang (light) switch	–	–	–	–	for TH-35 rail	31
BIS-414i 230 V	165÷265 V AC	2×16 A (160 A/20 ms)	2×NO	●	●	2	gang (light) switch	●	–	–	–	for TH-35 rail	31
BIS-414i 24 V	9÷30 V AC/DC	2×16 A (160 A/20 ms)	2×NO	●	●	2	gang (light) switch	–	–	–	–	for TH-35 rail	31
BIS-416 230 V	165÷265 V AC	2×8 A	2×NO	–	–	2	on/off	●	–	–	–	in flush mounted	28
BIS-419 230 V	165÷265 V AC	2×16 A	2×NO/NC	●	–	2	sequential	●	–	–	–	for TH-35 rail	32
BIS-419 24 V	9÷30 V AC/DC	2×16 A	2×NO/NC	●	–	2	sequential	–	–	–	–	for TH-35 rail	32
BIS-419i 230 V	165÷265 V AC	2×16 A (160 A/20 ms)	2×NO	●	●	2	sequential	●	–	–	–	for TH-35 rail	32
BIS-419i 24 V	9÷30 V AC/DC	2×16 A (160 A/20 ms)	2×NO	●	●	2	sequential	–	–	–	–	for TH-35 rail	32

Legend:
[1] With timer switch

With the "on/off" feature

The receiver is switched on after a current pulse caused by pressing any momentary (bell) button connected to the relay. After the next pulse, the receiver will be switched off.

The relay does not have a "memory" of the contact position, which means in the event of a power failure and its subsequent return, the relay contact will be set to "off". This prevents the controlled receivers from being switched on automatically without supervision after a prolonged power failure.

BIS-402   for ø60 flush-mounted box
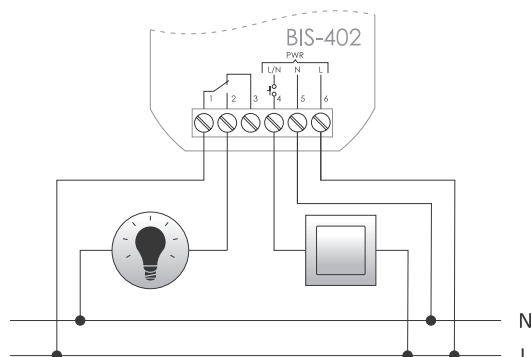
power supply	165÷265 V AC
contact	1×NO/NC
maximum load current (AC-1)	10 A
control pulse current	<1 mA
	triggered with L or N level
operation delay	0.1÷ 0.2 s
power consumption	0.4 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	Ø54 (size 48×43 mm), h= 20 mm
installation	in flush mounted box ø60
protection level	IP20

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

BIS-408 / BIS-408i   for ø60 flush-mounted box
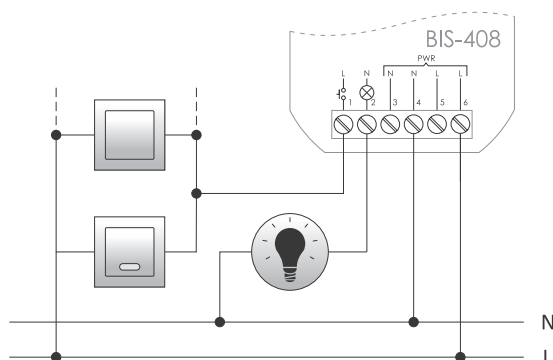
power supply	165÷265 V AC
contact	1×NO
maximum load current (AC-1)	
BIS-408	16 A
BIS-408i	16 A (160 A / 20 ms)
control pulse current	<5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power consumption	
standby	0.15 W
ON mode	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	Ø54 (size 48×43 mm), h= 25 mm
installation	in flush mounted box ø60
protection level	IP20

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

(!) Version with the "i" 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-411 / BIS-411M / BIS-411i / BIS-411Mi / BIS-411 2Z / BIS-411 1R1Z

Example of connection
with control pulse N

BIS-411

BIS-411i

BIS-411 2Z

BIS-411 1R1Z
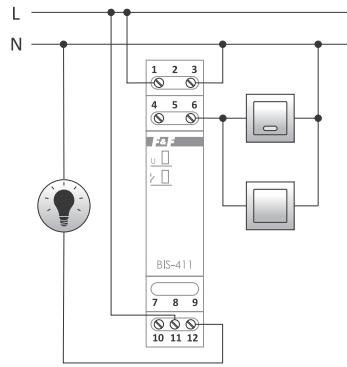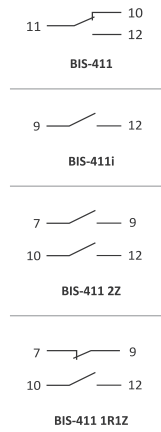
power supply	
BIS-411... 230 V	165÷265 V AC
BIS-411... 24 V	9÷30 V AC/DC
contact/maximum load current (AC-1)	
BIS-411	separated 1×NO/NC / 16 A
BIS-411i	separated 1×NO/16 A (160 A/20 ms)
BIS-411M	separated 1×NO/NC / 16 A
BIS-411Mi	separated 1×NO/16 A (160 A/20 ms)
BIS-411 2Z	separated 2×NO/2×8 A
BIS-411 1R1Z	separated 1×NO, 1×NC/2×8 A
control pulse current	5 mA
operation delay	0.1÷ 0.2 s
power indication	LED green
power operation	LED red
power consumption	
standby	0.15 W
ON mode	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

(!) Version with the "i" 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, for ø60 flush-mounted box

Operation

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

power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8A
control pulse current	<5 mA
operation delay	0.1÷ 0.2 s
power indication	LED green
power consumption	
standby	0.15 W
ON mode	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
installation	in flush mounted box ø60
protection level	IP20

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

Interesting and practical
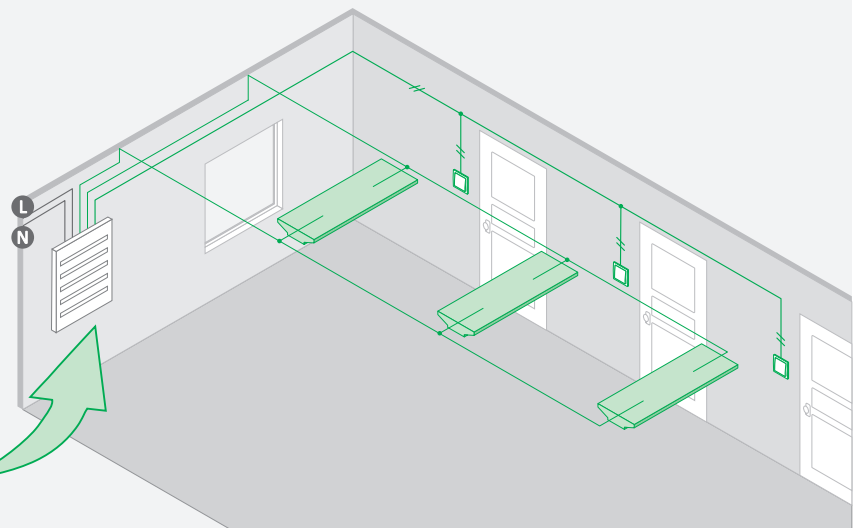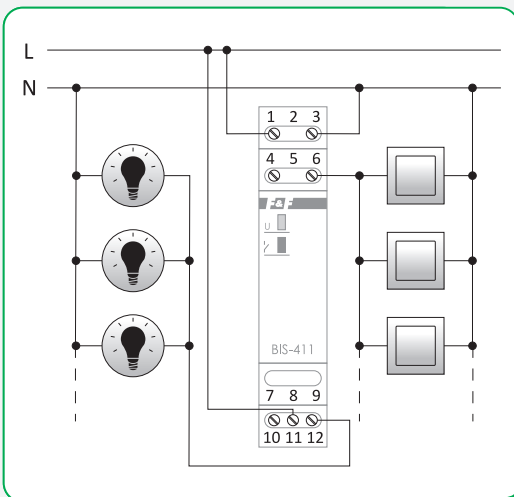
Example of a lighting control system with three points in a corridor

With timer switch

Operation

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   for ø60 flush-mounted box

❶ black   ❷ brown   ❸ red   ❹ blue

power supply	195÷253 V AC
contact	1×NO
maximum load current (AC-1)	10 A
control pulse current	<1 mA
	triggered with L or N level
operation delay	0.1÷0.2 s
power consumption	0.8 W
terminal	4×DY 1 mm², l= 10 cm
working temperature	-25÷50°C
dimensions	ø55, h= 13 mm
installation	in flush mounted box ø60
protection level	IP20

(!) BIS-403 cannot work with backlit buttons.

BIS-410 / BIS-410i   for ø60 flush-mounted box
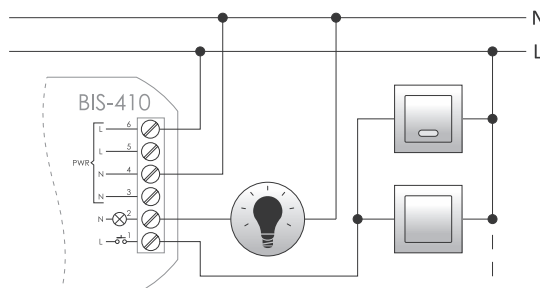
power supply	
BIS-410 230 V	165÷265 V AC
BIS-410 24 V	9÷30 V AC/DC
contact	1×NO
maximum load current (AC-1)	
BIS-410	16 A
BIS-410i	16 A (160 A / 20 ms)
control pulse current	<5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power consumption	
standby	0.15 W
ON mode	0.7 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	ø54 (size 48×43 mm), h= 25 mm
installation	in flush mounted box ø60
protection level	IP20

(!) BIS-410 / BIS-410i can work with backlit buttons with a maximum current of 5 mA.

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

BIS-413 / BIS-413i / BIS-413M / BIS-413Mi

Example of connection with control pulse N

Example of connection with control pulse L
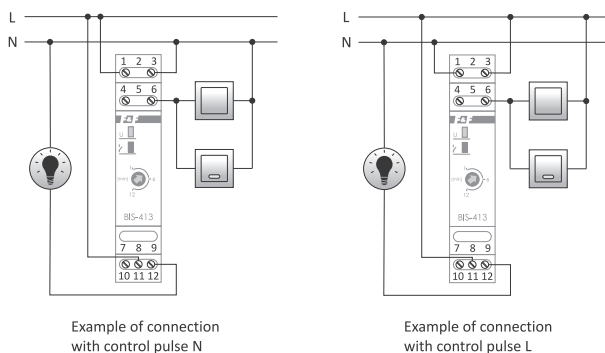
power supply	
BIS-413... 230 V	165÷265 V AC
BIS-413... 24 V	9÷30 V AC/DC
contact	
BIS-413/BIS-413M	1×NO/NC
BIS-413i/BIS-413Mi	1×NO
maximum load current (AC-1)	
BIS-413/BIS-413M	16 A
BIS-413i/BIS-413Mi	16 A (160 A / 20 ms)
control pulse current	<5 mA
	triggered with L or N level
operation delay	0.1÷0.2 s
power indication	LED green
power indication	LED red
power consumption	
standby	0.15 W
ON mode	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

(!) Only relays supplied with 230 V can operate with backlit buttons with maximum current 5 mA.

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

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

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

Purpose

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

BIS-412 / BIS-412i / BIS-412M / BIS-412Mi
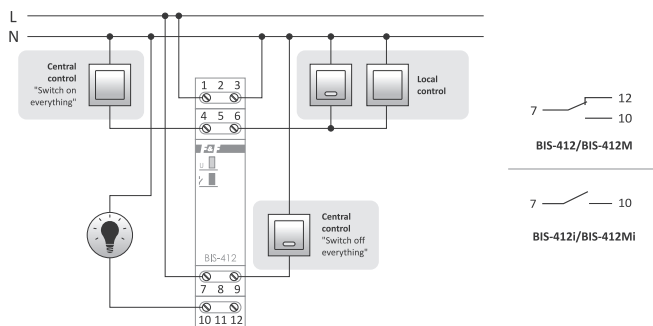
power supply	
BIS-412... 230V	165÷265 V AC
BIS-412... 24V	9÷30 V AC/DC
contact	
BIS-412/BIS-412M	separated 1×NO/NC
BIS-412i/BIS-412Mi	separated 1×NO
maximum load current (AC-1)	
BIS-412/BIS-412M	16 A
BIS-412i/BIS-412Mi	16 A (160 A/20 ms)
control pulse current	≤5 mA
	triggered with L or N level
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power indication	LED red
power consumption	
standby	0.15 W
ON mode	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

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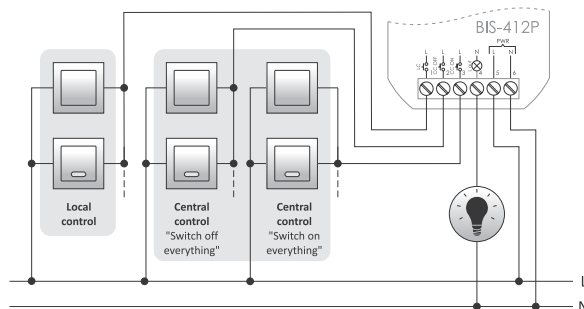
power supply	165÷265 V AC
contact	1×NO
maximum load current (AC-1)	16 A
control pulse current	<1 mA
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power consumption	
standby	0.15 W
ON mode	0.7 W
terminal	2.5 mm² screw terminals
tightening torque	0.4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

Operation

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

• Central control
– switch everything off – after the current impulse caused by pressing the momentary button, all connected relays will be switched off;
– switch everything on – after the current impulse caused by pressing the momentary button, all connected relays will be switched on;

Sequential (gang switch) – single-function

The sequential relay has 2 separate outputs. Each time the button is pressed, the status of the outputs will change according to the operating schedule shown below.
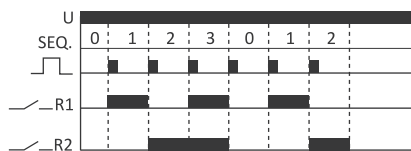
Sequence	Contact position
0	Sections R1 and R2 open
1	Only section R1 closed
2	Only section R2 closed
3	Sections R1 and R2 closed

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

BIS-404 for ø60 flush-mounted box

power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8A
control pulse current	<1 mA
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power consumption standby	0.15 W
ON mode	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
installation	in flush mounted box ø60
protection level	IP20

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

BIS-414 / BIS-414i
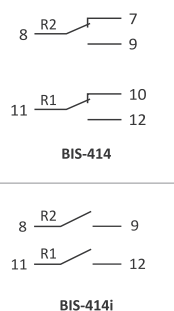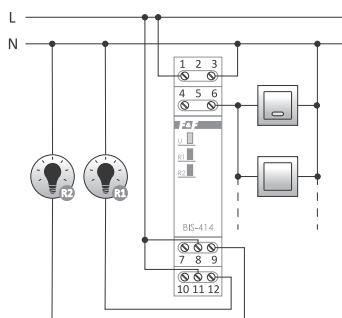
power supply BIS-414… 230 V	165÷265 V AC
BIS-414… 24 V	9÷30 V AC/DC
contact BIS-414	2×NO/NC
BIS-414i	2×NO
maximum load current (AC-1) BIS-414	2×16 A
BIS-414i	2×16 A (160 A/20 ms)
control pulse current	<1 mA
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power indication	2×LED red
power consumption standby	0.15 W
ON mode	0.7 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

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

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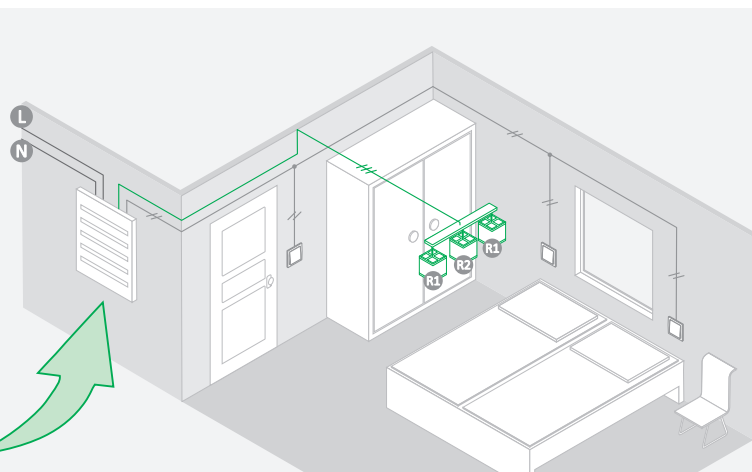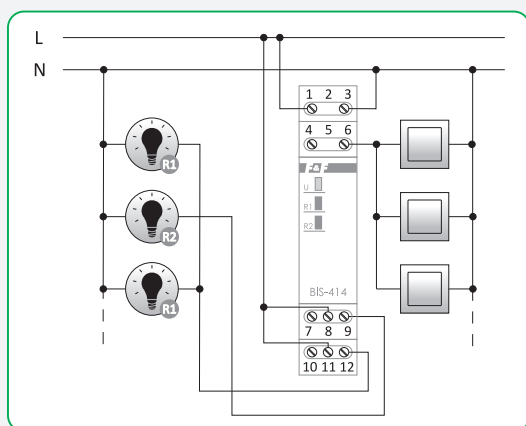
Example of a lighting system for controlling the light intensity by switching on sections R1 and R2 respectively

Sequential (gang switch) – four-function

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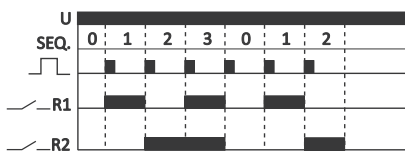
- Subsequent pressings of a button repeat the sequence 0-3.

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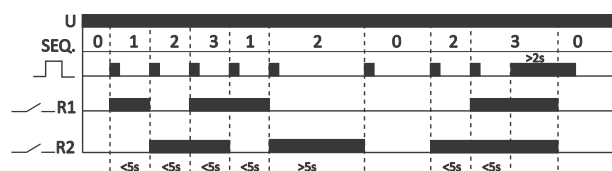
- Pressing the button again in less than 5 seconds repeats sequences 1-3.
- Pressing the button again after more than 5 seconds opens both contacts (sequence 0).
- A long press of the button - in any sequence - opens both contacts (sequence 0).
- After switching off both relays, pressing the button again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

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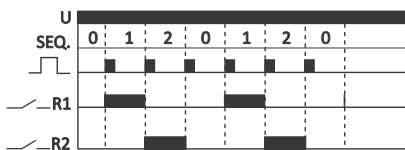
- Subsequent pressings of a button repeat the sequence 0-2.

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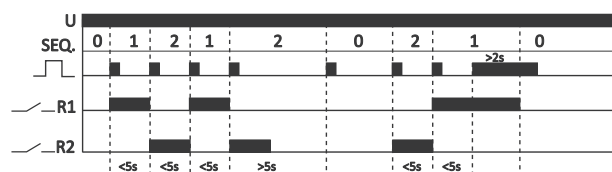
- Pressing the button again in less than 5 seconds repeats sequences 1-2.
- Pressing the button again after more than 5 seconds opens both contacts (sequence 0).
- A long press of the button - in any sequence - opens both contacts (sequence 0).
- After switching off both relays, pressing the button again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

BIS-409   for ø60 flush-mounted box

power supply	165÷265 V AC
contact	2×NO
maximum load current (AC-1)	2×8 A
control pulse current	<1 mA
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power consumption	
standby	0.15 W
ON mode	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
installation	in flush mounted box ø60
protection level	IP20

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

BIS-419 / BIS-419i
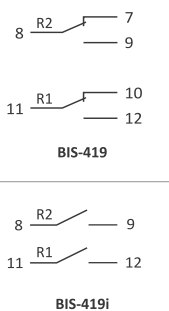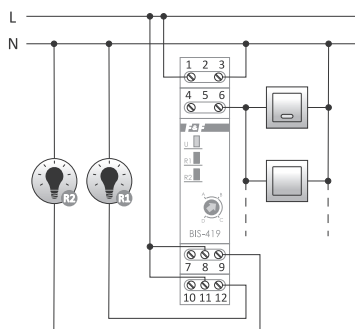
power supply	
BIS-419 230 V	165÷265 V AC
BIS-419 24 V	9÷30 V AC/DC
contact/maximum load current (AC-1)	
BIS-419	separated 2×NO/NC / 2×16 A
BIS-419i	separated 2×NO / 2×16 A (160 A / 20 ms)
control pulse current	<1 mA
total backlight current control buttons	5 mA
operation delay	0.1÷0.2 s
power indication	LED green
power operation	2×LED red
power consumption	
standby	0.15 W
ON mode	0.9 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

(!) Version with the "i" 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

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Purpose

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

Operation

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.

• •
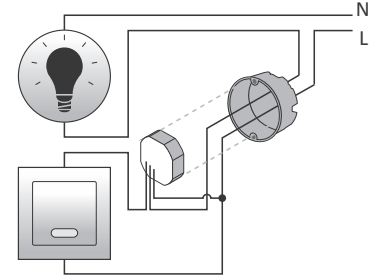
For incandescent and halogen lamps

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

Operation

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

SCO-801   300W   for ø60 flush-mounted box

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
installation	in flush mounted box ø60
protection level	IP20

SCO-811   350W

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)
installation	for TH-35 rail
protection level	IP20

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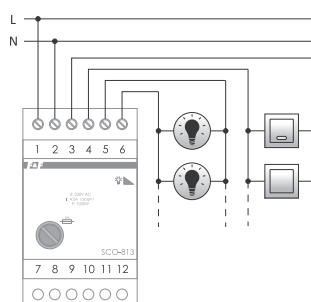
power supply	195÷265 V AC
maximum load current	4.5 A
maximum power connected light bulbs	1000 W
power consumption	0.3 W
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail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

With "memory" of light intensity settings

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

> ⓘ After a dimmer power failure, the first switching on sets the brightness to 100%.

SCO-802 300W for ø60 flush-mounted box

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
installation	in flush mounted box ø60
protection level	IP20

SCO-812 350W

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)
installation	for TH-35 rail
protection level	IP20

SCO-814 1000W
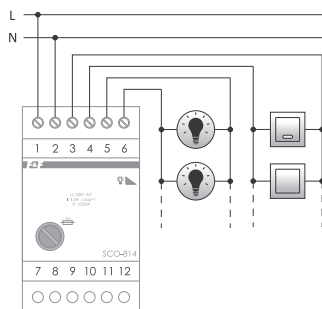
power supply	195÷265 V AC
maximum load current	4.5 A
maximum power connected light bulbs	1000 W
overload protection	fuse
	electronic and safety 6.3 A
power consumption	0.3 W
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
working temperature	-25÷50°C
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
protection level	IP20

Example of a lighting control system from three different points of the room

For 12 V LED lighting

With "memory" of light intensity settings

Operation

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

SCO-803   36W   for ø60 flush-mounted box

① brown
② black
③ red
④ black
⑤ blue
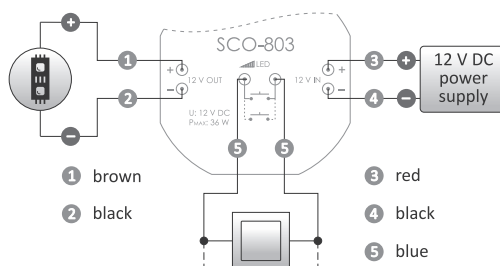
power supply	11÷14 V DC
maximum load current	3 A
maximum power connected light bulbs	36 W
power consumption	0.1 W
terminal	6×LY 0.75 mm², l= 10 cm
working temperature	-25÷50°C
dimensions	Ø55, h= 13 mm
installation	in flush mounted box ø60
protection level	IP20

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

SCO-815   up to 500W
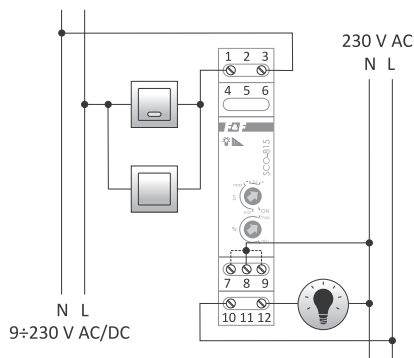
power supply	195÷265 V AC
maximum load current	2 A
maximum power connected light bulbs	
(R)	500 W
(L)	500 W
(C)	500 W
(ESL)	100 W
(LED)	100 W
power supply	9÷230 V AC/DC
power consumption	0.1 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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.

Operation

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

Functions

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

For high power receivers (up to 3500 W)

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

Purpose

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

Operation

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

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

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

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

power supply	195÷265 V AC
maximum load current	16 A
maximum power connected lamps	
incandescent and halogen	3500 W
inductive and capacitive	2300 W
power supply	
SCO-816	165÷265 V AC
SCO-816A	1÷10 V DC or 165÷265 V AC
SCO-816D	none
SCO-816M	none
cooling	built-in fan
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
installation	
protection level	IP20

Load

3500 W - resistive load: incandescent and halogen lamps.

2300 W - inductive and capacitive load: toroidal transformers, adjustable electronic transformers, and dimmable LED and ESL bulbs.
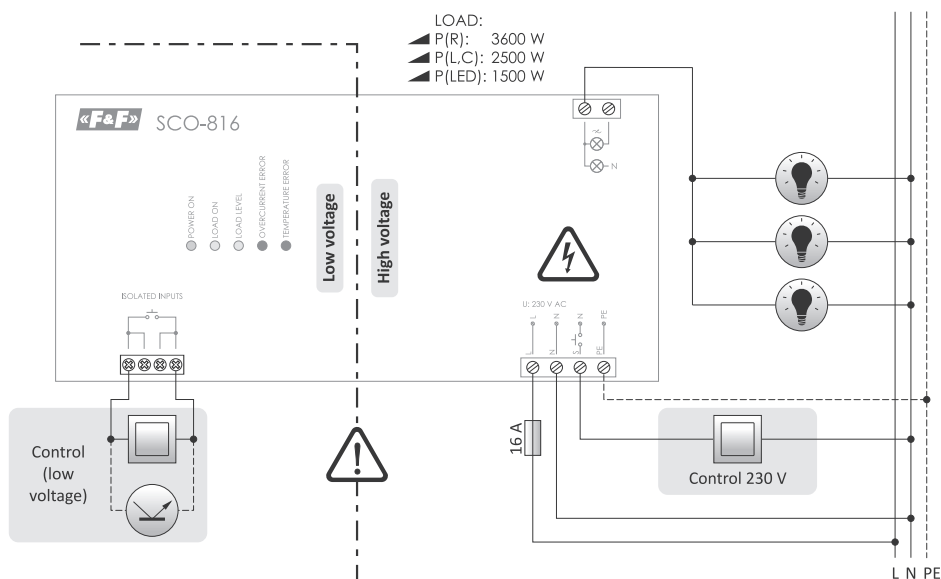
The actual load limit value depends on the ambient temperature.
If the operating temperature exceeds the limit value, the permissible load value is reduced.

Chapter 7
Motion sensors

Purpose

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

PIR (infrared)

Operation

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.
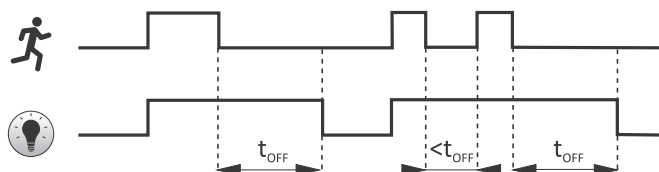
DR-03 white
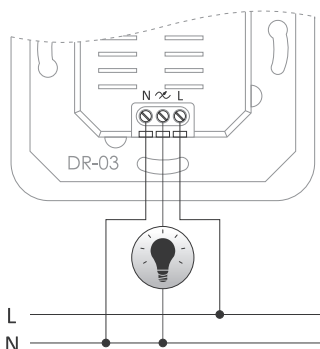
power supply	195÷265 V AC
maximum load current (AC-1)	3 A
twilight activation threshold	3÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	10 s (±3 s)÷7 min. (±2 min.)
horizontal detection field	160°
vertical detection field	45°
maximum radius detection (T<24°C)	9 m
sensor mounting height	1.0÷1.8 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	58mm
installation	surface mounting in flush mounted box ø60
protection level	IP20

DR-04W / DR-04B white/black, hermetically sealed IP65
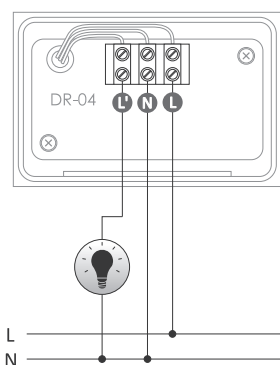
power supply	195÷265 V AC
maximum load current (AC-1)	5 A
twilight activation threshold	3÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	10 s (±3 s)÷15 min. (±2 min.)
horizontal detection field	180°
vertical detection field	45°
maximum radius detection (T<24°C)	12 m
range of head rotation (horizontally)	60°
range of head rotation (vertically)	180°
sensor mounting height	1.8÷2.5 m
power consumption	0.5 W
terminal	1.5 mm² screw terminals
tightening torque	0.3 Nm
working temperature	-20÷40°C
dimensions	
head set horizontally	80×52×120 mm
head set vertically	80×52×95 mm
installation	surface mounting
protection level	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-05B white/black
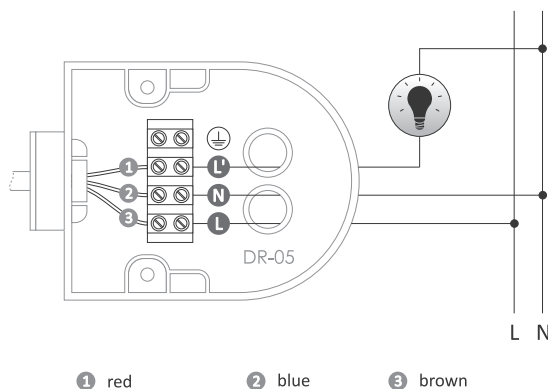
❶ red ❷ blue ❸ brown

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)÷10 min. (±2 min.)
horizontal detection field	180°
vertical detection field	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
installation	surface mounting
protection level	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-06B white/black
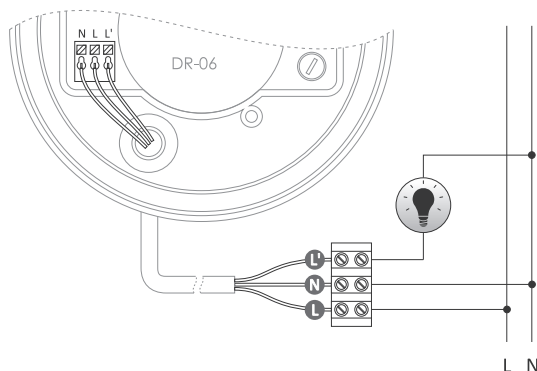
power supply	195÷265 V AC
maximum load current (AC-1)	4 A
twilight activation threshold	10÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷12 min. (±3 min.)
horizontal detection field	360°
maximum radius detection (for h= 2.3÷3.5 m, T<24°C)	5 m
sensor mounting height	2.5÷3.5 m
power consumption	
standby	0.10 W
ON mode	0.45 W
terminal	1.0 mm² screw terminals
tightening torque	0.25 Nm
working temperature	-10÷40°C
dimensions	⌀115 mm, h= 47 mm
installation	surface mounting
protection level	IP40

DR-07 ceiling-mounted
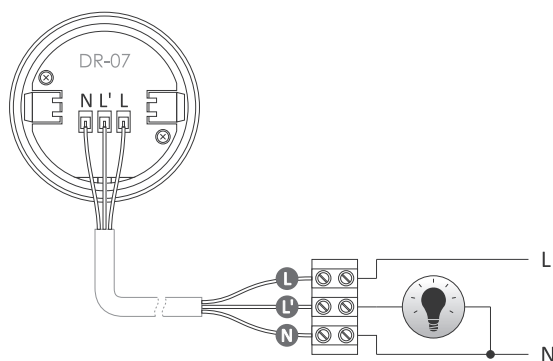
power supply	195÷265 V AC
maximum load current (AC-1)	1.5 A
twilight activation threshold	10÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷9 min. (±2 min.)
horizontal detection field	360°
maximum radius detection (for h= 2.3÷3.5 m, T<24°C)	4 m
sensor mounting height	2.5÷3.5 m
power consumption	
standby	0.10 W
ON mode	0.45 W
terminal	1.0 mm² screw terminals
tightening torque	0.25 Nm
working temperature	-10÷40°C
dimensions	
external	⌀50 mm, h= 52 mm
groove	⌀39 mm, h= 35 mm
mounting hole	⌀40 mm
screw spacing	33 mm
installation	surface mounting
protection level	IP20

DR-08 for ø60 flush-mounted box

power supply	195÷265 V AC
maximum load current (AC-1)	5 A
twilight activation threshold	3÷2000 lx
motion of detection	0.6÷1.5 m/s
switch-off time	3 s÷9 min. (±2 min.)
horizontal detection field	360°
maximum radius detection for (h= 2.3÷3.0 m, T<24°C)	2 m
sensor mounting height	2.5÷3.0 m
power consumption	
standby	0.10 W
ON mode	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
installation	in flush mounted box ø60
protection level	IP20

The DR-08 sensor detection field
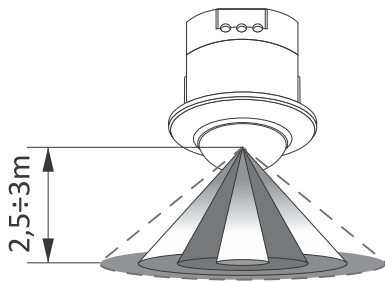
Height of the sensor installation
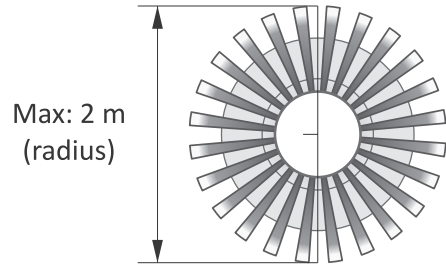
Adjustable range of the detection field

DR-09 ceiling-mounted

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

The DR-09 sensor detection field
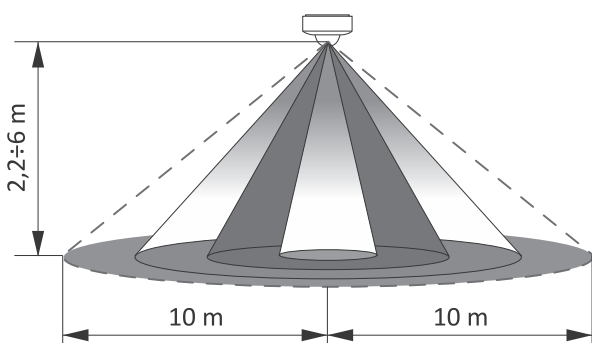
Detection field
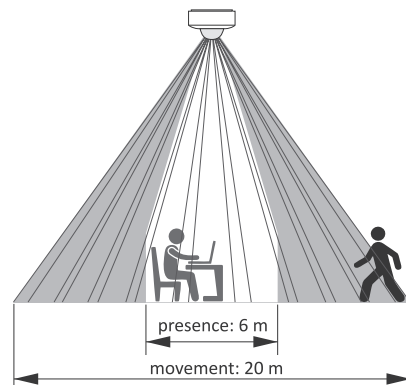
Direction of movement in the detection field

Microwave sensor with occupancy sensor feature

Operation

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

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

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

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

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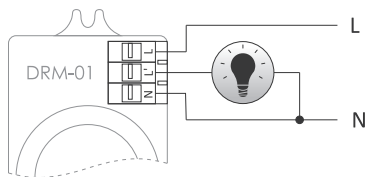
power supply	
DRM-01	195÷265 V AC
DRM-01 24 V	21÷27 V AC
maximum load current (AC-1)	5 A
frequency of microwaves radiation	5.8 GHz
radiation power	10 mW
detection field	360°
detection radius (adjustable) for h= 2.5 m	1÷10 m
twilight activation (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)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

DRM-02   ceiling-mounted

power supply	195÷265 V AC
maximum load current (AC-1)	5 A
frequency of microwaves radiation	5.8 GHz
radiation power	10 mW
detection field	360°
detection radius (adjustable) for h= 2.5 m	1÷10 m
twilight activation (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)	5 s÷12 min.
operation delay	1 s
power consumption	0.9 W
terminal	1.0 mm² screw terminals
tightening torque	0.25 Nm
working temperature	-25÷50°C
dimensions	Ø103 mm; h= 44 mm
installation	surface mounting
mounting height	2÷6 m
protection level	IP40

(!) The DRM-02 sensor can work with LED lamps.

DRM-07   for ø60 flush-mounted box
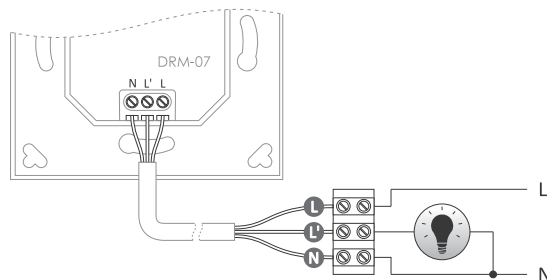
power supply	195÷265 V AC
maximum load current (AC-1)	6 A
frequency of microwaves radiation	5.8 GHz
radiation power	0.2 mW
motion of detection	0.6÷1.5 m/s
detection field	180°
maximum radius detection (adjustable) for h= 1÷1.8 m	0.5÷50 m
twilight activation (adjustable)	3÷2000 lx
switch-on time of receiver (adjustable)	10 s(±3s)÷12 s(±1 min.)
operation delay	<1 s
power consumption	0.9 W
terminal	1.0 mm² screw terminals
tightening torque	0.25 Nm
working temperature	-25÷50°C
dimensions	
external	80×80×48 mm
groove	Ø55 mm, h= 33 mm
mounting hole	Ø60 mm
screw spacing	58mm
installation	in flush mounted box ø60
mounting height	1.0÷1.8 m
protection level	IP20

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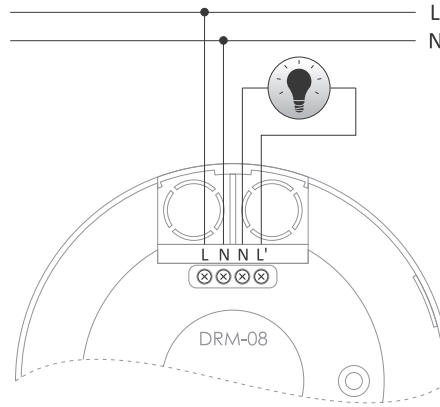
power supply	195÷265 V AC
maximum load current (AC-1)	10 A
frequency of microwaves radiation	5.8 GHz
radiation power	10 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
maximum radius detection (adjustable) for h= 2.5 m	1÷8 m
twilight activation (adjustable)	3÷2000 lx
switch-on time of receiver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

Laser sensors

DRL-12 with a distance sensor

Operation

The DRL-12 is a laser distance sensor that detects obstacles in the range of zero to two meters. Thanks to the low dispersion angle of the beam and precise detection range adjustment, it is ideal for switching on lighting circuits for example in open staircases, where it is important that the sensor detects presence only on stairs and ignores everything that happens outside them.

power supply	9÷27 V DC
maximum load current (AC-1)	4 A
detection range (adjustable)	0.1÷2.0 m
brightness level (adjustable)	2÷500 lx
switch-on time (adjustable)	0÷10 min.
detection	
sensor	laser sensor ToF
wavelength	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)	Ø 32, depth= 30 mm
mounting	in flush mounted box ø40
protection level	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*;
- Ability to trigger AS-225 cascade controllers;
- Compact size; can be mounted in a ø40mm box supplied with the sensor;
- LED indicating the operating status of the sensor.
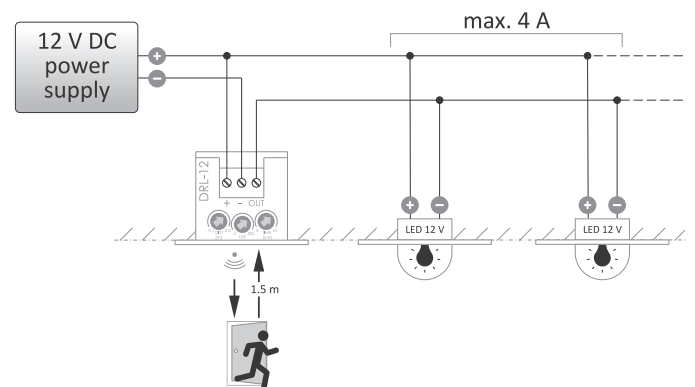
* In combination with dimmable LED lamps, for example with F&F staircase light fittings.

Ceiling lights with built-in microwave motion sensor

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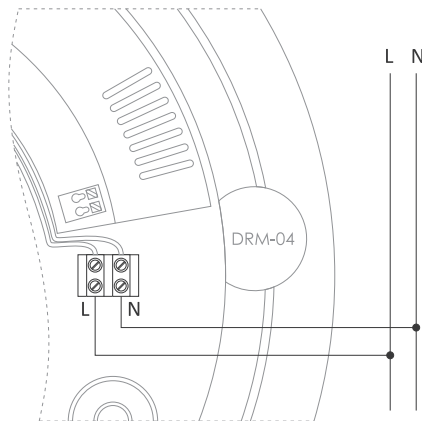
power supply	195÷265 V AC
lighting	
power	15 W
luminous flux	1030 lm
color	6000 K
frequency of microwaves radiation	5.8 GHz
motion sensors	
radiation power	10 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
detection radius (adjustable) for h= 2.5 m	1÷8 m
twilight activation (adjustable)	2÷2000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

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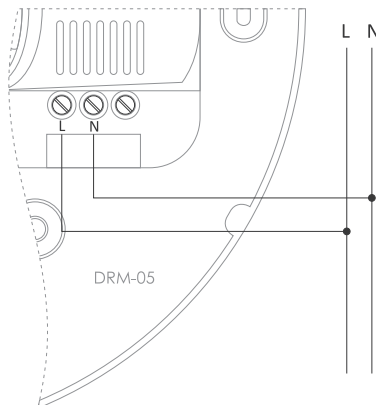
power supply	195÷265 V AC
maximum load current (AC-1)	0.1 A
frequency of microwaves radiation	5.8 GHz
radiation power	0.3 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
detection range (adjustable)	3÷9 m
twilight activation (adjustable)	2÷2000 lx
switch-on time of receiver (adjustable)	8 s÷12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

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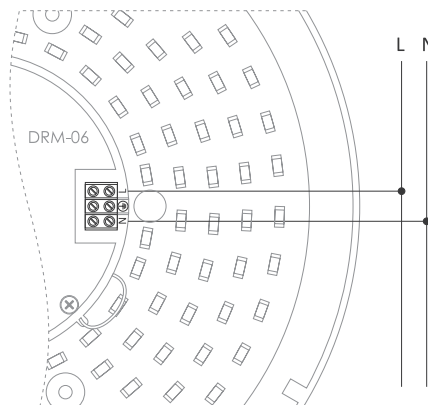
power supply	195÷265 V AC
lighting	
power	10 W
luminous flux	970 lm
color	6000 K
frequency of microwaves radiation	5.8 GHz
motion sensors	
radiation power	0.2 mW
motion of detection	0.6÷1.5 m/s
detection field	360°
detection range (adjustable)	1÷8 m
twilight activation (adjustable)	2÷2000 lx
switch-on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

Chapter 8

Lighting controllers

DC power supply (Power LED Driver)

PLD-01 350 / PLD-01 750

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. 35) as a brightness controller.
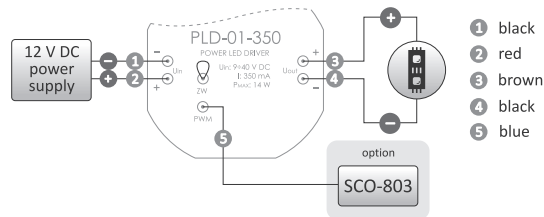
input voltage IN	5÷40 V DC
maximum current output stabilized	
PLD-01 350 for LED 1 W	350 mA
PLD-01 750 for LED 3 W	750 mA
LED power connected (Uin= 40 V)	
PLD-01 350 for LED 1 W	14 W
PLD-01 750 for LED 3 W	30 W
power consumption	0.1 W
terminal	5×LY 0.75 mm², l= 10 cm
working temperature	-20÷50°C
dimensions	ø55, h= 16 mm
installation	in flush mounted box ø60
protection level	IP20

1 black
2 red
3 brown
4 black
5 blue

Current surge arrester

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.

Operation

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
contact	1×NO
maximum load current (AC-1)	8 A
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)
installation	for TH-35 rail
protection level	IP20

MST-02

input voltage IN	195÷253 V AC
output voltage OUT	UOUT=UIN
contact	1×NO
maximum load current (AC-1)	8 A
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
installation	surface mounting
protection level	IP20

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
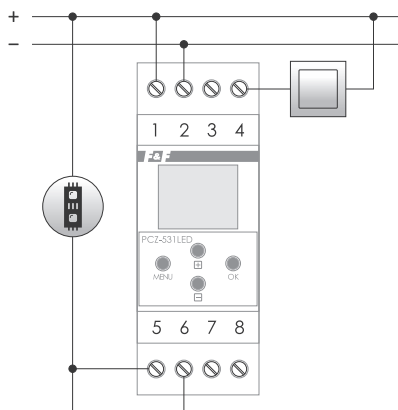
power supply	9÷30 V DC
output	open collector OC
maximum load current	8 A/50 V DC
input	potential-free (triggered with 0 V)
backup time clock operation	6 years*
battery type	2032 (lithium)
display maintenance	none
accuracy of the clock	1 s
time error	±1 s/24 h
time program setting accuracy	1 min.
program 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)
installation	for TH-35 rail
protection level	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
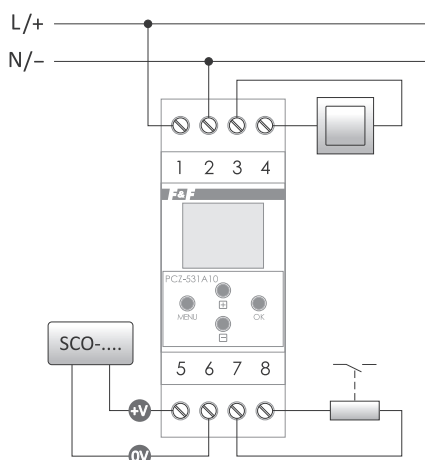
power supply	85÷265 V AC/DC
analog output	1÷10 V/30 mA
auxiliary contact	separated 1×NO
maximum load of the auxiliary contact	6 A/250 V AC
input	potential-free (short-circuit 3-4)
backup time clock operation	6 years*
battery type	2032 (lithium)
display maintenance	none
accuracy of the clock	1 s
time 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)
installation	for TH-35 rail
protection level	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
installation	for TH-35 rail
dimensions	1 module (18 mm)
protection level	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
installation	in flush mounted box ø60
dimensions	48×43×20 mm
protection level	IP20

Interesting and practical

max. 4 A

12 V DC power supply

DRL-12

1.5 m

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

LED-AMP-1P

12 V DC power supply

max. 16 A

LED 12 V

LED 12 V

LED 12 V

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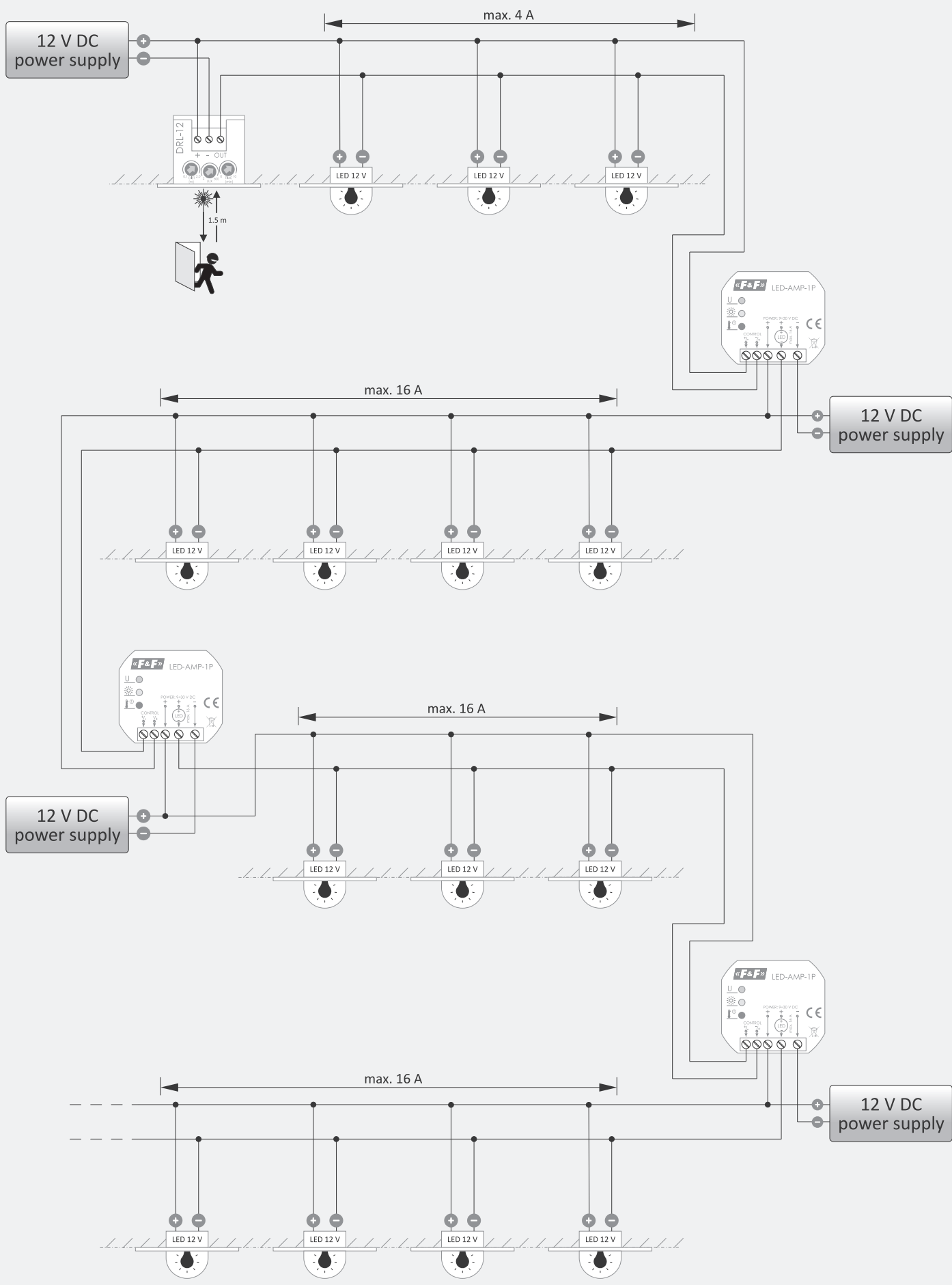
Use of LED-AMP amplifiers to increase the number of controlled lamps

Section **II**

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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.
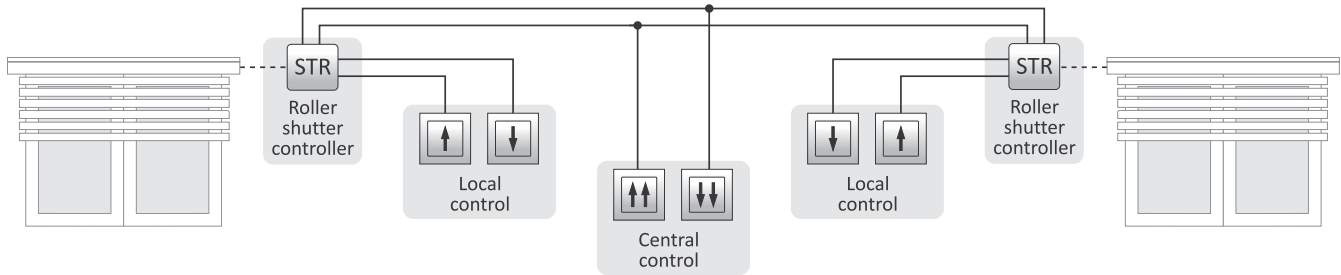
Operation

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-STR3 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.

Operation

• **Local control**

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

Two local buttons

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

One local button

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

• **Central control**

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

STR-3P for 230 V AC motors

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

PE N L

STR-3P

Local control

Central control

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

power supply	100÷265 V AC
load capacity (AC-1/AC-3)	8 A/1.5 A
power consumption	
standby	<0.15 W
ON mode	<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
installation	in flush mounted box ø60
protection level	IP20

STR-4P for 12/24 V DC motors

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

+ −

STR-4P

Local control

Central control

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

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

power supply	10÷27 V DC
load capacity	6 A
power consumption	
standby	<0.15 W
ON mode	<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
installation	in flush mounted box ø60
protection level	IP20

STR-3D for 230 V AC motors

L
N
PE

1 2 3
4 5 6

PROG.

STR-3D

7 8 9
10 11 12

Cables from the switchgear to central control: 3

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

Central control

Local control

power supply	100÷265 V AC
load capacity (AC-1/AC-3)	8 A/1.5 A
power consumption	
standby	<0.15 W
ON mode	<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)
installation	for TH-35 rail
protection level	IP20

STR-4D for 12/24 V DC motors

switchgear +
−

1 2 3
4 5 6

PROG

STR-4D

7 8 9
10 11 12

Cables from the switchgear to central control: 3

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

Central control

Local control

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

power supply	10÷27 V DC
load capacity	6 A
power consumption	
standby	<0.15 W
ON mode	<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)
installation	for TH-35 rail
protection level	IP20

GS2-STR3 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 mode	<0.8 W
control	
local	buttons on the glass housing
central	triggered with N level
switch-on time (adjustable)	1s÷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
installation	in flush mounted box ø60
protection level	
front	IP50
back	IP20

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 mode	<0.6 W
working temperature	-15÷50°C
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
dimensions	67×50×26 mm
installation	surface mounting
protection level	IP20

wind sensor

dimensions	ø80, h= 85 mm
cable	2× 0.25 mm², l= 5 m
installation	flat bar (L-profile) 150×70×3 mm
protection level	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.

① green　② white　③ brown

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

precipitation sensor

dimensions	55×50×13 mm
cable	3×0.25 mm², l= 5 m
installation	screw hole ø3/adhesive tape
protection level	IP65

STR-S   shock sensor

The STR-S controller along with an external acceleration probe is designed to monitor shocks of the awnings, etc. If the awning starts to move in the wind and the acceleration exceeds the preset threshold value, the internal relay is switched on, which in result will close the window shutters or the roll up the awnings.

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

shock probe

dimensions	15×40×8 mm
cable	3×0.25 mm², l= 5 m
installation	tie-wraps/adhesive tape
protection level	IP65

① green   **②** white   **③** brown

to central control

N
L

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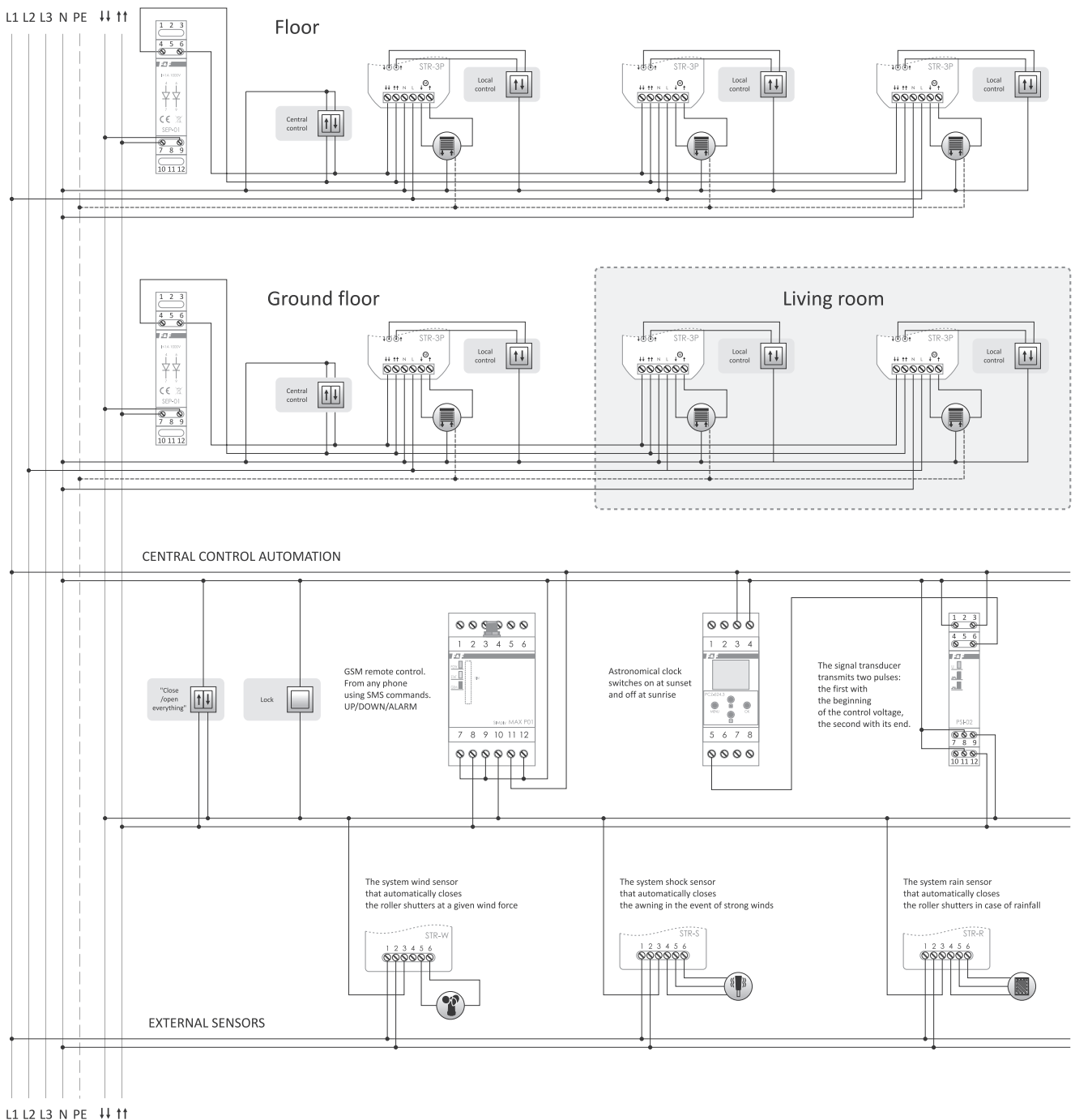
Two-button: 2 local control buttons "Up" and "Down"

Operation

• **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

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
installation	in flush mounted box Ø60
protection level	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
installation	surface mounting
protection level	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)
installation	for TH-35 rail
protection level	IP20

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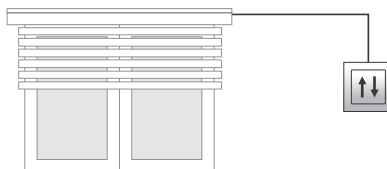
Operation

• **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

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
installation	in flush mounted box ø60
protection level	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
installation	surface mounting
protection level	IP20

STR-422

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

The standard of the future in your home

Purpose

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

System characteristics

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

Central unit

The central element of the system is a computer with a 12" touch panel. It is mounted outside the switchboard in the wall using a steel mounting casing. The computer is powered from 230 V mains and requires a separate connection with the main switchgear. The module communicates with the system via the CAN bus. It is possible to set the color of the screen menu and upload your own favourite graphics and photos as screen savers.

Functions

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

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

Graphical interface - user menu

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

Example of a user interface on a control panel

GSM and Wi-Fi remote

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

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

Switchgear, accessories and

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

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

Installation cost and savings

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

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

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

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

System installation

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

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

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

Elements of the system

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

www.fhome.pl

Chapter 11
Smart home radio system

F&Home
R A D I O

The standard of the future in our home

System characteristics

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

System architecture

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

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

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

Advantages of the wireless system

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

Internet

LAN

Cloud

Wi-Fi

Router

Wi-Fi

PC/Laptop

GPRS/3G

Server

SMS

Tablet

Phone

Smartphone

868 MHz

868 MHz

Signal amplifier

F&Home RADIO sensors and actors

F&Home RADIO sensors and actors
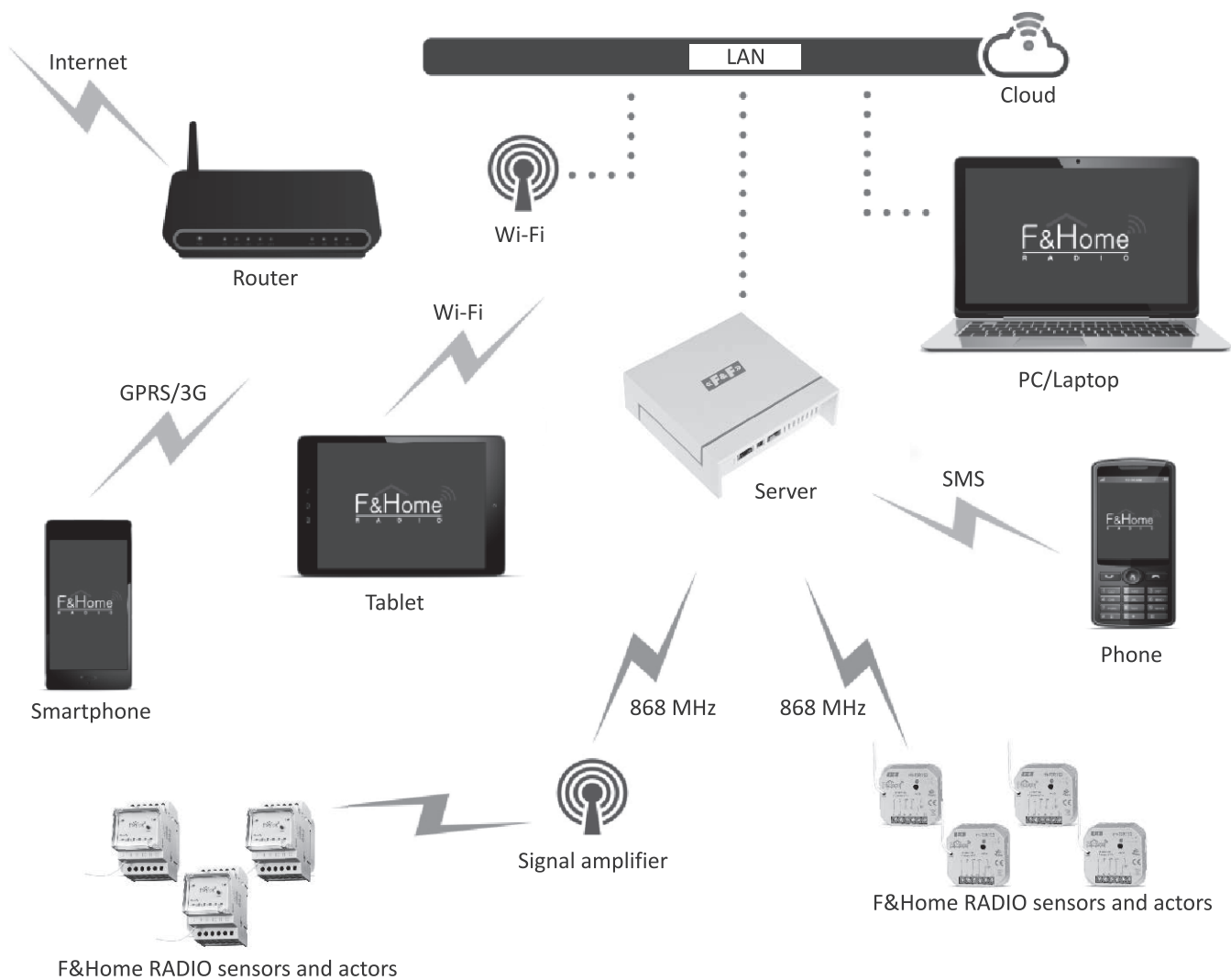
System features

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

Autonomous work

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

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

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

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

Configuration tools for installers

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

Other advantages of such a solution include:

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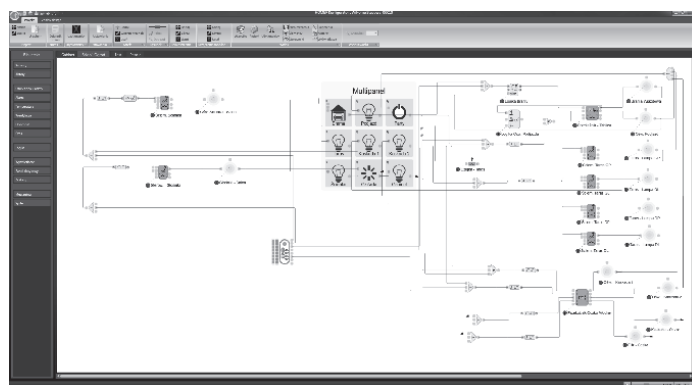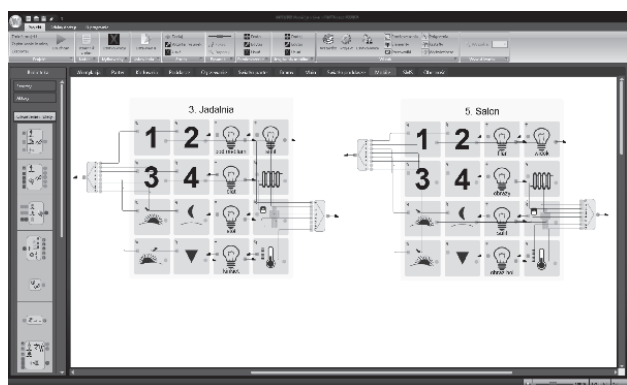
Example of system functionality for selected installations

Lighting:

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

Heating, air conditioning, ventilation:

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

Elements of the system

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

Glass touch buttons designed for the FHome RADIO system

rH-S4L4-B-24 / rH-S4L4-B-230
touch button, black

rH-S4L4-W-24 / rH-S4L4-W-230
touch button, white

«F&F»
NEW!

power supply	
rH-S4L4-B-24/rH-S4L4-W-24	9÷30 V DC
rH-S4L4-B-230/rH-S4L4-W-230	85÷265 V AC
power consumption	
standby	0.25 W
ON mode	0.6 W
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	81×81×12 mm
installation	in flush mounted box ⌀60
protection level	
front	IP50
back	IP10

Chapter 12
Smart Home for developers

Purpose

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

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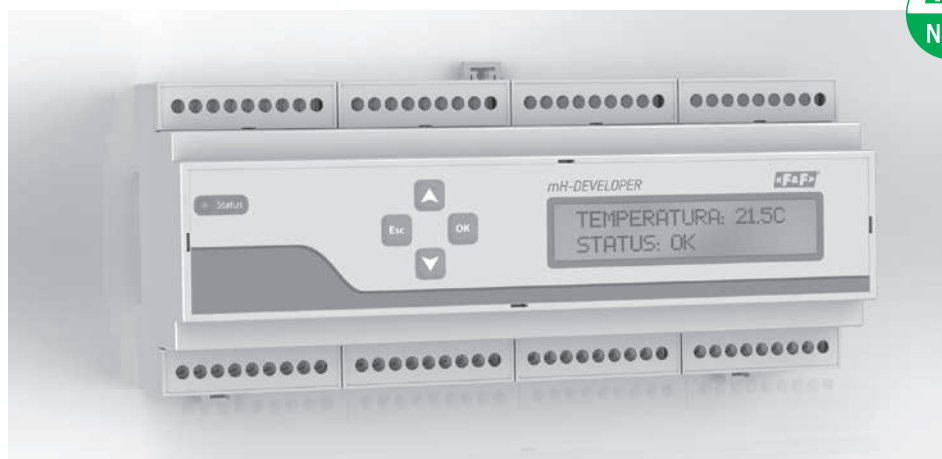
Functions

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

Module extensions

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

Program functionalities

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

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

Application

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

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

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

It is possible to prepare an individual graphic design of the application for a specific investment. The name of the application, logo, and colors may be changed.
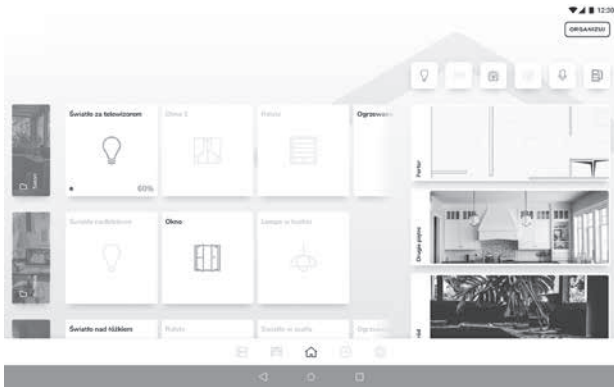
Mobile application: management of devices
in individual rooms
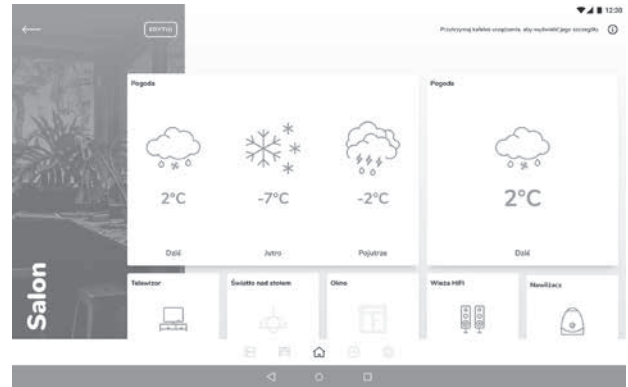
Mobile application: Weather forecast

Mobile application: heating management
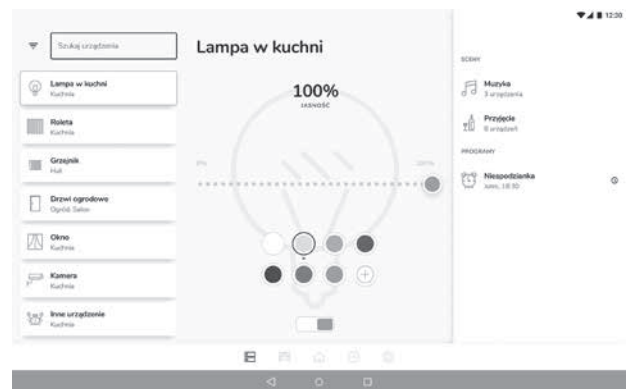
Mobile application: lighting management

Section III

Remote control

Chapter 13
F&Wave – radio control system

F&Wa☊e

Purpose

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

System features

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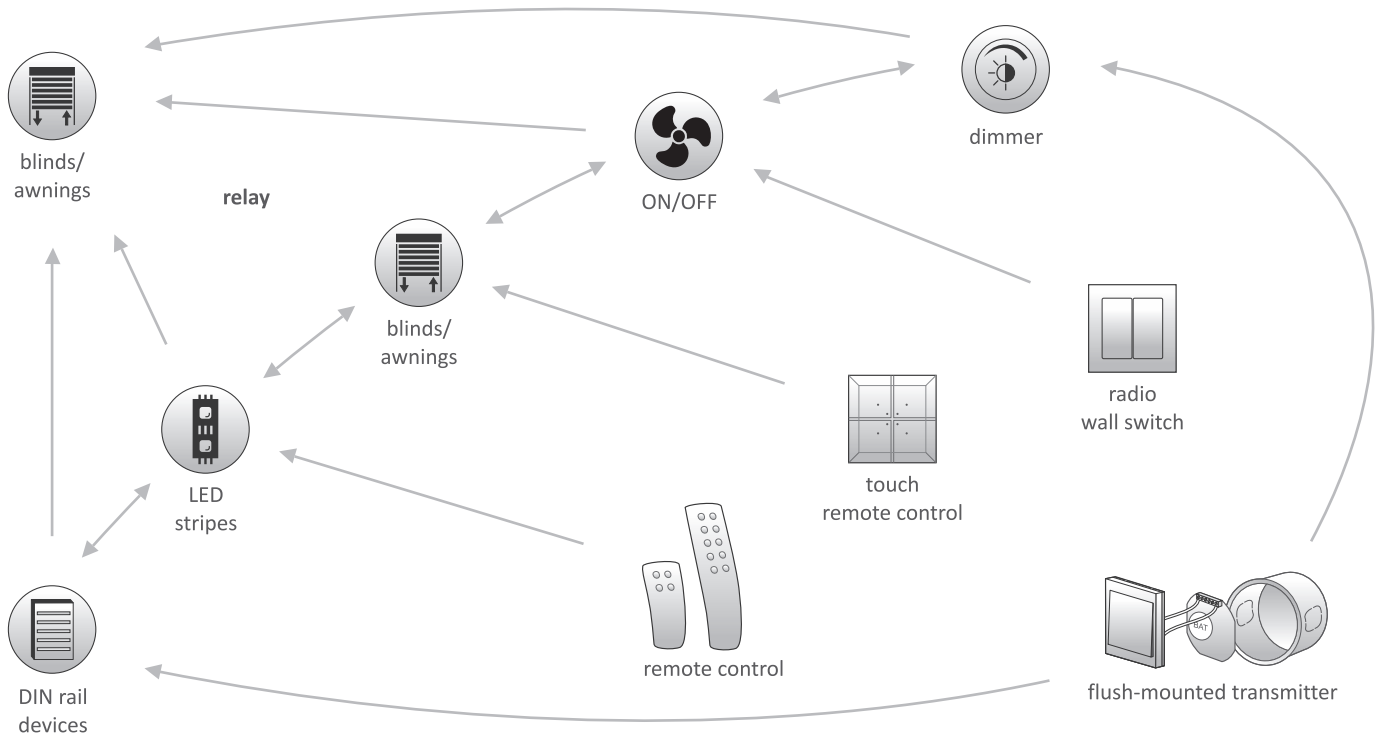
ON/OFF relays

Purpose

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

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

FW-R1P   single bistable relay

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

power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
ON mode	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
installation	in flush mounted box ø60
protection level	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 mode	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
installation	in flush mounted box ø60
protection level	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 mode	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)
installation	for TH-35 rail
protection level	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 mode	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)
installation	for TH-35 rail
protection level	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 mode (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
installation	in flush mounted box ø60
protection level	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 mode (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
installation	in flush mounted box ø60
protection level	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 mode (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)
installation	for TH-35 rail
protection level	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 mode (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)
installation	for TH-35 rail
protection level	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).
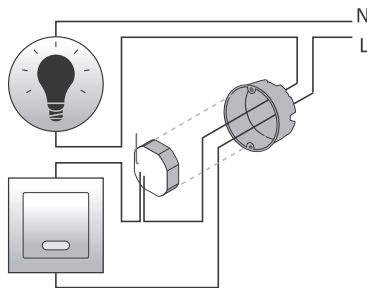
FW-R1P-NN — single multifunctional relay, suitable for operation without a neutral wire in the switch box

- 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.
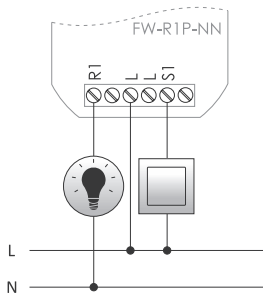
power supply	195÷265 V AC
control	triggered with L level
power consumption	0.1 W
output load (AC-1)	1000 A/250 V AC
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	49×49×20 mm
installation	in flush mounted box ⌀60
protection level	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.
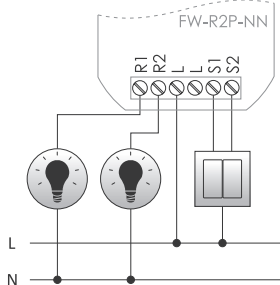
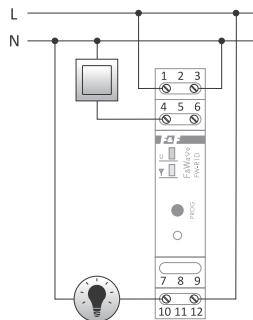| power supply	195÷265 V AC
control	triggered with L level
power consumption	0.1 W
load capacity output (AC-1)	
single channel	1000 W/250 V AC
total (2 channels)	1000 W/250 V AC
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	49×49×20 mm
installation	in flush mounted box ⌀60
protection level	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
protection level	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 mode	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
installation	in flush mounted box ø60
protection level	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;
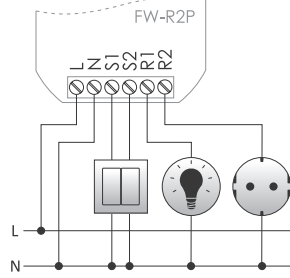- Possibility of connecting the relay with 32 transmitters.

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 mode	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
installation	in flush mounted box ø60
protection level	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 mode	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)
installation	for TH-35 rail
protection level	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.

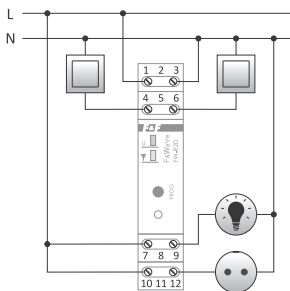| power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
ON mode	1 W
output load (AC-1/ AC-3)	8 A/1.5 A
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module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

Dimmers

Purpose

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

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

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

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

power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
ON mode	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
installation	in flush mounted box ø60
protection level	IP20

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

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

power supply	85÷265 V AC/DC
control	triggered with L or N level
control pulse current	<1 mA
power consumption	
standby	0.25 W
ON mode	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)
installation	for TH-35 rail
protection level	IP20

FW-LED2P 2-channel 12 V DC LED controller

- 2-channel 12 V LED dimmer supports:
  – 12 V LED strips (with dimming feature);
  – 12 V LED lamps (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.
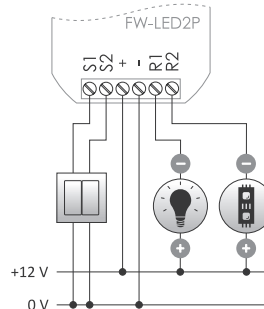
power supply	10÷16 V DC
power consumption	
standby	0.25 W
ON mode	0.4 W
output load (AC-1)	4 A/12 V
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	43×48×20 mm
installation	in flush mounted box ø60
protection level	IP20

FW-LED2D   2-channel 12 V DC LED controller

- 2-channel 12 V LED dimmer supports:
  – 12 V LED strips (with dimming feature);
  – 12 V LED lamps (with dimming feature);
- Soft start - smooth switching on/off of the lighting;
- Local and remote control;
- Direct control of the dimmer switch with any monostable button (such as bell button);
- The relay can be connected with 8 transmitters.
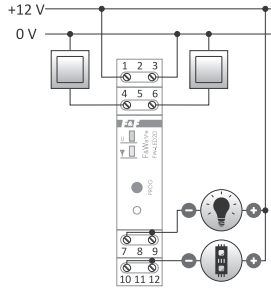
power supply	10÷16 V DC
power consumption	
standby	0.25 W
ON mode	0.4 W
output load (AC-1)	6 A/12 V
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Transmitters

With mains power supply

FW-GS-24-B/FW-GS-230-B   black
FW-GS-24-W/FW-GS-230-W   white

Purpose

Remote control transmitter designed to work with all receivers of the F&Wave system.
Touch wall-mounted remote control for ø60 flush-mounted box. Front panel made of glass. The transmitter works on a contactless and touch basis. 230 V AC or 24 V DC local power supply. The transmitter has 4 touch zones, 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.
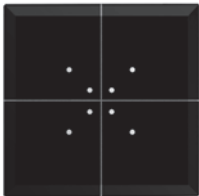
power supply	
FW-GS-24-B/ FW-GS-24-W	9÷30 V AC/DC
FW-GS-230-B/ FW-GS-230-W	85÷265 V AC/DC
power consumption	
standby	0.25 W
ON mode	0.6 W
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	
glass panel	81×81×12 mm
flush-mounted controller	
installation	in flush mounted box ø60
protection level	IP20

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

Mode	Button			
A	S1	S2	S3	S4
B	ON	S2	S3	S4
C	S1	OFF	S3	S4
D	ON	OFF	S3	S4

(!) At the special request of the customer, pictograms can be made to describe touch zones in accordance with their intended use.

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 230V 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 mode	0.6 W
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	43×48×20 mm
installation	in flush mounted box ø60
protection level	IP20

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

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

With battery power supply

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

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

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

FW-RC10   10-button remote control, black
FW-RC10G   10-button remote control, grey

power supply	3 V
battery	CR2032
radio frequency	868 MHz
working temperature	-25÷50°C
dimensions	44×149×44 mm

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

FW-KEY4   4-button remote control, keyring

power supply	3 V
battery	CR2032
radio frequency	868 MHz
power consumption	
standby	0.04 µW
ON mode	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).
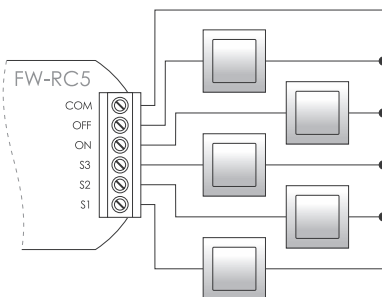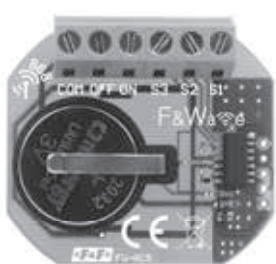
power supply	3 V
battery	2032 (lithium)
radio frequency	868 MHz
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	41×46×15 mm
installation	in flush mounted box ø60

FW-WS01 1-channel battery-operated remote control transmitter
FW-WS02 2-channel battery-operated remote control transmitter

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 VDC
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
installation	in flush mounted box ø60
dimensions	84×84×14 mm
protection level	IP20

FW-WS1 1-button
FW-WS2 2-button
FW-WS3 3-button

power supply	3 V
battery	2032 (lithium)
radio frequency	868 MHz
working temperature	5÷50°C
dimensions	86×86×15 mm
installation	surface mounting

Button functions
• SWITCH – switch on/switch off locally;
• ON – switch on/raise everything (FW-SW2 and FW-SW3);
• OFF – switch off/lower everything (FW-SW2 and FW-SW3);

Installation 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.

Chapter 14

RS – radio control system

Purpose

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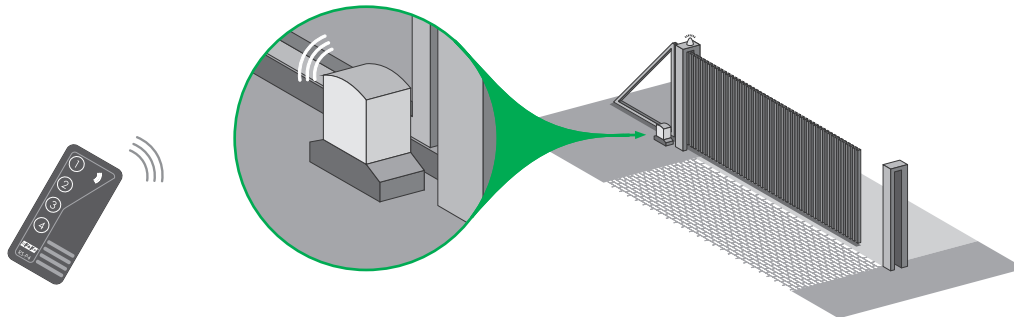
Operation

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

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

Receivers

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

RS-407M monostable

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

1 blue 2 black 3 brown 4 brown

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

RS-407B bistable

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

1 blue 2 black 3 brown 4 brown

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

Transmitters

The pulse triggered by pressing the transmitter button sends a coded signal to the receiver. The transmitter is protected against interruption of transmission after releasing the button. This ensures that even the shortest activation of the function results in the transmission of the full data frame. Data transmission from the transmitter is indicated by a flashing red LED.
The RS-N and RS-P radio transmitters work with dedicated RS-407M and RS-407B receivers.
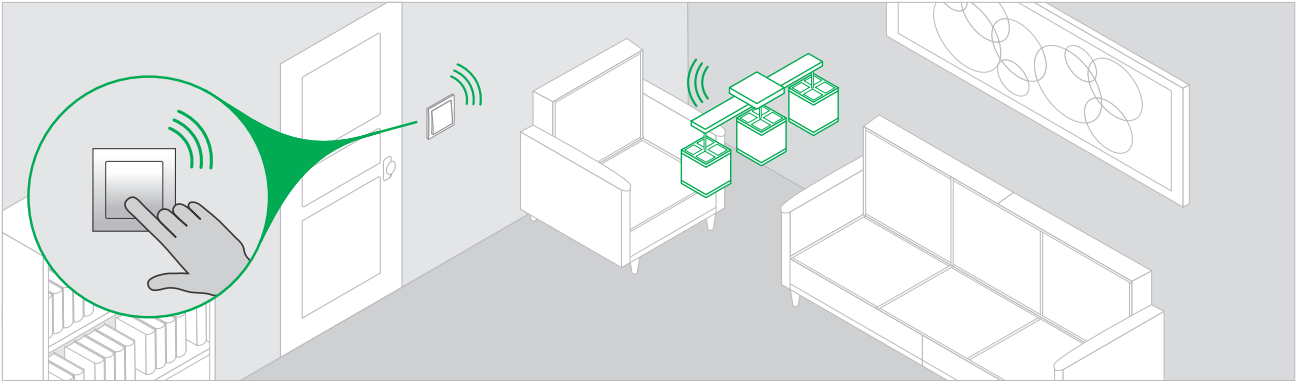
RS-N... flush-mounted transmitter

Purpose

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

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

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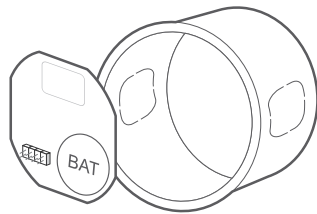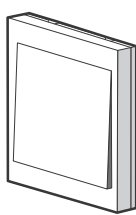
Installation in a flush mounted box
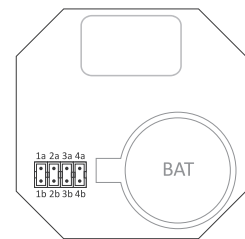
Channel terminals

RS-P... remote control

Compact remote control in the form of a keyring.

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

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

Chapter 15

Proxi – Bluetooth Smart remote control system

proxi.

Bluetooth SMART   www.getproxi.com

Purpose

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

Garage gate

Lighting

Blinds, awnings

On/Off devices

RGBW lamps

Application available on:

Android

iOS
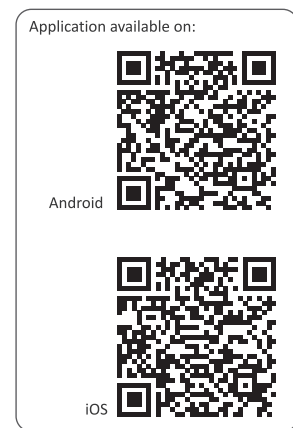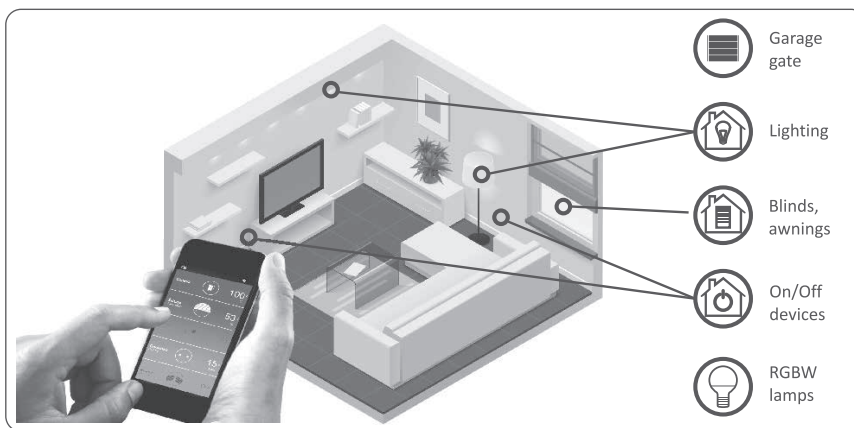
System features

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

buy   connect   download   control
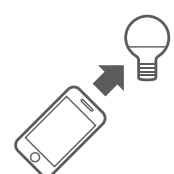
Proxi Plug   adapter for an electrical outlet

Purpose

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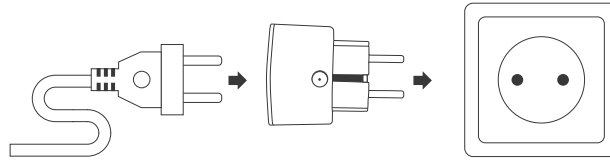
power supply	195÷253 V AC
output	contact 1×NO (13 A/250 V AC)
receiver power connected	3000 W
socket type	E EEC 7/4
	Schuko F EEC 7/5
Bluetooth transmission	
frequency	2.4 GHz
signal power	1 mW
transmission	two-way
coding	AES
range	30 m
power consumption	0.2÷ 0.8 W
working temperature	0÷65°C
thermal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

Proxi Power   on/off relay (rB-R2S2)

Purpose

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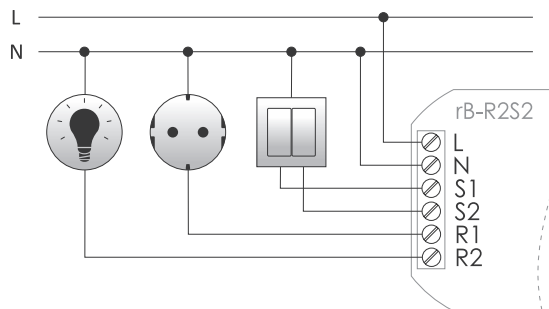
power supply	195÷253 V AC
control	triggered with L or N level
control pulse current	<1 mA
outputs	contact 2×NO (4 A/250 V AC)
Bluetooth transmission	
frequency	2.4 GHz
signal power	1 mW
transmission	two-way
coding	AES
range	30 m
power consumption	1 W
working temperature	0÷45°C
thermal protection	YES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

Proxi Light   lighting dimmer (rB-D1S2)

Purpose

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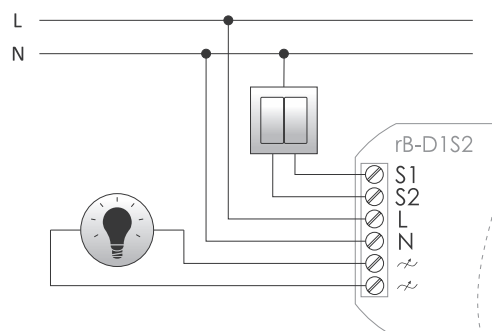
power supply	195÷253 V AC
control	triggered with L or N level
control pulse current	<1 mA
output	
resistive load	150 W
inductive load	100 W
Bluetooth transmission	
frequency	2.4 GHz
signal power	1 mW
transmission	two-way
coding	AES
range	30 m
power consumption	0.4 W
working temperature	0÷45°C
thermal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

Proxi Shade   roller shutter controller (rB-TSR1S2)

Radio module designed to control drives of roller shutters, blinds, screens, awnings and curtains offered by various manufacturers. The module can be mounted in an electrical box and connected to a 2-key switch (used in traditional solutions) or installed directly at/in the device.
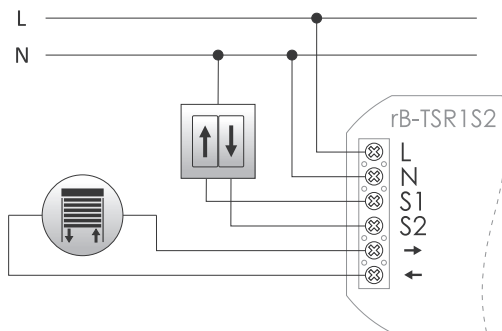
power supply	195÷253 V AC
control	triggered with L or N level
control pulse current	<1 mA
maximum load current (AC-1/AC-3)	3 A/ 0.6 A
Bluetooth transmission	
frequency	2.4 GHz
signal power	1 mW
transmission	two-way
coding	AES
range	30 m
power consumption	1 W
working temperature	0÷45°C
thermal protection	YES
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	Ø54 (48×43 mm), h= 25 mm
installation	in flush mounted box Ø60
protection level	IP20

Proxi Gate   gate controller

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

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

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

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

Proxi Bulb   230 V RGBW LED lamp

Proxi Bulb lamp allows you to freely change the brightness, color, and saturation of light, which brings a unique mood to your home, apartment or office. The lamp can be controlled via the free app on your smartphone or tablet, and thanks to Bluetooth Smart technology you don't need to connect to the Internet. The smart Proxi Bulb lamp is a worthwhile investment, with LED technology for up to 50,000 hours of uninterrupted operation.
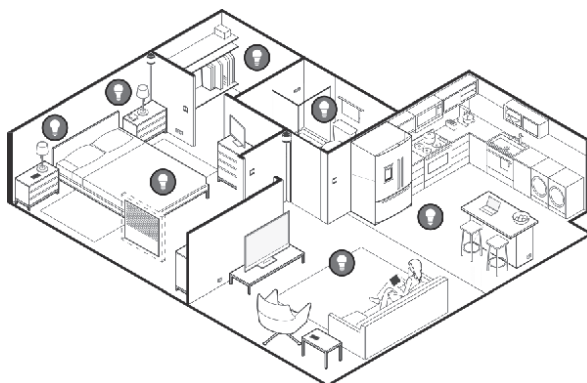
supply voltage	85÷265 V AC
brightness	600 lm
color temperature	3000÷6000 K
CRI	>80
Bluetooth transmission	
frequency	2.4 GHz
signal power	1 mW
transmission	two-way
coding	AES
range	30 m
power consumption	9 W
total system power factor	0.95
working temperature	0÷45°C
dimensions	Ø65×135 mm
installation	E27 screw base

Chapter 16

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

Operation

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.
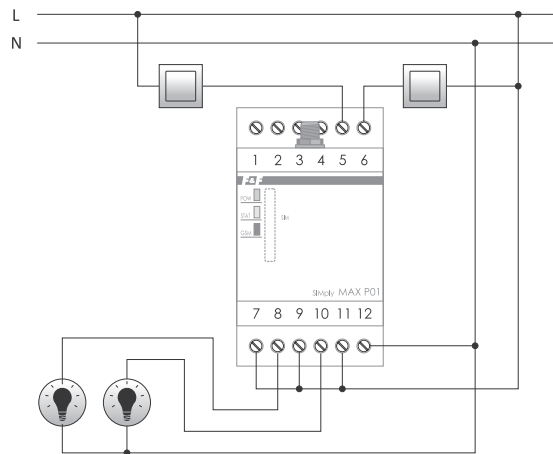
power supply	
MAX P01	100÷265 V AC
MAX P01 12 V	10÷16 V DC
control inputs	2
MAX P01	160÷260 V AC
MAX P01 12 V	8÷16 V DC
voltage tolerance	160÷260 V AC
relay outputs	2
type	1×NO
nominal voltage	230 V AC
Load capacity	<8 A
ports	SIM
power consumption	
standby	1.3 W
GSM communication	<3 W
terminal	1.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-10÷50°C
dimensions	3 modules (52 mm)
installation	for TH-35 rail
protection level	IP20

GSM antenna

SMA connector	
antenna dimensions	20×100 mm
wire length	2.5 m
installation	adhesive tape

(!) A 4-channel version of the relay is also available: SIMply MAX P04. More information on p. 80.

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 detection; 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.
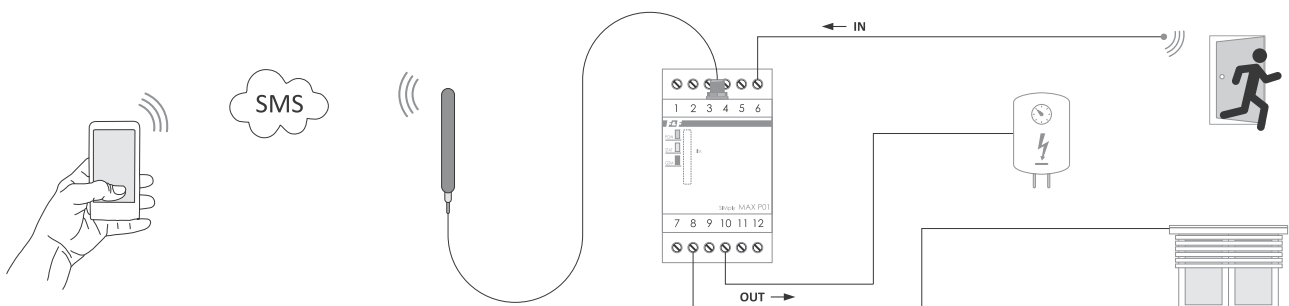
SIMply MAX P04 with on/off/alarm feature

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)
installation	for TH-35 rail
protection level	IP20

GSM antenna

SMA connector	
antenna dimensions	20×100 mm
wire length	2.5 m
installation	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 detection; 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.
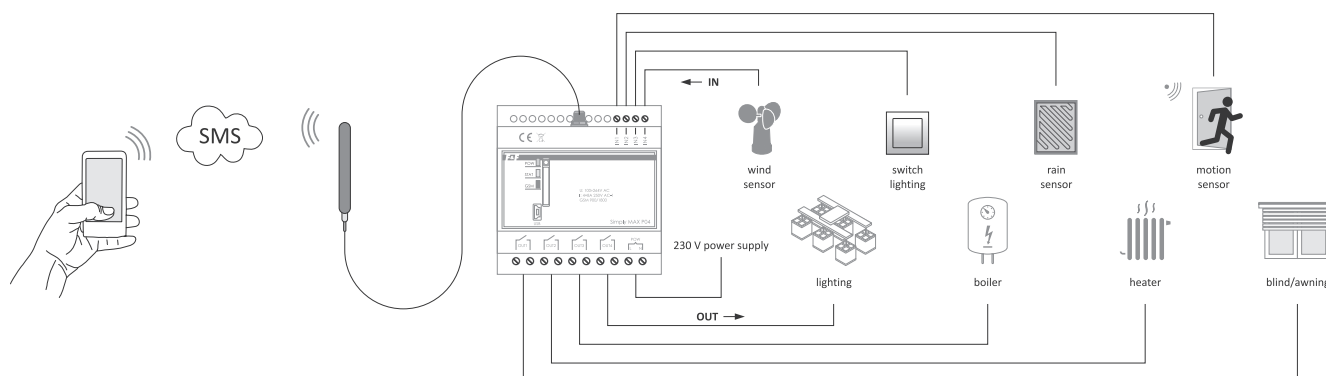
Cost-free GSM control of the gate, gateway and barrier control

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)
installation	for TH-35 rail
protection level	IP20
GSM antenna	
SMA connector	
antenna dimensions	20×100 mm
wire length	2.5 m
installation	adhesive tape

Operation

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.
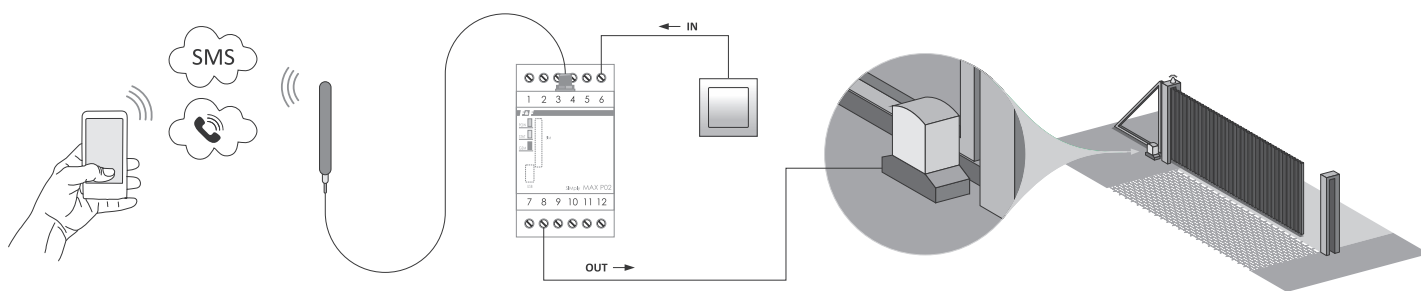
Functions

- 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.

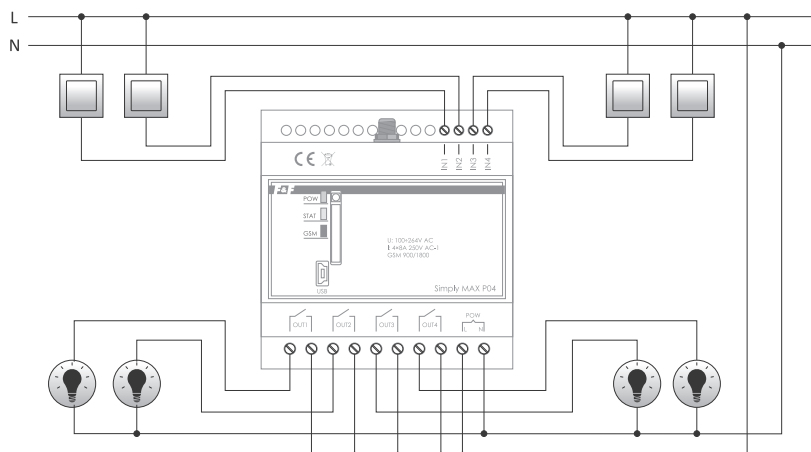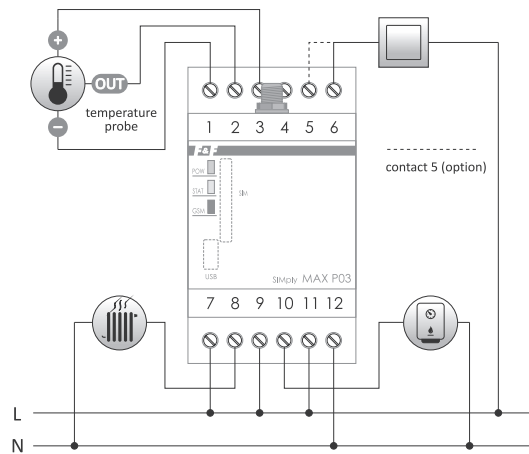| power supply	100÷265 V AC
inputs	
number	1
voltage tolerance	160÷260 V AC
relay outputs	
number	2
type	1×NO
nominal voltage	230 V AC
Load capacity	<8 A
temperature sensor type	DS1820
temperature probe	RT4
temperature adjustment range	+30÷65°C
hysteresis (adjustable)	0÷10°C
setting accuracy	0.1°C
measurement 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)
installation	for TH-35 rail
protection level	IP20

GSM antenna

SMA connector	20×100 mm
wire length	2.5 m

Functions

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

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

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

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

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

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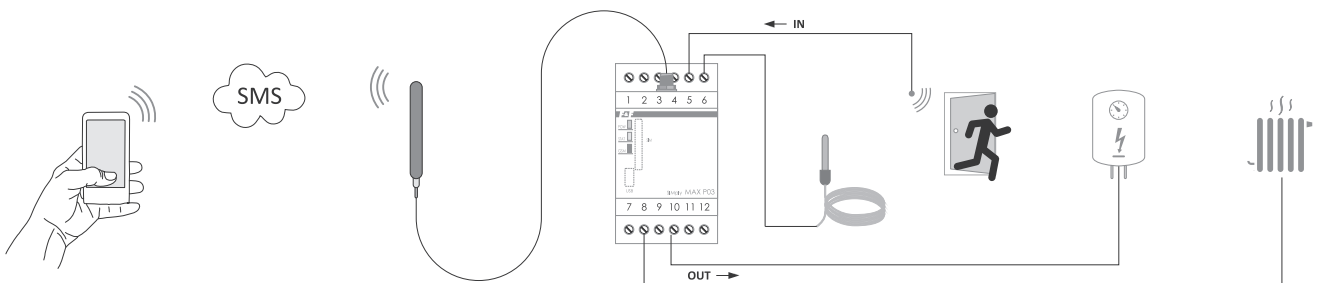
SIMply MAX P05 pulse and operating time counter + on/off/alarm

Purpose

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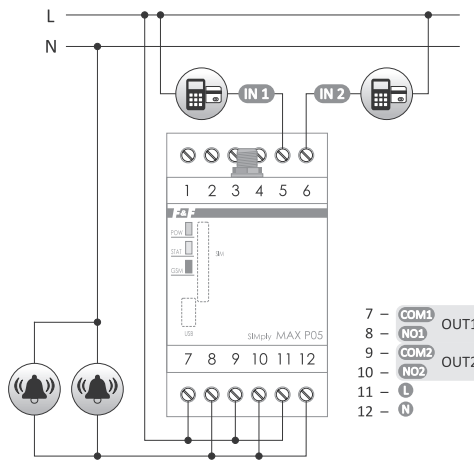
power supply	100÷265 V AC
inputs	
number	2
voltage tolerance	160÷260 V AC
minimum length of input pulse	1 s
relay outputs	
number	2
type	1×NO
nominal voltage	230 V AC
Load capacity	<8 A
ports	SIM, miniUSB
power consumption	
standby	1.3 W
GSM communication	<3 W
terminal	1.5 mm² screw terminals
working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

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.
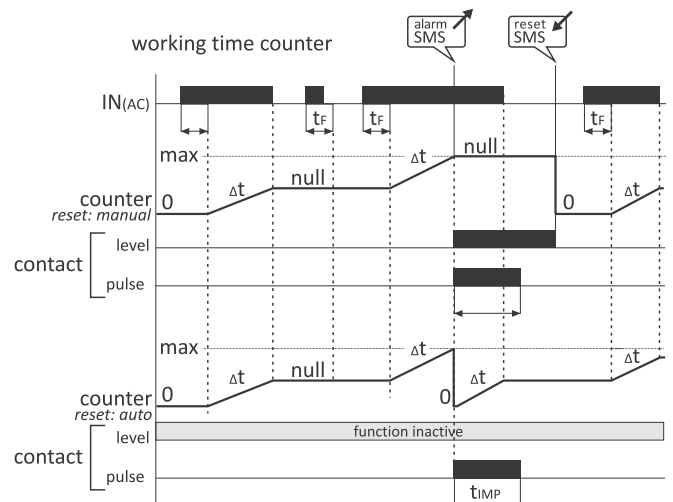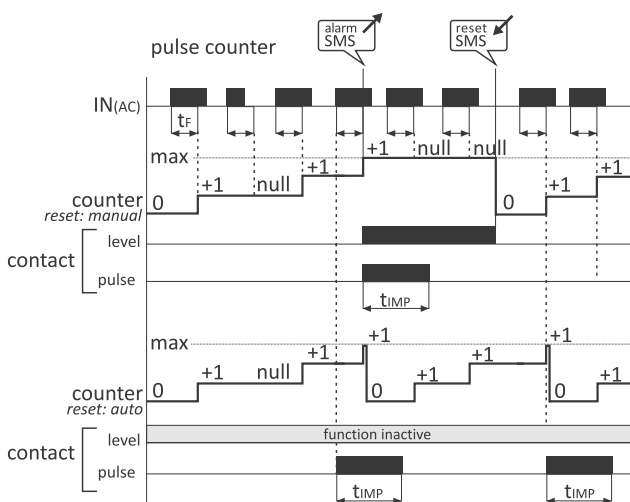
MAX H04   programmable controller with GSM communicator

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
installation	screws to the ground or for TH-35 rail
protection level	IP20

Operation

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
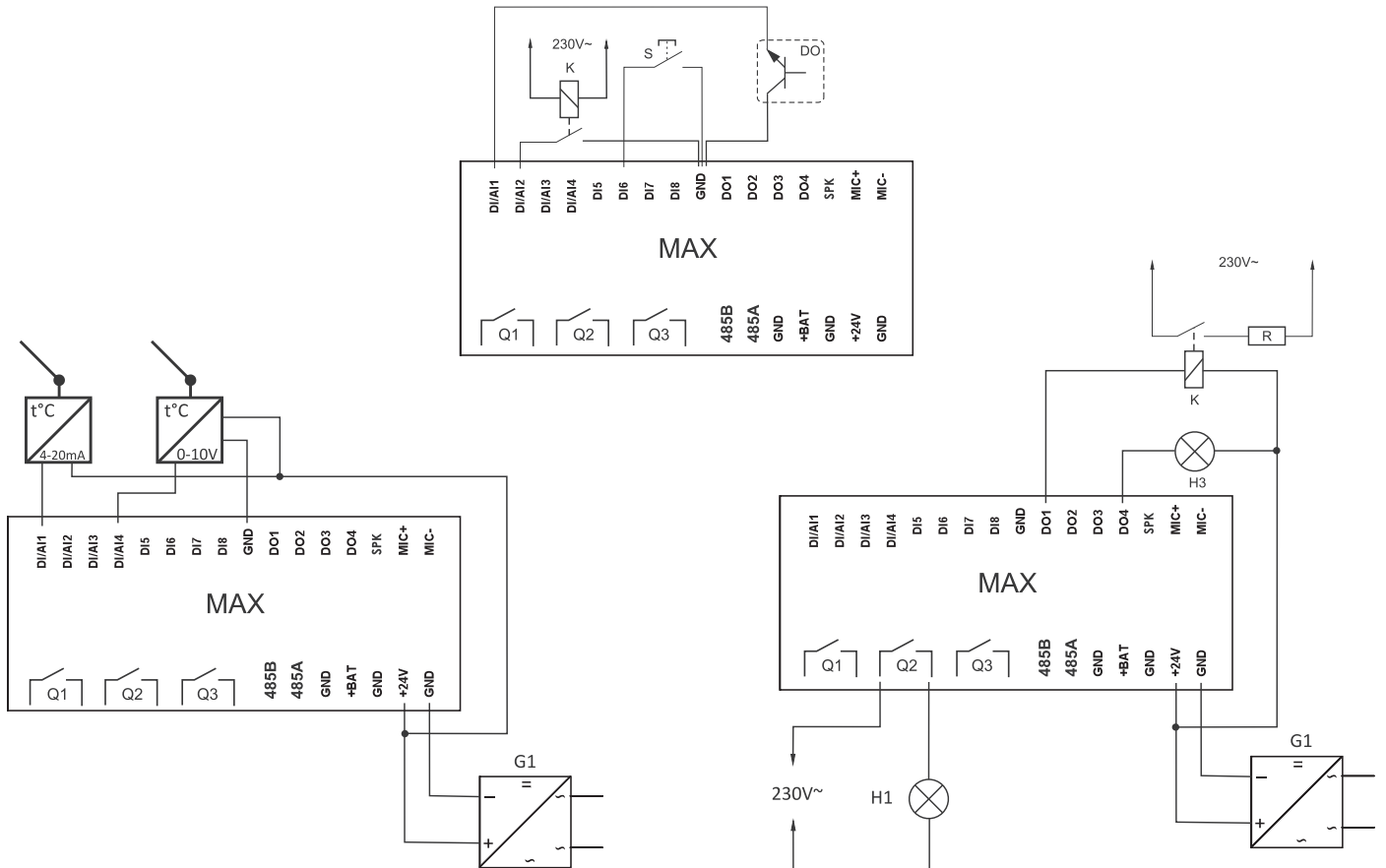
H04 Config   PC configuration software

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);
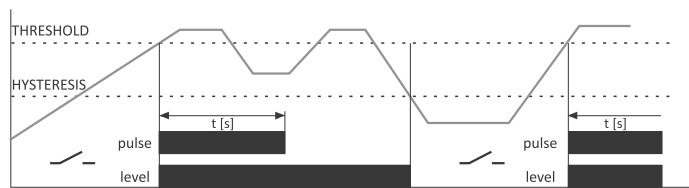
  – PULSE option - time activation of the output for a set time after the input has been activated;
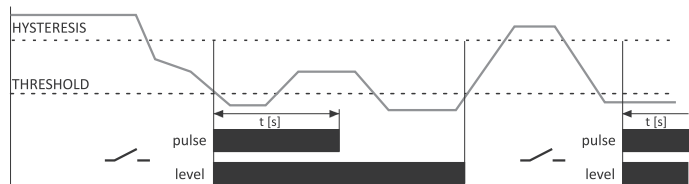
• Printing of states and values on LCD;
• User menu for settings of alarm threshold values and adjustments, telephone numbers, control options, etc.
• Control of the selected output as a function of CLIP (dial-up access) and astronomical clock.
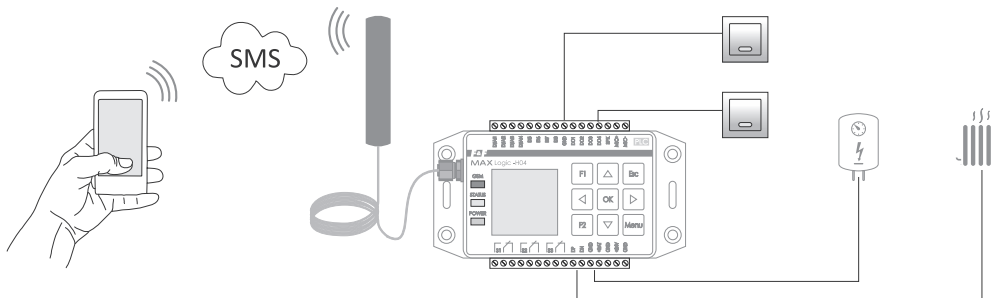
Configuration software

H04 supporting applications

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	●[5]	●	●	●	7"	640×480	●	●	●	●	●	●	●	2+0 or 1+1	–	–	–	–	●	282×135×23	preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones
MK-06WF	●[5]	●	–	●	7"	640×480	●	●	●	●	●	●	●	2+0 or 1+1	●	–	–	–	●	282×135×23	preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones, built-in memory for a register of 100 photos
MK-04B MK-04W	●	–	–	●	7"	640×480	–	●	●	●	●	●	●	2+0 or 1+1	–	–	–	–	●	254×160×18	expansion with 3 additional monitors or MU uniphones, moveable buttons, black or white
MK-03 MK-03W	●	●	–	●	7"	640×480	●	●	●	●	●	●	●	2+0 or 1+1	–	–	–	–	●	241×161×23	preview with starting the conversation and opening the door, expansion with 3 additional monitors or MU uniphones
MU-01[3]	–	–	–	–	–	–	–	●[6]	3	●	●	–	–	2+0	–	–	–	–	●	100×200×45	–
MU-02[3]	●	–	–	–	–	–	–	●[7]	3	–	●	–	–	2+0	–	–	–	–	●	160×120×42	–

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

MK-12B/MK-12W

NEW!

- 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

NEW!

- 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-10EX[1]/MK-10EXH[1] [2]

- 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)

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

MK-10FSD¹/MK-10FSDH¹ 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-10K¹

- Hands-free monitor
- 4" color screen LCD (on-screen menu)
- Preview with the ability to start the conversation and open the door without a call from outside
- Support for 2 door stations and 2 CCTV cameras (analog)
- Motion detection performed directly from cameras
- Electric door strike and automatic door control
- Photo/video recording function (micro SD card up to 16 GB not included)
- Adjustment of image parameters for each camera
- Ability to set 3 volume modes during the day
- Smoothly adjustable bolt opening time 1÷99 sec

- 12 ringtone melodies/a separate ringtone can be set for each input
- Digital frame function
- Wiring: 4+2 for bolt +2 for gate
- Power supply: 14.5 V DC
- Power supply for DIN rail included
- Dimensions: 226×151×23 mm
- Material: glass/plastic
- The module can be expanded by 3 additional monitors from the same series only (MK-10)

MK-08B

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

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

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

MK-08F

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

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

MK-06B

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

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

MK-06WF

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

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

MK-04B black/MK-04W white
previously MK-01/MK-02

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

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

MK-03 black/MK-03W white

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

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

Uniphones

MU-01 headset

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

MU-02 hands-free

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

Application

Uniphones work with all types of monitors.

Door stations and accessories

Product	...- subscriber door station	Image sensor	Resolution (TVL)	Lens (mm)	Lens viewing angle	Lens adjustment	Lighting, number of IR LEDs (infrared)	4-wire installation	Power supply	Flush-mounted	Surface mounting	Impact protection rating	Aluminum housing	Dimensions of door station (mm) [W×H×D]	Dimensions of a flush-mounted cassette (mm) [W×H×D]	Additional feature
KK-20DA	1	½"	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-21DAH**	1	½"	1.3 Mpix	1.9	130°	–	5	•	•²	•	•⁵	•	•	120×250×35	112×237×39	built-in card reader and encryptor, backlit call button and keypad, relay (voltage free) output to the bolt
KK-50A**	1	½"	600	3.6	87°	±10°	6	•	•²	•	•	•	•	78×185×60	–	RFID reader enables bolt control via proximity tags backlit signboard and call button; relay (voltage free) output to the bolt
KK-01 KK-01S	1	½"	600	3.6	87°	–	4	•	•¹	–	•	•	•	59×135×39	–	relay (voltage free) output to the bolt
KK-01FP*	1	½"	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	½"	600	3.6	87°	–	6	•	•²	–	•	•	•	97×130×43	–	backlit signboard and call button, relay (voltage free) output to the bolt
KK-03	1	½"	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	½"	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	½"	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	½"	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	½"	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	½"	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	½"	600	3.6	87°	±10°	6	•⁴	•²	•	•⁵	•	–	120×250×51	110×240×46	front panel made from brushed stainless steel, backlit signboard and call button, relay (voltage free) output to the bolt

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

KK-20DA

NEW!

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

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

KK-21DAH

NEW!

- 1- subscriber door station
- 1/3" CMOS image sensor
- Camera resolution 1.3 Mpix
- Lens 1.9 mm/viewing angle of 130°
- Night-time backlight - IR LED (5 infrared LEDs)
- Twilight sensor
- Built-in combination lock for the opening of the entrance: max. 200 codes
- Built-in Unique 125kHz proximity reader: max 200 tags
- Backlit keypad and ringtone button (backlight color - blue)
- Housing: brushed stainless steel

- Protection against unauthorized use
- 12÷14.5 V DC power supply
- Operating temperature range: -25°C÷55°C
- Power consumption:
  standby 0.40 W
  operation 0.95 W
- Ingress protection: IP65
- Programming with the keyboard
- Dimensions: 120×250×35 mm
- Box dimensions: 112×237×39 mm
- Works only with MK-10 series monitors

KK-50A

NEW!

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

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

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

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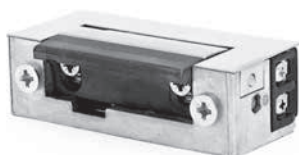
Product	Power supply	Power consumption	Memory	Switch
EZ-02	12 V DC	270 mA	–	–
EZ-03	12 V DC	270 mA	•	•
EZ-04	230 V AC	270 mA	•	–
EZ-05	230 V AC	270 mA	–	•

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

DSW-1 signalling relay

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.

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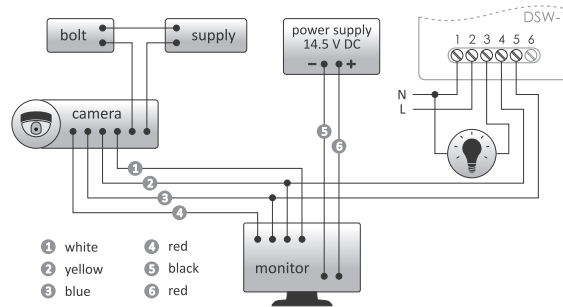
power supply	100÷265 V AC
maximum load current (AC-1)	2 A
switch-on/activation time (adjustable)	5÷30 s
switching time ON/OFF	1 s/1 s
power consumption	
standby	0.25 W
ON mode	0.6 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-15÷50°C
dimensions	51×67×26 mm
installation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

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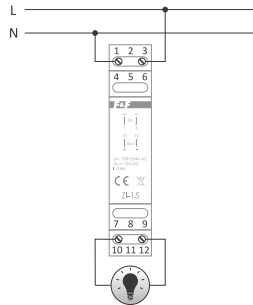
input voltage	15 V DC
output power	12 W
current limit	Imax= 110% Iout
minimum load	0%
keying frequency	70 kHz
terminal	2.5 mm² screw terminals
working temperature	-10÷40°C
dimensions	1 module (18 mm)
wight	80 g
installation	for TH-35 rail
protection level	IP20

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

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

Analog mailboxes

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

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

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

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

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

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

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

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

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

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

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

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

Digital mailboxes

SLC-1201A-SKM mailbox with a video intercom

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

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

SLC-1201A-SKP mailbox with a video intercom

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

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

SLC-1401D-SKM mailbox with a video intercom

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

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

Section V

Time controllers

Chapter 20

Time relays

Purpose

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

| Product	Voltage power supply	Actuator element	Maximum load current	Installation	Input Start/Reset	Number of functions	Description	Page
PCA-512 230 V	195÷253 V AC	relay	10 A	for TH-35 rail	–	1	off delay	105
PCA-512 24 V	21÷27 V AC/DC	relay	10 A	for TH-35 rail	–	1	off delay	105
PCA-512 UNI	12÷264 V AC/DC	relay	10 A	for TH-35 rail	–	1	off delay	105
PCA-514 DUO	195÷253 V AC 21÷27 V AC/DC	relay	10 A	for TH-35 rail	–	1	off delay	105
PCR-513 230 V	195÷253 V AC	relay	10 A	for TH-35 rail	–	1	on delay	105
PCR-513-16 230 V	**195÷253 V AC**	**relay**	**16 A**	**for TH-35 rail**	**–**	**1**	**on delay**	**105**
PCR-513 24 V	21÷27 V AC/DC	relay	10 A	for TH-35 rail	–	1	on delay	105
PCR-513 UNI	12÷264 V AC/DC	relay	10 A	for TH-35 rail	–	1	on delay	105
PCR-515 DUO	195÷253 V AC 21÷27 V AC/DC	relay	10 A	for TH-35 rail	–	1	on delay	105
PCS-506	195÷253 V AC	relay	10 A	in flush mounted	●	8	multifunctional	109
PCS-516 DUO	195÷253 V AC 21÷27 V AC/DC	relay	8 A	for TH-35 rail	●	10	multifunctional	110
PCS-516 UNI	12÷264 V AC/DC	relay	8 A	for TH-35 rail	●	10	multifunctional	110
PCS-516 AC	85÷265 V AC	symistor	2 A AC	for TH-35 rail	●	10	multifunctional	110
PCS-516 DC	9÷30 V DC	transistor	8 A DC	for TH-35 rail	●	10	multifunctional	110
PCS-517	24÷264 V AC/DC	relay	16 A	for TH-35 rail	●	18	multifunctional	112
PCS-519 12 V	11÷14 V AC/DC	2xrelay	2×8 A	for TH-35 rail	●	10	multifunctional	110
PCS-519 DUO	195÷253 V AC 21÷27 V AC/DC	2xrelay	2×8 A	for TH-35 rail	●	10	multifunctional	110
PCS-533	9÷264 V AC/DC	relay	16 A	for TH-35 rail	●	programmable	with wireless NFC communication	113
PCS-534	160÷260 V AC/DC	4xrelay	4×16 A	for TH-35 rail	●	programmable	pulse-time, with USB port	117
PCU-504 UNI	12÷264 V AC/DC	2xrelay	2×4 A	for TH-35 rail	–	3	contacts status back-up after a power failure	107
PCU-507 230 V	195÷253 V AC	2xrelay	2×8 A	for TH-35 rail	–	2	cyclic operation	108
PCU-507 24 V	21÷27 V AC/DC	2xrelay	2×8 A	for TH-35 rail	–	2	cyclic operation	108
PCU-510 DUO	195÷253 V AC 21÷27 V AC/DC	2xrelay	2×8 A	for TH-35 rail	–	4	multifunctional	106
PCU-511 230 V	195÷253 V AC	relay	8 A	for TH-35 rail	–	4	multifunctional	106
PCU-511 DUO	195÷253 V AC 21÷27 V AC/DC	relay	8 A	for TH-35 rail	–	4	multifunctional	106
PCU-511 UNI	12÷264 V AC/DC	relay	8 A	for TH-35 rail	–	4	multifunctional	106
PCU-518	195÷253 V AC 21÷27 V AC/DC	relay	8 A	for TH-35 rail	–	4	multifunctional, with external potentiometer for time settings	107
PCU-520 230 V	195÷253 V AC	2xrelay	2×8 A	for TH-35 rail	–	2	cyclic operation	108
PCU-520 24 V	21÷27 V AC/DC	2xrelay	2×8 A	for TH-35 rail	–	2	cyclic operation	108
PCU-520 UNI	12÷264 V AC/DC	2xrelay	2×8 A	for TH-35 rail	–	2	cyclic operation	108
PCU-530	100÷264 V AC/DC	3xrelay	3×8 A	for TH-35 rail	–	4	multifunctional	106
PO-405 230 V	195÷253 V AC	relay	10 A	surface-mounted	●	1	off delay	114
PO-405 24 V	21÷27 V AC/DC	relay	10 A	surface-mounted	●	1	off delay	114
PO-406	195÷253 V AC	relay	10 A	in flush mounted	●	1	off delay	114
PO-415 230 V	195÷253 V AC	relay	10 A	for TH-35 rail	●	1	off delay	114
PO-415 24 V	21÷27 V AC/DC	relay	10 A	for TH-35 rail	●	1	off delay	114
STP-541	24÷264 V AC/DC	2xrelay	2×16 A	for TH-35 rail	–	1	right/left operation	115
PCG-417	195÷253 V AC 21÷27 V AC/DC	2xrelay	2×8 A	for TH-35 rail	–	1	star/delta switch	116

Single-function

## With operating function: off delay

PCA-512 / PCA-514

Operation

The contact remains in position 11-10 until the relay is switched on. After the supply voltage "U" is applied, the contact is switched to position 11-12 and the preset operating time is measured. After the set time has elapsed, the contact returns to position 11-10. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.
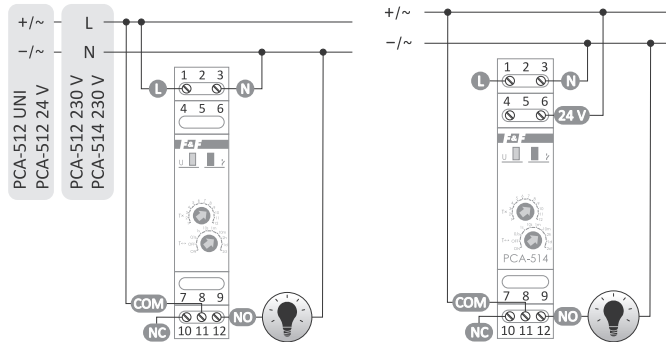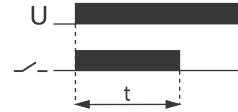
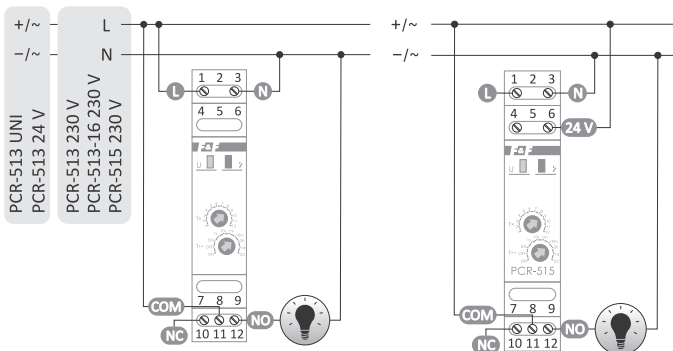| power supply	
PCA-512 230 V	195÷253 V AC
PCA-512 24 V	21÷27 V AC/DC
PCA-512 UNI	12÷264 V AC/DC
PCA-514 DUO	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷576 h
operation delay	<50 ms
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

PCA-514 24 V power supply

With operating function: on delay

PCR-513 / PCR-513-16 / PCR-515
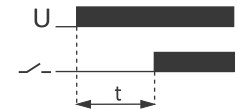
«F&F» NEW!

Operation

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

power supply	
PCR-513 230 V	195÷253 V AC
PCR-513-16 230 V	195÷253 V AC
PCR-513 24 V	21÷27 V AC/DC
PCR-513 UNI	12÷264 V AC/DC
PCR-515 DUO	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	
PCR-513/PCR-515	8 A
PCR-513-16	16 A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

PCR-515 24 V power supply

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

time settings knob
time range selection knob

Multifunctional

Operation

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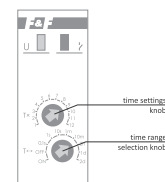 Before and after the supply voltage is applied, the contacts remain in the NC position and the preset operating time "t" is measured. After the preset time has elapsed, the contacts switch to the NO position. To execute the operating mode of the relay again you need to switch off the power supply voltage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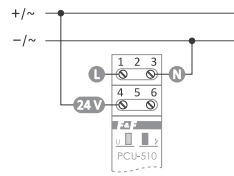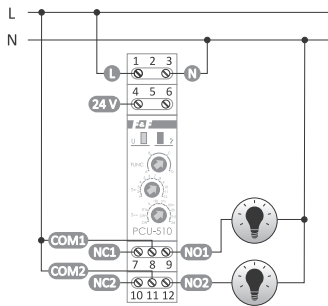
- **Off delay - cyclic (C)**
  Off delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.

- **On delay - cyclic (D)**
  On delay operating mode is carried out cyclically at equal intervals between the preset operating time and break time.
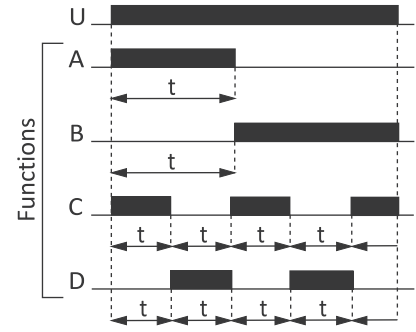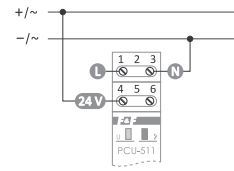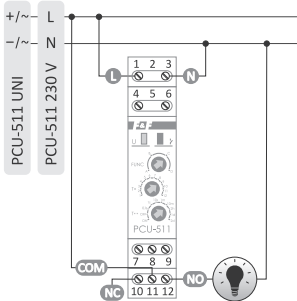
PCU-510 DUO — 2×NO/NC contact

PCU-510 DUO 24 V power supply

PCU-510 DUO 230 V power supply

power supply	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	2×8A
contact	separated 2×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

PCU-511 — 1×NO/NC contact

PCU-511 24 V power supply

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)	8A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

PCU-530 — 3×NO/NC contact

power supply	100÷264 V AC/DC
maximum load current (AC-1)	3×8A
contact	separated 3×NO/NC
working time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

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

work functions selection knob

time settings knob

time range selection knob
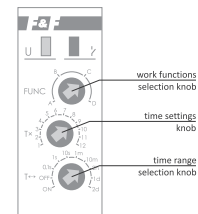
With external potentiometer for time setting

PCU-518 + potentiometer (ZP-18) included

power supply	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
working time (adjustable)	0.1 s÷24 h
power indication	LED green
contact status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20
external potentiometer (ZP-18)	
cable	3× 0.42 mm², l= 70 cm
box dimensions with cable gland	83×42×30 mm
height/diameter of the mandrel	30 mm/ø6
mounting hole	ø10
resistance	100 kΩ

① white
② green
③ brown

⚠ Visualization of operating modes presented on the previous page.

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

With back-up after power failure

PCU-504 UNI

Operation

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

Ⓐ 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.
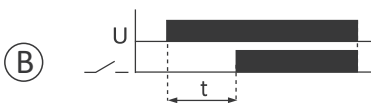
Ⓑ On delay feature.
The back-up feature is not implemented.
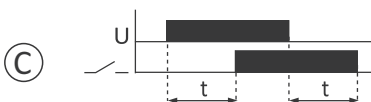
Ⓒ After the power supply voltage is switched on, the contacts are closed after the preset time (on delay). After a power failure, the contacts are closed for a set period of time.
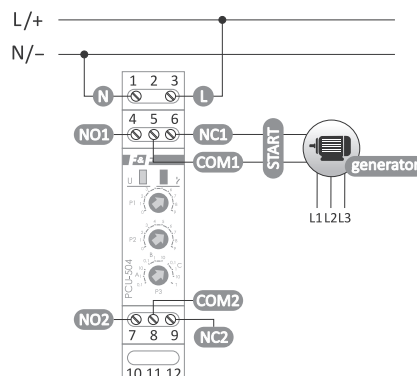
power supply	12÷264 V AC/DC
maximum load current (AC-1)	2×4 A
contact	separated 2×NO/NC
working time (adjustable)	0.1 s ÷ 10 min.
power indication	LED green
contact status indication	LED red
power consumption	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Dual-time setting of two independent times: operating time (t_1) and break time (t_2)
PCU-520 4-function
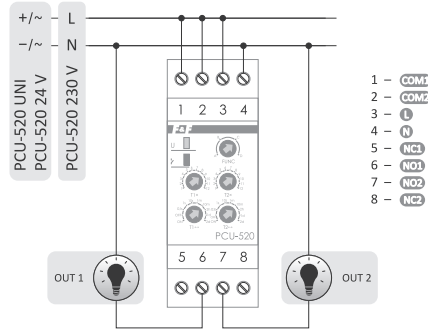
power supply	
PCU-520 230 V	195÷253 V AC
PCU-520 24 V	21÷27 V AC/DC
PCU-520 UNI	12÷264 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO/NC
working time (adjustable)	0.1 s÷576 h
break time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
power consumption	1.2 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	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.

....
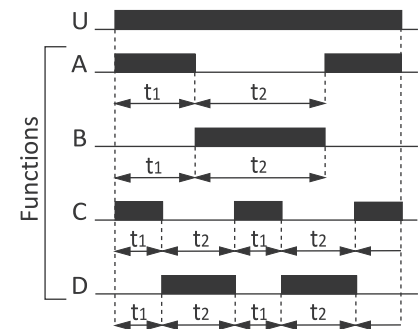
PCU-507 2-function
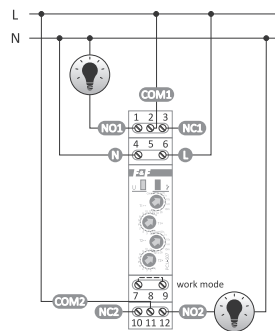
power supply	
PCU-507 230 V	195÷253 V AC
PCU-507 24 V	21÷27 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO/NC
working time (adjustable)	0.1 s÷576 h
break time (adjustable)	0.1 s÷576 h
power indication	LED green
contact status indication	LED red
power consumption	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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.
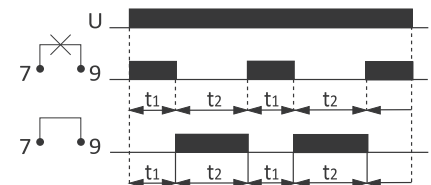
- When the power supply is switched on, setting the time range selection knob to:
  – ON – permanently closes the contacts if the power supply is switched on.
  – OFF – permanently open the contacts if the power supply is switched on.
- When the power supply is switched on, the system does not react 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
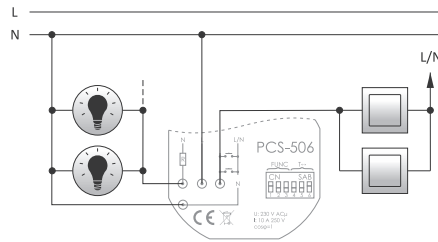
power supply	195÷253 V AC
maximum load current (AC-1)	10 A
contact	1×NO
control pulse current	<1 mA
working time (adjustable)	0.1 s÷24 h
power consumption	0.8 W
terminal	4×DY1 mm², l= 10 cm
working temperature	-25÷50°C
dimensions	Ø55, h= 13 mm
installation	in flush mounted box ø60
protection level	IP20

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

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

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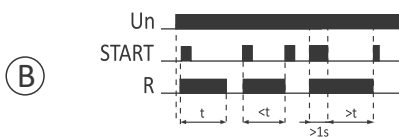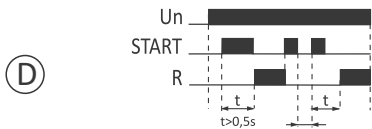g the time measurement causes the relay to be switched off. Pressing and holding the control button for more than 1 second will switch the lighting on permanently until the next pulse is given, which will switch off the relay.

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

D — On delay of the relay using the START signal. When the relay is switched on, the next START pulse switches it off. The next START pulse causes the time to be measured again and the relay to be switched on. The interval between the trailing edge of the deleting signal and the rising edge of the START signal causing subsequent time measurement - minimum 0.5 sec.

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

F — Generating a single pulse with time "t" by the trailing edge of the START signal. During the time measurement, the system does not react to START pulses.
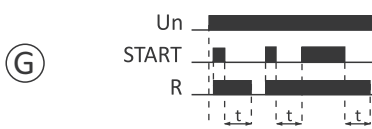
G — Off delay with back-up feature. The rising edge of the START signal causes the relay to be switched on, while the trailing edge causes the start of time measurement. Applying the START signal during the time measurement starts the operating cycle from the beginning.

H — Off delay and on delay with a back-up feature. If the START voltage is shorter than 45 s, the system ignores it, if it is longer than 45 s, then after this time the relay switches on and time measurement begins with the START signal trailing edge. If during the time measurement another START pulse occurs, the trailing edge of this signal will cause the time to be measured from the beginning (for example, for ventilation: short term activation of the lighting does not switch on the fan, switching on the lighting for longer than 45 seconds switches the fan on).
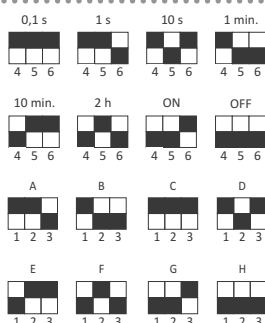
Time ranges
Setting the time range switch to ON when the power supply is switched on causes the relay to be permanently switched on.
Setting the time range switch to OFF when the power supply is switched on causes Switch relay to be permanently switched off.

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

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

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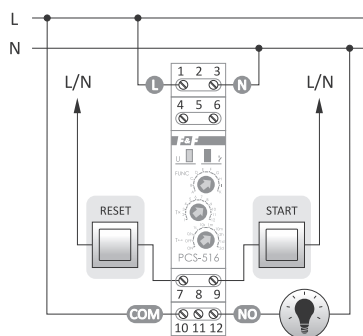
PCS-516 AC
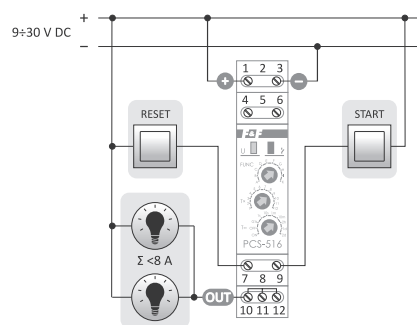
PCS-516 DC

Features

PCS-516AC:
- 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-516DC:
- 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.
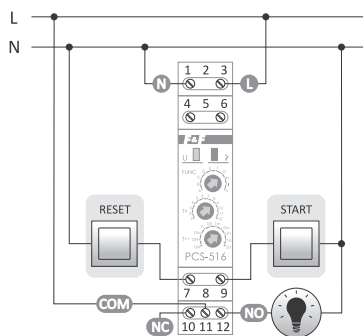
PCS-516 DUO 230 V power supply
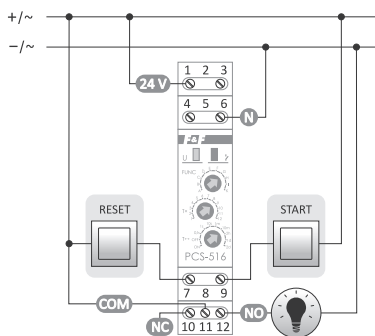
PCS-516 DUO 24 V power supply
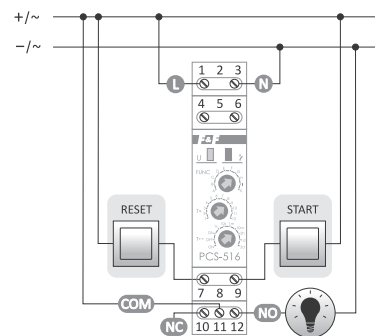
PCS-516 UNI
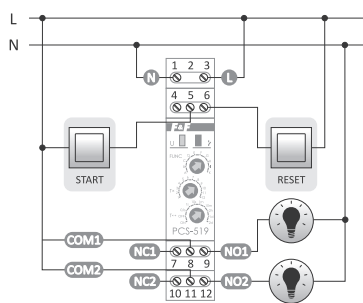
PCS-519 DUO 230 V power supply
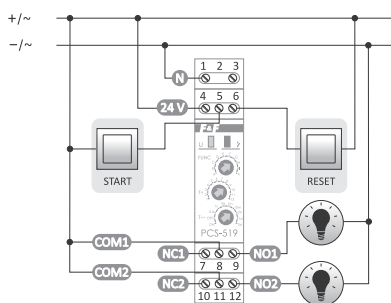
PCS-519 DUO 24 V power supply
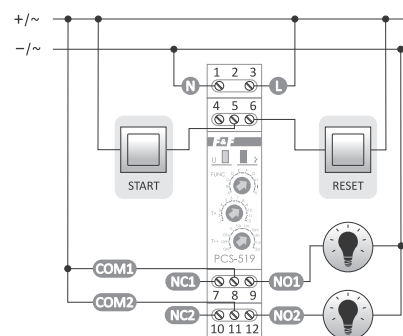
PCS-519 12 V power supply

	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 (open collector)	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	LED green					
Contact status indication	LED red					
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)					
Installation	for TH-35 rail					
Protection level	IP20					

To select a specific time range and relay operating function, set the appropriate combination of rotary coding switches.

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

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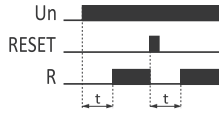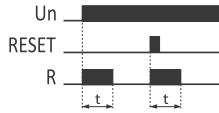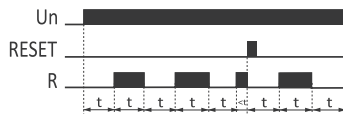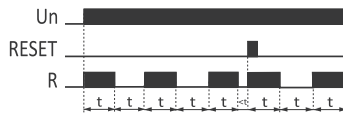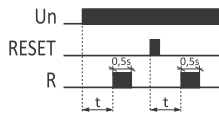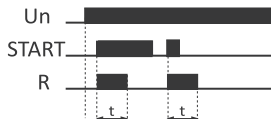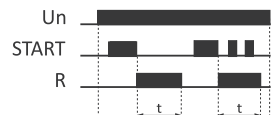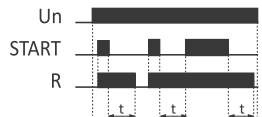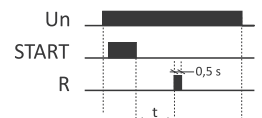
On delay. After the supply voltage is switched on (the green LED U is on), the contact remains in position 3-5 and the set operating time "t" is measured. After the preset time has elapsed, the contact switches to position 3-7 (the red LED R is on). To execute the operating mode of the relay again you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

B

Off delay. The contact remains in 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 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.

C

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

D

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

E

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

F

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.

G

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.

H

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.

I

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

K

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

PCS-517 18-function

1 – COM
2 –
3 – L
4 – N
5 – NO
6 – NC
7 –
8 – START

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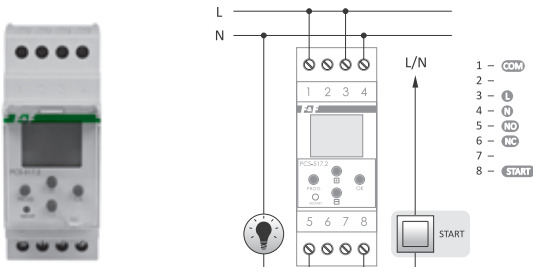
> ⓘ Time setting range (0.25 s ÷ 100 h) allows for a very precise adjusting of the contact closing, such as 2 h 13 min. 27 s.

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

P00 The state of "inactivity"

P01

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

P02
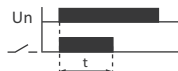
The contact remains in position 1-6 (off) until the voltage is switched on. After the supply voltage is applied, the contact is switched to position 1-5 (on) and the set time "t" is measured. To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

P03
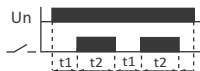
On delay operating mode is carried out cyclically at the preset intervals of the operating time "t_1" and break time "t_2" (on).

P04

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

P05
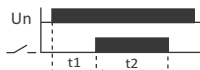
When the power supply voltage is applied, the contact remains in position 1-6 (off) and the preset delay time "t_1" is measured. After the time t_1 has elapsed, the contacts switch to position 1-5 (on) for a duration of time "t_2". To execute the operating mode of the relay again you need to switch off the power supply voltage and switch it back on.

P06

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

P07

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

P08

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

P09

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

P10

$$t_A+t_B+...+t_X=t$$

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

P11

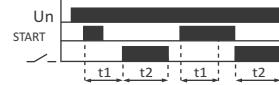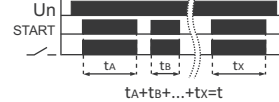Closing of the contact (position 1-5) for a time "t" by the trailing edge of the START signal. While measuring time "t", the relay does not react to subsequent pulses of the START signal.

P12

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

P13

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

P14

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

P15

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

P16

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

P17

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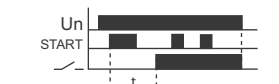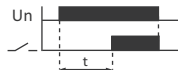
P18

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

Programmable

PCS-533 with NFC wireless communication

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.

Operation

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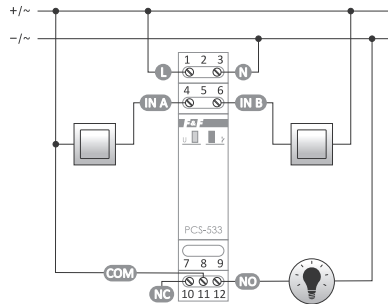
power supply	9÷264 V AC/DC
maximum load current (AC-1)	16A
contact	separated 1×NO/NC
control pulse current	<1 mA
working time (adjustable)	0.1 s÷24 h
power indication	LED green
contact status indication	LED red
power consumption	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working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

PCS533 Configurator

Functions

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

Command list

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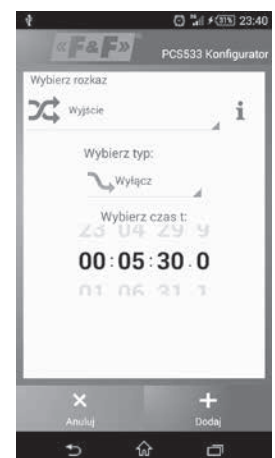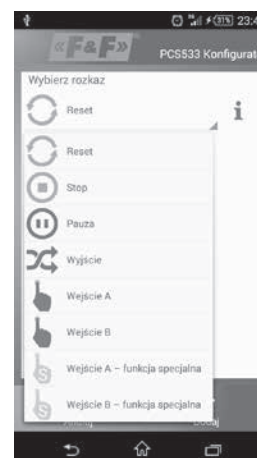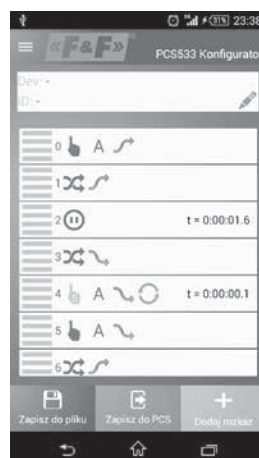
PCS Configurator application

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.

Operation

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.
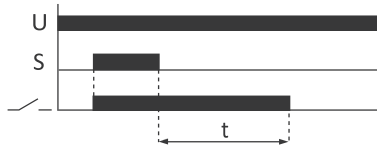
PO-405
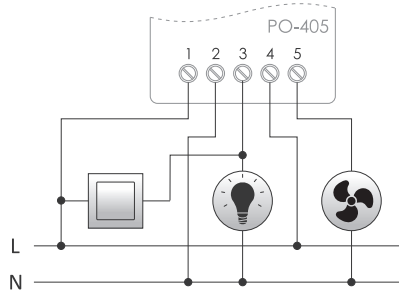
power supply	
PO-405 230 V	195÷253 V AC
PO-405 24 V	21÷27 V AC/DC
maximum load current (AC-1)	10 A
contact	1×NO
backup time	1÷15 min.
power indication	LED green
power indication	LED red
power consumption	0.56 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	50×67×26 mm
installation	surface mounting
protection level	IP20

PO-406

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	∅55, h= 13 mm
installation	surface mounting
protection level	IP20

1 blue   **2** brown   **3** red   **4** black
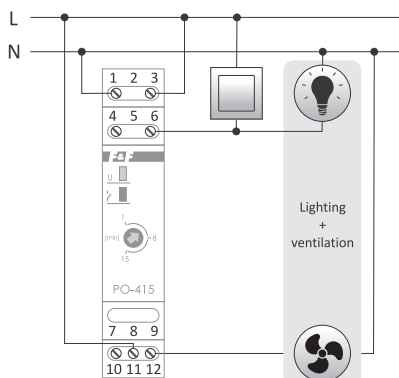
PO-415

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	LED green
power indication	LED red
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)
installation	for TH-35 rail
protection level	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.

Operation

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.
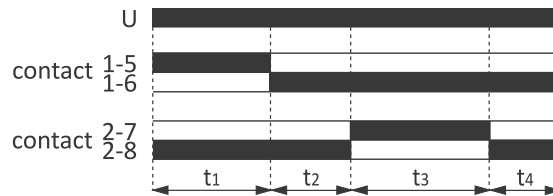
power supply	24÷264 V AC/DC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO/NC
time settings t_1, t_2, t_3, t_4	1 s÷100 h
time setting accuracy	1 s
number of cycle repetitions	1÷999999 or in an infinite loop
power consumption	1.5 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-20÷50°C
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP20

Connection scheme

SG – main contactor
SP – "right" system contactor
SL – "left" system contactor

Diagram of the contactor switching system of the following type: right/left operation

"Star"/"delta" switch

PCG-417 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.

Operation

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
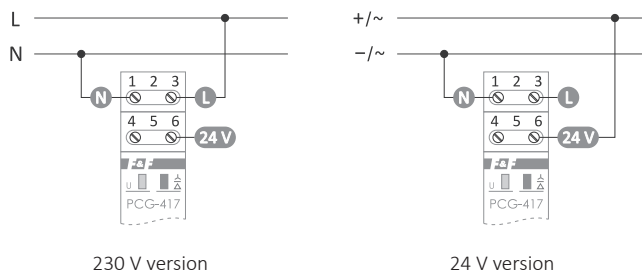
power supply	195÷253 V AC
	21÷27 V AC/DC
maximum load current (AC-1)	2×8 A
contact	2×NO
"star" start-up time	1÷1000 s
switching time (adjustable)	75 or 150 ms
power indication	LED green
power indication	LED red
power consumption	0.8 W
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
working temperature	-25÷50°C
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Connection scheme
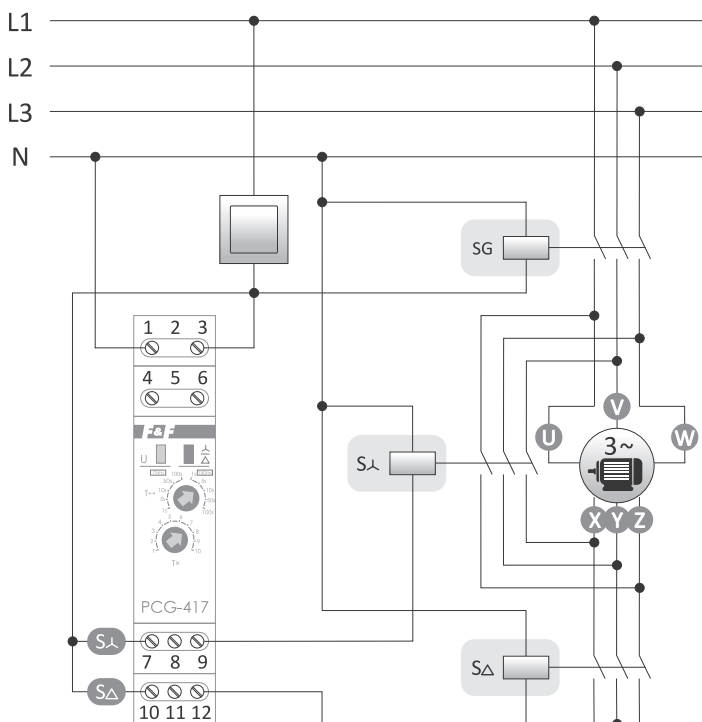
SG – main contactor
SΔ – "delta" system contactor
Sx – "star" system contactor

t2= 75 or 150 ms
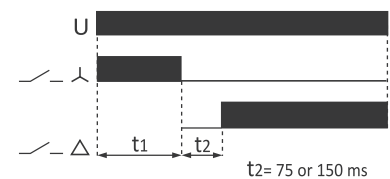
PCS-534 4-channel, pulse-time sequential controller

Purpose

The PCS-534 controller is designed for automation systems, in which there is a need to simultaneously control a group of receivers in an established ON/OFF combination, forced by successive pulses applied manually or automatically to the control input or according to time intervals between successive switchings.
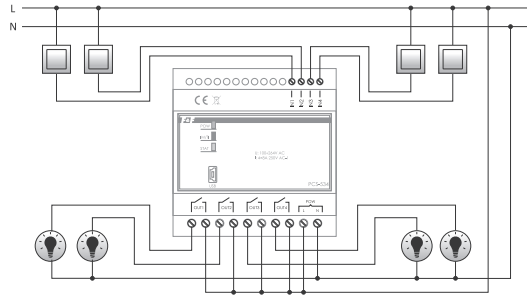
power supply	160÷260 V AC/DC
output load current OUT	4×16 A
contact	4×NO
input voltage tolerance IN	160÷260 V AC/DC
time settings t_1, t_2, t_3, t_4	1 s÷99 h 59 min. 59 s
time setting accuracy	1 s
number of cycle repetitions	1÷999999
	or in an infinite loop
communication port	miniUSB
power consumption	1.3 W
terminal	2.5 mm² screw terminals
working temperature	-20÷50°C
dimensions	5 modules (87.5 mm)
installation	for TH-35 rail
protection level	IP20

Operation

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.
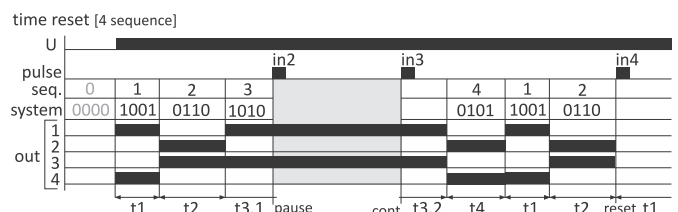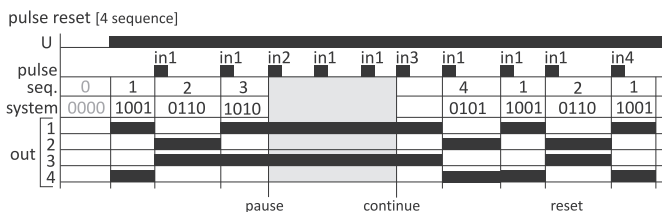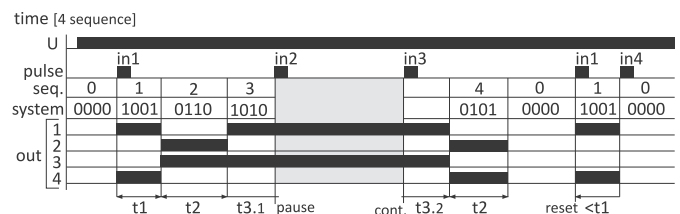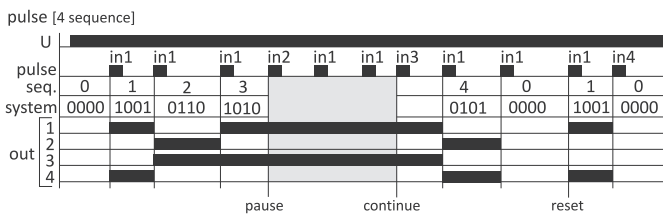
Control timers (programmable)

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	119
PCZ-521.3 PLUS	**programmable, weekly**	**1**	**relay**	**118**
PCZ-522.3	programmable, weekly	2	relay	119
PCZ-523.2	pulse (bell)	1	relay	119
PCZ-524.3	astronomical	1	relay	121
PCZ-525.3	astronomical with a night-time break	1	relay	122
PCZ-525.3 PLUS	**astronomical with a night-time break**	**1**	**relay**	**122**
PCZ-526.3	astronomical with a night-time break	2	relay	123
PCZ-529.3	yearly	1	relay	120
PCZ-531A10	programmable, weekly	1	analog output	44
PCZ-531LED	programmable, weekly	1	transistor	44

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)
installation	for TH-35 rail
protection level	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)	16A
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)
installation	for TH-35 rail
protection level	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)	2×16A
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	500
	(2× 125 pairs of ON/OFF commands/channel)
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)
installation	for TH-35 rail
protection level	IP20

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

ON/OFF type: pulse (bell)

PCZ-523.2 1-channel, with two 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)	16A
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)
installation	for TH-35 rail
protection level	IP20

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

ON/OFF type: yearly

PCZ-529.3 1-channel

Operation

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
	(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)
installation	for TH-35 rail
protection level	IP20

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

- -

New features in the PCZ-xxx.3 (PCZ-521.3, PCZ-521.3 PLUS, PCZ-522.3, PCZ-529.3) type timers

NFC wireless communication – wireless reading and writing of the control timer configuration via an Android phone equipped with the NFC communication module.

PCZ CONFIGURATOR app – free app for Android phones and tablets equipped with NFC wireless communication module.

Functions

- Setting the timer configuration in offline mode (without the connection with the timer);
- Reading and writing the configuration to the controller;
- Quick programming of multiple controllers with one configuration;
- Reading and writing the configuration to the file;
- Configuration sharing via e-mail, Bluetooth, network drives;
- Unique identification of the connected timer and the ability to give the devices their own names;
- Automatic backup of the configuration;
- Restore previous configuration (in conjunction with the unique identifier of each timer);
- Set the time and date based on the watch on your phone.

Application is available on:

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

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.

Operation

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;
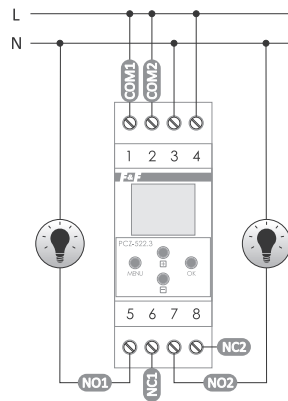• NFC wireless communication;
• PCZ Configurator app for your smartphone.

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)
installation	for TH-35 rail
protection level	IP20

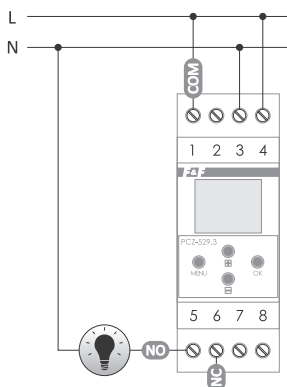* battery life addicted to weather conditions and frequency of mains failure

With the programmable night-time break

The ability to set a night-time break, which means switching off the controlled receiver for a specified time "t" (for example, from 21.15 to "t_1", then from "t_2" to 04.20) between the points of program switchings.

PCZ-525.3 PLUS   1-channel

Functions

- 500 memory cells;
- NFC wireless communication;
- **A backlit LCD display with adjustable brightness level;**
- **An external button for manual control of the relay can be connected;**
- **Ability to connect an external brightness sensor (probe Plus): adjustment of the switch-on/off moment to real conditions (for example: on a cloudy day the light will switch on earlier than it would based on the astronomical settings);**
- Free PCZ Configurator app for your smartphone (Android);

- A memory of the relay status in manual mode;
- Operating modes:
  - automatic – the switching on of the receiver is determined by the operating program of the controller;
  - semi-automatic – operation in automatic mode can be temporarily interrupted and the status of the relay can be set manually;
  - manual – the status of the relay can be set manually;
- Battery back-up of the timer operation and an indication of the battery charge status.

«F&F» NEW!

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)
installation	for TH-35 rail
protection level	IP20

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

(!) PCZ-525.3 PLUS cannot 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)
installation	for TH-35 rail
protection level	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)
installation	for TH-35 rail
protection level	IP20

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

(!) An additional option of manually setting the "fixed" switch-on time, which allows to anticipate sunset and switch on the lighting at the same time on a daily basis, regardless of the settings. Similarly, it is possible to set a "fixed" switch-off time to extend the lighting operation time after sunrise.

New features in the PCZ-xxx.3 (PCZ-524.3, PCZ-525.3, PCZ-525.3 PLUS, PCZ-526.3)

NFC wireless communication – wireless reading and writing of the control timer configuration via an Android phone equipped with the NFC communication module.

PCZ CONFIGURATOR app – free app for Android phones and tablets equipped with NFC wireless communication module.

Functions

- Setting the timer configuration in offline mode (without the connection with the timer);
- Reading and writing the configuration to the controller;
- Quick programming of multiple controllers with one configuration;
- Reading and writing the configuration to the file;
- Configuration sharing via e-mail, Bluetooth, network drives;
- Unique identification of the connected timer and the ability to give the devices their own names;
- Automatic backup of the configuration.

Combined with the unique identifier of each timer, the previous configuration can easily be restored;

- Set the time and date based on the watch on your phone;
- Set the geographical coordinates of the place of the timer installation using the GPS function of your phone.

Application is available on:

https://play.google.com/store/apps/details?id=pl.com.fif.clockprogramer
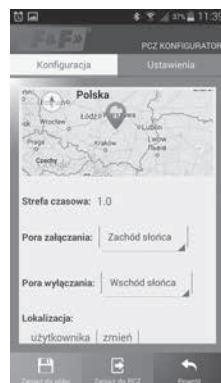
Lighting brightness controls with weekly timer

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. 44

Section VI

Programmable controllers

Chapter 23
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;
  − RS485 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**	–	–	–	–	–	–	–	–

Software tools

The free FLCLogic Soft utility software is used to program FLC drivers.

Basic features of the application:
- create programs using the function block diagram;
- application, contextual help, and documentation for the program is available in Polish;
- simulation of the program operation without the need to connect the FLC driver;
- writing and reading the program to and from the FLC driver by means of the FLC-USB programmer or Ethernet connection (FLC18-ETH);
- advanced testing of the program running on the controller:
  - online preview of the status of inputs, outputs, and variables;
  - forcing the state of variables;
  - registration of analog and digital data.

FLCLogic Soft application

Registration of analogue data in FLCLogic Soft app.
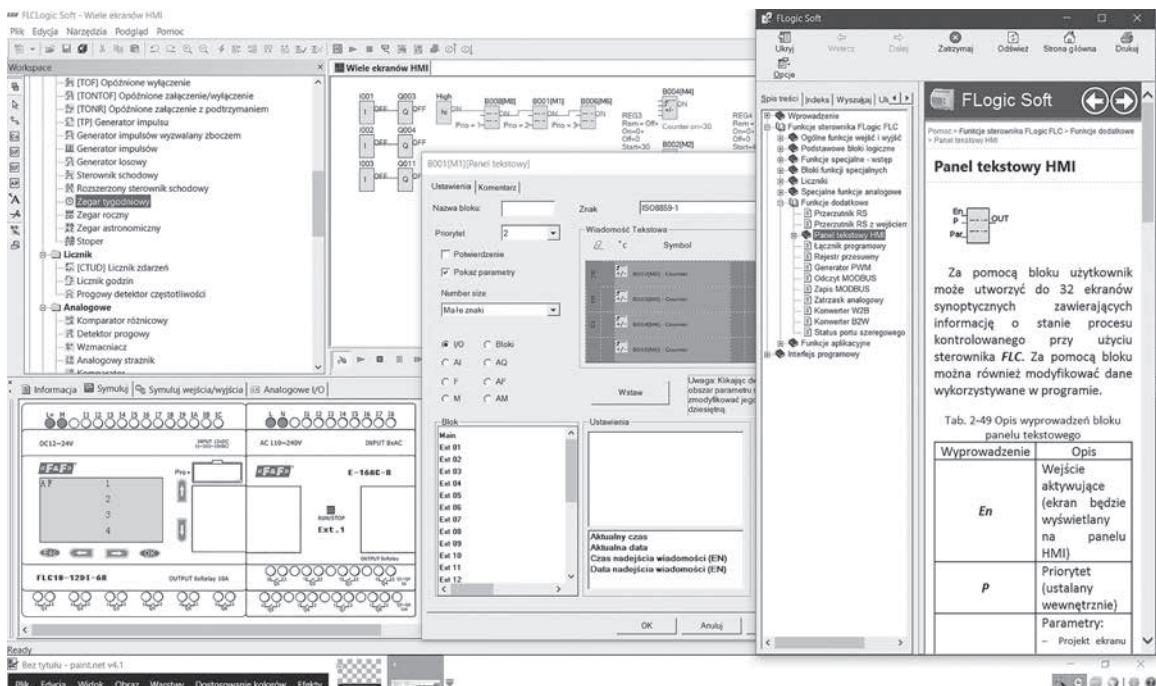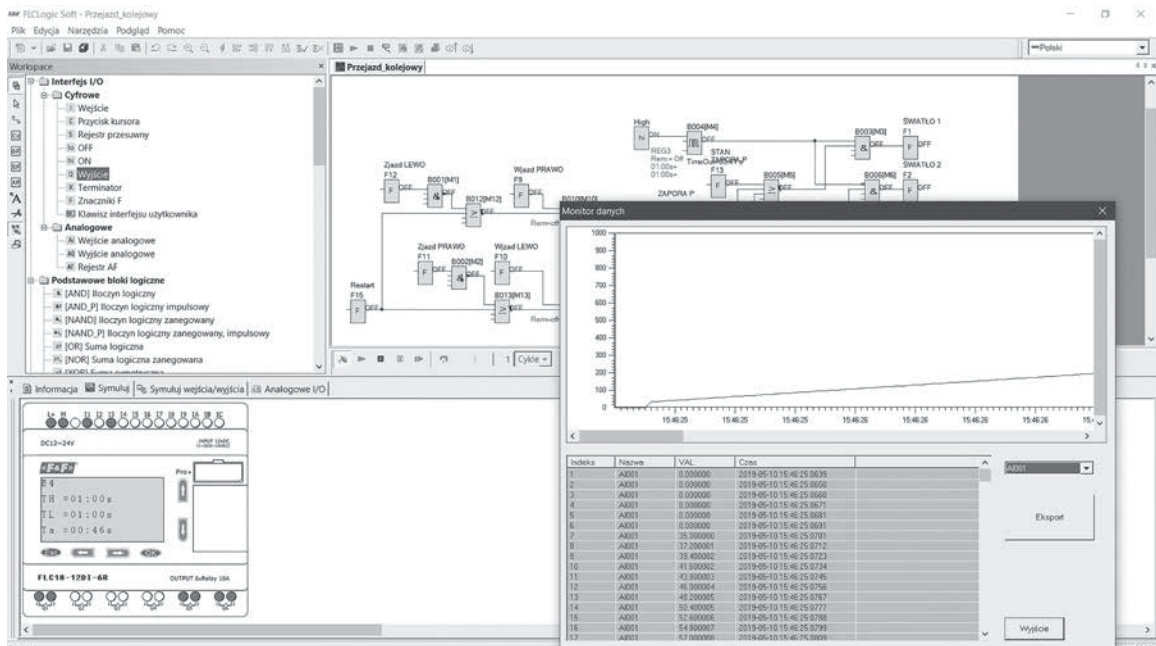
Elements of the system

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

Purpose

FLC18-ETH-12DI-6R is an advanced programmable relay, which integrates many solutions, thus enabling the construction of functional automatic control systems.

Functions

- 12 inputs and 6 relay outputs;
- Analog inputs, both voltage 0÷10 V and current 0÷20 mA, enabling direct connection of many types of measurement sensors to the relay;
- Ability to expand the driver with 16 expansion modules;
- Ethernet port for connecting the relay to the local network;
- Built-in web server and access to the controller via a web browser;
- Integration with Internet Of Things (IOT) devices provided by MQTT protocol support;
- Data can be recorded on SD card;
- Isolated RS-485 port with Modbus RTU/ASCII support;
- Programming of the controller via Ethernet or directly via the programmer;
- An LCD display and keyboard for ease of use;
- Real-time clock with calendar and battery back-up.

programming language	FBD
number of function blocks	1024
size of the FBD program	64 kB
power supply	
nominal	12÷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
wight	400 g
protection level	IP20

Chapter 23
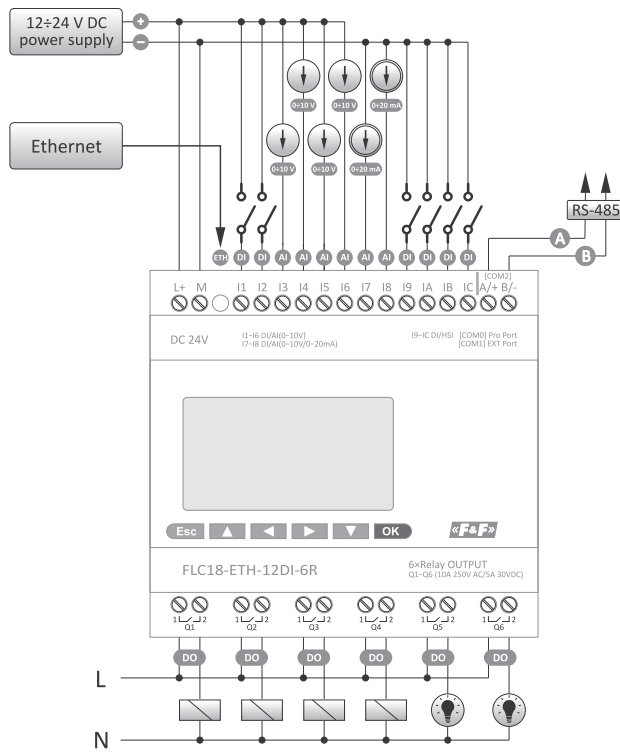
FLC18-12DI-6R CPU central unit

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 digts
working temperature	-20÷55°C
dimensions	95×90×61 mm
wight	400 g
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
protection level	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
wight	300 g
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
protection level	IP20

Chapter 23

DC 12–24V	INPUT 12×DC (1–I6(0–10VDC)	
FLC18-12DI-6R	OUTPUT 6×Relay 10A	
FLC18E-8DI-8TN		
FLC18E-3PT100		
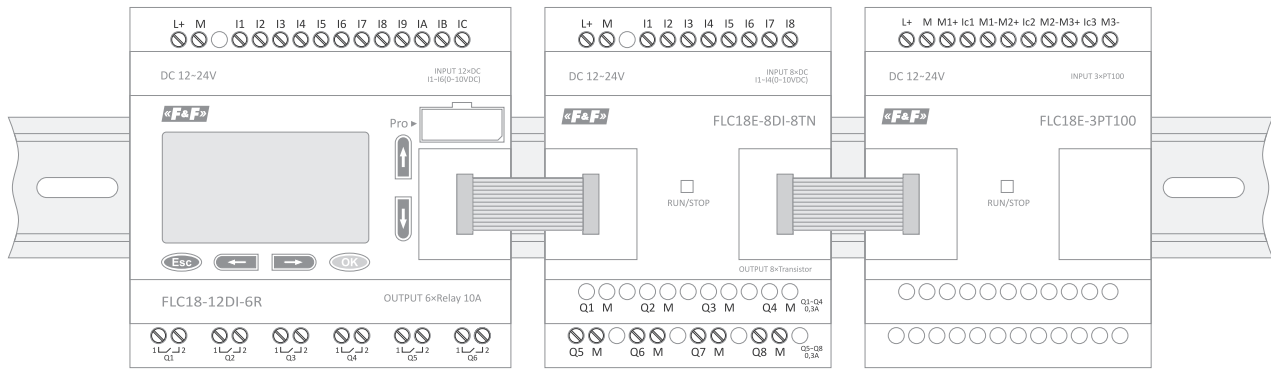
FLC-USB (programmer) interface for programming FLC drivers

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

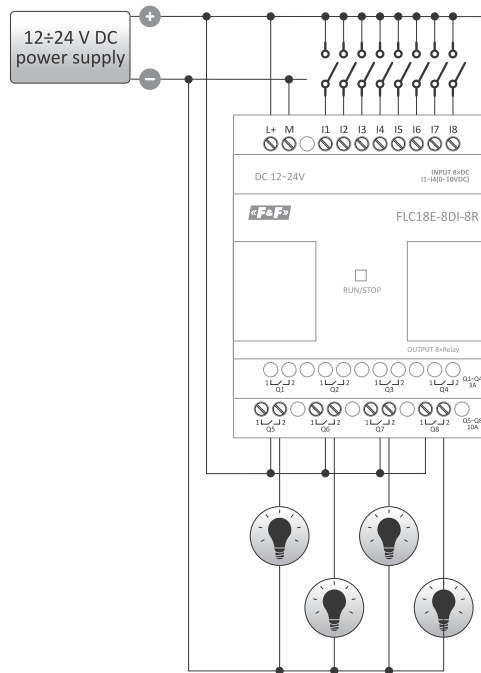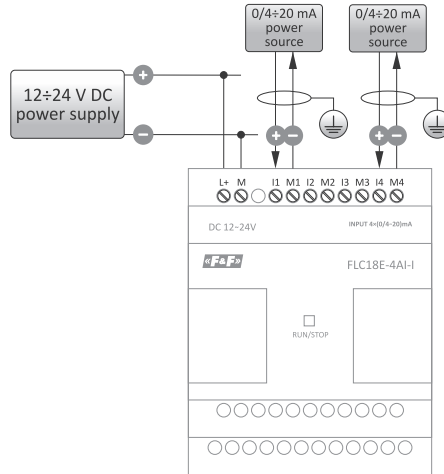| power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	3.5÷ 4 W
inputs	
total number of inputs	8 (I1÷I8)
number of digital inputs	8 (I1÷IC)
number of digital inputs	4 (I1÷I4) (0÷10 V DC)
range of input voltages	0÷28.8 V DC
input type	resistive
isolation between 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
wight	300 g
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
protection level	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
wight	300 g
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
protection level	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
protection level	IP20

FLC18E-2AQ-VI expansion module of analog outputs (2 voltage + 2 current)
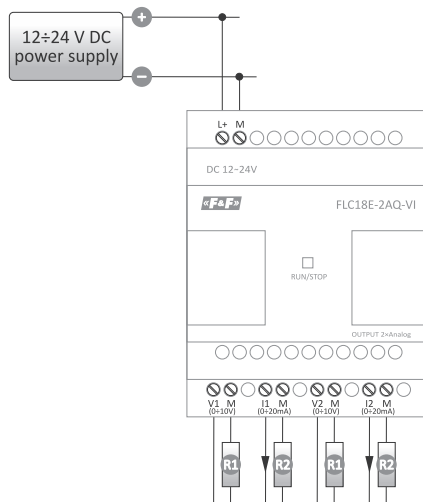
power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	1.8 W
analog voltage/current output	
number of analog outputs	2
range of output voltages	0÷10 V DC
range of output currents	0÷ 20 mA
resolution	10 bit
voltage accuracy at 25°C	20 mV
voltage accuracy at 25°C	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
protection level	IP20

FLC18E-3PT100 expansion module for PT100 temperature sensors with 3 inputs
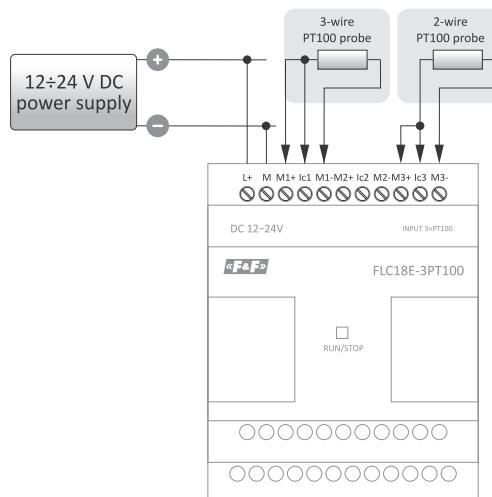
power supply	12÷24 V DC
resistance to temporary power failure	5 ms
starting current	250 mA
power	1 W
sensor inputs PT100	
number of sensors	3 (AI1÷AI3)
measuring probe	PT100
probe type	2- or 3-wire
resolution	12 bit
measurement accuracy at 25°C	0.3°C
other parameters	
cooperation with the CPU modules	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
protection level	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	RS485
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
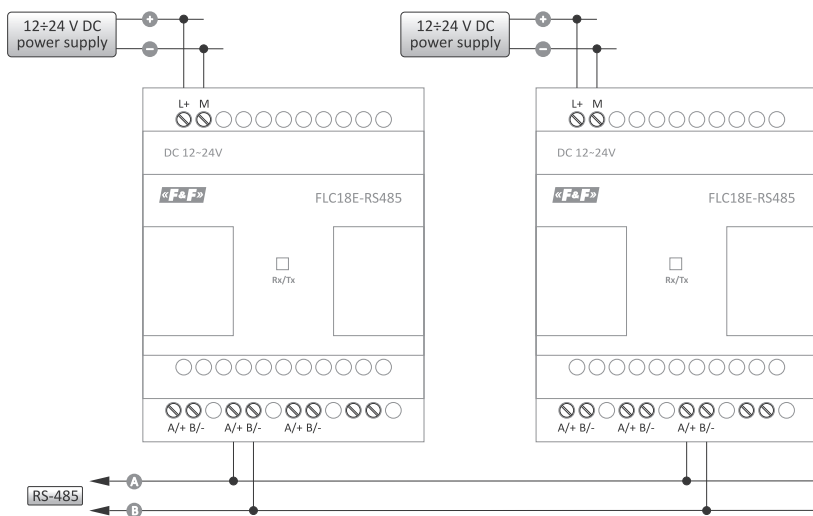
MAX H04 with GSM communicator (SMS, VOICE, GPRS, CLIP)

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 techno-logical 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.
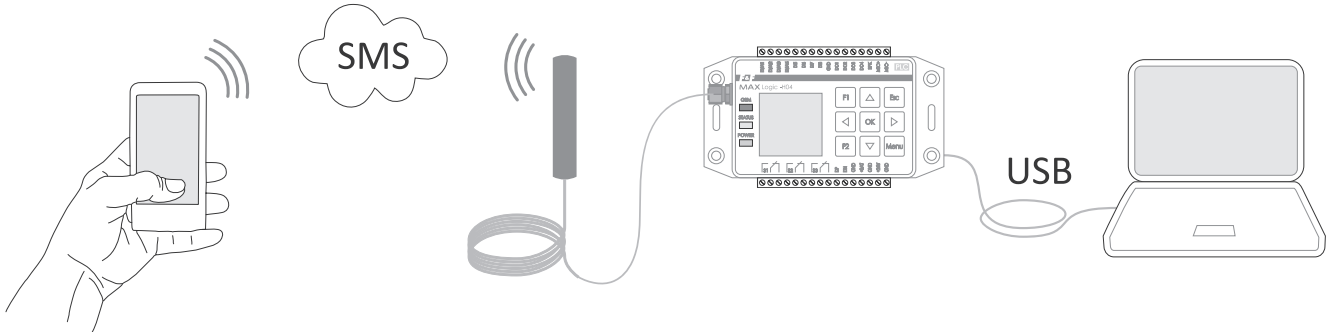
Functions

- **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 MAXLad-derSoft programming languages.
- **Configuration menu**
  Graphical-text menu for setting controller functions, configuring input types, setting specific output functions, providing telephone numbers to which notifications are to be sent, establishing access lock and specifying performance parameters for specific tasks.
- **IVR voice menu** (playback of *.wav sound files)
  It allows you to remotely control in standard voice call mode using the DTMF functions (selecting an option by pressing the desired phone keypad button).
- **Recorder**
  The stand-alone recorder stores data in one of three modes:
  – interval mode – data are read at equal, preset intervals;
  – event mode – data are recorded only when there are any changes in the logical state of inputs/outputs;
  – user-mode – data is recorded in accordance with the user format defined in the ForthLogic language application.
  The data is stored in the non-volatile internal memory or on an SD card as a text file.
  The data is written in series in the form of text: 13:04:39|19/03|18.4 13.8|353 0000 0000 0000 | 01010100|0100|110

- **Remote control and notifications**

  The remote control function allows you to directly manage the outputs and control the operating status of devices connected to the controller inputs via your mobile phone.

- **Voice menu**

  The IVR voice menu (playback of .wav sound files) allows you to remotely control in standard voice connection mode using the DTMF functions (selecting an option by pressing the desired phone keypad button). When creating a program in ForthLogic language it is possible to create any voice menu based on the individual needs of the user such as boiler control 1, heating control 2, group control 3, and system status 4.

- **SMS commands**

  SMS commands are standard ForthLogic language commands, which are known to the Forth-system word interpreter and are directly executed by the controller. Therefore, it is possible to specify any command word from the standard ForthLogic dictionary, which will be implemented directly by the controller, for example: 1 1 RO! As a parameter word, it sets the relay output 1 to the active state. After executing the command, you will receive a return message "(OK)". If the command unknown to the Forth-system word interpreter is given, the return message "ERROR - UNKNOWN WORD" will be sent.

  When creating a program in the ForthLogic language according to the individual needs of the user, it is possible to create commands of any meaning, for example, START, STATE, PUMP? etc. performing actions defined by ForthLogic language words.

- **Notifications**

  The notification function allows you to receive instant SMS information on the user's phone about the change in the status of digital or analog inputs, change of operating parameters of the system, etc. SMS content is standard words or system messages or specially defined phrases such as "Attention, main power failure".

- **RS-485 communication port and Modbus RTU protocol**

  The controller can exchange data with external devices via the RS-485 interface using the Modbus RTU protocol.
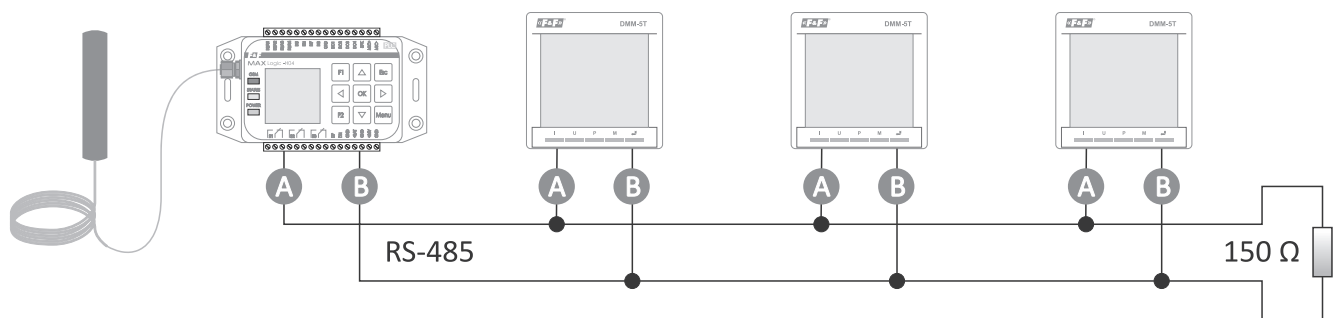
- **Internal memory**

  Built-in 2 MB non-volatile memory designed to store recorded data.

- **SD card**

  SD/MMC memory card reader allows you to perform service functions and record and store registration data. SD, SDHC and MMC memory cards up to 32 GB are supported.

- **RS-485 communication port and Modbus RTU protocol**

  The controller can exchange data with external devices via the RS-485 interface using the Modbus RTU protocol.

- **Power supply**

  The power module and built-in battery charger allow you to implement a flexible power supply scheme. For many functions of the controller, an emergency power supply (backup) in the form of an external gel battery with a nominal voltage of 12 V is required. The controller continuously monitors the state of the battery charge and charges it automatically when the main supply voltage is present.
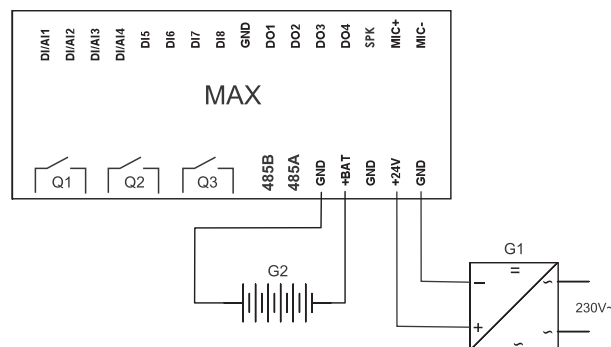
- **Clock**

  The controller has the function of automatic time change from the daylight saving time to standard time with the possibility of switching it off. In order to increase the accuracy of the system clock, it is possible to set the automatic time correction in seconds using the MAX Tool program. System time is adjusted on the first day of each month at 21:00:00 by adding the preset correction value to the system time.

- **Access lock**

  It is possible to set a password that protects access to the system through the terminal and SMS commands. The password is a sequence of 4÷15 digits set in the MAX Tool, H04 Config program and Forth language commands.

- **Status of IN/OUT**

  The status screen of the inputs and outputs allows for an optical evaluation of the operating status of the controller, informs about the firmware version, available memory and parameters of supply voltages.

H04 Config   configuration software

- Control of outputs via SMS commands;
- Queries about the status of inputs and outputs by SMS commands;
- SMS/VOICE alerts about the activation of inputs;
- SMS/VOICE alerts about exceeding the measurement value, for example exceeding the temperature;
- Definition of the content of SMS alarms - A(up to 160 characters);
- The option of sending a second text message when the alarm threshold is continuously exceeded;
- Output control depending on the assigned input:
  - LEVEL option – representation of the state (IN 1 -> OUT 1, IN 0 -> OUT 0);
  - PULSE option – time activation of the output for a set time after the input has been activated;
- The function of a two-state controller of the HEATING/COOLING type (based on the definitions of the analog input scale, threshold, and output assigned to it);
- Selection of options for actuation and alarm triggering (high state 1 or low state 0);
- Printing of states and values on LCD;
- User menu for settings of alarm threshold values and adjustments, telephone numbers, control options, etc.
- CLIP (dial-up) feature and an astronomical clock function.
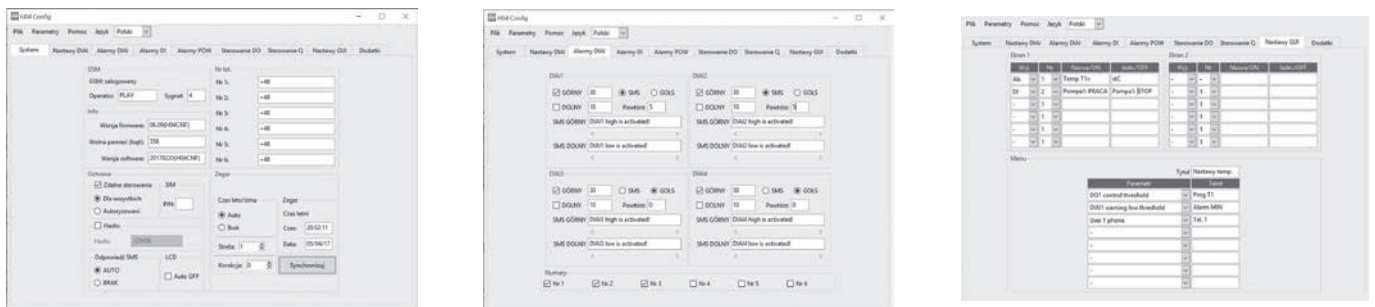
Screenshots from H04 Config program

Software tools

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

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

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

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

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

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

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

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

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

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

| HyperTerminal | MaxLadder Soft | Notepad++Putty+Forthlogic Programmer |

DC 24V

I1–I6 DI/AI(0–10V)
I7–I8 DI/AI(0–10V/0–20mA)

I9–IC DI/HSI [COM0] Pro Port
[COM1] EXT Port

[COM2]
A/+ B/-

FLC18-ETH-12DI-6R

6×Relay OUTPUT
Q1–Q6 (10A 250V AC/5A 30VDC)

INPUT 8×DC
I1–I4(0–10VDC)

FLC18E-8DI-8R

OUTPUT 8×Relay

Q1–Q4
3A

Q5–Q8
10A

DC 12–24V

FLC18E-RS485

Rx/Tx

A/+ B/-   A/+ B/-   A/+ B/-

LE-01MW

kWh

230 V 0.25÷5(100) A

1000
imp/kWh

25 24 23

«F&F» LE-03MW EN50470–1/3

M18 0120
0120/SGS0306

kWh
–25°C÷55°C
3×230/400V
0.25÷5(80)A
5(A) 1.2
50 Hz

A B
1000imp/kWh 1000imp/kvarh

MB-PT100

MB–AHT–1   IP65

MB–LS–1   IP65

RS-485 communication network (Modbus RTU) based on FLC controllers

Chapter 24

Section VII

Power supply control

Phase loss sensors

Purpose

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value.

Operation

The green LED is on when the power supply voltage is correct. A voltage drop below 320 V or rise above 480 V on at least one phase is indicated by the LED being off. Voltage asymmetry is indicated by the flashing of the LED corresponding to the phase that causes it. Both of the above anomalies (exceeding the voltage threshold, asymmetry) cause the device relay to be switched off and, as a result, the motor to be disconnected. Disconnection is delayed in order to avoid accidental switch-offs in case of temporary network disturbances. The relay is switched on again automatically (with a delay) when the correct network parameters return.

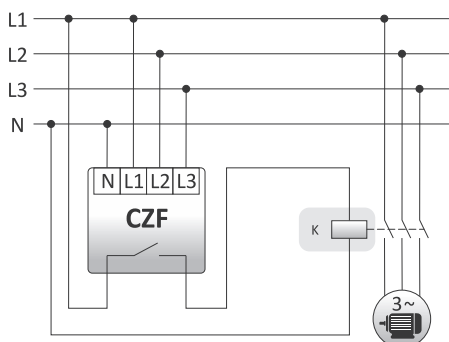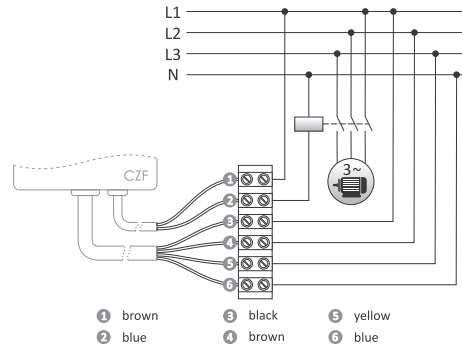| Product	Supply voltage	Maximum load current (AC-1)	Configuration of the contacts	Contact separa-tion	Voltage asymmetry of tripping	Off delay	Cooperation with power generators	Control of phase sequence	Control of contactor contacts	Terminal	Installation	Page
CZF	3×400 V+N	10 A	1×NO	●	45 V	4 s	–	–	–	OMY 4×1 mm²; 2×0.75 mm², I: 0.5 m	surface-mounted	141
CZF-B	3×400 V+N	16 A	1×NO	●	55 V	4 s	–	–	–	4.0 mm² screw terminals	for TH-35 rail	141
CZF-BR	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	4 s	–	–	–	4.0 mm² screw terminals	for TH-35 rail	142
CZF-BS	3×400 V+N	16 A	1×NO/NC	●	55 V	4 s	–	–	–	4.0 mm² screw terminals	for TH-35 rail	141
CZF-BT	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	1÷10 s	–	–	–	4.0 mm² screw terminals	for TH-35 rail	142
CZF-310	3×400 V+N	8 A	1×NO/NC	●	55 V	4 s	–	–	–	2.5 mm² screw terminals	for TH-35 rail	141
CZF-311	3×400 V+N	8 A	1×NO/NC	●	40÷80 V	4 s	–	–	–	2.5 mm² screw terminals	for TH-35 rail	142
CZF-312	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	142
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	143
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	144
CZF-333	3×400 V	10 A	1×NO/NC	●	20÷50 V	4 s	●	–	–	4.0 mm² screw terminals	for TH-35 rail	143
CZF-334	3×400 V	2×6 A	2×NO/NC	●	20÷80 V	1÷10 s	●	–	–	2.5 mm² screw terminals	for TH-35 rail	143
CZF2	3×400 V+N	10 A	1×NO	●	45 V	4 s	–	–	●	1.5 mm² screw terminals	surface-mounted	145
CZF2-B	3×400 V+N	10 A	1×NO	–	55 V	4 s	–	–	●	4.0 mm² screw terminals	for TH-35 rail	145
CZF2-BR	3×400 V+N	10 A	1×NO	–	40÷80 V	4 s	–	–	●	4.0 mm² screw terminals	for TH-35 rail	145
CKF	3×400 V+N	10 A	1×NO	●	45 V	4 s	–	●	–	OMY 4×1 mm²; 2×0.75 mm², I: 0,5 m	surface-mounted	147
CKF-B	3×400 V+N	16 A	1×NO	●	55 V	4 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	147
CKF-BR	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	4 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	148
CKF-BT	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	0.5÷5 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	148
CKF-316	3×400 V+N	8 A	1×NO/NC	●	55 V	4 s	–	●	–	2.5 mm² screw terminals	for TH-35 rail	147
CKF-317	3×400 V+N	8 A	1×NO/NC	●	40÷80 V	4 s	–	●	–	2.5 mm² screw terminals	for TH-35 rail	148
CKF-318	3×400 V	2×8 A	2×NO/NC	●	20÷80 V	1÷10 s	●	●	–	2.5 mm² screw terminals	for TH-35 rail	149
CKF-319	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	149
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	149
CKF2-BT	3×400 V+N	8 A	1×NO/NC	●	20÷80 V	0.5÷15 s	●	●	●	2.5 mm² screw terminals	for TH-35 rail	150

Chapter 25

With a constant tripping threshold of voltage asymmetry
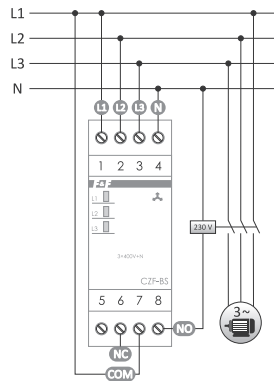
CZF surface-mounted, separated contact 1×NO

- ❶ brown
- ❷ blue
- ❸ black
- ❹ brown
- ❺ yellow
- ❻ blue

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	280 V
effective voltage unbalance	45 V
voltage hysteresis	5 V
switching OFF delay	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	51×67×26mm
installation	surface mounting
protection level	IP20

CZF-B separated contact 1×NO

power supply	3×400 V+N
contact	separated 1×NO
maximum load current (AC-1)	16 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	55 V
voltage hysteresis	5 V
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

CZF-BS separated contact 1×NO/NC

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	55 V
voltage hysteresis	5 V
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

CZF-310 1-module housing, separated contact 1×NO/NC

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	55 V
voltage hysteresis	5 V
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

With an adjustable tripping threshold of voltage asymmetry

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

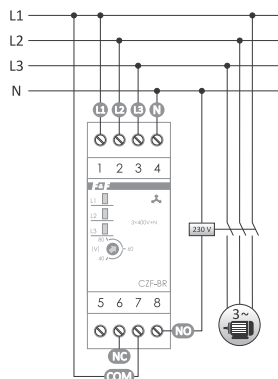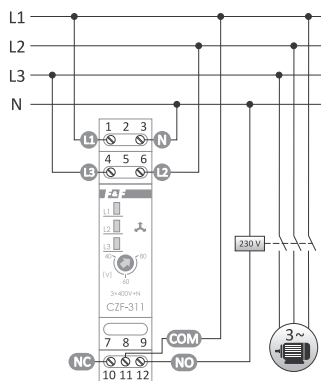|	
power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working 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)
installation	for TH-35 rail
protection level	IP20

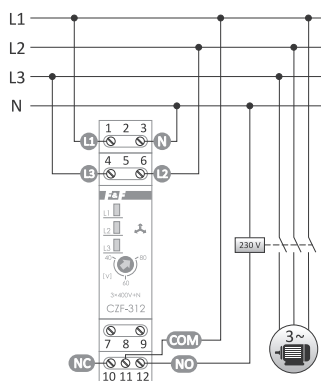## CZF-BT — separated contact 1×NO/NC, adjustable asymmetry and off delay

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF delay	1÷10 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)
installation	for TH-35 rail
protection level	IP20

CZF-311 — 1-module housing, separated contact 1×NO/NC, adjustable asymmetry

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

CZF-312 — 1-module housing, separated contacts: 1×NC, 1×NO, with a tripping time of 0.5 s

power supply	3×400 V+N
contact	separated 1×NC, 1×NO
maximum load current (AC-1)	2×8 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF delay	0.5 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)
installation	for TH-35 rail
protection level	IP20

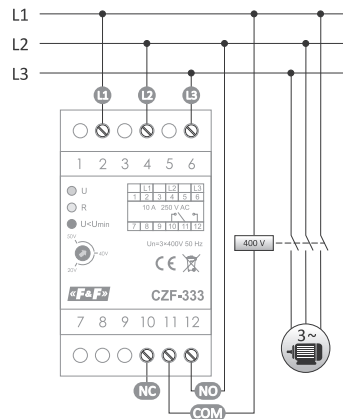# CZF-331 separated contacts 2×NO/NC, adjustable asymmetry

power supply	3×400 V+N
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
indication of the correct power supply	3×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

Failure signalling

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

CZF-333 adjustable asymmetry, without neutral wire

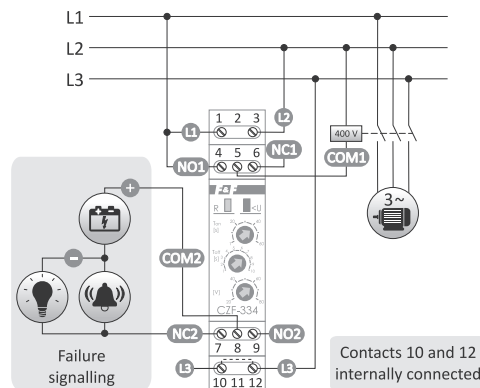|	
power supply	3×400 V
contact	separated 1×NO/NC
maximum load current (AC-1)	10 A
indication of the correct power supply	3×LED
effective voltage unbalance	20÷50 V
activation interphase voltage	<320 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working temperature	-25÷40°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
protection level	IP20

CZF-334 1-module housing, separated contacts 2×NO/NC, adjustable asymmetry, on delay and off delay, without neutral wire

power supply	3×400 V
contact	separated 2×NO/NC
maximum load current (AC-1)	2×6 A
indication of the correct power supply	2×LED
minimum phase voltage	320 V
maximum phase voltage	480 V
effective voltage unbalance	20÷80 V
voltage hysteresis	5 V
switching OFF delay	1÷10 s
return 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)
installation	for TH-35 rail
protection level	IP20

Failure signalling

Contacts 10 and 12 internally connected

With control of the contactor contacts

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
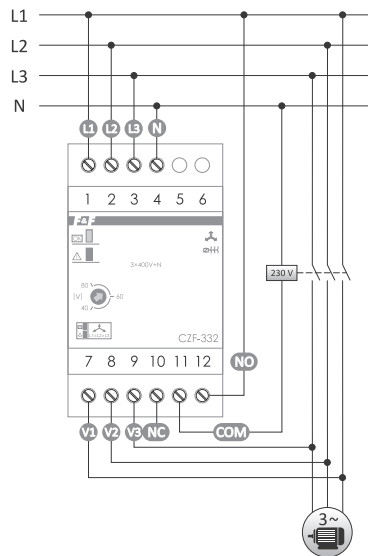• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value;
• contactor contact failure.

Operation

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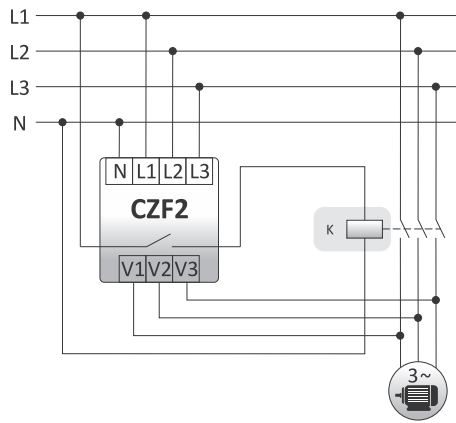
CZF-332 separated contact 1×NO/NC, adjustable asymmetry

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
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

Chapter 25

CZF2 surface-mounted, separated contact 1×NO

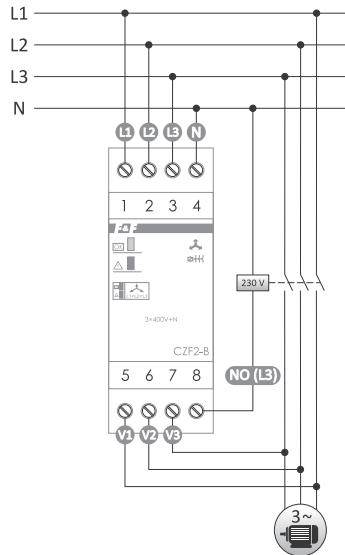|	
power supply	3×400 V+N
contact	separated 1×NO
maximum load current (AC-1)	10 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	45 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working temperature	-25÷40°C
terminal	1.5 mm² screw terminals (cord/wire)
tightening torque	0.3 Nm
dimensions	95×60×25 mm
installation	surface mounting
protection level	IP20

CZF2-B installation 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
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

CZF2-BR adjustable asymmetry

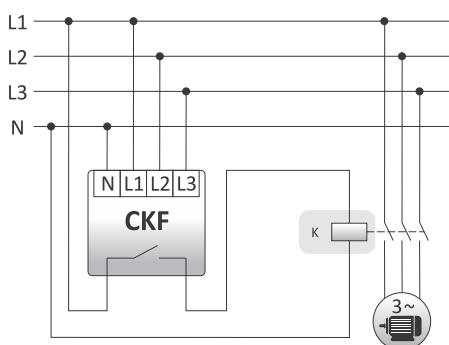|	
power supply	3×400 V+N
contact	1×NO
maximum load current (AC-1)	10 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	40÷80 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working temperature	-25÷40°C
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP20

Phase sequence and phase loss sensors

Purpose

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value;
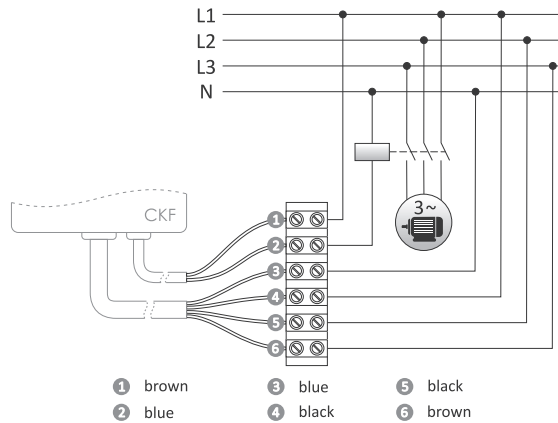• incorrect phase sequence.

Operation

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 separa-tion	Voltage asymmetry of tripping	Off delay	Cooperation with power generators	Control of phase sequence	Control of contactor contacts	Terminal	Installation	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	147
CKF-B	3×400 V+N	16 A	1×NO	●	55 V	4 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	147
CKF-BR	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	4 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	148
CKF-BT	3×400 V+N	16 A	1×NO/NC	●	40÷80 V	0.5÷5 s	–	●	–	4.0 mm² screw terminals	for TH-35 rail	148
CKF-316	3×400 V+N	8 A	1×NO/NC	●	55 V	4 s	–	●	–	2.5 mm² screw terminals	for TH-35 rail	147
CKF-317	3×400 V+N	8 A	1×NO/NC	●	40÷80 V	4 s	–	●	–	2.5 mm² screw terminals	for TH-35 rail	148
CKF-318	3×400 V	2×8 A	2×NO/NC	●	20÷80 V	1÷10 s	●	●	–	2.5 mm² screw terminals	for TH-35 rail	149
CKF-319	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	149
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	149
CKF2-BT	3×400 V+N	8 A	1×NO/NC	●	20÷80 V	0.5÷15 s	●	●	●	2.5 mm² screw terminals	for TH-35 rail	150

With a constant tripping threshold of voltage asymmetry
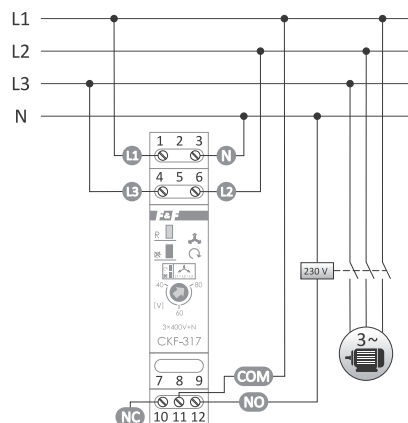
CKF surface-mounted, separated contact 1×NO

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	280 V
effective voltage unbalance	45 V
voltage hysteresis	5 V
switching OFF delay	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	51×67×26mm
installation	surface mounting
protection level	IP20

1 brown **3** blue **5** black
2 blue **4** black **6** brown

CKF-B separated contact 1×NO

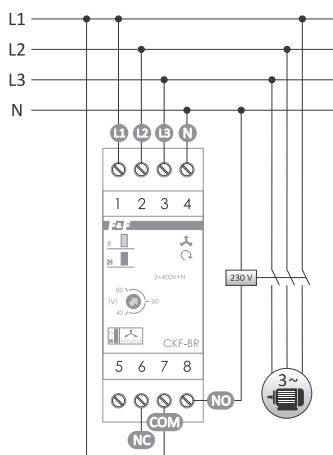|	
power supply	3×400 V+N
contact	separated 1×NO
maximum load current (AC-1)	16 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	55 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working temperature	-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)
installation	for TH-35 rail
protection level	IP20

CKF-316 1-module housing, separated contact 1×NO/NC

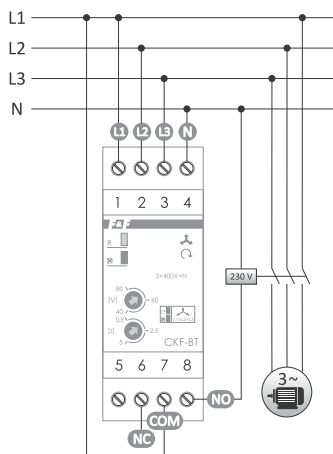|	
power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	55 V
voltage hysteresis	5 V
switching OFF delay	4 s
power consumption	1.6 W
working temperature	-25÷40°C
terminal	2.5 mm² screw terminals (cord/wire)
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

With an adjustable tripping threshold of voltage asymmetry
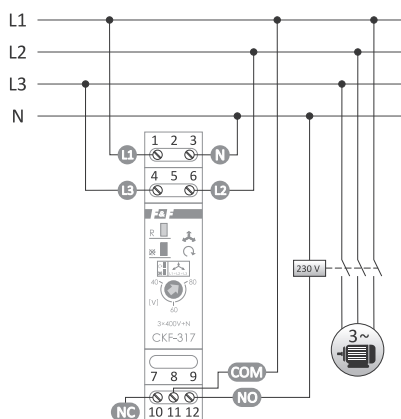
CKF-BR separated contact 1×NO/NC, adjustable asymmetry

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	16 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
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

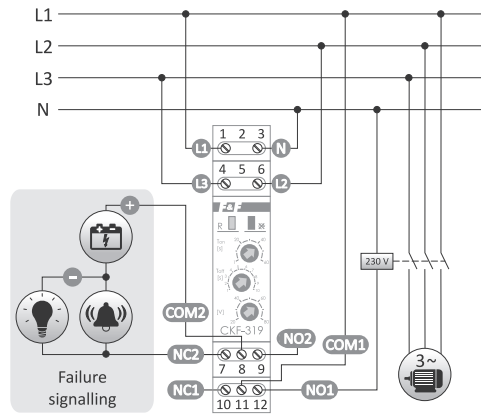## CKF-BT separated contact 1×NO/NC, adjustable asymmetry and off delay

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	16 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
switching OFF delay	1÷10 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)
installation	for TH-35 rail
protection level	IP20

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

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 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
switching OFF 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)
installation	for TH-35 rail
protection level	IP20

CKF-319
1-module housing, separated contacts 2×NO/NC, on delay and off delay

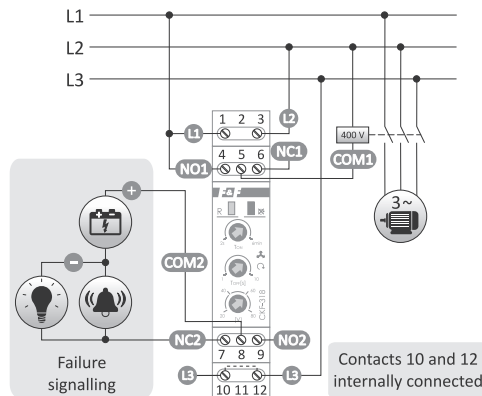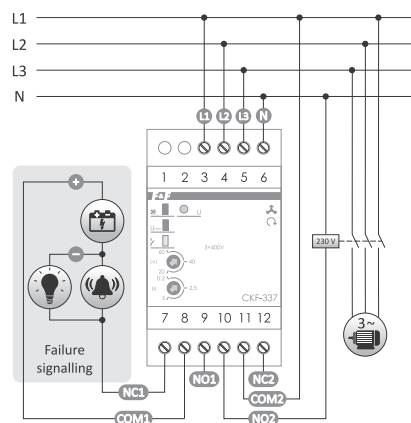|	
power supply	3×400 V+N
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
indication of the correct power supply	2×LED
minimum phase voltage	150 V
maximum phase voltage	280 V
effective voltage unbalance	20÷80 V
voltage hysteresis	5 V
switching OFF delay	1÷10 s
switching ON delay	1÷60 s
power 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)
installation	for TH-35 rail
protection level	IP20

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

CKF-318
1-module housing, separated contacts 2×NO/NC, adjustable asymmetry, on delay and off delay, without neutral wire

Contacts 10 and 12 internally connected

power supply	3×400 V
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
indication of the correct power supply	2×LED
minimum phase voltage	320 V
maximum phase voltage	480 V
effective voltage unbalance	20÷80 V
voltage hysteresis	5 V
switching OFF delay	1÷10 s
switching ON 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)
installation	for TH-35 rail
protection level	IP20

CKF-337
separated contact 1×NO/NC, adjustable asymmetry, off delay, without neutral wire

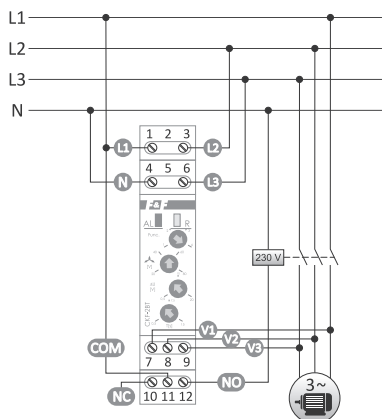|	
power supply	3×400 V
contact	separated 1×NO/NC
maximum load current (AC-1)	10 A
indication of the correct power supply	4×LED
effective voltage unbalance	20÷60 V
activation interphase voltage	<320 V
voltage hysteresis	5 V
switching OFF delay (adjustable)	0.2÷5 s
power consumption	1.6 W
working temperature	-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)
installation	for TH-35 rail
protection level	IP20

With control of the contactor contacts

Phase loss sensor with the control of the contactor contacts is designed for protection of electric motor supplied from three-phase mains in the following cases:
• a voltage loss in at least one phase;
• a voltage drop in at least one phase below 150 V;
• a voltage rise in at least one phase above 280 V;
• an asymmetry of voltages between phases above the set value;
• incorrect phase sequence;
• contactor contact failure.

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, 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. 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.

CKF2-BT 1-module housing, separated contact 1×NO/NC, adjustable asymmetry, switching OFF delay

power supply	3×400 V+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
indication of the correct power supply	2×LED
minimum phase voltage	160 V
maximum phase voltage	265 V
effective voltage unbalance	20÷80 V
return hysteresis	5 V
voltage drop at the contacts	0.8÷20 V
switching OFF delay	
when the phase voltage drops	0.5÷15 s
when the maximum voltage is exceeded	0.5 s
when asymmetry occurs	0.5÷15 s
if the contactor fails	12 s
power consumption	1.6 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)
installation	for TH-35 rail
protection level	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.
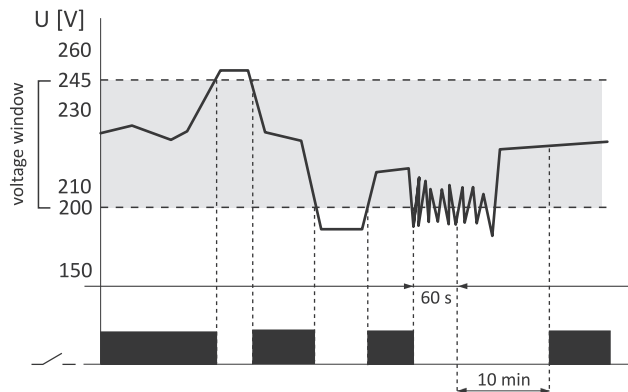
(!) All types of voltage relays can be supplied with voltages up to 450 V. This allows for effective protection of the receiver even if the voltage exceeds the permissible standards. Also in cases of replacing the polarity of the power supply or disconnecting the "zero", it will not destroy (burn) the relay.
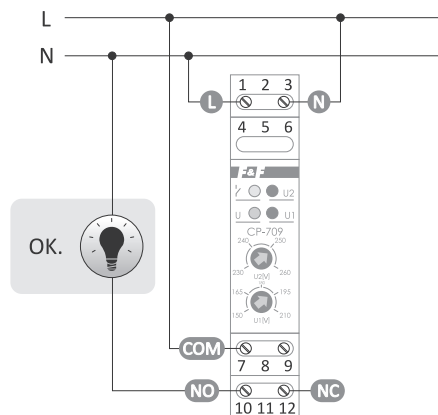
Operation

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.
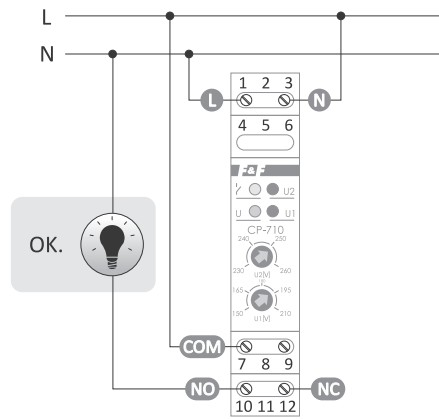

CP-709 without time lock

power supply	50÷450 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
power 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)
installation	for TH-35 rail
protection level	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 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)
installation	for TH-35 rail
protection level	IP20

* Note on the previous page
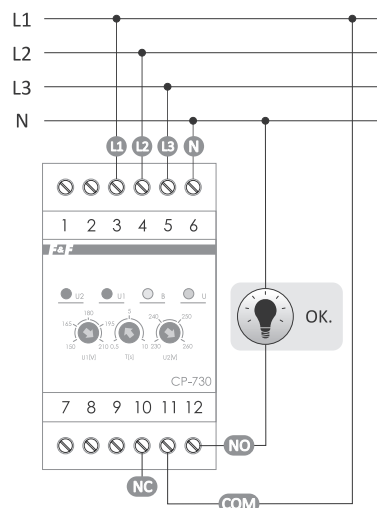
CP-721 programmable, without time lock
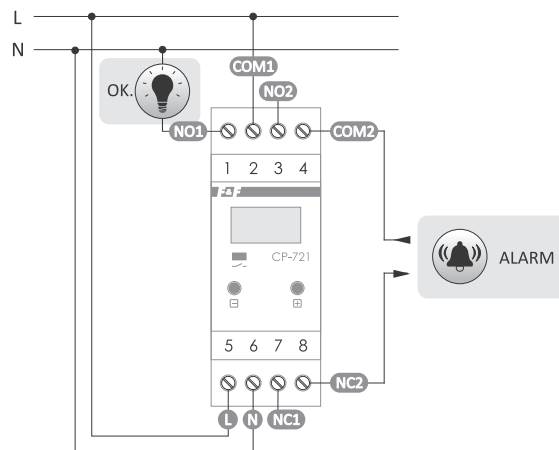
power supply	150÷450 V AC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
tripping voltage thresholds / step	
lower UL	150÷210 V/5 V
upper UH	230÷260 V/5 V
voltage hysteresis	
for threshold UL	5 V
for threshold UH	5 V
tripping time/step	
for threshold UL	2÷10 s/1 s
for threshold UH	0.1÷1 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	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

Functions

- Setting the voltage window (UL and UH thresholds);
- Separate setting of the tripping times when the UL and UH thresholds are exceeded;
- Return time setting;
- Continuous display of the mains voltage;
- Signaling of correct mains voltage and closing of the contact.

CP-730 3-phase, with time lock*

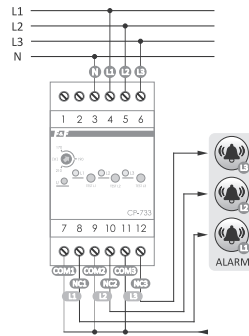| power supply	3×(50÷450 V)+N
contact	separated 1×NO/NC
maximum load current (AC-1)	8 A
power control	4×LED
voltage activation threshold	
lower UL	150÷210 V
upper UH	230÷260 V
return voltage hysteresis	
for threshold UL and UH	5 V
activation time	
for threshold UL (adjustable) 0.5÷10 s	
for threshold 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)
installation	for TH-35 rail
protection level	IP20

* Note on the previous page

Under-voltage

CP-733   3×NC contacts

Operation

When the mains voltage is correct, the contacts remain open. Voltage loss in a phase or its drop below a set threshold of tripping voltage will cause the closing of a contact corresponding to this phase. The contact is opened automatically when the voltage in the phase returns or when the voltage increases by 5 V above the set threshold (by the value of voltage hysteresis).
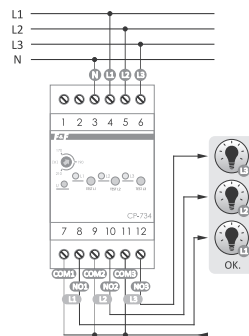

power supply	3×(50÷450 V)+N
contacts	separated 3×NC
maximum load current (AC-1)	3×8 A
power control	4×LED
tripping voltage (adjustable)	170÷210 V
voltage hysteresis	5 V
tripping/return time	0.5 s/ 1.5 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
protection level	IP20

CP-734   3×NO contacts

Operation

When the mains voltage is correct, the contacts remain closed. Voltage loss in a phase or its drop below a set threshold of tripping voltage will open a contact corresponding to this phase. The contact is closed automatically when the voltage in the phase returns or when the voltage increases by 5 V above the set threshold (by the value of voltage hysteresis).
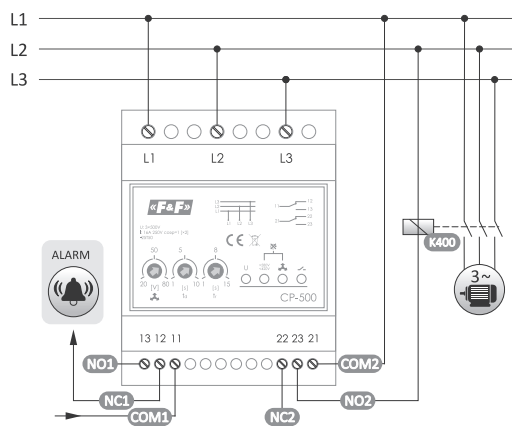

power supply	3×(50÷450 V)+N
contacts	separated 3×NO
maximum load current (AC-1)	3×8 A
power control	4×LED
tripping voltage (adjustable)	170÷210 V
voltage hysteresis	5 V
tripping/return time	0.5 s/ 1.5 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
protection level	IP20

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

Operation

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 control/status indication	4×LED
tripping voltage/asymmetry (adjustable)	20÷80 V
tripping time in case of asymmetry (adjustable)	1÷10 s
voltage thresholds/tripping time	
upper	580 V/0.5 s
lower	420 V/5 s
voltage hysteresis	5 V
return time (adjustable)	1÷15 s
power consumption	1.4 W
working temperature	-25÷50°C
connection of contacts 1 and 2	2.5 mm² screw terminals
tightening torque	0.4 Nm
terminal L₁, L₂, L₃	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	4 modules (70 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- Protection against phase loss;
- Protection against phase sequence change;
- Protection against phases asymmetry;
- Protection against rising of the voltage above 580 V;
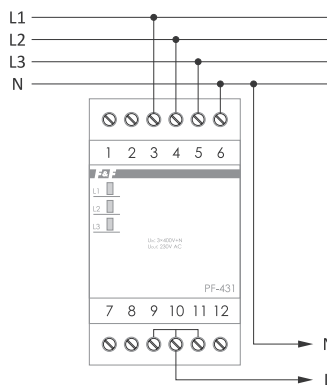- Protection against dropping of the voltage below 420 V.

Purpose

Automatic phase switches are designed to ensure the continuity of power supply to single-phase receivers in the event of a power phase loss or a drop in its parameters below the norm. They constitute a single-phase automatic transfer switching system. They are particularly useful in cases where a continuous supply of voltage with correct parameters is required, for example, refrigeration and air-conditioning equipment, computer and telecommunications networks, cable television, alarm systems, etc.

PF-431/PF-431i   with a priority phase

Operation

A three-phase voltage (3×400 V+N) is applied to the input of the switch. The switch output is supplied with a single-phase voltage (230 V AC), which means phase voltage of one of the phases. The electronic circuit of the switch controls the voltage values of the applied phases so that the output voltage is not less than 195 V. The phase with the correct parameters is directed to the switch output. The L_1 is a priority phase, which means if its parameters are correct, this phase will always be switched to the output. In case of a voltage drop in the phase L_1 below 190 V or its loss, the electronic circuit will switch L_2 phase to the output (if its parameters are correct). In the case of the simultaneous absence of correct voltages in the L_1 and L_2 phases, the L_3 phase will be switched to the output. If the correct supply voltage in phase L_1 (above 195 V) returns, the system will switch this phase to the output.

power supply	3×400 V+N
output voltage	230 V AC
maximum load current (AC-1)*	
PF-431	<16 A
PF-431i	<16 A (160 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
signalling input voltage	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)
installation	for TH-35 rail
protection level	IP20

* Actual permissible load depends on the nature of the receivers. The use of the PF-441 switch with additional contactors is essential for the power supply of large household appliances, heating devices, lighting (LEDs, meta-halogens, ESL bulbs).

PF-441   for work with contactors, with a priority phase
with lower (195 V) and upper (250 V) actuation threshold
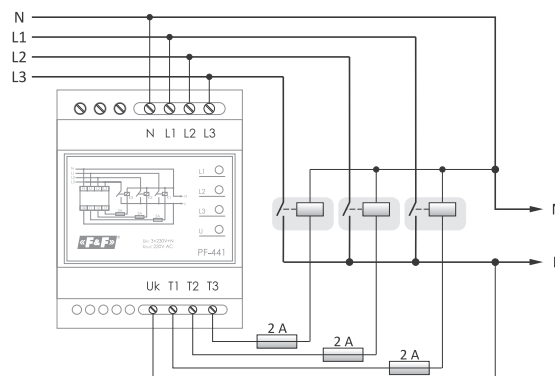
Operation

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.

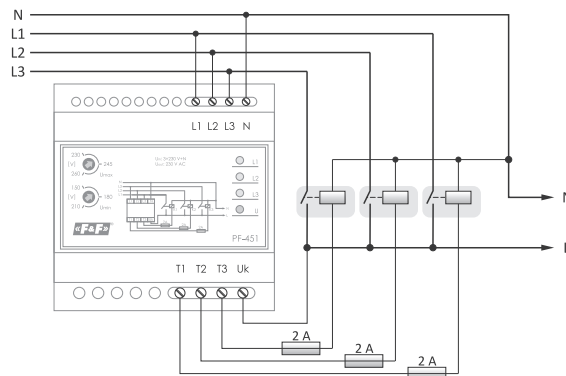| power supply	3×400 V+N
output voltage	230 V AC
maximum load current (AC-1)	
direct connection	16 A
with contactors	to the load capacity of contactor contacts
activation threshold	
lower	195 V
upper (adjustable)	250 V
voltage hysteresis	5 V
voltage measurement error	±1%
switching time	0.5÷0.8 s
power indication	LED green
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)
installation	for TH-35 rail
protection level	IP20

PF-451
for work with contactors, without a priority phase
with adjustable lower (150÷210 V) and upper (230÷260 V) actuation threshold

Operation

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
signalling input voltage	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)
installation	for TH-35 rail
protection level	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)

Operation

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.
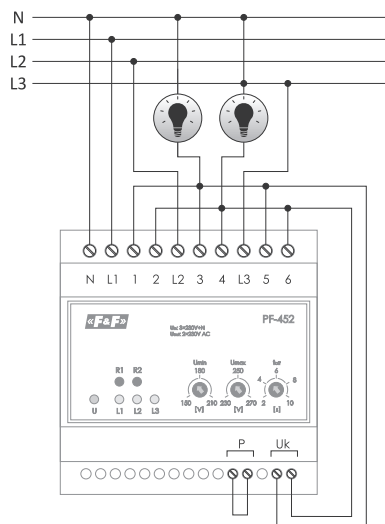
The switch can operate in two receiving options: phase-to-phase 400 V AC voltage or 2×230 V AC phase voltages.

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 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	
function A	400 V
function B	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	LED green
indication of the selected phase	3×LED yellow
outputs indication	2×LED red
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)
installation	for TH-35 rail
protection level	IP20

Automatic transfer switches

Automatic transfer switches are designed to control the parameters and correctness of power supply lines and automatic switching of power supply sources of the facility in case of a drop in power supply line parameters or a total loss of voltage in this line.

SZR-277

Purpose

The SZR-277 automatic transfer switch is designed for automatic switching of power sources operating in the following configuration: N1+N2 or N1+G in single-phase networks.

Functions

- Control of supply line parameters;
- Protection of the receivers from too high or too low voltage;
- Control of the relay contacts and protection against the possibility of a short circuit between the generator and the mainline;
- Generator startup control;
- Emergency external safety switch;
- Backup power supply for the controller from the battery along with the battery charging system.

supply voltage	
main line (terminals 1-2)	195÷265 V/50 Hz
generator (terminals 1-3)	195÷265 V/50 Hz
battery* (terminals 1-4)	10÷14.5 V DC
maximum allowable voltage (terminals 1-2, 1-3)	400 V
maximum switching current	16 A (AC-1)/250 V
of internal contacts	3 A (AC-15)/250 V
contacts	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)
installation	for TH-35 rail
protection level	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
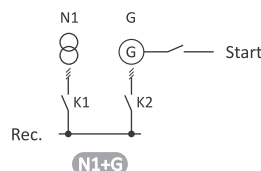
Connection scheme
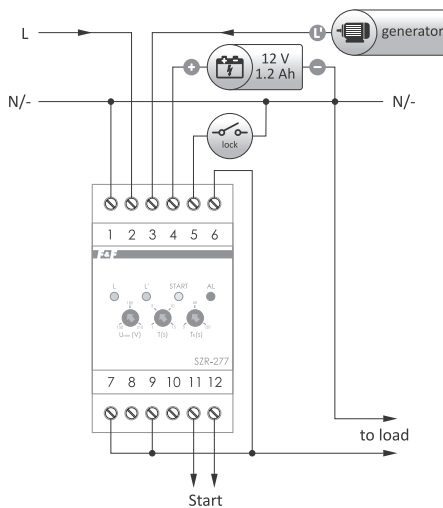
Connection at the current <16 A (AC-1)
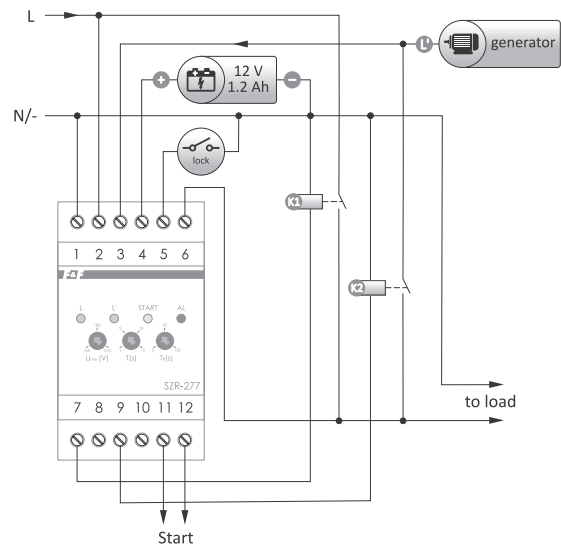
Connection (with the contactors) at the current above 16 A (AC-1)

Operating modes

SZR-278

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)
installation	for TH-35 rail
protection level	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.

Connection scheme
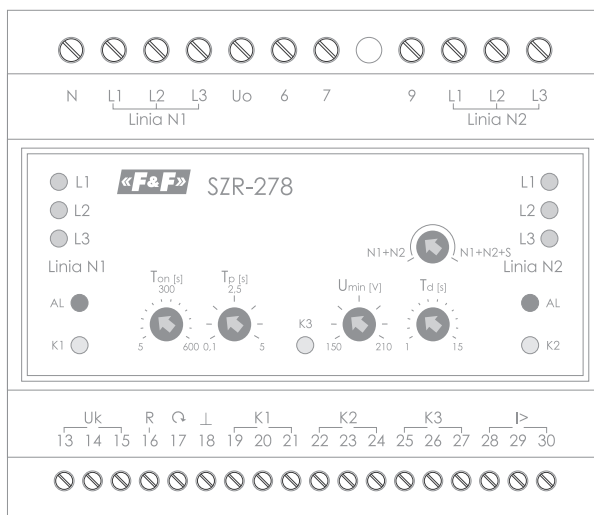
2-4	line N1
10-12	line N2
13-15	voltage control
16	safety switch
17	error reset
19-27	control of output devices
28-30	auxiliary control input

Operating modes

N1+N2

N1+N2+S

SZR-279

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)
installation	for TH-35 rail
protection level	IP20

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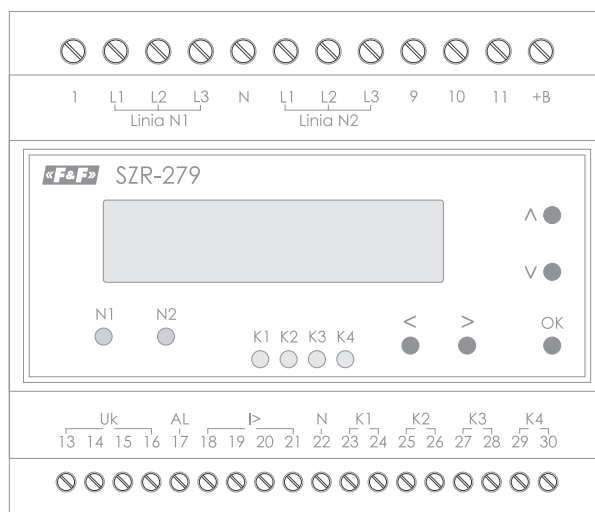
2-4	line N1
6-8	line N2
12	auxiliary power supply
13-15	voltage control
17	error indication
18-20	current control
21	safety switch
22-28	control of output devices
29-30	start-up of the generator

N1+G

N1+N2

N1+N2+S

N1+N2+S1+S2

N1+N2+G

N1+N2+S+G
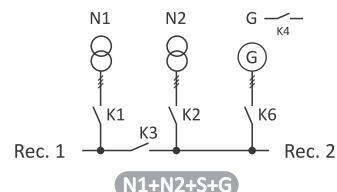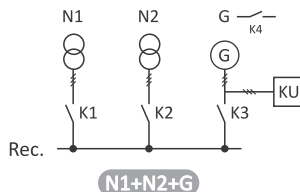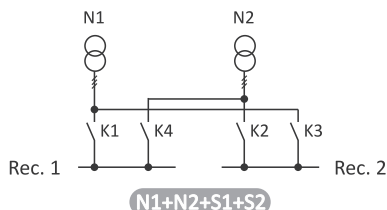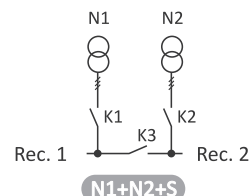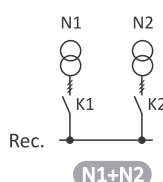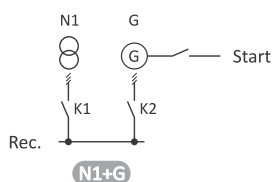
SZR-280 / SZR-280/12

Purpose

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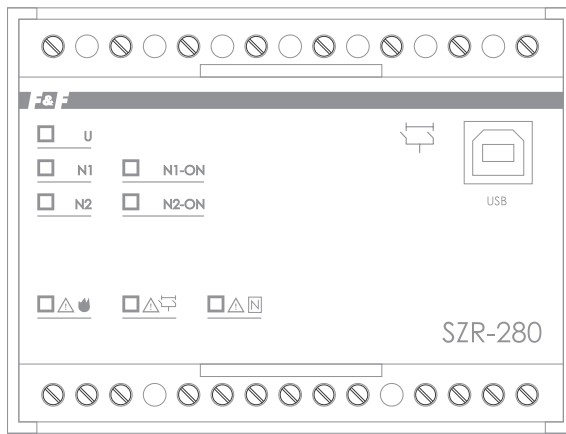

controlled lines	2-×400V+N
controller power supply	
supply voltage	
SZR-280	85÷264 V AC
SZR-280/12	11÷14 V AC/DC
power consumption	4 W
input voltage measured	
rated voltage	230 V
measuring range	80÷300 V
frequency	45÷55 Hz
accuracy	1% of the full scale + 1 digit
relay outputs	
contacts	5×NO
maximum load 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
installation	for TH-35 rail
protection level	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.

Connection scheme

1-7	line N1
9-15	line N2
13-15	voltage control
16-18	controller power supply
20-25	control of output devices
29-30	controller lock

Operating modes

N1+G

N1+N2
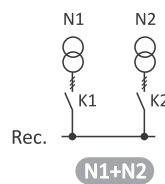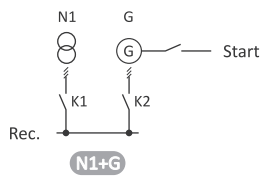
## SZR-280 app

Section VIII

Current protection
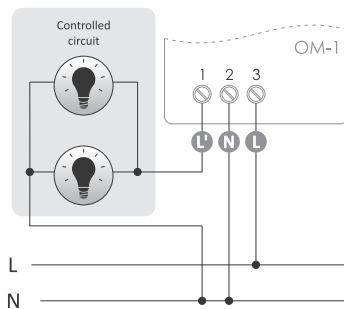
Power consumption limiters

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.

Operation

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.
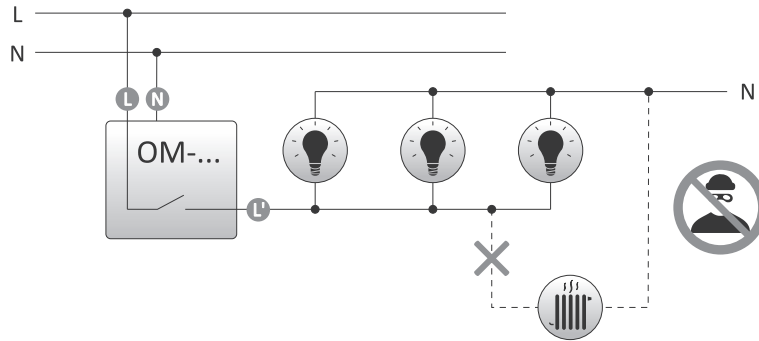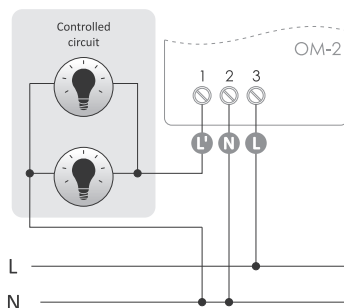

OM-1   with a fixed return time

power supply	195÷253 V AC
maximum load current (AC-1)	16 A
power limit	200÷2000 VA
operation delay	1.5÷ 2 s
return supply hysteresis	2%
return 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
installation	surface mounting
protection level	IP20

OM-2   with an adjustable return time

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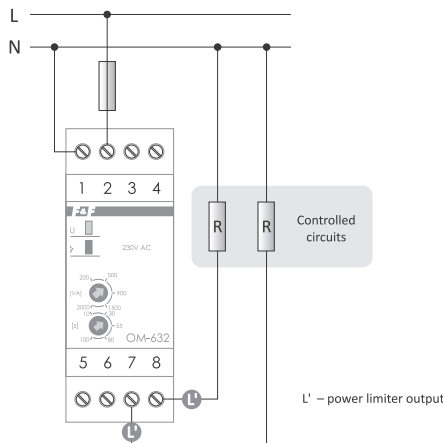

L' – power limiter output

power supply	195÷253 V AC
contact	1×NO
maximum load current (AC-1)	16 A
power limit	200÷1000 VA
operation delay	1.5÷ 2 s
return supply hysteresis	2%
return 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)
installation	for TH-35 rail
protection level	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.
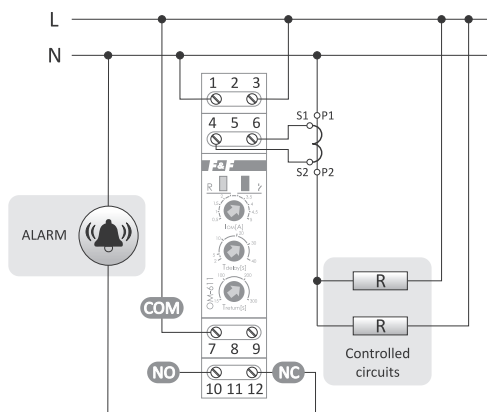

L' – power limiter output

power supply	195÷253 V AC
contact	1×NO
maximum load current	
AC-1	16 A
AC-3	4 A
power limit	200÷2000 VA
operation delay	1÷ 2 s
return supply hysteresis	2%
return 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)
installation	for TH-35 rail
protection level	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
twilight activation (adjustable)	0.5÷ 5 A
operation delay (adjustable)	2÷40 s
return supply hysteresis	2%
return 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)
installation	for TH-35 rail
protection level	IP20

OM-616 to a flush-mounted box, with a voltage relay function

Power limiter designed for direct control of the power of plug sockets. Useful in public buildings, hotels, boarding houses, hospitals, etc. Reduces power consumption from a single outlet to low values. An additional function of a voltage relay disconnects the output when the supply voltage exceeds 270 V or drops below 150 V.

Power supply   Receiver
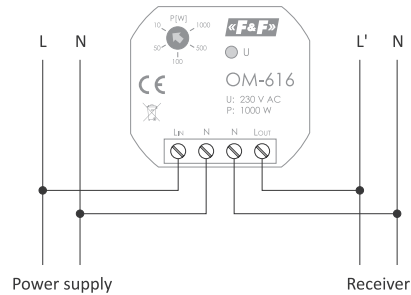
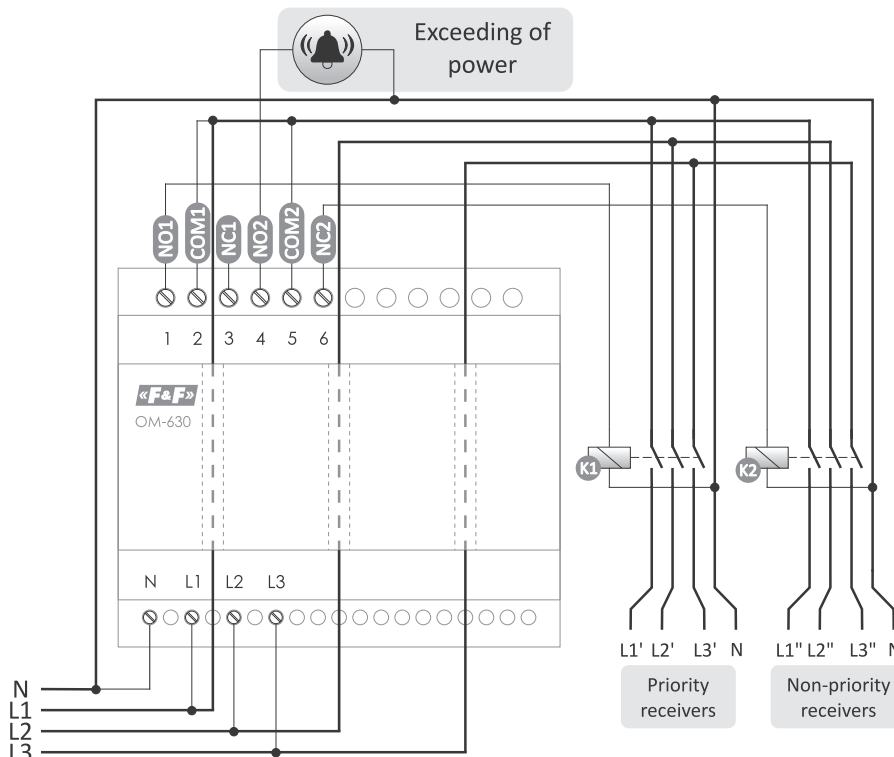|	
power supply	85÷265 V AC
contact	separated 1×NO
maximum load current (AC-1)	5 A
power	
power limit (adjustable)	10÷1000 W
tripping/return time	4 S/ 30 s
voltage	
lower activation threshold U_L	150 V
upper activation threshold U_H	270 V
lower activation time U_L	10 s
upper activation time U_H	0.3 s
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	Ø54 (48×43 mm), h= 20 mm
installation	in flush mounted box Ø60
protection level	IP20

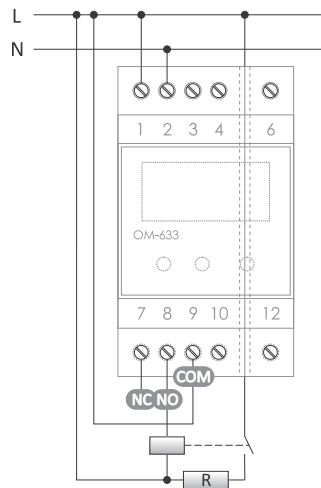# OM-630 three-phase, direct measurement up to 50 kW

Functions

- Measurement of the active power of a three-phase system;
- Control of asymmetry, presence, and sequence of the phases;
- Short-circuit protection;
- Priority relay function;
- The function of a three-phase voltage relay;
- Time lock for the operation of the limiter due to frequent exceeding of the setting threshold;
- Indication of exceeding the power limit value;
- Adjustment of the tripping and return times short circuit protection.

power supply	3×(50÷450 V)+N
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
power	
power limit (adjustable)	5÷50 kW
set-up step	0.5 kW
activation time T_{OFF} (adjustable)	1÷240 s
return time T_{ON} (adjustable)	2÷3600 s
voltage	
Lower activation threshold U_L	<160 V
upper activation threshold U_H	> 260 V
lower activation time U_L	5 s
upper activation time U_H	0.1 s
measurement error	
voltage 50÷300 V	<2%
current 3÷100 A	<3%
through-hole diameter	10 mm
power consumption	≤ 1.5 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	6 modules (105 mm)
installation	for TH-35 rail
protection level	IP20

Exceeding of power

Priority receivers   Non-priority receivers

OM-633 with power consumption indicator and voltage relay function

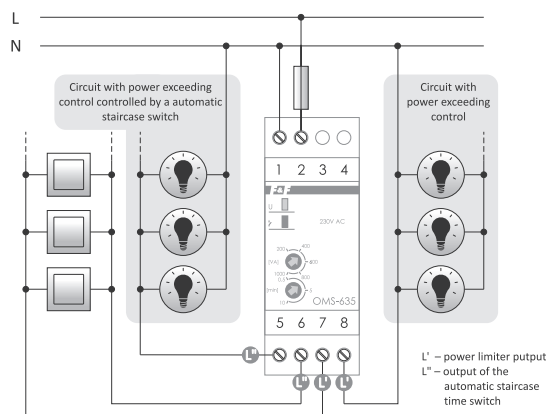| power supply	195÷253 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
power	
power limit (adjustable)	1÷10 kW
activation time (adjustable)	1÷180 s
return time (adjustable)	4÷360 s
voltage	
lower activation threshold U_L	150÷210 V
upper activation threshold U_H	230÷260 V
lower activation 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)
installation	for TH-35 rail
protection level	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 automatic staircase lighting time switch

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	200÷1000 VA
operation delay	1.5÷ 2 s
return supply hysteresis	2%
return supply time	30 s
switch-on time lighting(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)
installation	for TH-35 rail
protection level	IP20

Circuit with power exceeding control controlled by a automatic staircase switch

Circuit with power exceeding control

L' – power limiter putput
L" – output of the automatic staircase time switch

Chapter 31

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.
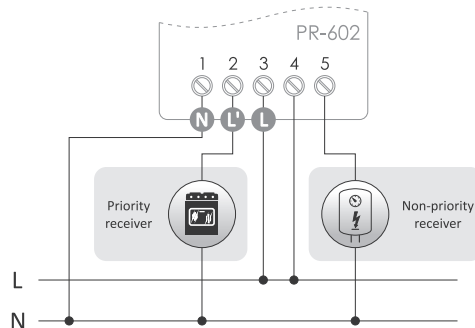
Operation

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.
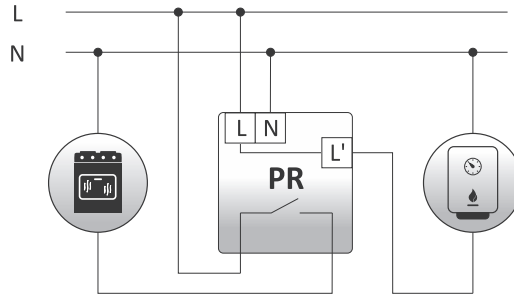
⚠ For circuits with PR (priority relays), it is recommended to use overcurrent protections with longer activation time so that they do not overtake the PR reaction.
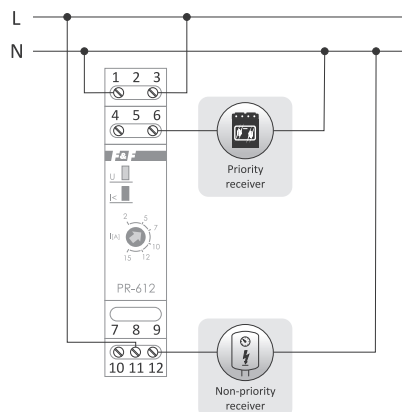
PR-602   adjustment range: 2÷15 A

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
installation	surface mounting
protection level	IP20

* a higher current requires an additional contactor.

PR-612   adjustment range: 2÷15 A

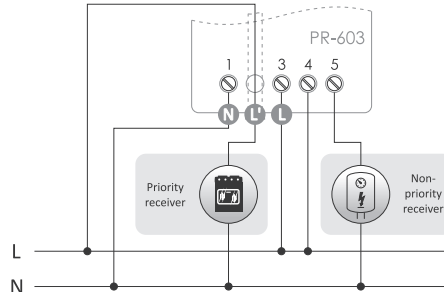| power supply	195÷253 V AC
maximum non-priority receivers current (AC-1)*	16 A
maximum priority receivers current (AC-1)	15 A
contact	separated 1×NO/NC
switching current	2÷15 A
switching delay	0.1 s
return hysteresis	10%
return delay	0.1 s
power consumption	0.4 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	1 module (18mm)
installation	for TH-35 rail
protection level	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 ⌀= 4 mm), which is galvanically separated from the measuring system of the relay.

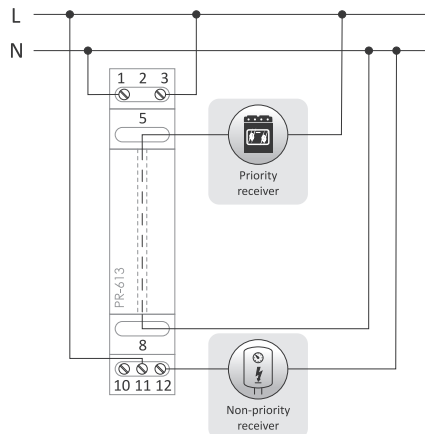## PR-603 adjustment range: 2÷15 A

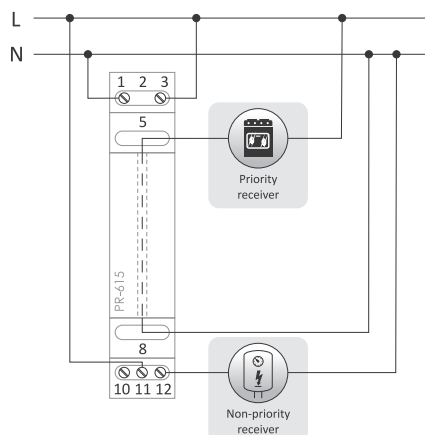|	
power supply	195÷253 V AC
maximum non-priority receivers current (AC-1)*	16 A
maximum current of the receivers priority (AC-1)	limited by the cross-section of the cable (maximum ⌀4 mm)
contact	separated 1×NO
switching current	2÷15 A
switching delay	0.1 s
return hysteresis	10%
return delay	0.1 s
power 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
installation	surface mounting
protection level	IP20

* a higher current requires an additional contactor.

PR-613 adjustment range: 2÷15 A

power supply	195÷253 V AC
maximum non-priority receivers current (AC-1)*	16 A
maximum current of the receivers priority (AC-1)	limited by the cross-section of the cable (maximum ⌀4 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)
installation	for TH-35 rail
protection level	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 current of the receivers priority (AC-1)	limited by the cross-section of the cable (maximum ⌀4 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)
installation	for TH-35 rail
protection level	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).
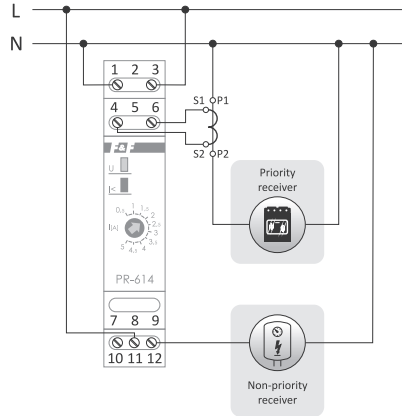
power supply	195÷253 V AC
maximum non-priority receivers current (AC-1)*	16 A
current of the measuring input 4-6	<5 A
contact	separated 1×NO/NC
switching current	0.5÷5 A
switching delay	0.1 s
return hysteresis	10%
return delay	0.1 s
power consumption	0.4 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

* a higher current requires an additional contactor.

Interesting and practical
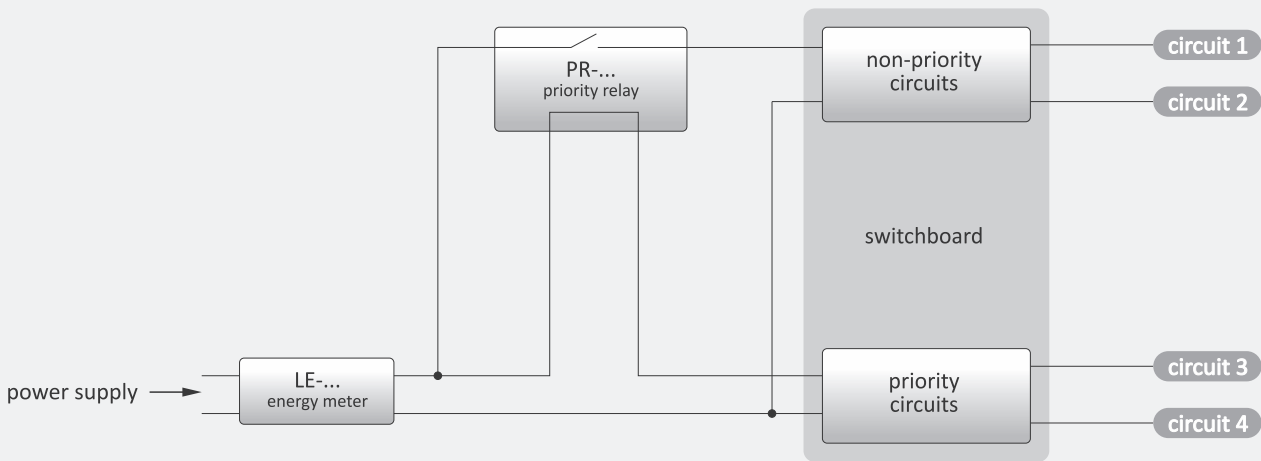
Protection against exceeding the limit of the contracted power

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.
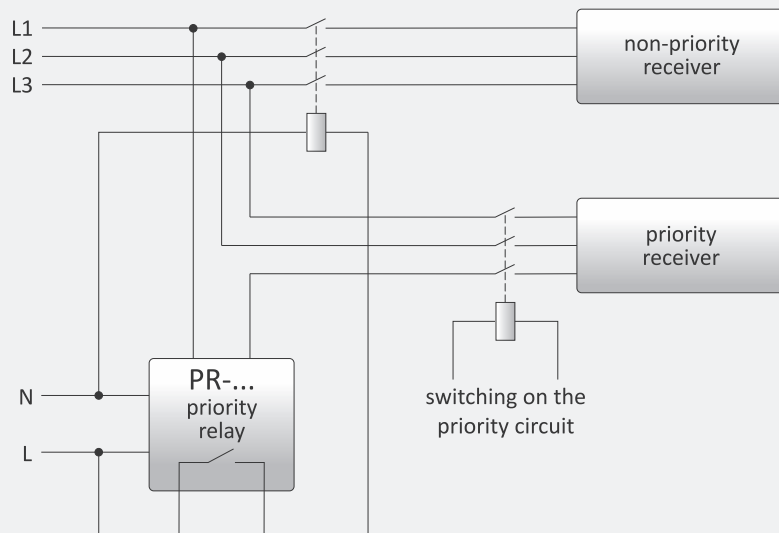
Use of the PR in the symmetrical three-phase receiver system

Chapter 31

Current relays

The current relays are used to control the values of the current in circuits measured with contact switching function when the current exceeds the set threshold values.

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

Operation

The EPP-618 relay enables the display of values and control of single-phase AC current flowing in the measured circuit.

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.
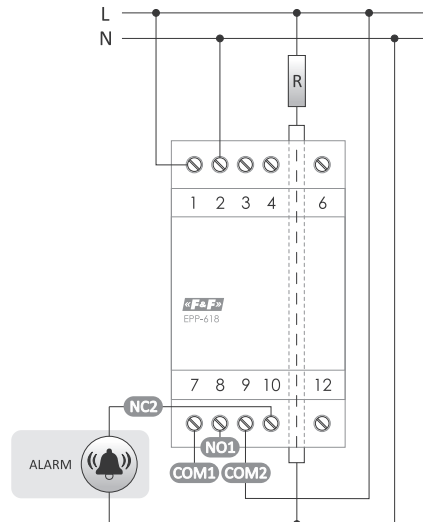
power supply	195÷253 V AC
contact	separated 1×NO, 1×NC
maximum load current (AC-1)	2×8 A
adjustment range for direct measurement	0.5÷50 A
ratio adjustment range	1÷999
switch-on time adjustment range	0.5÷60 s
switch-off time adjustment range	0.5÷60 s
constant hysteresis	10%
measurement error	<3%
diameter 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)
installation	for TH-35 rail
protection level	IP20

EPP-619 with a pass-through duct for a current cable of the measured circuit

Operation

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).
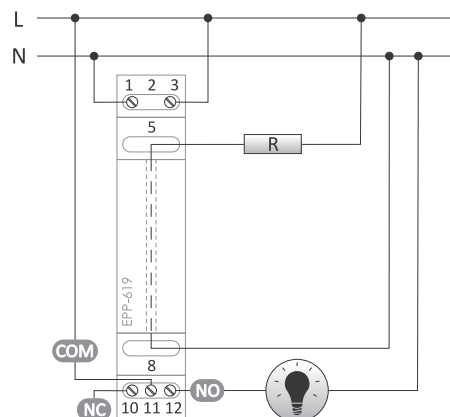
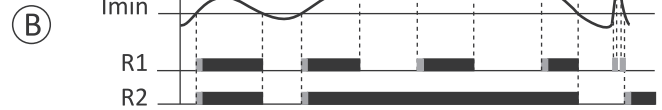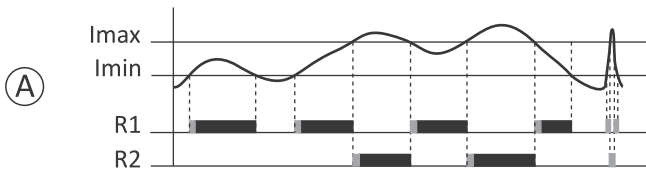|	
power supply	195÷253 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
current measuring circuit	limited by the cross-section of the cable
switching current (adjustable)	0.6÷16 A
return hysteresis	10%
operation delay (adjustable)	0.5÷10 s
return delay	0.5 s
power consumption	0.4 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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

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}". If the measured current value is exceeded, the corresponding contacts are closed according to the selected operating function. The contact is closed with the delay set via potentiometers T_1 (for the R_1 contact) and T_2 (for the R_2 contact).
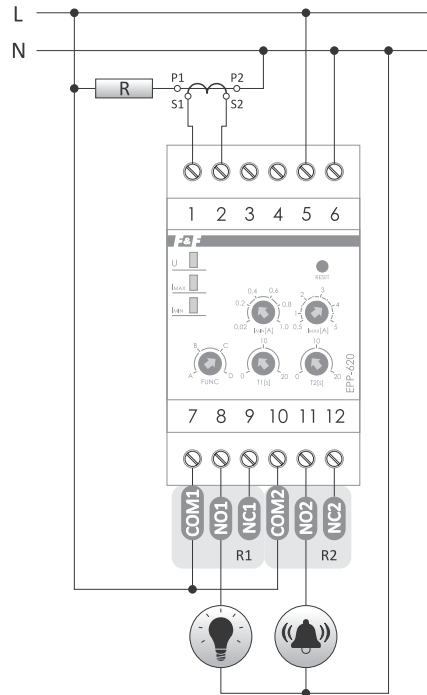
power supply	85÷264 V AC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×8 A
maximum current of the measuring input	5 A
current thresholds (adjustable)	
I_{min}	0.02÷1 A
I_{max}	0.5÷5 A
operation delay (adjustable)	0÷20 s
return hysteresis	10%
return time	0.5 s
power consumption	0.4 W
working 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)
installation	for TH-35 rail
protection level	IP20

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

If "I_{min}" is exceeded, the contacts R_1 and R_2 are closed. After exceeding the "I_{max}" threshold, the contact R_1 will be open and the contact R_2 will be closed.
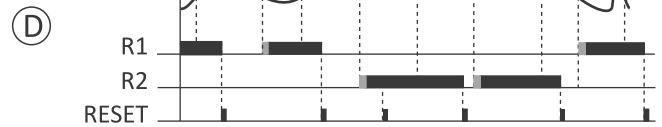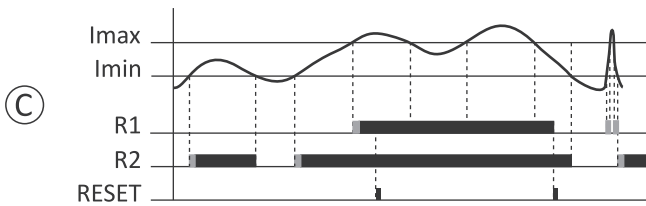
If "Imin" is exceeded, the contact R_2 is closed. After exceeding the "Imax" threshold, the contact R_1 will be closed. The R_1 contact is locked until the RESET button is pressed. If the value exceeds "Imax", the contact R_1 does not react to RESET.

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.

Operation

- 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).
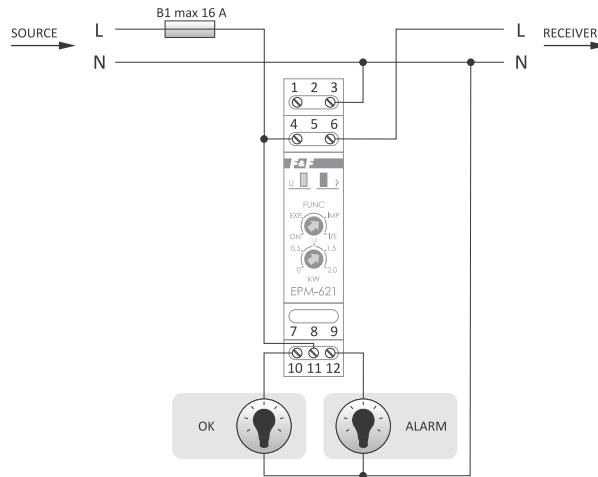
power supply	85÷264 V AC
contact	separated 1×NO/NC
maximum load current (AC-1)	16 A
maximum current of the measuring circuit	16 A
measuring range	0÷2 kW
operation delay	1 s
return hysteresis	5%
return delay	1 s
power consumption	0.8 W
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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.

Operation

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
installation	for TH-35 rail
protection level	IP20
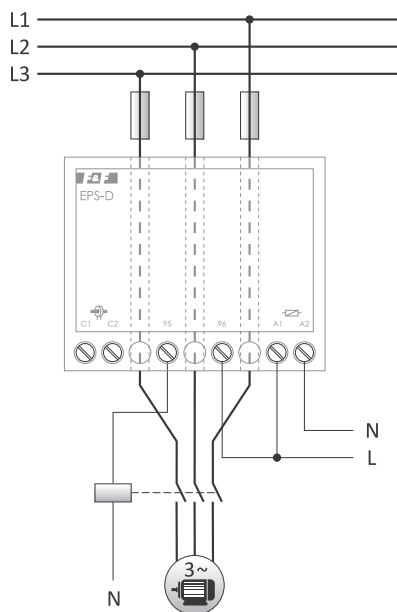
Connection scheme
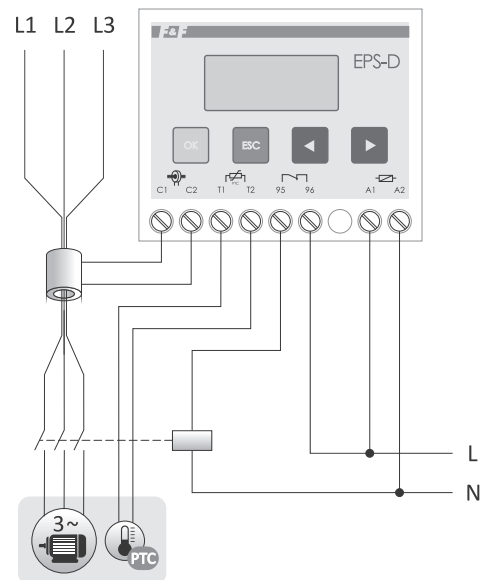
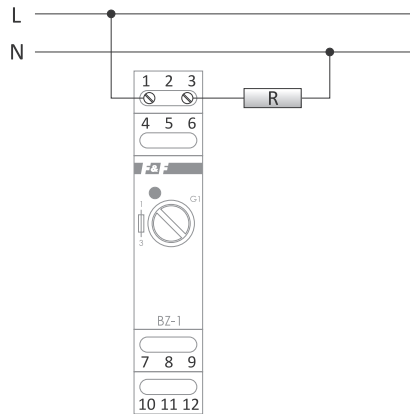Additional residual current and temperature protection

Fuse modules

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.
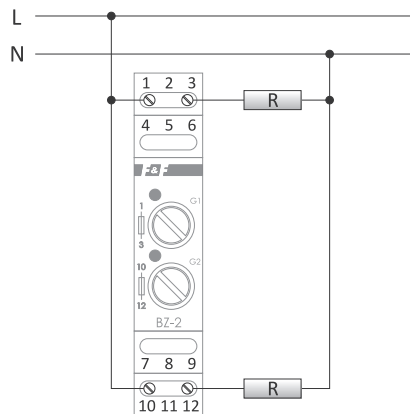
Operation

The fuse activation (fuse-link burnout) is indicated by the red LED.
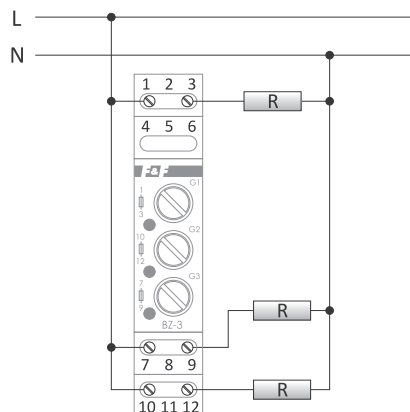
BZ-1 1-socket

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)
installation	for TH-35 rail
protection level	IP20

BZ-2 2-socket

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

BZ-3 3-socket

fuse	fuse link ø5×20 mm
maximum voltage	250 V AC
maximum load current	6.3 A
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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. 174.

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BZ-4 4-socket

fuse	fuse link ø5×20 mm
maximum voltage	250 V AC
maximum load current	6.3 A
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	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

«F&F» Section VIII. Current protection

Section IX

Power supply

Power supplies and transformers

Operation

Power supplies and mains transformers are designed to safely convert 230 V AC mains voltage to low AC or DC voltages.

Product	Type	Input voltage	Output voltage	Maximum load current (AC-1)	Power output	Size of the housing	Page
ZI-1	pulse power supply	85÷264 V AC	5 V DC	10 A	50 W	6 modules (105 mm)	177
ZI-2	pulse power supply	85÷264 V AC	12 V DC	4 A	50 W	6 modules (105 mm)	177
ZI-3	pulse power supply	85÷264 V AC	18 V DC	3 A	50 W	6 modules (105 mm)	177
ZI-4	pulse power supply	85÷264 V AC	24 V DC	2 A	50 W	6 modules (105 mm)	177
ZI-5	pulse power supply	85÷264 V AC	15 V DC	3.3 A	50 W	6 modules (105 mm)	177
ZI-6	pulse power supply	85÷264 V AC	48 V DC	1 A	50 W	6 modules (105 mm)	177
ZI-10-12P	pulse power supply	180÷264 V AC	12 V DC	0.85 A	10 W	for ø60 flush-mounted box	180
ZI-20-12P	pulse power supply	180÷264 V AC	12 V DC	1.7 A	20 W	for ø60 flush-mounted box	180
ZI-11	pulse stabilizer	8÷28 V AC/ 12÷37 V DC	5 V DC	3 A	15 W	3 modules (52.5 mm)	180
ZI-12	pulse stabilizer	12÷28 V AC/ 16÷37 V DC	12 V DC	3 A	36 W	3 modules (52.5 mm)	180
ZI-13	pulse stabilizer	18÷28 V AC/ 22÷37 V DC	18 V DC	3 A	54 W	3 modules (52.5 mm)	180
ZI-14	pulse stabilizer	24÷28 V AC/ 28÷37 V DC	24 V DC	3 A	72 W	3 modules (52.5 mm)	180
ZI-15	pulse power supply	100÷264 V AC	15 V DC	0.8 A	12 W	1 module (18 mm)	177
ZI-16	pulse power supply	100÷264 V AC	13.5 V DC	0.9 A	12 W	1 module (18 mm)	177
ZI-17	pulse power supply	100÷264 V AC	14.5 V DC	0.8 A	12 W	1 module (18 mm)	177
ZI-20	pulse power supply	100÷264 V AC	12 V DC	1 A	12 W	1 module (18 mm)	177
ZI-21	pulse power supply	100÷264 V AC	24 V DC	0.5 A	12 W	1 module (18 mm)	177
ZI-22	pulse power supply	100÷264 V AC	12 V DC	2.5 A	30 W	3 modules (52.5 mm)	177
ZI-24	pulse power supply	100÷264 V AC	24 V DC	1.25 A	30 W	3 modules (52.5 mm)	177
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	179
ZI-61-12	pulse power supply	180÷264 V AC	12 V DC	5 A	60 W	4.5 module (78 mm)	178
ZI-61-24	pulse power supply	180÷264 V AC	24 V DC	2.5 A	60 W	4.5 module (78 mm)	178
ZI-75-12	pulse power supply	100÷240 V AC	12 V DC	6.25 A	75 W	130×57×115 mm	179
ZI-100-12	pulse power supply	180÷264 V AC	12 V DC	8.3 A	100 W	6 modules (100 mm)	178
ZI-100-24	pulse power supply	180÷264 V AC	24 V DC	4.15 A	100 W	6 modules (100 mm)	178
ZI-120-12	pulse power supply	100÷240 V AC	12 V DC	10 A	120 W	130×67×115 mm	179
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	179
ZI-240-12	pulse power supply	180÷264 V AC	12 V DC	20 A	240 W	130×127×115 mm	179
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	179
ZS-1	transformer power supply	195÷253 V AC	5 V DC	2 A	12 W	6 modules (105 mm)	177
ZS-2	transformer power supply	195÷253 V AC	12 V DC	1 A	12 W	6 modules (105 mm)	177
ZS-3	transformer power supply	195÷253 V AC	18 V DC	0.66 A	12 W	6 modules (105 mm)	177
ZS-4	transformer power supply	195÷253 V AC	24 V DC	0.5 A	12 W	6 modules (105 mm)	177
ZS-5	transformer power supply	195÷253 V AC	15 V DC	0.8 A	12 W	6 modules (105 mm)	177
ZS-6	transformer power supply	195÷253 V AC	48 V DC	0.25 A	12 W	6 modules (105 mm)	177
TR-08	mains transformer	195÷265 V AC	8 V DC	1 A	8 VA	2 modules (35 mm)	180
TR-12	mains transformer	195÷265 V AC	12 V DC	0.66 A	8 VA	3 modules (52.5 mm)	180
TR-24	mains transformer	195÷265 V AC	24 V DC	0.5 A	12 VA	3 modules (52.5 mm)	180

ZS-1 / ZS-2 / ZS-3 / ZS-4 / ZS-5 / ZS-6 transformer power supplies 12 W

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
installation	for TH-35 rail
protection level	IP20

ZI-15 / ZI-16 / ZI-17 / ZI-20 / ZI-21 pulse power supplies
12 W

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	80g
installation	for TH-35 rail
protection level	IP20

ZI-22 / ZI-24 pulse power supplies 30 W

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	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	190g
installation	for TH-35 rail
protection level	IP20

ZI-1 / ZI-2 / ZI-3 / ZI-4 / ZI-5 / ZI-6 pulse power supplies 50 W

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	190g
installation	for TH-35 rail
protection level	IP20

Chapter 35

ZI-61-12 / ZI-61-24   pulse power supplies 60 W

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
the accuracy of output voltage stabilization	1%
voltage range - adjustable	
ZI-61-12	10.8÷13.8 V
ZI-61-24	21.6÷28.0 V
pulsation and noises	
ZI-61-12	240 mV p-p
ZI-61-24	360 mV p-p
overload	120÷180% Iout/10 s
overvoltage protection threshold	
ZI-61-12	18÷23 V
ZI-61-24	36÷45 V
power indication	LED green
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
installation	for TH-35 rail
protection level	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   pulse power supplies 100 W

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
the accuracy of output voltage stabilization	1%
voltage range - adjustable	
ZI-100-12	10.8÷13.8 V
ZI-100-24	21,6÷28,0 V
pulsation and noises	
ZI-100-12	240 mV p-p
ZI-100-24	360 mV p-p
overload	110÷160% Iout/10 s
overvoltage protection threshold	
ZI-100-12	18÷23 V
ZI-100-24	30÷40 V
thermal protection threshold	80÷85°C
power indication	LED green
working temperature	-20÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	6 modules (100 mm)
weight	310 g
installation	for TH-35 rail
protection level	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 industrial pulse power supplies

input voltage	
ZI-75-12	100÷240 V AC
ZI-120-12	100÷240 V AC
ZI-240-12	180÷264 V AC
frequency	50÷60 Hz
output voltage	12 V DC
overload	150%/3 min.
overvoltage IN->OUT	3 kV
power indication	LED green
overload/overvoltage signaling	red LED
working temperature	-10÷70°C
cooling	gravitational
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
installation	for TH-35 rail
protection level	IP20

Type	Power [W]	Current [A]	Dimensions [mm]	Weight [g]
ZI-75-12	75	6.25	130×57×115	530
ZI-120-12	120	10.0	130×67×115	670
ZI-240-12	240	20.0	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 industrial pulse power supplies

input voltage	90÷264 V AC
	120÷370 V DC
frequency	47÷63 Hz
starting current	40 A/20 ms
leakage current	<3,5 mA/240 V AC
output voltage	24 V DC
voltage regulation range	22÷28 V DC
the accuracy of output voltage stabilization	1%
overload	150%/3 min.
efficiency	86%
overvoltage IN->OUT	3 kV
overvoltage IN->PE	1.5 kV
overvoltage OUT->PE	0.5 kV
isolation resistance	100 MΩ/500 V DC
protection	short circuit/overload / overvoltage/temperature
power indication	LED green
overload/overvoltage signaling	red LED
working temperature	-10÷70°C
humidity (non-condensing)	95% RH
MTBF	188000 h at 25°C
cooling	gravitational
terminal	4.0 mm² screw terminals
tightening torque	0.5 Nm
installation	for TH-35 rail
protection level	IP20

Type	Power [W]	Current [A]	Output adjustment [V]	Efficiency [%]	Dimensions [mm]	Weight [g]
ZI-60-24	60	2.5	22÷27	84	130×50×90	485
ZI-120-24	120	5.0	22÷28	87	130×75×90	630
ZI-240-24	240	10.0	22÷28	86	130×110×90	1040

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, for flush-mounted box

Type	Power [W]	Current [A]
ZI-10-12P	10	0.85
ZI-20-12P	20	1.7

input voltage	180÷264 V AC
output voltage	12 V DC
efficiency	82%
starting current	4 A/20 ms
leakage current	1 mA
the accuracy of output voltage stabilization	3%
overload	140÷160%% Iout/10s
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
installation	in flush mounted box ø60
protection level	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
installation	for TH-35 rail
protection level	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
installation	for TH-35 rail
protection level	IP20

! The PTC (positive-temperature-coefficient) thermistor is included in the transformer circuit as an overcurrent protection.

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

The ECH-06 module along with an external gel battery with a nominal voltage of 12 V constitutes a backup power supply system for receivers with a supply voltage of 9÷30 V DC.
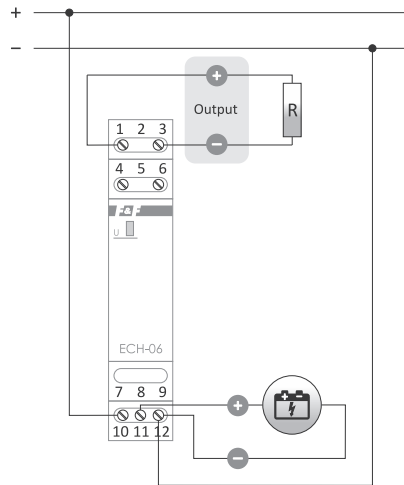
supply/charging voltage	18÷30 V DC
output voltage U$_{out}$	U$_{in}$ -0.5 V DC
	U$_{acu}$ -0.5 V DC
current of the output load U$_{out}$	<3 A
supported battery capacity	1.3÷7.2 Ah
maximum battery voltage	13.8 V DC
charging current	<0.35 A
power supply cut-off threshold	<10.5 V DC
own power consumption	< 1 W
working temperature	-10÷40°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

An example of 9÷30 V DC receiver power supply system

Power indicators and multimeters

Product	Installation	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 single-phase	–	–	●	–	–	–	–	–	–	100÷300 V AC	–	–	185
DMA-1 TrueRMS	for TH-35 rail	ammeter single-phase	–	–	●	–	–	–	–	–	●	100÷300 V AC	–	–	185
DMA-3	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	–	100÷300 V AC	–	–	185
DMA-3 TrueRMS	for TH-35 rail	ammeter 3-phase	–	–	●	–	–	–	–	–	●	100÷300 V AC	–	–	185
DMA-1T	panel-mounted	ammeter single-phase	–	–	●	–	–	–	–	–	–	195÷265 V AC	–	–	186
DMA-3T	panel-mounted	ammeter 3-phase	–	–	●	–	–	–	–	–	–	195÷265 V AC	–	–	186
DMM-1T	panel-mounted	multimeter single-phase	●	–	●	●	–	–	–	–	–	195÷265 V AC	–	–	186
DMM-4T	panel-mounted	multimeter 3-phase	●	●	●	●	–	–	–	–	–	195÷265 V AC	–	–	187
DMM-5T	panel-mounted	analyzer 3-phase	●	●	●	●	●	●	●	●	●	85÷264 V AC/DC	●	–	187
DMV-1	for TH-35 rail	voltmeter single-phase	●	–	–	–	–	–	–	–	–	100÷300 V AC	–	–	183
DMV-1 TrueRMS	for TH-35 rail	voltmeter single-phase	●	–	–	–	–	–	–	–	●	100÷300 V AC	–	–	183
DMV-3	for TH-35 rail	voltmeter 3-phase	●	–	–	–	–	–	–	–	–	100÷300 V AC	–	–	183
DMV-3 TrueRMS	for TH-35 rail	voltmeter 3-phase	●	–	–	–	–	–	–	–	●	100÷300 V AC	–	–	183
DMV-1T	panel-mounted	voltmeter single-phase	●	–	–	–	–	–	–	–	–	195÷265 V AC	–	–	183
DMV-3T	panel-mounted	voltmeter 3-phase	●	–	–	–	–	–	–	–	–	195÷265 V AC	–	–	183
DMV-1AC-MBT	panel-mounted	relay voltage AC	●	–	–	–	–	–	–	–	●	80÷265 V AC	●	●	184
DMV-1DC-MBT	panel-mounted	relay voltage DC	●*	–	–	–	–	–	–	–	–	9÷30 V DC	●	●	184
WN-711	for TH-35 rail	voltage indicator single-phase	●	–	–	–	–	–	–	–	–	195÷265 V AC	–	–	188
WN-723	for TH-35 rail	voltage indicator 3-phase	●	–	–	–	–	–	–	–	–	3×230 V AC	–	–	188

* voltage measurement in the range of 0÷60 V DC

Chapter 36

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)
installation	for TH-35 rail
protection level	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.
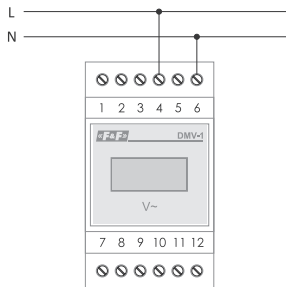
DMV-1/DMV-1 TrueRMS
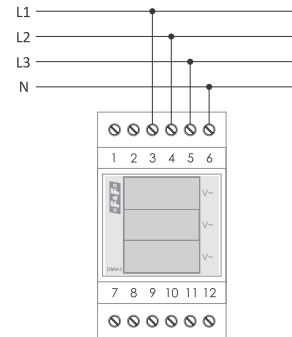
DMV-3/DMV-3 TrueRMS

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
protection level	IP20
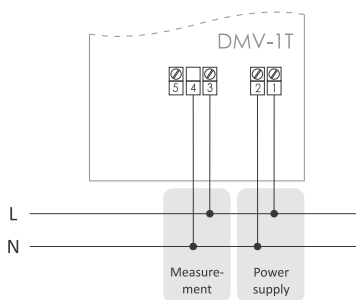
Connection scheme DMV-1T
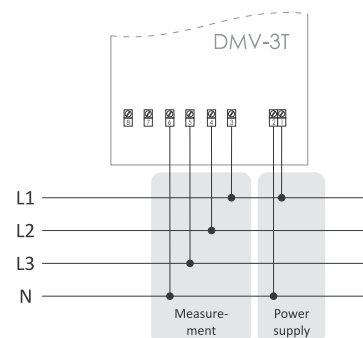
Connection scheme DMV-3T

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

DMV-1AC-MBT is a panel-mounted indicator of True RMS voltage value with the ability to set two independent alarms that control two relays. The measurement result is displayed on a 14 mm display. The device is equipped with a Modbus RTU bus which enables configuration and reading of measured parameters.

Functions

- 2 independent alarms controlling two outputs;
- Voltage measurement 0÷400 V AC;
- Galvanic separation between the power supply and measurement chain;
- Measurement of True RMS values.
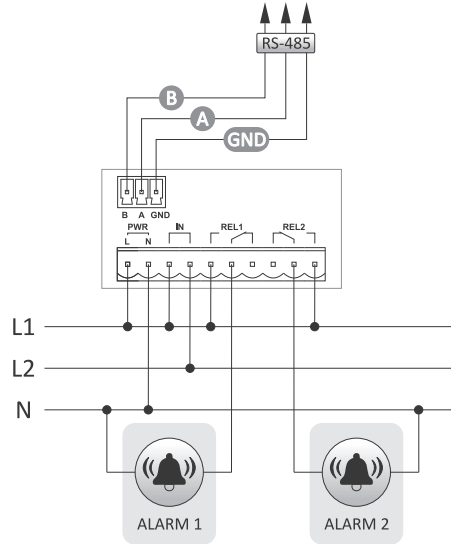
power supply	80÷265 V AC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×6 A
measurement input	separated 0÷400 V AC
measurement accuracy	1%
alarm hysteresis	1 V÷150 V
lower alarm threshold	10 V÷399 V
upper alarm threshold	11 V÷400 V
alarm delay	0÷180 s
communication parameters	
baud rate (adjustable)	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 terminal
tightening torque	0.4 Nm
dimensions	
housing	72×36×72 mm
mounting hole	67.5×32.5 mm
display height	14 mm
mounting	panel
protection level	IP20

DMV-1DC-MBT panel-mounted DC (0÷60 V) voltage relay

Purpose

DMV-1DC-MBT is a panel-mounted indicator of True RMS voltage value with the ability to set two independent alarms that control two relays. The measurement result is displayed on a 14 mm display. The device is equipped with a Modbus RTU bus which enables configuration and reading of measured parameters.

Functions

- 2 independent alarms controlling two outputs;
- Voltage measurement 0÷60 V DC;
- Galvanic separation between the power supply and measurement chain.
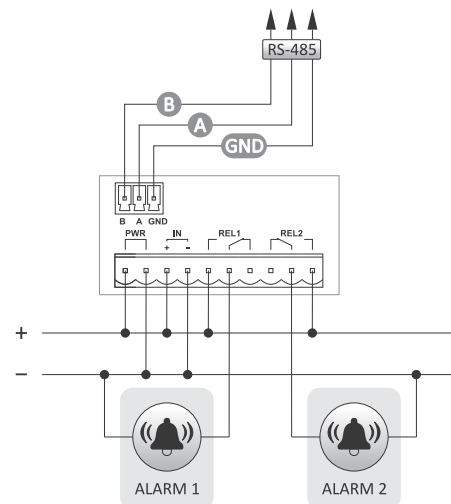
power supply	9÷30 V DC
contact	separated 2×NO/NC
maximum load current (AC-1)	2×6 A
measurement input	0÷60 V DC
measurement accuracy	1%
alarm hysteresis	1 V÷30 V
lower alarm threshold	0 V÷59 V
upper alarm threshold	1 V÷60 V
alarm delay	0÷180 s
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1 or 2
parity bit	EVEN/ODD/NONE
address	1÷247
power consumption	2 W
working temperature	-10÷40°C
terminal	2.5 mm² detachable terminal
tightening torque	0.4 Nm
dimensions	
housing	72×36×72 mm
mounting hole	67.5×32.5 mm
display height	14 mm
mounting	panel
protection level	IP20

Current intensity indicators

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

Digital

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

Functions

- Independent current measurement in each of the three phases;
- Indicators with **True RMS** label, equipped with an RMS (Root Mean Square) transformer, indicate the correct current value for the distorted waveforms.

power supply	100÷300 V AC
supply frequency	45÷55 Hz
current indication range	
versions for direct measurement	0÷20 A
versions for indirect measurement	0÷ primary current of the transformer
maximum instantaneous overload	
versions for direct measurement	40 A/1 s
versions for indirect measurement	10 A/1 s
indication accuracy	
DMA-1	1%
DMA-3	1%
DMA-1 True RMS	0.5%
DMA-3 True RMS	0.5%
display	
DMA-1	4-digit LED, digit 10×14 mm
DMA-3	3-digit LED, digit 10×6 mm
power consumption	4 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord) 4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
protection level	IP20

Purpose

The DMA indicators are designed to work with current transformers with the rated secondary current of 5 A. Current range of current transformers: 25÷1000/5 A. The primary value of the transformer current determines the maximum measured current and the actual value of the current on the indicator.

DMA-1 20 A and DMA-3 20 A are designed for direct measurement (without the use of transformers) in the range of 0÷20 A.
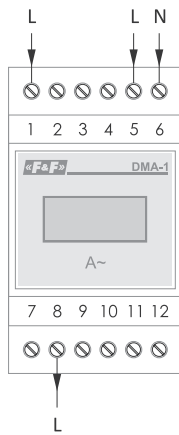
Connection scheme DMA-1
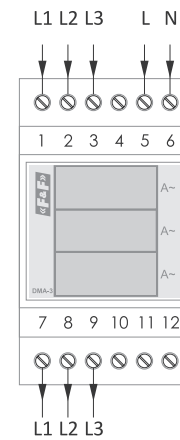
Connection scheme DMA-3

Method of marking when placing an order

Indirect measurement (with the use of transformers)

DMA- X Y 5 A True RMS

1-phase: 1
3-phase: 3

option

Value of the rated primary current of the transformer:
25, 30, 40, 50, 70, 75, 80, 100, 120, 125, 150, 160, 200, 250, 300, 400, 500, 600, 700, 750, 800, 900, 1000.
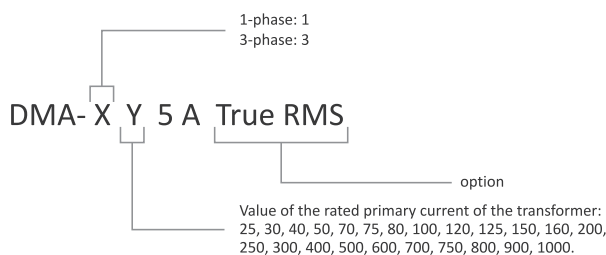
Example:
DMA-1 50/5 A – single-phase indicator for work with 50/5 A transformer, measured range 0 ÷ 50 A, without True RMS.
DMA-3 150/5 A True RMS – 3-phase indicator for work with 3×150/5 A transformers, measured range 3×0 ÷ 150 A, with True RMS.

Direct measurement (without the use of transformers)

DMA- X 20 A True RMS

1-phase: 1
3-phase: 3

option
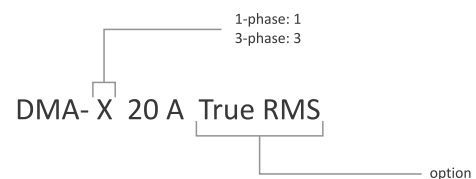
Example:
DMA-1 20 A – single-phase for 20 A, measured range 0 ÷ 20 A, without True RMS.
DMA-3 20 A True RMS – 3-phase for 20 A, measured range 3×(0 ÷ 20 A), with True RMS.

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.
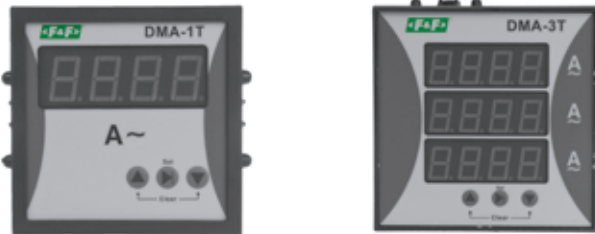
power supply	195÷265 V AC
current indication range	
direct measurement	0÷5 A
indirect measurement	0÷ primary current of the transformer
indication accuracy	1%
display	
DMA-1T	4-digit LED 14×8 mm
DMA-3T	3×(4-digit LED 10×6 mm)
power consumption	3 VA
working temperature	-5÷50°C
terminal	2.5 mm² screw terminals
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
protection level	IP20
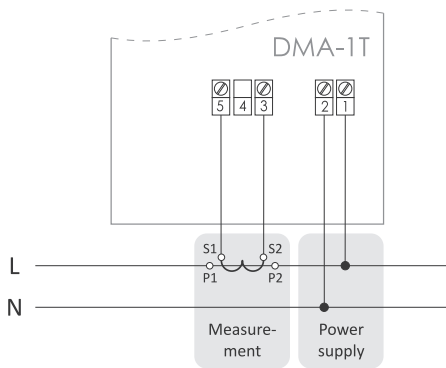
Connection scheme DMA-1T
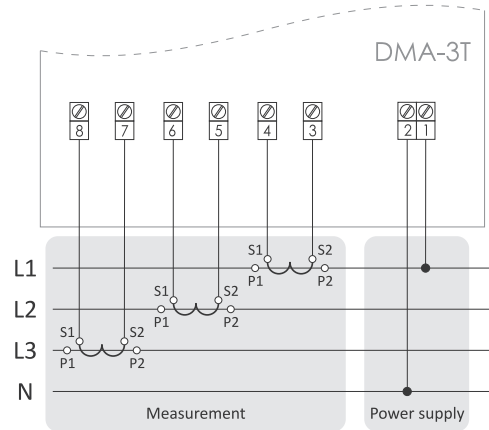
Connection scheme DMA-3T

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
protection level	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
protection level	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-phase network parameter analyzer with Modbus RTU communication
4-quadrant electricity measurement
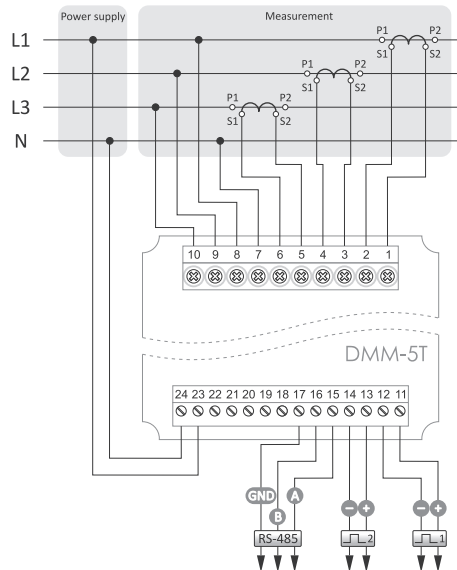
power supply	85÷264 V AC/DC
voltage measurement	
rated voltage	400 V AC (L-N); 693 V AC (L-L)
frequency	45÷55 Hz
grid	three-phase, 3- or 4-wire
measuring range	3÷120% Un
current measurement	
rated current	5 A
measuring range	0.5÷120% In
communication protocol	
interface	RS-485
protocol	Modbus RTU
speed	2400/4800/9600/19200/38400 bps
display	monochrome LCD
power consumption	8 W
working temperature	-20÷60°C
terminal	1.5 mm² screw terminals
tightening torque	0.3 Nm
dimensions	95×95×85 mm
mounting hole	90×90 mm
protection level	IP20

Functions

- Indirect or direct measurement of phase currents;
- Indirect or direct (>230 / 400 V) measurement of phase and phase-to-phase voltages;
- Measurement of frequency, active, reactive and apparent power;
- Minimum and maximum values;
- Measurement of power factors;

- 4-quadrant measurement of energy imported and exported to the grid;
- Energy measurement in 4 tariffs;
- Monthly energy settlement;
- The pulse output of the OC (open collector) type for energy indicators;
- Communication with external devices via RS-485 port and Modbus RTU protocol

Power supply indicators (bar)

WN-711 1-phase

Purpose

Voltage indicators WN-711 are designed for continuous reading of voltage values in a single-phase network.
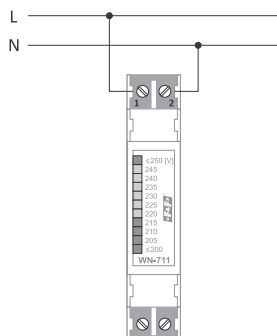
power supply	195÷265 V AC
voltage indicator	11×LED
indication range	205÷245 V
scale	5 V
reading accuracy	2.5 V
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

WN-723 3-phase

Purpose

Voltage indicators WN-723 are designed for continuous reading of voltage values in a three-phase network.
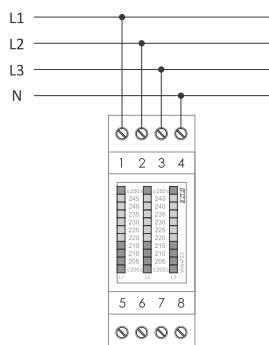
power supply	3×230 V+N
voltage indicator	3×(11×LED)
indication range	205÷245 V
scale	5 V
reading accuracy	2.5 V
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP20

Signal lights

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

for the optical indication of voltage in individual phases of a three-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.
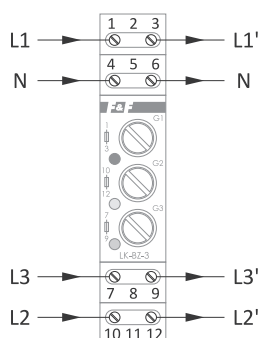
power supply	3×230 V +N
rated current (the signal light is on)	1.7 mA/phase
power consumption (the signal light is on)	0.2 W/phase
indication of voltage	3×LED ø3 mm
fuse	fuse link ø5 mm×20 mm
maximum disconnection voltage	250 V AC
maximum fuse current	6.3 A
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Type	LED color
LK-BZ-3 G	3×green
LK-BZ-3 K	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.
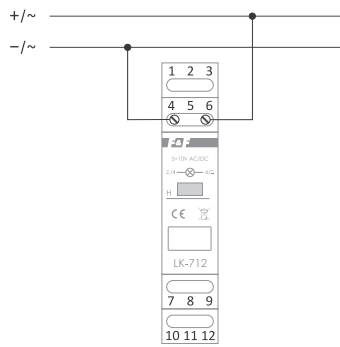
power supply (implementation only in one range)	5÷10 V AC/DC
	10÷30 V AC/DC
	30÷130 V AC/DC
	130÷260 V AC/DC
power control	1×LED ø5
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

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

LK-713 3-phase

Purpose

It is designed for the optical indication of the presence of voltage in individual phases of a three-phase network.
The presence of voltage in the phase is indicated by the corresponding green LED incorporated in the circuit of this phase.
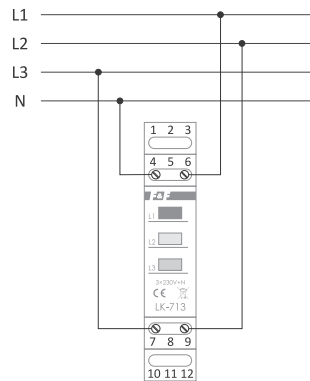
power supply	3×230 V +N
rated current	1.7 mA
indication of voltage	3×LED ø5
power consumption	1.1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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

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

LK-714 2-state

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
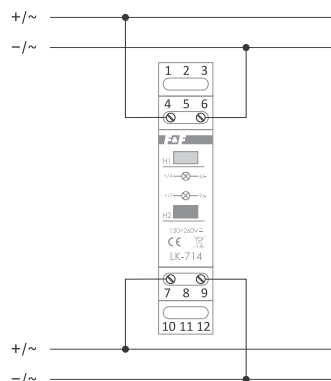
power supply (implementation only in one range)	5÷10 V AC/DC
	10÷30 V AC/DC
	30÷130 V AC/DC
	130÷260 V AC/DC
state control	1×green LED ø5
	1×LED red ø5
power consumption	0.8 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Example of marking when placing an order: LK-714   130÷260 V — supply voltage

Inverters and soft starters

Purpose

The inverters belong to the group of electronic frequency converters and are designed for smooth control of the rotational speed of the asynchronous three-phase motors.
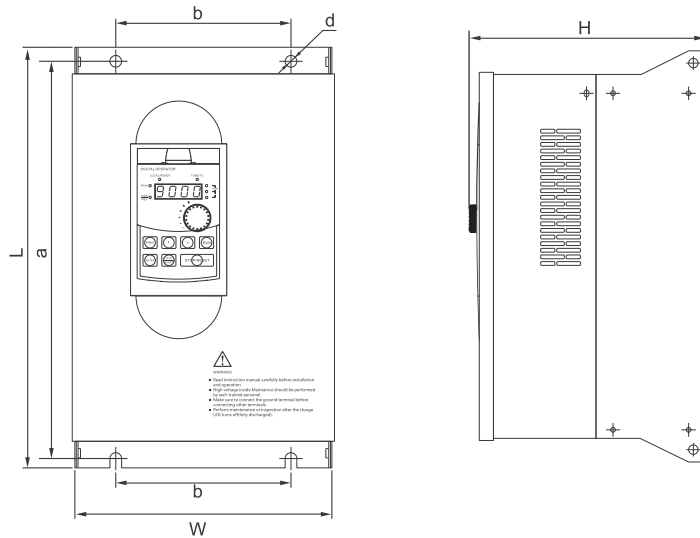
FA-1LX / FA-3HX

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

Control panel

Description of inputs and outputs

Optional elements

DC gland

Braking resistor

Power supply 3×400 V
L1
L2
L3

R (L1)
S (L2)
T (L3)

P
P+
RB

U (T1)
V (T2)
W (T3)

3~

Power circuit

Control circuit

Digital inputs DI 1÷DI 6 (programmable)
DI 1
DI 2
DI 3
DI 4
DI 5
DI 6

J5
3 +24 V
2 DCOM
1 COM

DI 1÷DI 6 triggering:
J5 (3-2) – COM level (default)
J5 (1-2) – +24 V level

J13
Expansion slot (encoder card)

J16
S2
S2
S1

J15
3 AI 3
2
1 PT100

PT100

J12
Expansion slot (RS-485 card)

+24 V
PLC
COM
COM
PLC
+24 V

J2
3
2
1
0÷10 V DC
0÷20 mA DC

J1
3
2
1
0÷10 V DC
0÷20 mA DC

DA 1
GND

DA 2
GND

Analog inputs DA 1÷DA 2 (programmable) 0÷10 V DC, max 5 mA 0÷20 mA DC, max 250 Ω

+10 V
AI 1
GND

J3
3
2
1
0÷10 V DC
0÷20 mA DC

SPA
COM

SPB
COM

Transistor outputs SPA i SPB (programmable) max 24 V DC/50 mA

Analog inputs AI 1÷AI 2 (programmable)

+10 V
AI 2
GND

J4
3
2
1
0÷10 V DC
0÷20 mA DC

J17
COM
3
2
1
0÷10 V DC
0÷20 mA DC

TA1
TB1
TC1

Relay output T1 (programmable) max 250 V AC/5 A or 24 V DC/5A

Functions		Technical data
	FA-1LX	1-phase
	Voltage and frequency	1×230 V (±10%), 50/60 Hz (±5%)
	Output voltage	3×230 V (for 230 V power supply)
	FA-3LX	3-phase
	Voltage and frequency	3×400 V (±10%), 50/60 Hz (±5%)
	Output voltage	3×400 V (for 400 V power supply)
	Output frequency	0.00÷3200 Hz (U/F control) 0.00÷300.0 Hz (vector control)
Power supply	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.

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

Chapter 37

FA-3X

- 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.

Optional elements

DC gland   Braking resistor

Power supply
3×400 V

L1   R (L1)
L2   S (L2)   **Power circuit**
L3   T (L3)

P   P+   RB

U (T1)
V (T2)   3 ~
W (T3)

Control circuit

Digital inputs
DI 1÷DI 4
(programmable)

DI 1
DI 2   J6
DI 3   3 +24 V   DI 1÷DI 4 triggering:
DI 4   2 DCOM   J6 (3-2) – COM level (default)
        1 COM   J6 (1-2) – +24 V level

COM
+24 V

J13

Expansion slot
(encoder card)

J12   Expansion slot
       (RS-485 card)

Digital inputs
DI 5÷DI 8
(programmable)

DI 5
DI 6   J5
DI 7   3 +24 V   DI 5÷DI 8 triggering:
DI 8   2 DCOM   J5 (3-2) – COM level (default)
        1 COM   J5 (1-2) – +24 V level

DA 1
GND

Analog inputs DA 1 and DA 2
(programmable)
0÷10 V DC, max 5 mA
0÷20 mA DC, max 250 Ω

+24 V
PLC   J2
COM   3 0÷10 V DC
        2
COM   1 0÷20 mA DC
PLC
+24 V   J1
        3 0÷10 V DC
        2
        1 0÷20 mA DC

DA 2
GND

SPA
COM

Transistor outputs SPA and SPB
(programmable)
max 24 V DC/50 mA

SPB
COM

Analog inputs
AI 1÷AI 2
(programmable)

VR   +10 V   J3
1 K   AI 1   3 Voltage 0÷10 V DC
2 W   GND   2
               1 Current 0÷20 mA DC

VR   +10 V   J4
1 K   AI 2   3 Voltage 0÷10 V DC
2 W   GND   2
               1 Current 0÷20 mA DC

TA
TB1
TC1

TA2
TB2
TC2

Relay outputs T1 and T2
(programmable)
max 250 V AC/5 A
or 24 V DC/5A

Chapter 37

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

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

Chapter 37

FA-1F for control of the single-phase motors

FA-1F series inverters are designed to control single-phase AC motors with an auxiliary starting capacitor.

The most important functions

- The ability to change the direction of rotation of the motor;
- The ability to adjust the rotation speed in the range from 0 to 400 Hz;
- High driving torque at low rotation speed;
- Great freedom of programming digital and analog inputs and outputs;
- PLC mode - up to 7 steps can be programmed that are executed once or cyclically by the inverter. For each step, you can specify the speed, acceleration/braking time and duration;
- A multi-function control panel that can be dismantled and connected on the outside of the inverter.

⚠ WARNING
- Do not connect AC power to output terminals UVW
- Do not open this front cover while power is applied and within 10 minutes after power-off

(!) Before connecting a single-phase motor, it is necessary to change its internal connections in order to eliminate the startup capacitor.
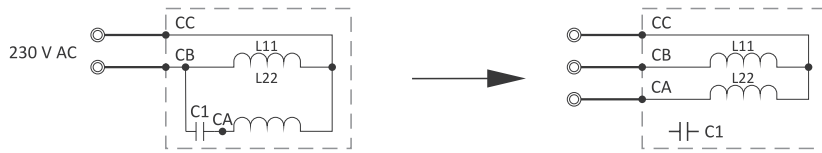
Typical single-phase motor diagram
with starting capacitor

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

⚠ WARNING
- Do not connect AC power to output terminals UVW
- Do not open this front cover while power is applied and within 10 minutes after power-off
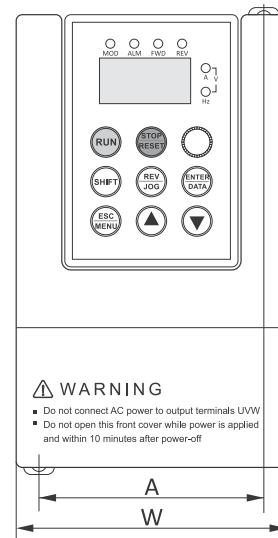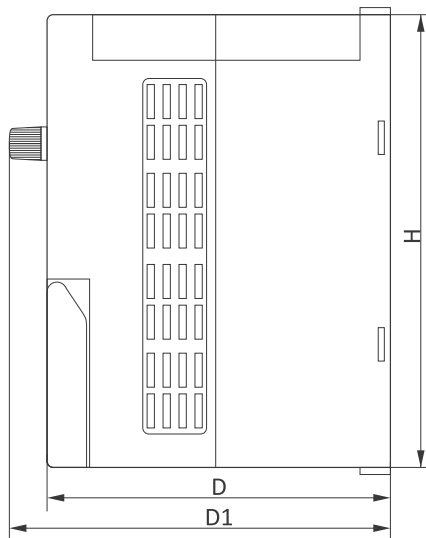
FA-1F004 FA-1F004, FA-1F007, FA-1F015 inverters

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.
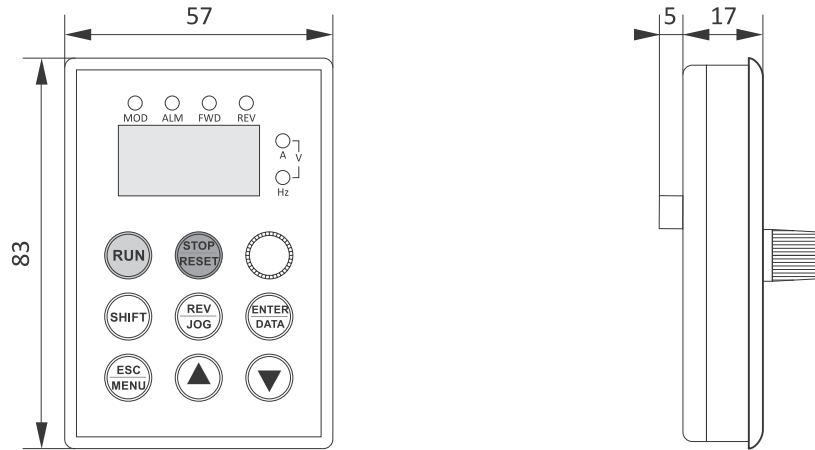
Description of inputs and outputs

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

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

Chapter 37

Soft starters

Soft starters are used to safely start asynchronous 3-phase squirrel-cage motors. The use of a soft starter eliminates star/delta systems, and at the same time radically reduces the current surge occurring during the start-up of even the most heavily loaded drives (such as mills and crushers).

SF-110÷SF-550

DIGITAL OPERATOR
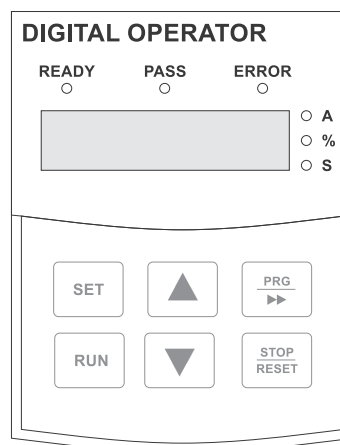
The motor start-up is carried out on all three phases of the power supply, which prevents the asymmetry of the mains load and uneven load of motor windings. In addition, the advanced safety functions implemented in the soft starter protect the engine during start-up, operation, and braking.

- 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.

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.

Power circuit

Control circuit

1 LOCK
2 STOP button
3 START button
4 COM

Analog output of
the current control

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

Chapter 38
Electricity consumption meters

Purpose

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

Operation

A special electronic system, under the influence of the current flowing through it and the applied voltage, generates impulses in the amount proportional to the electric energy consumed. The number of pulses is converted into energy consumed and its value is indicated on the display. The meters are equipped with a pulse output SO+ SO- or communication ports with communication protocols. Input and output terminal covers of the meters can be sealed.

Product	Type	MID	Cooperation with current transformers	Two-way	Measurement of additional parameters											Communication		Page
					Active imported energy	Active exported energy	Reactive energy	Reactive induction energy	Reactive capacitive energy	Apparent power active, reactive	Power demand	Voltage	Current	Frequency	Power factor	Modbus	M-Bus	
LE-01	meter of 1-phase	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	207
LE-01d	meter of 1-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	207
LE-01M	meter of 1-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	•	–	212
LE-01MB	meter of 1-phase	•	–	•	•	•	–	•	•	•	•	•	•	•	•	–	•	220
LE-01MQ	meter of 1-phase	•	–	•	•	•	–	•	•	•	•	•	•	•	•	•	–	218
LE-01MR	meter of 1-phase	•	–	•	•	–	•	–	–	•	–	•	•	•	•	•	–	214
LE-01MW	meter of 1-phase	•	–	•	•	•	–	•	–	•	–	•	•	•	•	•	–	215
LE-02d	meter of 3-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	208
LE-02d CT	meter of 3-phase	–	•	–	•	–	–	–	–	–	–	–	–	–	–	–	–	210
LE-03	meter of 3-phase	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	208
LE-03d	meter of 3-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	209
LE-03d CT200	meter of 3-phase	–	•	–	•	–	–	–	–	–	–	–	–	–	–	–	–	210
LE-03d CT400	meter of 3-phase	–	•	–	•	–	–	–	–	–	–	–	–	–	–	–	–	210
LE-03M	meter of 3-phase	•	–	–	•	–	–	–	–	–	–	–	–	–	–	•	–	213
LE-03M CT	meter of 3-phase	–	•	–	•	–	–	–	–	–	–	–	–	–	–	•	–	213
LE-03MB	meter of 3-phase	•	–	•	•	–	•	•	•	•	•	•	•	•	•	–	•	220
LE-03MB CT	meter of 3-phase	–	•	•	•	•	–	•	•	•	•	•	•	•	•	–	•	221
LE-03MP	meter of 3-phase	–	–	–	•	–	•	–	–	•	–	•	•	•	–	–	–	214
LE-03MQ	meter of 3-phase	•	–	•	•	•	–	•	•	•	•	•	•	•	•	•	–	218
LE-03MQ CT	meter of 3-phase	•	•	•	•	•	–	•	•	•	•	•	•	•	•	•	–	219
LE-03MW	meter of 3-phase	•	–	•	•	•	•	•	•	•	•	•	•	•	•	•	–	216
LE-03MW CT	meter of 3-phase	–	•	•	•	•	•	•	•	•	•	•	•	•	•	•	–	217
LE-04d	meter of 3-phase	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	211
LE-05d	meter of 3-phase	–	–	–	•	–	–	–	–	–	–	–	–	–	–	–	–	211

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
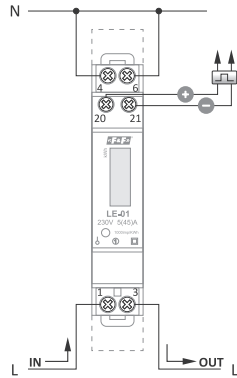
reference voltage	230 V
base current	5 A
maximum current	45 A
minimum detection current	0.02 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.9 kWh
meter constant	1000 imp/kWh
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1000 imp/kWh
pulse duration	70 ms
working temperature	-20÷65°C
terminal	6 mm² screw terminals
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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**
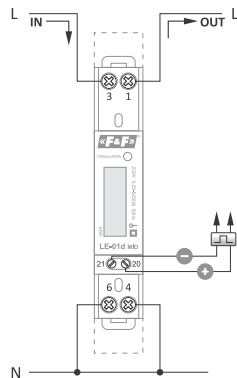
compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	5 A
maximum current	50 A
minimum detection current	0.02 A
measurement accuracy	B
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.9 kWh
meter constant	1000 imp/kWh
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1000 imp/kWh
pulse duration	70 ms
working temperature	-20÷50°C
terminal	6 mm² screw terminals
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Functions

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

Power supply system of the pulse output with the external meter connected

In order to connect an external counting device to the electric energy indicator, connect a 12÷24 V DC power supply to the system in parallel through a current-limiting resistor 3.6÷8.2 kΩ/0.5 W. The maximum load on the counting circuit is 27 mA.
Changing the power polarity may damage the pulse output of the indicator.
If no external counting device is connected, do not connect the power supply to the pulse output.

12÷24 V DC
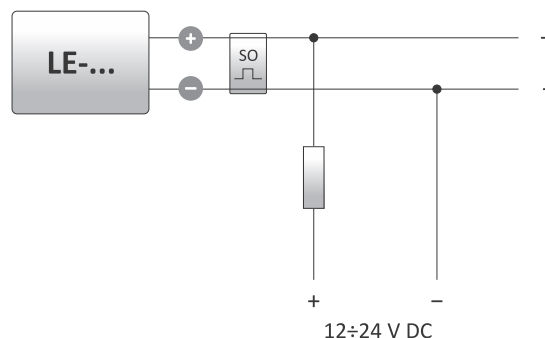
LE-02d 3-phase, with LCD display, **MID certificate**

compliance	MID Directive 2014/32/EU
reference voltage	3×400 V+N
base current	3×5 A
maximum current	3×80 A
minimum detection current	0.04 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant	800 imp/kWh
current consumption indication	3× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh
pulse duration	35 ms
working temperature	-20÷55°C
terminal	16 mm² screw terminals
dimensions	4.5 modules (75 mm)
installation	for TH-35 rail
protection level	IP20

Functions

• 3-phase;
• Direct measurement 3×63 A;
• MID compliance;

• LCD display;
• SO pulse output.

LE-03 3-phase, with a mechanical drum counter

reference voltage	3×400 V+N
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	800 imp/kWh
current consumption indication	3× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh
pulse duration	35÷80 ms
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	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	3×5 A
maximum current	3×100 A
minimum detection current	0.04 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	1000 imp/kWh
current consumption indication	3× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1000 imp/kWh
pulse duration	35÷80 ms
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- 3-phase;
- Direct measurement 3×100 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. 277)

LE-02d CT 3-phase, for use with current transformers

Operation

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.
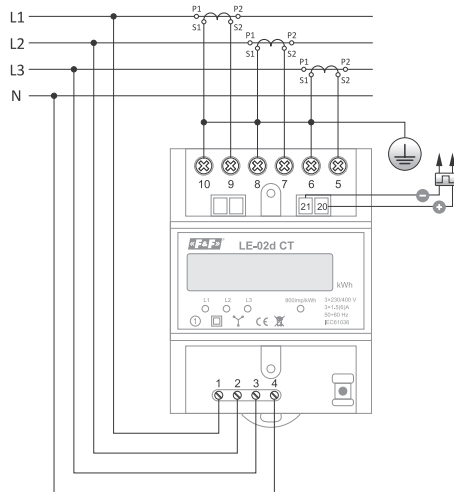
reference voltage	3×230/400 V
base current	3×1.5 A
maximum current	3×6 A
transformer secondary current	5 A
minimum detection current	0.04 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
number of the counter digits	8
indication range	depend on the ratio
meter constant	depend on the ratio
current consumption indication	3× LED red
read-out signalling	LED red
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	-20÷55°C
terminal	16 mm² screw terminals
dimensions	4.5 modules (75 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- 3-phase;
- Semi-indirect measurement 3×5 A;
- Transformers 5÷6000/5 A;

- The ratio is set once by pressing the button;
- LVD compliance;
- SO pulse output.

LE-03d CT200 / LE-03d CT400 for dedicated current transformers

Operation

When using transformers with dedicated parameters, the indicator shows the actual value of electricity consumed by the system.
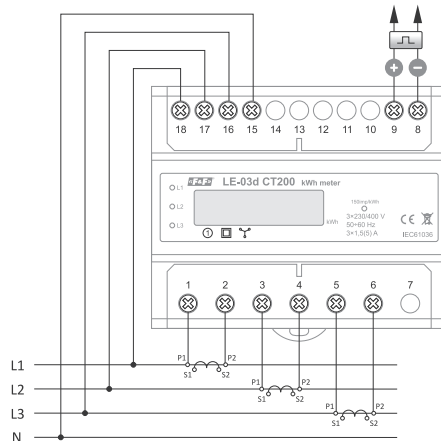
transformer type	
LE-03d CT200	200/5 A
LE-03d CT400	400/5 A
reference voltage	3×230/400 V
base current	3×1.5 A
maximum current	3×5 A
minimum detection current	0.04 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
number of the counter digits	8
indication range	0÷9999999 kWh
meter constant	300 imp/kWh
current consumption indication	3× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	300 imp/kWh
pulse duration	35 ms
working temperature	-20÷50°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	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

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.

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 (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant	800 imp/kWh
current consumption indication	3× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh
pulse duration	35 ms
working temperature	-20÷55°C
terminal	16 mm² screw terminals
dimensions	4.5 modules (75 mm)
installation	for TH-35 rail
protection level	IP20

- 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

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.
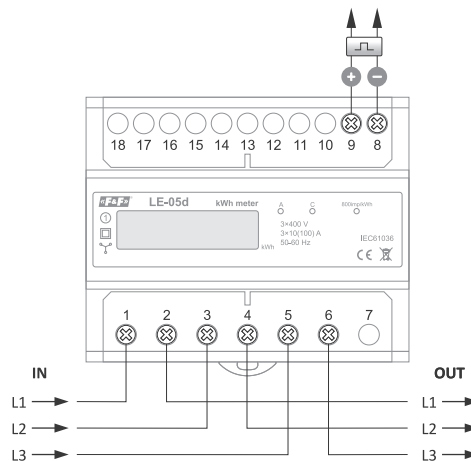
reference voltage	3×400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
indication range	0÷999999.9 kWh
meter constant	800 imp/kWh
current consumption indication	2× LED red
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh
pulse duration	35÷80 ms
working temperature	-20÷50°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	IP20

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

Remote reading meters

Purpose

Remote reading meters are used to indicate the consumed electricity and power supply network parameters with the ability of remote reading, archiving data or indications in financial and billing systems, BMS, SCADA, etc.
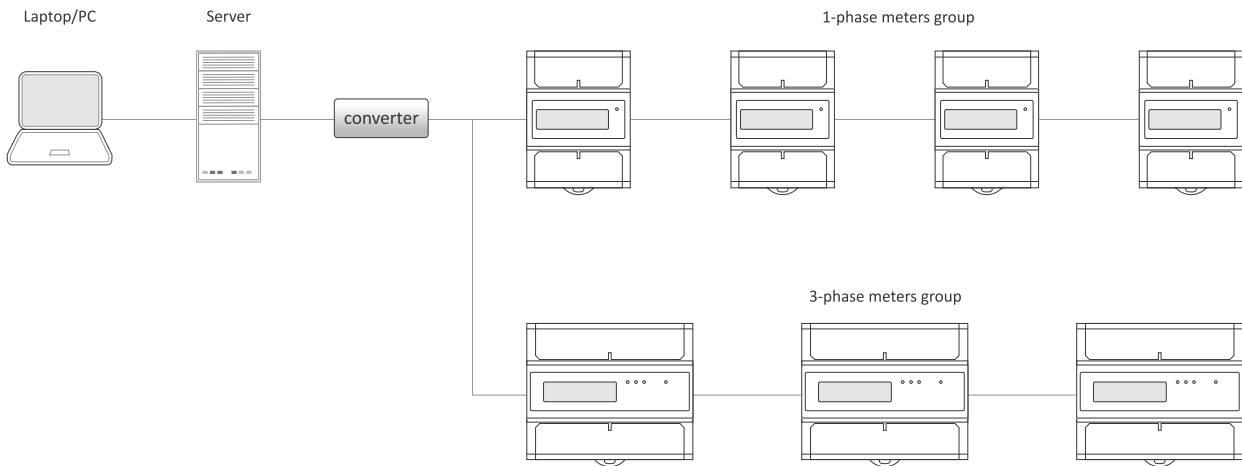
Operation

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. 223

Active energy meters with Modbus RTU communication

LE-01M   1-phase, **MID certificate**
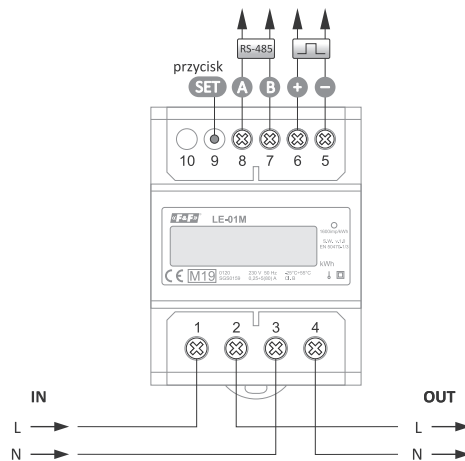
compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	5 A
maximum current	80 A
minimum detection current	0.04 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷99999.99 kWh
meter constant	1600 imp/kWh
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1600 imp/kWh
pulse duration	35÷80 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	4.5 modules (75 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- 1-phase;
- Direct measurement 100 A;
- kWh indication;
- MID compliance;

- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

LE-03M   3-phase

compliance	IEC61036
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
accuracy class (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
indication range	0÷99999.99 kWh
meter constant	800 imp/kWh
phase A, B, C current consumption indication	3×red LED
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh
pulse duration	35÷80 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	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

Operation

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.

compliance	IEC61036
reference voltage	3×230/400 V
base current	3×1.5 A
maximum current	3×5 A
minimum detection current	0.04 A
accuracy class (per IEC61036)	1 class
own power consumption	<10 VA; <2 W
number of the counter digits	7
indication range	depend on the ratio
meter constant	depend on the ratio
read-out signalling	LED red
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	-20÷55°C
terminal	25 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- 3-phase;
- Semi-indirect measurement 3×5 A;
- Transformers 5÷6000/5 A;
- Ratio set according to Modbus RTU;
- kWh indication;

- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

Active/reactive energy meters with network parameters measurement

The meters are used to indicate and record the consumed electricity and the parameters of the power supply network. The network parameters measured by the indicator are displayed cyclically on the LCD display. Remote reading of all indications is possible via the RS-485 standard wired communication network.

LE-01MR 1-phase, MID certificate

compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	5 A
maximum current	100 A
minimum detection current	0.02 A
measurement accuracy	B
own power consumption	<8 VA; <0.4 W
indication range	0÷99999.99 kWh
meter constant	1000 imp/kWh
read-out signalling	LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	1000 imp/kWh
pulse duration	35 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷65°C
terminal	25 mm² screw terminals
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

- 1-phase;
- Direct measurement 100 A;
- kWh/kvar indication + network parameters;
- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

LE-03MP 3-phase
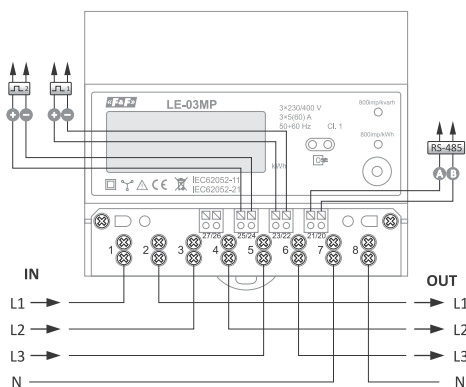
reference voltage	3×230/400 V
base current	3×5 A
maximum current	3×60 A
minimum detection current	0.02 A
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <1.5 W
indication range	0÷999999.99 kWh
meter constant (kWh)	800 imp/kWh
meter constant (kvarh)	800 imp/kvarh
read-out signalling	2×LED red
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant	800 imp/kWh or 800 imp/kvarh
pulse duration	10 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	16 mm² screw terminals
dimensions	7 modules (122 mm)
installation	for TH-35 rail
protection level	IP20

- 3-phase;
- Direct measurement 3×60 A;
- kWh/kvar indication + network parameters;
- Prepaid;
- LVD compliance;
- Modbus RTU protocol;
- RS-485 port;
- SO pulse output.

- Internal relay for switching on of phase circuits L₁, L₂, L₃;
- Manual control of the relay;
- Overcurrent protection - the setting of the load limit value;
- Prepaid energy – the value of active energy at which the meter disconnects the internal relay;
- Automatic operation – activating automatic relay shutdown after exceeding the set excess current and activating the prepaid function;
- Status – current status of the relay [ON/OFF].

Multi-tariff

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

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.
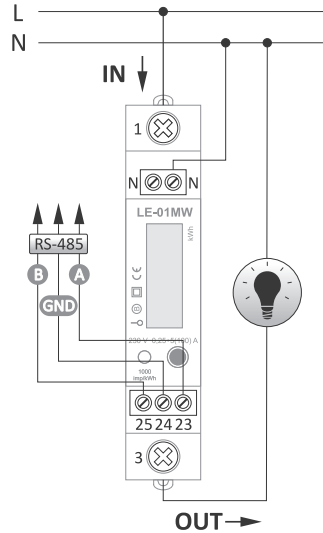
compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	5 A
maximum current	100 A
minimum detection current	0.02 A
voltage measuring range	100÷289 V AC
rated frequency	50 Hz
measurement accuracy	B class
installation	1-phase, 2-wire
overload	30×Imax/10 ms
isolation	4 kV/1 min.; 6 kV/1 μs
own power consumption	<8 VA; <0.4 W
indication range	6 digits
meter constant	100; 1000; 2000 imp/(kWh/kvarh)
communication	
port	RS-485
communication protocol	Modbus RTU
transmission rate	1200, 2400, 4800, 9600 bps
parity	BRAK, EVEN, ODD
parity bits	2
working temperature	-25÷55°C
terminal	25 mm² screw terminals
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 1-Phase electricity meter;
- Direct measurement up to 100 A;
- Installation on DIN rail (1 module);
- Operation in one of two measurement modes:
  – measurement of active and reactive energy,
  – measurement of active energy imported from and exported to the grid
- Energy measurement in four tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- MID compliance;
- RS-485 port;
- Modbus RTU protocol;
- Backlit LCD display;
- Energy consumption indication can be read locally even if the meter is not powered.

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

Purpose

LE-03MW is an electronic, compliant with the MID Directive, 2-way, 4-tariff three-phase electricity meter, designed for measurement in a direct system. The built-in real-time clock allows the measurement of energy consumption divided into different tariff zones. It is equipped with communication interfaces: RS-485 with Modbus RTU protocol and optical port according to EN62056 (IEC1107) which allows remote reading and configuration of the meter.
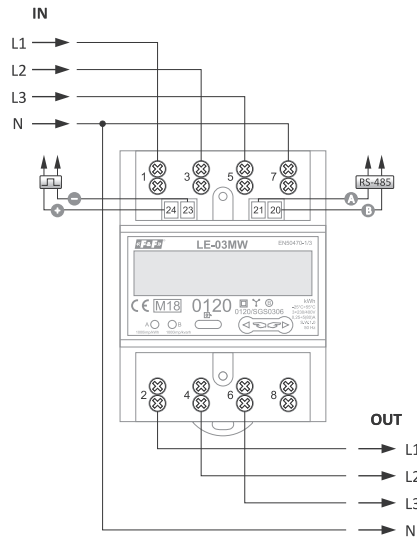
compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×5 A
maximum current	3×80 A
minimum detection current	0.04 A
measured voltage	
L-N	100÷289 V AC
L-L	173÷500 V AC
measurement accuracy	B class
own power consumption	<10 VA; <1.5 W
indication range	0÷999999.99 kWh
meter constant (kWh)	800 imp/kWh
meter constant (kvarh)	800 imp/kvarh
read-out signalling	2×LED red
pulse outputs	
number of outputs	2
type	OC (open collector)
maximum voltage	27 V DC
maximum current	27 mA
pulse constant of the output 1	1, 10,100, 1000 imp/kWh
pulse constant of the output 2	1000 imp/kvar
pulse duration	10 ms
communication	
port	RS-485
communication protocol	Modbus RTU
transmission rate	1200, 2400, 4800, 9600 bps
parity	EVEN
parity bits	2
optical port	according to EN62056 (IEC1107)
working temperature	-25÷55°C
terminal	25 mm² screw terminals
dimensions	4.5 modules (76 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 4-tariff;
- 2-way (import/export);
- Direct measurement up to 80 A;
- Energy measurement in four tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- Total and tariff-divided consumption registration:
  – total active and reactive energy;
  – active and reactive energy divided into individual quadrants;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand for individual tariffs;
- Additional, resettable energy consumption meter;
- MID compliance;
- RS-485 port;
- Modbus RTU protocol;
- Optical communication port in accordance with EN62056 (IEC1107);
- 2 SO pulse outputs with a programmable number of pulses per kWh/kvarh;
- Multifunctional LCD display.

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

LE-03MW CT is an electronic, 4-tariff, 2-way three-phase electricity meter, designed for measurement in a semi-indirect system. The built-in re-al-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.
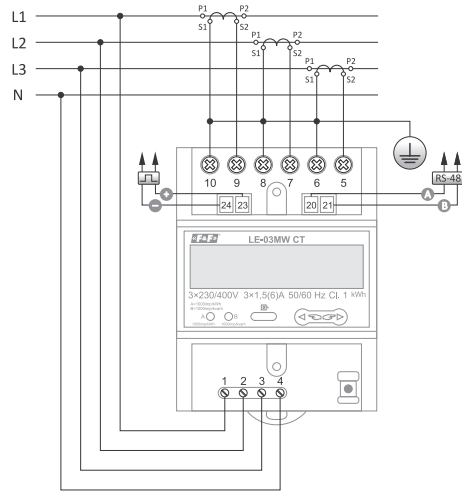
reference voltage	3×230/400 V
base current	3×1.5 A
maximum current	3×6 A
minimum detection current	0.02 A
measured voltage	
L-N	100÷289 V AC
L-L	173÷500 V AC
measurement accuracy (per IEC61036)	1 class
own power consumption	<10 VA; <1.5 W
indication range	0÷999999.99 kWh
meter constant (kWh)	12000 imp/kWh
meter constant (kvarh)	12000 imp/kvarh
read-out signalling	2×LED red
pulse outputs	
number of outputs	2
type	OC (open collector)
maximum voltage	27 V DC
maximum current	27 mA
pulse constant of the output 1	1, 10,100, 1000 imp/kWh
pulse constant of the output 2	1000 imp/kvar
pulse duration	10 ms
communication	
port	RS-485
communication protocol	Modbus RTU
transmission rate	1200, 2400, 4800, 9600 bps
parity	EVEN
parity bits	2
optical port	according to EN62056 (IEC1107)
working temperature	-25÷55°C
terminal	25 mm² screw terminals
dimensions	4.5 modules (76 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 4-tariff;
- 2-way (import/export);
- Semi-indirect energy measurement using 5A secondary current transformers;
- Energy measurement in four tariff zones;
- Built-in real-time clock with battery backup for switching tariff zones;
- Total and tariff-divided consumption registration:
  – total active and reactive energy;
  – active and reactive energy divided into individual quadrants;
- 8 time schedules dividing the day into tariff zones;
- The possibility of settling the energy according to different schedules for working days and weekend;
- Ability to divide the year into 8 time periods: in each period the energy (for working days) can be settled according to a different schedule;
- Indication of network parameters (voltage, currents, active power, reactive power, apparent power, power factor, frequency);
- Calculation of power demand for individual tariffs;
- Additional, resettable energy consumption meter;
- RS-485 port;
- Modbus RTU protocol;
- Optical communication port in accordance with EN62056 (IEC1107);
- 2 SO pulse outputs with a programmable number of pulses per kWh/kvarh;
- Multifunctional LCD display.

Active/reactive imported/exported energy meters, bi-directional with network parameters measurement

With RS-485 port and Modbus RTU protocol

LE-01MQ 1-phase, 2-way, 4-quadrant electricity meter, **for photovoltaic systems, MID certificate**

compliance	MID Directive 2014/32/EU
reference voltage	230 V
base current	5 A
maximum current	100 A
minimum detection current	0.02 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷99999.99 kWh
meter constant (kWh)	1, 10, 100, 1000 imp/kWh
meter constant (kvarh)	1, 10, 100, 1000 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	1, 10, 100, 1000 imp/kWh
pulse constant (kvarh)	1, 10, 100, 1000 imp/kvarh
pulse duration	60, 100, 200 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	16 mm² screw terminals
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 1-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- MID compliance;

- Modbus RTU protocol;
- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

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

compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
meter constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
pulse constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
pulse duration	60, 100, 200 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	4.5 modules (76 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 3-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- MID compliance;
- Modbus RTU protocol;

- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MQ meter can be found on page 222.

Section X. Electricity consumption meters

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
accuracy class	B
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 imp/kWh
meter constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
pulse constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
pulse duration	60, 100, 200 ms
port	RS-485
communication protocol	Modbus RTU
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	4 modules (72 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 3-phase;
- 2-way (4-quadrant);
- 1 A or 5 A transformers;
- Current ratio 1÷9999;
- Adjustable measuring voltage 100÷500 V;
- Voltage ratio 1÷9999;
- Ratio set according to Modbus RTU;
- Indications of kWh/kvar (imported/exported);

- Indication of network parameters;
- MID compliance;
- Modbus RTU protocol;
- RS-485 port;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MQ CT meter can be found on page 222.

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. 223

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
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷99999.99 kWh
meter constant (kWh)	1, 10, 100, 1000 imp/kWh
meter constant (kvarh)	1, 10, 100, 1000 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	1, 10, 100, 1000 imp/kWh
pulse constant (kvarh)	1, 10, 100, 1000 imp/kvarh
pulse duration	60, 100, 200 ms
communication protocol	M-Bus
working temperature	-20÷55°C
terminal	16 mm² screw terminals
dimensions	2 modules (35 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 1-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;

- MID compliance;
- M-Bus protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

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

compliance	MID Directive 2014/32/EU
reference voltage	3×230/400 V
base current	3×10 A
maximum current	3×100 A
minimum detection current	0.04 A
accuracy class	B
own power consumption	<10 VA; <2 W
indication range	0÷999999.99 kWh
meter constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
meter constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
pulse constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
pulse duration	60, 100, 200 ms
communication protocol	M-Bus
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	4.5 modules (76 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 3-phase;
- 2-way (4-quadrant);
- Direct measurement 100 A;
- Indications of kWh/kvar (energy imported/exported);
- Indication of network parameters;

- MID compliance;
- M-Bus port and protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!)

Chapter 38

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

reference voltage	3×230/400 V
base current	3×5 A
maximum current	3×6 A
minimum detection current	0.02 A
accuracy class	1
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 imp/kWh
meter constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
read-out signalling	2×LED
pulse output	
type	open collector
maximum voltage	27 V DC
maximum current	27 mA
pulse constant (kWh)	0.01; 0.1; 1; 10; 100 imp/kWh
pulse constant (kvarh)	0.01; 0.1; 1; 10; 100 imp/kvarh
pulse duration	60, 100, 200 ms
communication protocol	M-Bus
working temperature	-20÷55°C
terminal	25 mm² screw terminals
dimensions	4 modules (72 mm)
installation	for TH-35 rail
protection level	IP51

Functions

- 3-phase;
- 2-way (4-quadrant);
- 1 A or 5 A transformers;
- Current ratio 1÷9999;
- Adjustable measuring voltage 100÷500 V;
- Voltage ratio 1÷9999;
- Ratio set according to Modbus RTU;

- Indications of kWh/kvar (imported/exported);
- Indication of network parameters;
- M-Bus port/protocol;
- 2× pulse output SO;
- Backlit, multifunctional LCD display;
- Password-protected meter configuration.

(!) Measuring systems for the LE-03MB CT meter can be found on page 222.

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

LE-03MB
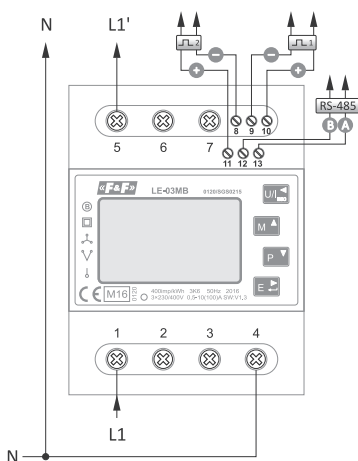
230 V AC
1-phase 2-wire installation
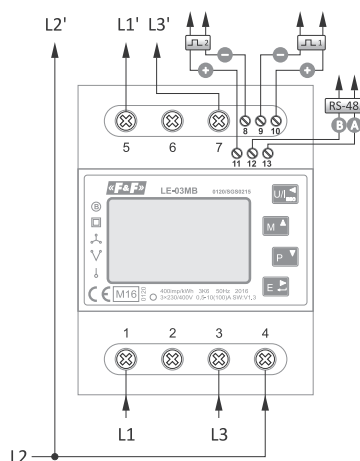
3×400 V
3-phase 3-wire installation
(without neutral wire)
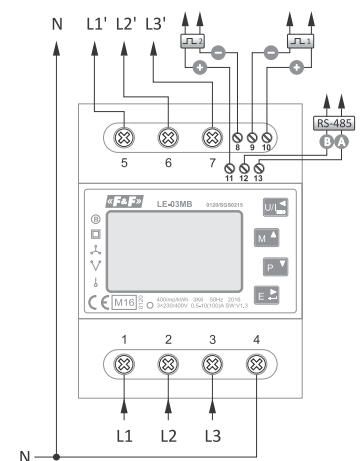
3×400 V
3-phase 3-wire installation
(without neutral wire)

continued on next page
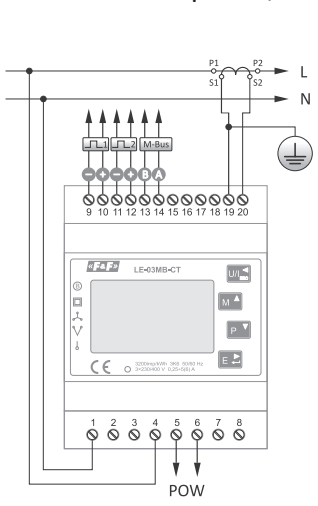
Chapter 38

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

230 V AC
1-phase 2-wire installation
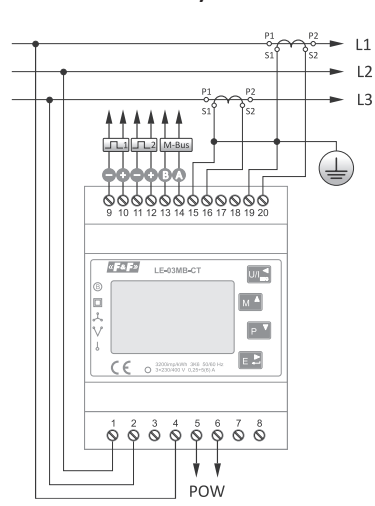
3×400 V
3-phase 3-wire inst. (without neutral wire)
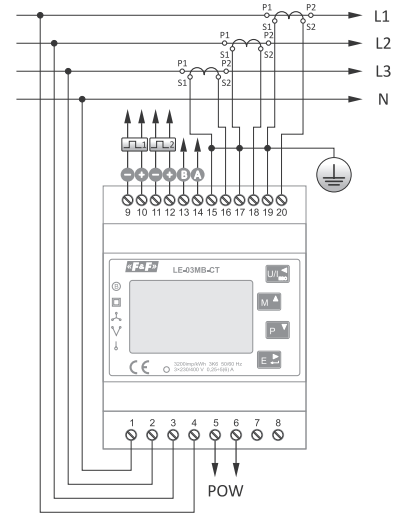
3×230 V+N
3-phase 4-wire installation

LE-03MQ   3-phase, 2-way, 4-quadrant electricity meter, **MID certificate**
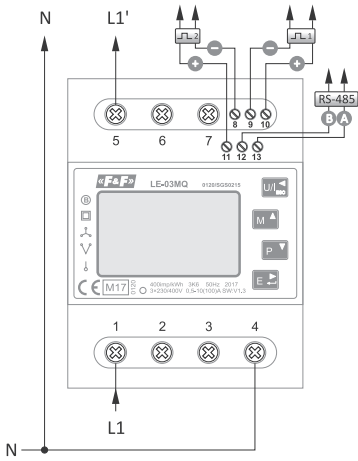
230 V AC
1-phase 2-wire installation
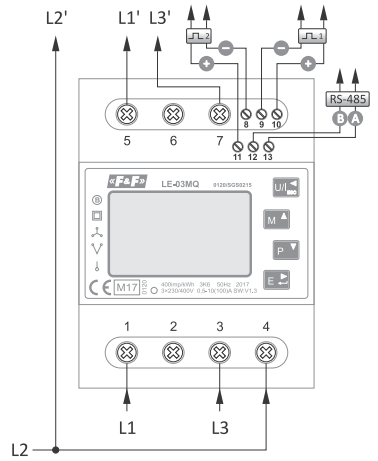
3×400 V
3-phase 3-wire inst. (without neutral wire)
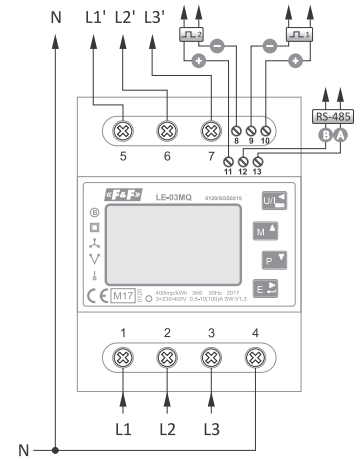
3×230 V+N
3-phase 4-wire installation

LE-03MQ CT   3-phase, 2-way, 4-quadrant electricity meter, **MID certificate**
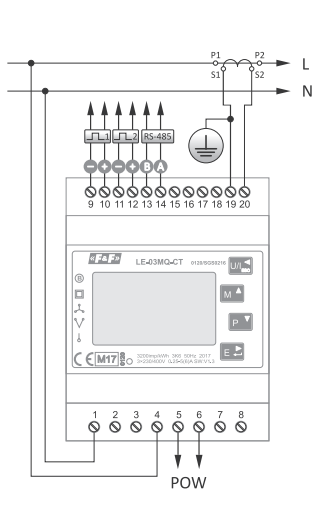
230 V AC
1-phase 2-wire installation
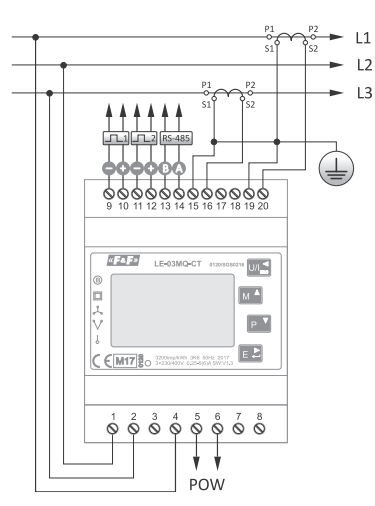
3×400 V
3-phase 3-wire inst. (without neutral wire)
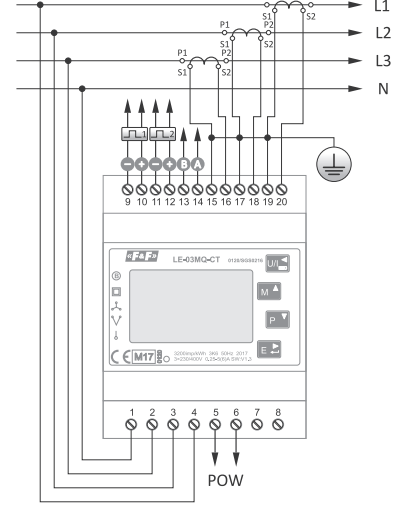
3×230 V+N
3-phase 4-wire installation

Remote reading and recording system

MeternetPRO

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.
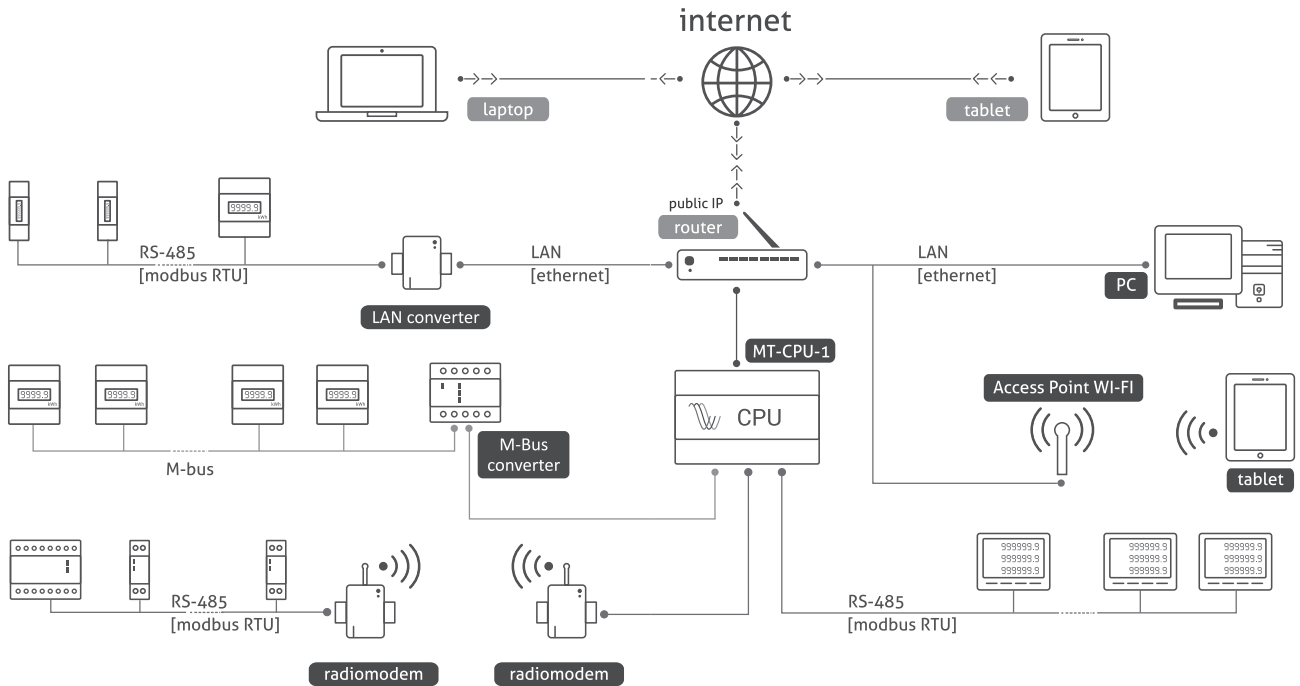
Areas of application

- Large factories;
- Small production facilities;
- Office buildings;
- Apartment buildings;
- Apartment blocks;
- Shopping malls;
- Markets;
- Public buildings;
- Single-family housing estates;
- Campings;
- Plot gardens.

Frequent applications

- Measurements for energy audit;
- Reports on the consumption of electricity, water, gas, etc.
- Subtenant billings;
- Analysis of production and operating costs;
- Power/current/voltage charts;
- On-line parameter monitoring;
- Supervision of power limits (power guard);
- Adjusting electricity tariff.

Functions

- The system does not require the installation of any programs on the user's hardware;
- Local and remote access through any web browser;
- No workstation licenses - an unlimited number of users;
- The MT-CPU-1 server is a stand-alone unit that manages devices and the archive;
- Supported protocols: Modbus RTU, Modbus TCP, M-Bus, DLMS;
- Supported ports: Ethernet RJ-45, RS-485, USB ×4;
- Status – preview panel of performance and correctness of system operation;
- Reports – a preview of current and archival recorded values (results table, graphs), report filters, time ranges, subscription billing of energy consumption, etc.
- Dashboard – a window of graphic indicators, visualization, and control panels (webscada);
- Widgets – graphical indicators assigned to the recorded values (hints, bar graphs, trends, thermal maps, etc.);
- Configuration – simple system settings without programming skills, the definition of device names, system settings;
- Data acquisition – direct writing to .csv file, transfer over LAN, import of data in the form of .csv and .xls file to user's computer, external SQL databases;
- "Mathematics" software module – for algebraic transformations of read values;
- SMS/e-mail alerts;
- Manual and automatic control (threshold/hysteresis double state control, power guard);
- The differential function allows you to convert the electricity consumption [kWh] into instantaneous power [kW]. The result is a graphical profile of power consumption that allows you to track trends and find the peak power consumption.
- Integration with external devices such as water meters, gas meters, etc.

MT-CPU-1 hardware server

Purpose

Central unit for managing the system. The computer queries the devices, archives the data, manages the communication and distribution of data.
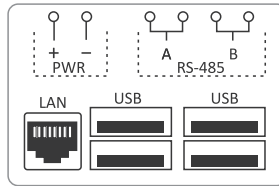
supply voltage	9÷30 V DC
ports	
LAN	RJ-45
USB	2.0
RS-485	Modbus RTU
working status indication	5×LED
RTC clock	YES
system memory	8 GB
battery type	2032 (lithium)
battery life	6 years*
power consumption	0.8 W
working temperature	-25÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.3 Nm
dimensions	6 modules (105 mm)
installation	for TH-35 rail
protection level	IP20

* battery life depends on weather conditions

Archives and data

Data archiving is carried out in a designated memory space:

- storage drives: HDDs and SSDs with USB 3.0/2.0 connection;
- flash memory (pendrive);

- storage available in the LAN (FTP, SQL, etc.);
- cloud storage (hosting), accessible via the Internet.
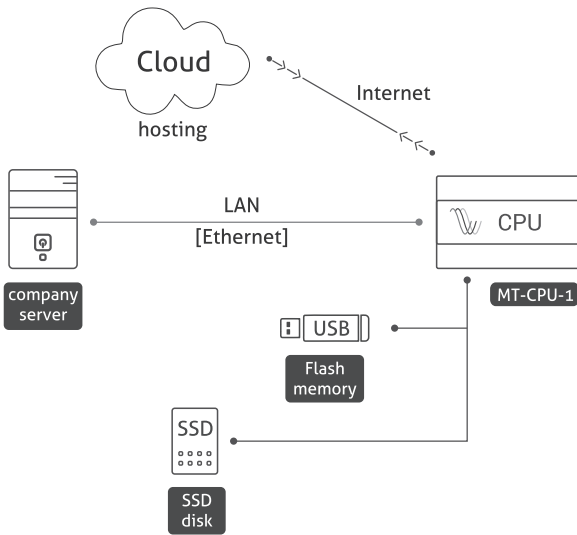
Supported archive types:

Internal database   *.csv file

Postgre SQL database   MS SQL database   Oracle database

Pendrive64 flash memory USB 64 GB

Purpose

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

memory	flash
interface	USB 3.1
read speed	220 MB/s
write speed	120 MB/s
power consumption	0.35 W
installation	USB port

SSD275 flash memory USB 275 GB

Purpose

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

memory	SSD
interface	SATA M.2 2280SS
read speed	530 MB/s
write speed	500 MB/s
power consumption	
standby	0.35 W
ON mode	1.1 W
terminal	USB Micro-B
installation	for TH-35 rail

MeternetPRO   system app

The system application, together with the MT-CPU-1 server is the central unit of the system. For measuring devices, it acts as a Master.

Data exchange between devices is carried out via RS-485 port, built into MT-CPU-1 server, standard RS-485 or M-Bus to USB converters or LAN converters (Ethernet/TCP-IP).

The system does not require the installation of any programs on the user's hardware. The server is a LAN device and serves as a Web server. The application is available through a web browser for every computer operating in the same subnet. To access the system, use the login panel. In the case of LAN with a router (with a public IP address), it is possible to read data over the Internet. The read data are archived on external memory (HDD/SDD, Flash) connected to the server or sent to an external database (hosting). Data can be freely shaped according to software functions or imported to the user's computer in the form of .csv files (opened in Excel or any other database program).

Software interface

Screenshot from the "Reading" section - results table

Screenshot from the "Dashboard" section - time course

Screenshot from the "Dashboard" section - graphic indicators

Screenshot from the "Configuration" section

Chapter 38

- **LIC-MT-B** basic license:
  - registration of all selected parameters to the system database;
  - the operating status of the system;
  - ten tokens;
  - table of current readings;
  - reports: tabular, historical for a given time point, historical graph for one parameter for a selected time period; export of generated reports to a .csv file (opened in Excel or any other database program) and a dump of generated graphs to a .jpg file;
  - dashboard: 1 dashboard + 3 indicators (widgets).
- **LIC-MT-D** – device license (token)

  Tokens are so-called system points. Each device added to the system or a specific software license takes an appropriate number of tokens. Within the purchased number of tokens, the user can freely match different devices in the system, for example, having a license for 8 tokens, we can assemble four LE-03M meters in the system or only one LE-03MP meter. The number of tokens for a given device or software licenses is presented by the current inventory and price list available on the website: www.meternetpro.pl. Adding of purchased tokens to the system is done using the sent license code.

- **LIC-MT-R** – extension license – "reports" module

  This version with an active license allows you to create multiple parallel incremental reports. It is used as a module of subscription billing of electricity consumption (or other recorded incremental values, such as consumption of water, heat, etc.). It allows you to calculate increments in the determined settlement periods. Cycles: monthly, weekly, daily, hourly. Additionally, the license activates the ability to create historical graphs for 10 parameters on a one-time axis (such as dependence of consumed power on temperature).

- **LIC-MT-P** –extension license – "dashboard" module

  A panel of graphical indicators of current indications of selected parameters. The version with an active "dashboard" license allows you to create an unlimited number of dashboards and indicators (widgets).

- **LIC-MT-L** – software module – "control and alarm" module

  Module for assigning event logic depending on the input parameter value:
  - e-mail notifications;
  - SMS notifications;
  - manual ON/OFF control of the MR-RO-1 and MR-RO-4 output modules;
  - automatic ON/OFF control of the MR-RO-1 and MR-RO-4 output modules on a bi-state adjustment basis;
  - manual control of the output analog voltage signal of the MR-AO-1 module;
  - automatic control of the output analog voltage signal of the MR-AO-1 module;
- **LIC-MT-M** – extension license – "math" module

  This module enables algebraic transformations (calculations) of registered values (sum, difference, multiplying, division, differential, average, min., max., etc.). The result is recorded as a virtual device parameter and is subject to all software rules as any real device result.

- **LIC-MT-K** –extension license – "camping" module

  This module allows you to calculate the consumption of electricity or other utilities (water, gas, etc.) in a given time by means of the manual START/STOP control and to settle the user's account with the due amount in accordance with the set rate. Each billing report starts and ends with printing to a PDF file. The billing archive is saved in a special file in the Files tab and can be exported to a CSV file.

- **LIC-MT-Z** –extension license - "prepaid" module

  Module allowing for prepayment management of electricity or other utilities (water, gas, etc.) consumption. It allows you to automatically disconnect the power source when the set threshold is exceeded or to manually control on an ON/OFF basis.

- **LIC-MT-I** – extension license - external implementation

  Software complementation of the system library with a foreign device, not produced by the F&F. Service available at the request of the client. It allows you to integrate other Modbus RTU-compatible devices. Each device will have an individual number of tokens assigned to it.

LIC-MT-R – software extension license - "reports" module

The module of subscription settlements of electricity consumption (or other recorded incremental values, such as consumption of water, heat, etc.). It allows you to calculate increments in the determined billing periods. Cycles: monthly, weekly, daily, hourly. This version with an active license allows you to create multiple parallel reports.

Chapter 38

Server location

Install the server in a separate distribution box. Avoid installation in switchgear with high load devices and devices producing strong electromagnetic fields. In case of strong interference caused by high loads, operation of induction machines (motors), operation of inverters and a large number of capacitive load receivers (LEDs), it is recommended to install the server in a metal box with grounding.

Power supply

The use of the backup power supply is recommended.

System restart can take up to 5÷7 minutes.

During that time, no data from the system will be recorded. Also, in case of sudden voltage loss, there is a risk of damage to the data recorded in external memory. Use a UPS or backup power supply system based on the ECH-06 module.
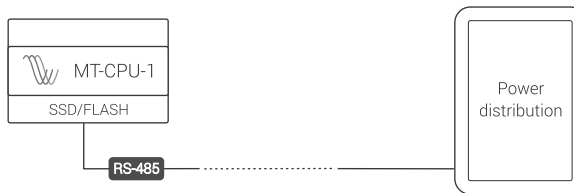
Types of devices	Description of the device	Page
ECH-06	Backup power supply module	181
AKU-12	12 V 1.3 Ah gel battery	–
ZI-24	24 V 30 W stabilized power supply	177

The ECH-06 module constantly monitors the state of charge of the battery and charges it automatically when the main power supply voltage is present. In case of main voltage loss or drop of its value below the voltage on the battery, the receiver is powered from the battery.

Devices associated with MeternetPRO

Converters

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

Purpose

The converter enables access to the RS-485 port from any PC or other Master-type device equipped with a USB interface.
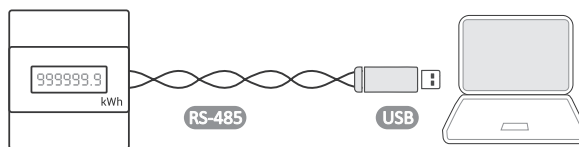
wire length	1.8 m
terminal RS-485	2×0.34 mm²

MAX-CN-ETH-485   RS-485 <-> USB 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.
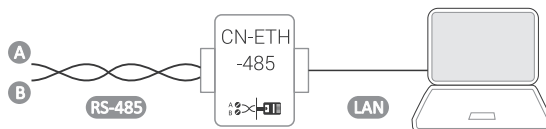
power	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	86×100×26 mm
installation	surface mounting

Types of devices	Description of the device	Page
DMM-5T	Multimeter, indirect 4-quadrant measurement 5÷9000 A, measurement of U, I, F, AE, RE, P, Q, cos	187
LE-01M	1-phase direct energy meter 100 A	212
LE-03M	3-phase direct energy meter 100 A	213
LE-03M CT	3-phase direct energy meter 5÷6000 A	213
LE-01MR	Energy meter, direct 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, T	214
LE-03MP	Energy meter, direct 3-phase 60 A, measurement of U, I, F, AE, RE, P, Q, cos, T, Prepaid	214
LE-01MQ	Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos	218
LE-03MQ	Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos	218
LE-03MQ CT	Energy meter, semi-indirect 2-way 1-phase 5 A, measurement of U, I, F, AE, RE, P, Q, cos	219
LE-01MB	Energy meter, direct 2-way 1-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus	220
LE-03MB	Energy meter, direct 2-way 3-phase 100 A, measurement of U, I, F, AE, RE, P, Q, cos; M-Bus	220
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	221
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	216
LE-03MW CT	Energy meter, semi-indirect 2-way 3-phase 5A, measurement of U, I, F, AE, RE, P, Q, cos; Modbus	217
MB-1U-1	1-phase measuring transducer for AC/DC voltage	265
MB-3U-1	3-phase measuring transducer for AC/DC voltage	265
MB-1l-1	1-phase measuring transducer for AC/DC intensity	265
MB-3l-1	3-phase measuring transducer for AC/DC intensity	265
MB-AHT-1	Humidity and temperature transducer	270
MB-DS-2	Temperature measuring transmitter, DS sensor (×2), range -50÷130°C	267
MB-PT-100	Temperature measuring transducer, PT-100 sensor, range -100÷400°C	268
MB-TC-1	Temperature transducer for use with thermocouples	268
MB-LI-4	4-channel pulse counter	269
MB-LG-4	4-channel operating time counter	269
MR-DIO-1	Digital I/O expansion module (×6)	271
MR-DI-4	Digital I/O expansion module (×4)	271
MR-RO-1	16 A relay output expansion module (×1)	272
MR-RO-4	16 A relay output expansion module (×4)	272
MR-AI-1	Analog input expansion module 4÷20 mA/0÷10 V (×4)	273
MR-AO-1	0÷10 V relay output expansion module (×4)	273

(!) It is possible to read the registers of devices outside the F&F offer.
This requires an individual configuration of the program according to the user's requirements.

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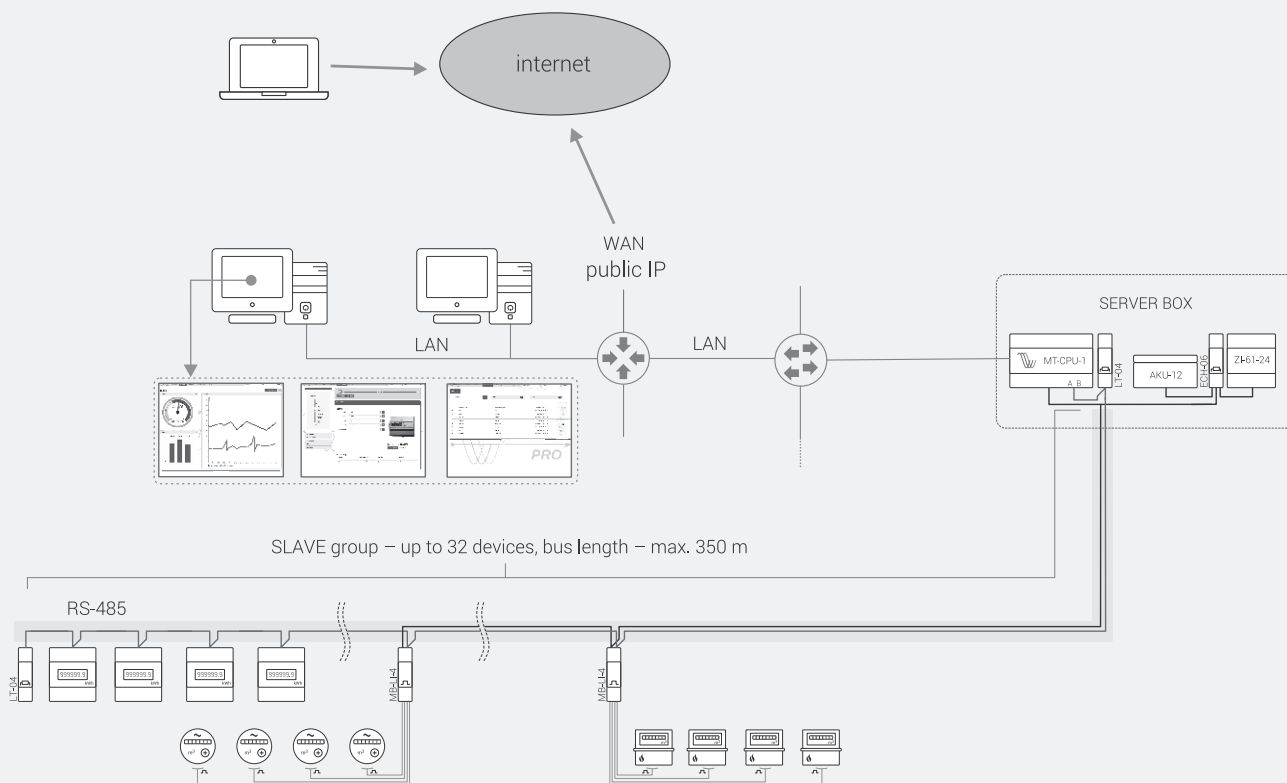
Example application of an integration system for electricity, water, and gas consumption readings

Status monitoring,
measurement and regulation

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	231
CLI-02	pulse meter	● (menu)	●	for TH-35 rail	●	8	–	●*	10÷264 V AC/DC	24÷264 V AC/DC	232
CLI-11T 24 V	pulse meter	–	–	panel-mounted	●	8	–	●	4÷30 V DC	internal battery	231
CLI-11T 230 V	pulse meter	–	–	panel-mounted	●	8	–	●	110÷240 V AC/DC	internal battery	231
CLG-03	operating time meter	● (menu)	not applicable	for TH-35 rail	●	6+1	–	●	10÷264 V AC/DC	24÷264 V AC/DC	234
CLG-04	operating time meter	–	not applicable	for TH-35 rail	●	6+2	–	–	100÷240 V AC/DC	internal battery	234
CLG-13T 24 V	operating time meter	–	not applicable	panel-mounted	●	5+1	–	●*	4÷30 V DC	internal battery	233
CLG-13T 230 V	operating time meter	–	not applicable	panel-mounted	●	5+1	–	●*	110÷240 V AC/DC	internal battery	233
CLG-14T	operating time meter	–	not applicable	panel-mounted	●	6+2	–	●	110÷240 V AC/DC	internal battery	233
CLG-15T	electromechanical operating time meter	–	not applicable	panel-mounted	–	5+2	–	–	230 V AC/DC	230 V AC/DC	233
MB-LI-4 Lo	4-channel pulse meter	●	●	for TH-35 rail	–	not applicable	●	–	6÷30 V AC/DC	9÷30 V DC	232
MB-LI-4 Hi	4-channel pulse meter	●	●	for TH-35 rail	–	not applicable	●	–	160÷265 V AC/DC	9÷30 V DC	232
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	269
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	269

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

Pulse meters

Pulse meters are used to count AC/DC voltage signals generated by additional external devices in order to determine the number of work cycles performed in automation systems, for example, to control the number of press strokes, the number of rotations of the rotational device, the number of elements coming off the production line, etc.

CLI-11T panel-mounted

Operation

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
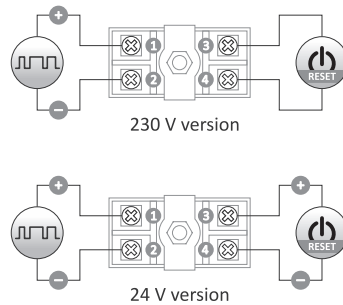
power supply	internal battery
battery life	10 years*
counting input voltage	
CLI-11T 230 V	110÷240 V AC/DC
CLI-11T 24 V	4÷30 V DC
maximum counting frequency	200 Hz
display	8 characters/h= 6.7 mm
indication accuracy	1% ±1 digit
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×52 mm
mounting hole	45×23 mm
protection level	IP20

* battery life depends on weather conditions

CLI-01 programmable

Operation

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)
installation	for TH-35 rail
protection level	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

Operation

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)
installation	for TH-35 rail
protection level	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
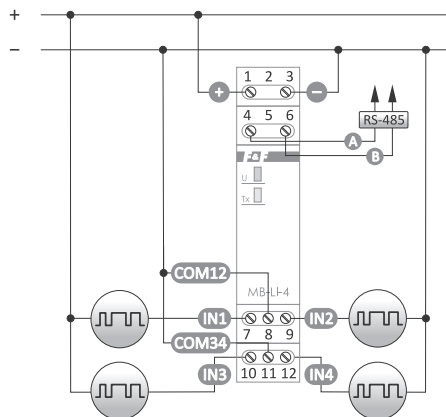
supply voltage	9÷30 V DC
number of counting inputs	4
counting input voltage	
low voltage version lo	6÷30 V AC/DC
high voltage version Hi	160÷265 V AC/DC
maximum counting frequency	100 Hz
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
baud rate (adjustable)	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)
installation	for TH-35 rail
protection level	IP20

Functions

- 2 versions of the device:
  – Lo for counting low-voltage signals;
  – Hi for signals with 230 V mains voltage;
- 4 independent counters;
- Counter input suitable for AC/DC signals;
- Factor setting (floating-point value);
- Scaled value (number of pulses × factor);
- Selection of the state trigger option 1: high or low voltage level;
- Selection of the input pulse edge (rising or trailing);
- Frequency filter, which allows limiting the maximum frequency of the counted pulses (to eliminate interference at the input of the counter);
- The memory of the meter status after a power failure;
- Digital input function.

Operating time meters

Operating time meters are used to count the number of working hours in automatic production processes or the number of working hours of equipment which, due to safety requirements and efficiency of operation, has a certain service life, that is, an operating capacity which must not be exceeded (for example advanced propulsion units, specialized radioactive lamps, etc.).

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

Operation

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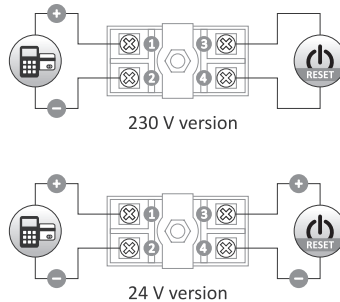
power supply	internal battery
battery life	10 years*
counting input voltage	
CLG-13T 230 V	110÷240 V AC/DC
CLG-13T 24 V	4÷30 V DC
display	6 characters/h= 6.7 mm
indication accuracy	0.1 h (6 min.)
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×52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

* battery life depends on weather conditions

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

Operation

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
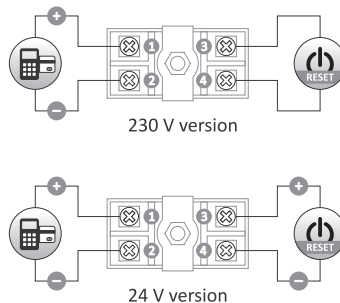
power supply	internal battery
battery life	10 years*
counting input voltage	
CLG-14T 230 V	110÷240 V AC/DC
CLG-14T 24 V	4÷30 V DC
display	8 characters/h= 6.7 mm
indication accuracy	1 min.
working temperature	-10÷40°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×52 mm
mounting hole	45×23 mm
protection level	IP20

* battery life depends on weather conditions

CLG-15T electromechanical

Operation

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 control voltage is applied to terminals "+" and "−". When the maximum result is reached, the meter starts from 0.

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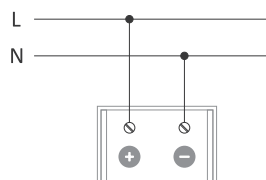
power supply	230 V AC/DC
voltage of counting input	230 V AC/DC
voltage tolerance	
indication accuracy	0.01 h (36 s)
working temperature	-25÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	48×24×60 mm
mounting hole	32×22 mm
protection level	IP20

CLG-03 programmable

Operation

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)
installation	for TH-35 rail
protection level	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.
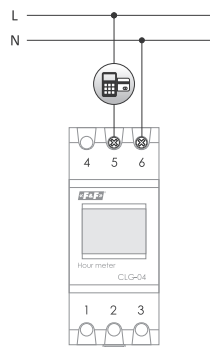
power supply	internal battery (CR14335 soldered)
battery life	5 years (depending on the operating conditions)
voltage of counting input	100÷240 V AC/DC
display	6+2 characters (backlit during time counting)
indication accuracy	1 min.
power consumption	1.5 W
working temperature	-10÷40°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	2 modules (36 mm)
installation	for TH-35 rail
protection level	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	Page
PZ-828	1	1	1×NO/NC	●	–	235
PZ-828 RC	1	1	1×NO/NC	●	●	235
PZ-829	2	3	2×NO/NC	●	–	236
PZ-829 RC	2	3	2×NO/NC	●	●	236
PZ-831 RC	3	4	3×NO	●	●	238
PZ-832 RC	4 (2+2 alarm)	5	4×NO/NC	●	●	237

Single-state

PZ-828 + 1 PZ probe / PZ-828RC   with sensitivity adjustment + 1 PZ probe

Operation

The PZ-828 is a liquid level control relay that operates on the principle of detecting the presence or absence of conductive liquid.
The relay can operate in two modes:
- emptying the tank (diagram 1): the pump is switched on when the sensor is flooded with liquid and switched off when the sensor loses contact with the liquid;
- filling the tank (diagram 2): the pump is switched on when the sensor loses contact with the liquid and switched off when the sensor is flooded with liquid;

PZ-828 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.
Examples of liquid resistances are shown in the table on page 237.
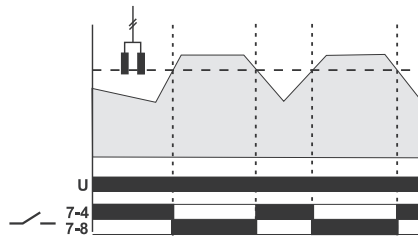
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
sensitivity (adjustable for PZ-828 RC)	1÷100 kΩ
output voltage measurement	<6 V
power indication	LED green
work status indication	LED red
power consumption	1.1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	2 modules (35 mm)
installation	for TH-35 rail
flooding probe type	1×PZ
separation of the measuring probe	galvanic (transformer)
protection level	IP20
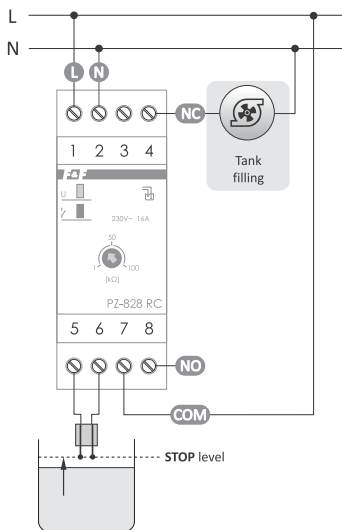
Tank filling
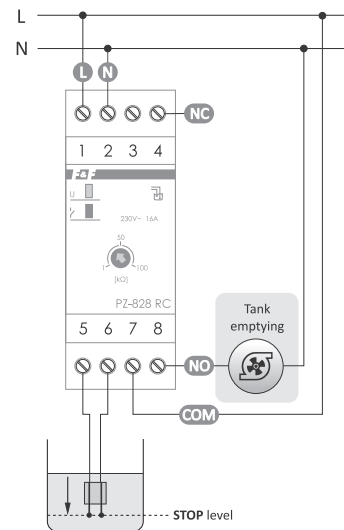
Tank emptying

Bi-state

PZ-829 + 3 PZ probes / PZ-829RC with sensitivity adjustment + 3 PZ probes

Operation

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

The relay can operate in two modes:
- emptying the tank (diagram 1). As soon as the liquid level reaches the set MAX level, the pump is switched on and it will continue to operate until the liquid level falls below MIN.
- filling the tank (diagram 2). As soon as the liquid level falls below the preset MIN level, the pump is switched on and it will continue to operate until the liquid level reaches the MAX value.

PZ-829 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.

power supply	230 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO/NC
sensitivity (adjustable for PZ-829 RC)	1÷100 kΩ
contacts switching delay	
for MIN point	1÷2 s
for MAX point	<5 s
output voltage measurement	<6 V
power indication	LED green
work status indication	2×LED red
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)
installation	for TH-35 rail
flooding probe type	3×PZ2
separation of the measuring probes	galvanic (transformer)
protection level	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

Bi-state (with MIN and MAX alarm states)

PZ-832RC + 5 PZ2 probes

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

The relay can operate in two modes:
- emptying the tank (diagram 1). As soon as the liquid level reaches the set MAX level, the pump is switched on and it will continue to operate until the liquid level falls below MIN.
- filling the tank (diagram 2). As soon as the liquid level falls below the preset MIN level, the pump is switched on and it will continue to operate until the liquid level reaches the MAX value.

The PZ-832 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.

PZ-829 RC additionally enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.
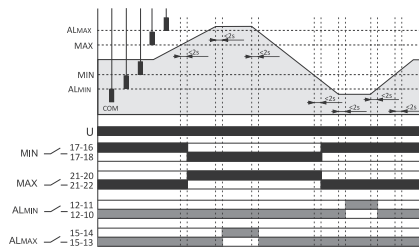
power supply	230 V AC
contact	separated 4×NO/NC
maximum load current (AC-1)	
MIN and MAX contacts	16 A
ALMIN and ALMAX contacts	8 A
sensitivity (adjustable)	1÷100 kΩ
operation delay	1÷2 s
output voltage measurement	<6 V
power indication	LED green
working indication	LED yellow
status indication MIN and MAX	2×LED green
alarm state signalling	2×LED red
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)
installation	for TH-35 rail
flooding probe type	5×PZ2
separation of the measuring probes	galvanic (transformer)
protection level	IP20
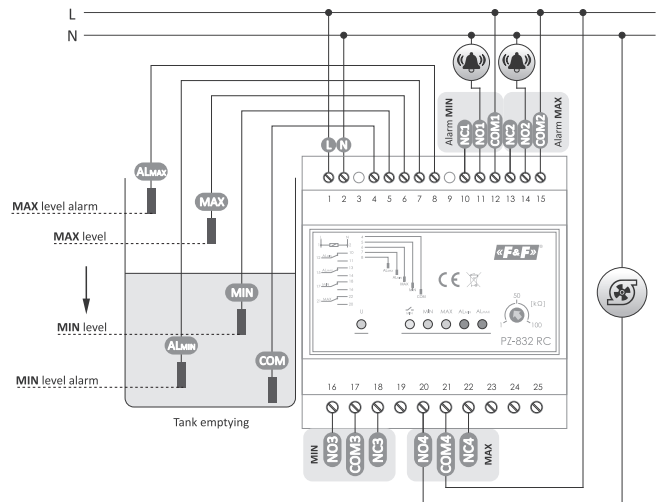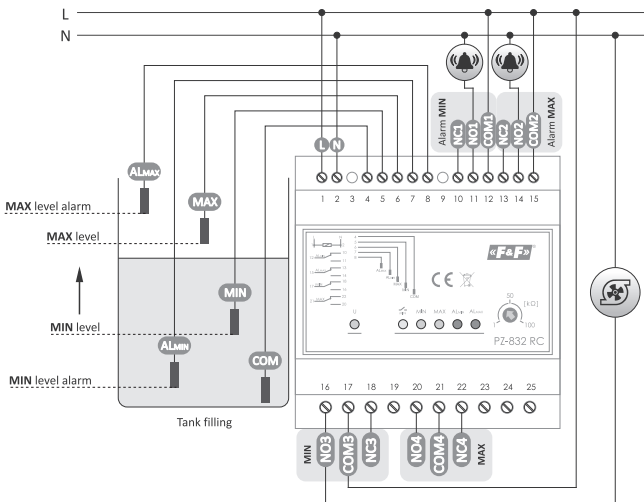
Liquid resistance table

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

Tri-state

PZ-831RC   + 4 PZ2 probes

Operation

PZ-831 is a liquid level control relay, which, thanks to being equipped with 4 PZ2-type flooding probes, enables the detection and independent monitoring of reaching 3 preset liquid levels. The relay can also be used in a cascade pump switching system, where exceeding the next liquid level indicates the need to switch on an additional pump.

PZ-831 RC enables adjustment of the sensitivity level of the relay (in the range of 1÷100 kΩ), thanks to which the relay can be used to detect liquids with different degrees of specific resistance.

Examples of liquid resistances are shown in the table below.
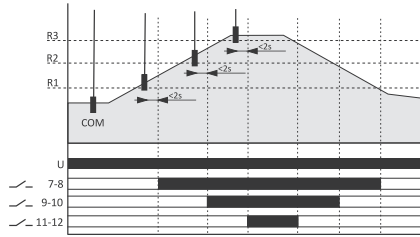
power supply	230 V AC
maximum load current (AC-1)	3×8 A
contact	separated 3×NO
sensitivity (adjustable)	1÷180 kΩ
contacts switching delay	2 s
output voltage measurement	<6 V
power indication	LED green
work status indication	3×LED red
power consumption	1.1 W
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals (cord)
	4.0 mm² screw terminals (wire)
tightening torque	0.5 Nm
dimensions	3 modules (52.5 mm)
installation	for TH-35 rail
flooding probe type	4×PZ2
separation of the measuring probes	galvanic (transformer)
protection level	IP20
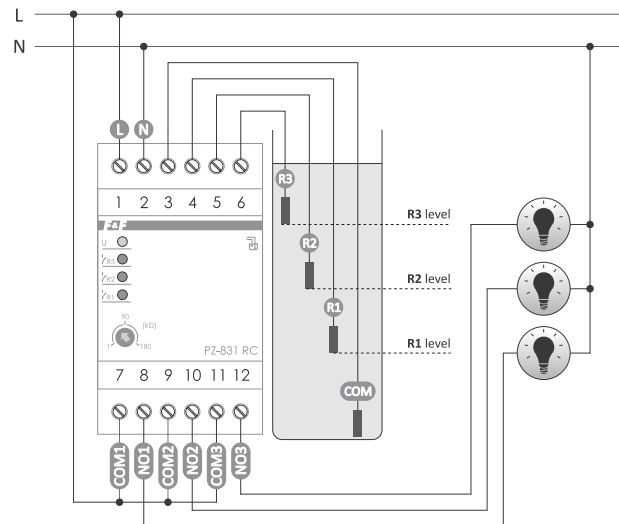
Liquid resistance table

Type of liquid	Specific resistance
Drinking water	5÷10 kΩ
Well water	2÷5 kΩ
River water	2÷15 kΩ
Rainwater	15÷25 kΩ
Sewage water	0.5÷2 kΩ
Sea water	0.03 kΩ
Natural hardness water	5 kΩ
Chlorinated water	5 kΩ
Distilled water	no detection

Dedicated probes for liquid control relays

PZ probe for PZ-828, PZ-828 RC

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

Connection of the probe

The design of the probe allows it to be mounted on a flat horizontal ground such as on the floor in a room with hydro-valves, flow pipes or in the laundry room, which allows quick detection of a failure and flooding of the room with liquid, with simultaneous switching off of electrical circuits or activation of sound or light signaling (alarm). The probe cable can be extended to 100 m.

Up to 10 probes (in series or parallel) can be connected to input 5-6:

- in series - for a dependent fluid level control system at multiple points, all connected sensors must be shorted simultaneously for the relay to trip;
- in parallel - for an alternative fluid level control system at multiple points, at least one of the connected sensors must be shorted. With a serial connection, the sensitivity of the sensors decreases (conductivity decreases).
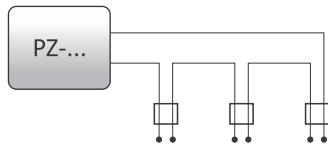
Serial connection
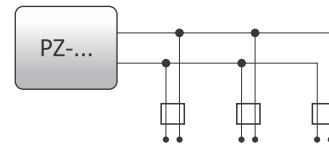
Parallel connection

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

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

Automatic Anti-flood System (AFS)

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.
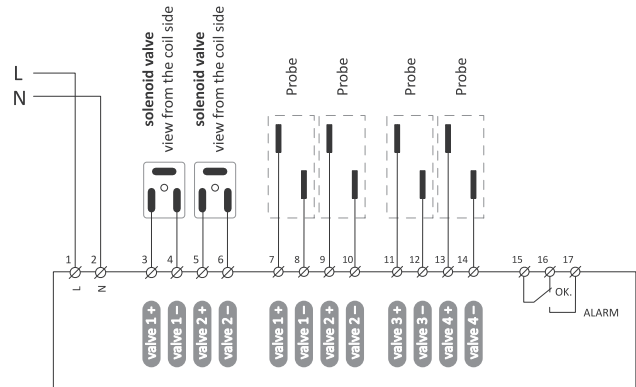
Functions

- 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

Elements of the system

- Distribution box containing: central controller SAM-01, protection of electrical circuits and a battery to support the operation of the system at short power outages.
- Solenoid valve size 1", 2", 3/4" or 5/4" – 1 piece
- SON-K flood probe for boiler room – 1 piece
- SON-M flood probe for living quarters – 2 pieces

| SAM-1 multifunctional controller for AFS system management | Solenoid valve to shut off the water supply to the object (1", 2", 3/4" or 5/4") | SON-K Flood probe for use in the boiler room | SON-M Flood probe for use in living quarters |

Temperature controllers

Purpose

Temperature controllers are used to controlling heating or ventilation devices to maintain a constant ambient temperature.

Product	Type	Application	Settings	Built-in clock programmable	Actuator element	Maximum load courrent AC-1:	Contact configuration	Contact separation	Range of adjustment of temperature	Hysteresis	Type of probe	Probe	Page
CRT-04	digital, for DIN rail	with the weekly programmer	display, keyboard	•	relay	16 A	1×NO/NC	•	0÷60 °C	0÷10 °C	DS1820	•	244
CRT-05	digital, for DIN rail	2-function (heating, cooling)	display, keyboard	–	relay	16 A	1×NO/NC	•	-100÷400 °C	0÷10 °C	PT100	–	245
CRT-06	digital, two-channel, For DIN rail	10-function	display, keyboard	–	relay	16 A	2×NO	•	-100÷400 °C	0÷10 °C	PT100	–	245
CRT-15T	digital PID, panel-mounted	PID control	display, keyboard	–	relay	3 A	1×NO/NC	•	0÷400 °C	–	PT100	•	247
RT-820	analog, for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	4÷30 °C	0.5÷3 °C	KTY81-210	•	242
RT-821	analog, for DIN rail	anti-icing systems	potentiometers	–	relay	16 A	1×NO/NC	•	-4÷5 °C	0.5÷3 °C	KTY81-210	•	242
RT-822	analog, for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	30÷60 °C	0.5÷3 °C	KTY81-210	•	242
RT-823	analog, for DIN rail	general	potentiometers	–	relay	16 A	1×NO/NC	•	60÷95 °C	0.5÷3 °C	KTY81-210	•	242
RT-824	analog, wall-mounted	wall-mounted, mechanical	potentiometer	–	relay	16 A	1×NO	–	5÷35 °C	3°C	NTC	•	243
RT-825	digital, wall-mounted	wall-mounted, with the weekly programmer and display	display, keyboard	•	relay	16 A	1×NO	–	5÷60 °C	1°C	NTC	•	243
RT-826	digital, for DIN rail	digital, with display	display, keyboard	–	relay	16 A	1×NO	•	-25÷130 °C	1÷30 °C	KTY81-210	–	242
RT-833	digital, with control of the fan speed, for DIN rail	with control of the fan speed	potentiometers	–	transistor +relay	fan 6 A DC, relay 10 A	1×NO/NC	•	25÷60 °C	5÷30 °C	KTY81-210	–	247
CR-810	analog, for protection of electrical equipment, such as engines for DIN rail	cooperation with PTC thermistors	not	–	relay	16 A	1×NO/NC	•	not applicable	not applicable	PTC	–	248

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

Operation

Until the desired ambient temperature is reached, the relay contact is in position 2-1 and the heating device is switched on. When the set temperature is reached, the contact is switched to position 2-8 and the heater is switched off or the ventilation unit is switched on. Temperature drop by the value of hysteresis will switch the heating device on again (contacts 2-1 closed) until the preset temperature is reached.

power supply	230 V AC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
temperature adjustment range	
RT-820	4÷30°C
RT-821	-4÷5°C
RT-822	30÷60°C
RT-823	60÷95°C
hysteresis (adjustable)	0.5÷3°C
setting accuracy	1°C
measurement accuracy	±1°C
temperature sensor type	RT/RT2
power indication	LED green
work status indication	LED red
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)
installation	for TH-35 rail
protection level	IP20

(!) The parameters of the dedicated RT or RT2 probe can be found in the table on page 244.

RT-826 digital, temperature range -25÷130°C (probe not included)

power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO
temperature adjustment range	-25÷130°C
hysteresis (adjustable)	1÷30°C
setting accuracy	1°C
measurement accuracy	±1°C
alarm indication	
audible	
volume	80 dB
frequency	2.4 kHz
control output	
type	open collector
maximum voltage	24 V
maximum load current	30 mA
display	3-digit LED 5×9 mm
contact signalling activation	LED red
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)
installation	for TH-35 rail
protection level	IP20

Controller functions

- Operating modes: heating or cooling;
- Indication correction ±9°C;
- Display of the currently measured temperature value;
- Audible and visual alarm when the temperature exceeds the set value by 5°C.
- Cooperation with RT or RT2 probes.

(!) The parameters of the dedicated RT or RT2 probe can be found in the table on page 244.

RT-824 + RT probe, temperature range 5÷35°C
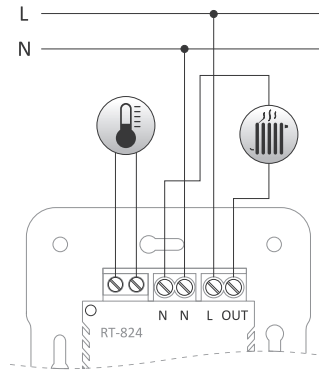
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO
temperature adjustment range	5÷35°C
hysteresis	3°C
setting accuracy	1°C
measurement accuracy	±1°C
internal temperature sensor	NTC
power consumption	0.8 W
terminal	1.5 mm² screw terminals
tightening torque	0.2 Nm
dimensions	
front	83.5×83.5 mm; depth: 22 mm
back	ø50; depth: 27.5 mm
installation	in flush mounted box ø60
protection level	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 244.

RT-825 + RT probe, temperature range 5÷60°C
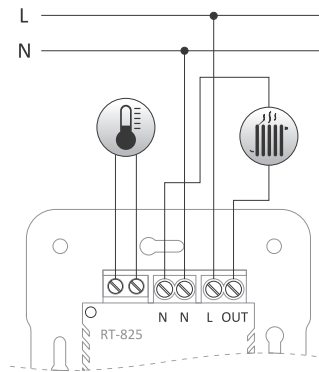
power supply	230 V AC
maximum load current (AC-1)	16 A
contact	1×NO
temperature adjustment range	5÷60°C
temperature adjustment range	0÷10°C
hysteresis	1°C
setting accuracy	1°C
measurement accuracy	±1°C
reading accuracy	0.1°C
backup time clock operation	<1 h
internal temperature sensor	NTC
power consumption	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
installation	in flush mounted box ø60
protection level	IP20

Controller functions

- A control panel that allows you to program and monitor the operation of the device;
- Maintaining the set temperature according to the programmed hours and days of the week;
- 4 intervals with the desired temperature per day can be programmed;
- 12 program entries: 4 with the desired temperature for working days (Mon-Fri); 4 with the desired temperature for Saturday (Sat) and 4 with the desired temperature for Sunday (Sun);
- Quick manual correction of the currently maintained temperature;
- Adjustable hysteresis;
- 2 temperature sensors: internal and external;
- 3 modes of the controller operation: operation with the internal temperature sensor, operation with the external temperature sensor, operation with 2 temperature sensors;
- In the mode of operation with 2 temperature sensors, the external sensor is a limiter h a temperature set in the range of 15÷50°C.

(!) The parameters of the dedicated RT45 probe can be found in the table on page 244.

Digital, programmable

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 + RT probe, temperature range 0÷99°C

Operation

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)
installation	for TH-35 rail
protection level	IP20

* battery life addicted to 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
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
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
K400	K400	0÷400°C	M6 thread; h= 15 mm	steel	PC 2×0.34 mm²; l= 1 m (in metal braid)	CRT-15T

Chapter 41

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)
installation	for TH-35 rail
protection level	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 244.

CRT-06   10-function, temperature range -100÷400°C (probe not included)
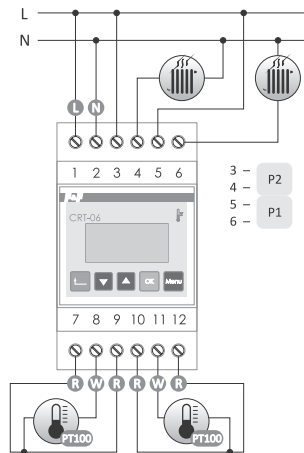
power supply	230 V AC
maximum load current (AC-1)	2×16 A
contact	separated 2×NO
temperature adjustment range	-100÷400°C
hysteresis (adjustable)	0÷100°C
setting accuracy	1°C
indication correction	±20°C
switch-on time lighting (adjustable)	0÷45 min.
sampling rate (adjustable)	1÷120 samples
	/1 min.
temperature 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)
installation	for TH-35 rail
protection level	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 244.
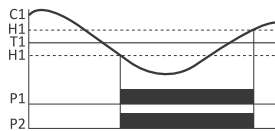
① **Heating** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)
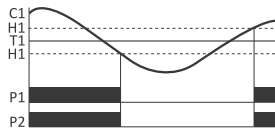
② **Cooling** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– parallel operation of contacts P1 and P2
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)
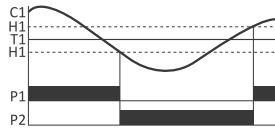
③ **Heating/Cooling** mode
P1 and P2 contacts dependent on the C1 sensor.
– 1 sensor: C1
– alternating contact operation: P1 – cooling; P2 – heating;
– 1 temperature setting: T1
– 1 hysteresis setting: H1 (upper and lower threshold)
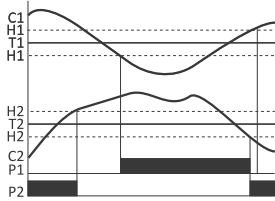
④ **Heating** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – heating; P2 – heating;
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2
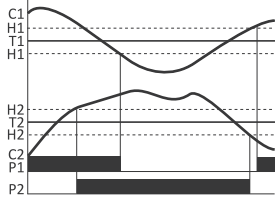
⑤ **Cooling** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor.
P2 contact dependent on the C2 sensor.
– 2 sensors: C1 and C2
– independent contact operation: P1 – cooling; P2 – cooling
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2
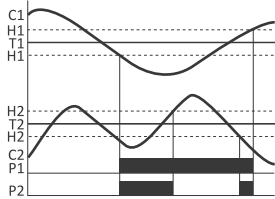
⑥ **Heating** mode for P1 and P2 contacts.
P1 contact dependent on the C1 sensor;
P2 contact dependent on the C2 and C1 sensor (switched on only if the P1 contact is closed).
– 2 sensors: C1 and C2
– dependent contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– 2 hysteresis setting: H1 - upper and lower threshold for T1; H2 - the upper and lower threshold for T2
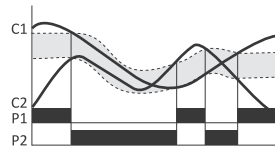
⑦ **Differential** mode.
P1 contact is switched on at a temperature difference greater than the setting.
P2 contact switches on in the opposite situation to the P1 contact - at a difference less than the setting.
– 2 sensors: C1 and C2
– alternating contact operation: P1 - heating; P2 - heating with P1 switched on
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting
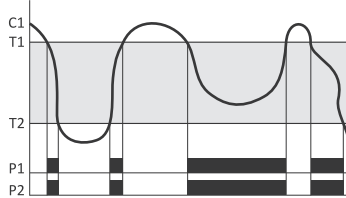
⑧ **Window** mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 1 sensor: C1
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no hysteresis setting: H1 and H2
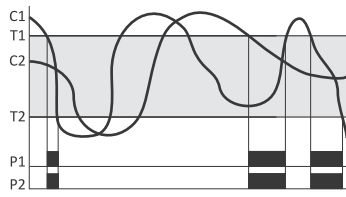
⑨ **Window** mode.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
– 2 sensors: C1 and C2
– parallel contact operation: P1 and P2
– 2 temperature setting: T1 and T2
– no H1 and H2 hysteresis setting
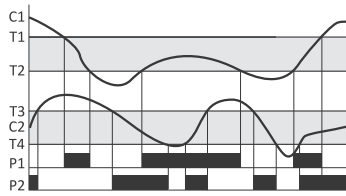
⑩ **Window** mode independent for P1 and P2 contacts.
P1 and P2 contacts are switched on when the temperature of the C1 sensor is between set values of T1 and T2 temperatures.
P2 and P2 contacts are switched on when the temperature of the C2 sensor is between set values of T3 and T4 temperatures.
– 2 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
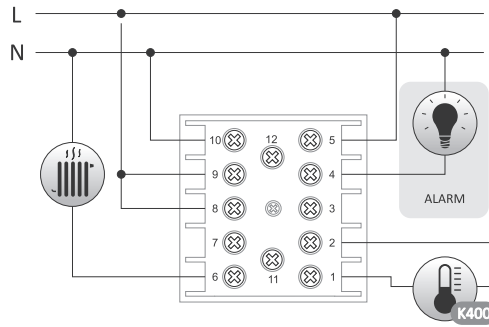
power	100÷240 V AC
controller output	
contact	separated 1×NO/NC
maximum load current (AC-1)	3 A
control	PWM
alarm output	
contact	separated 1×NO
maximum load current (AC-1)	1 A
temperature adjustment range	0÷400°C
PID setting	
proportional part P	0÷100
integral part I	0÷255
derivative part D	0÷255
setting 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
protection level	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 244. 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.
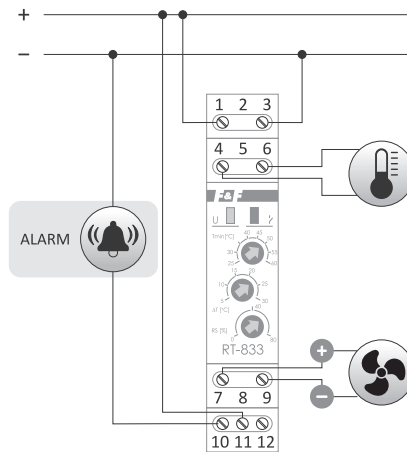
power	12÷24 V DC
control output	
maximum load current (DC-1)	6 A
control	PWM
alarm output	
contact	separated 1×NC
maximum load current (AC-1)	10 A
temperature adjustment range	
Tmin	25÷60°C
ΔT	5÷30°C
measurement accuracy	±1°C
start speed setting	0÷80%
temperature sensor type	RT/RT2
power indication	LED green
work status indication	LED red
power consumption	
standby	0.05 W
ON mode	0.6 W
working temperature	-15÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Operation

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 RT45 probe can be found in the table on page 244.

Resistance relay

CR-810   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.

Operation

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	LED green
damage indication	2×LED red
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)
installation	for TH-35 rail
protection level	IP20
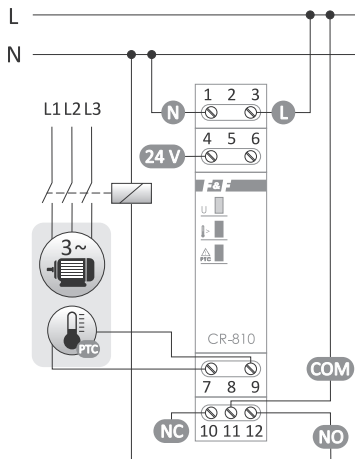
Power supply 230 V
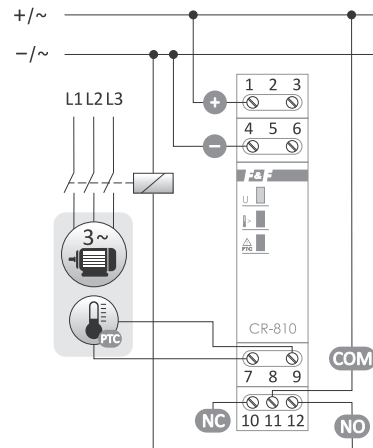
Power supply 24 V

Section XII

Auxiliary elements of automation systems

Control signal separators

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

course
of action

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)
installation	for TH-35 rail
protection level	IP20

SEP-02 control signal separator, for flush-mounted box

course
of action

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
installation	in flush mounted ø60
protection level	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.
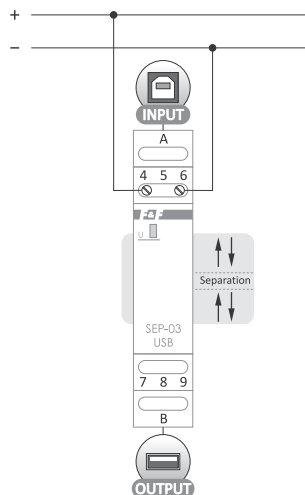
power supply	
via a USB port (input)	5 V DC
external Uopt	12÷30 V DC
maximum load current (output)	
for USB power supply	0.4 A
for Uopt power supply	1 A
USB standard	1.1/2.0
speed	Low speed 1.5 Mbps/Full speed 12 Mbps
separation	
input <-> output	galvanic 5 kV
UUSB <-> output	resistance
UUSB <-> output	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)
installation	for TH-35 rail
protection level	IP20

"Continuous/pulse" – type signal transducers

Purpose

"Continuous-pulse"-type signal transducers are used to convert a continuous control signal into single control pulses required in automation control systems. After receiving the control signal at the UST input (rising edge), the transducer generates a pulse at the output 12 (contact 11-12 will be closed for the set time). After receiving the control signal at the (rising edge), the transducer generates a pulse at the output 9 (contact 8-9 will be closed for the set time).
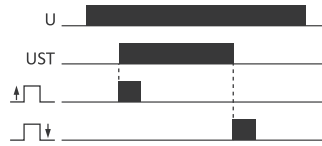
PSI-02 for DIN rail
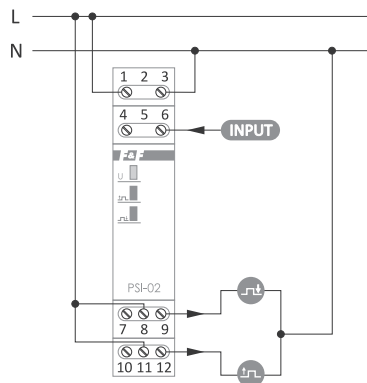
power supply	
PSI-02 230 V	165÷265 V AC
PSI-02 24 V	21÷27 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO
input signal	
PSI-02 230 V	230 V AC
PSI-02 24 V	24 V AC/DC
output pulses time	1 s
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

PSI-02D with adjustable pulse length, for DIN rail
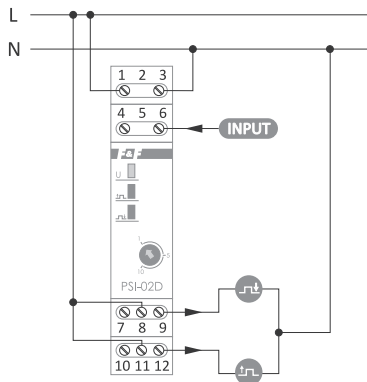
power supply	
PSI-02D 230 V	165÷265 V AC
PSI-02D 24 V	9÷30 V AC/DC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO
input signal	
PSI-02D 230 V	165÷265 V AC
PSI-02D 24 V	9÷30 V AC/DC
output pulse time (adjustable)	1÷10 s
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

PSI-02P with adjustable pulse length, for flush-mounted box
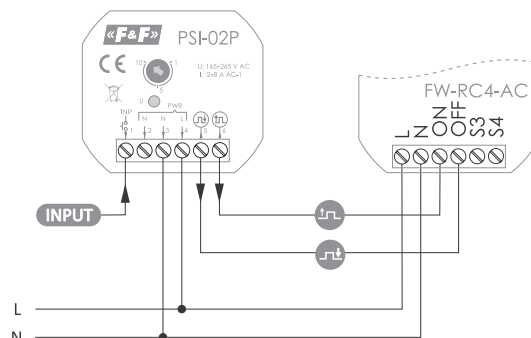
power supply	
PSI-02P 230 V	165÷265 V AC
maximum load current (AC-1)	2×8 A
contact	separated 2×NO
input signal	
PSI-02P 230 V	165÷265 V AC
output pulse time (adjustable)	1÷10 s
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	48×43×20 mm
installation	in flush mounted ø60
protection level	IP20

Chapter 42

MPG-03　full-wave rectifier bridge (Graetz bridge)

Purpose

MPG-03 is used to convert alternating current into unidirectional direct current.
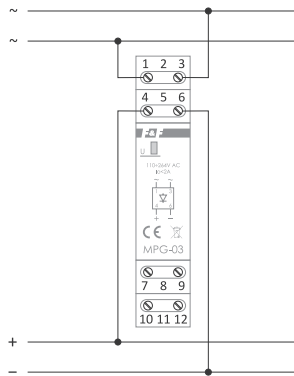
power supply	
MPG-03 230 V	110÷264 V AC
MPG-03 12÷48 V	12÷48 V AC
maximum load current	2 A
output voltage indication	green LED
working temperature	-25÷40°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

(!) MPG-03 12÷48 V additionally contains a 940 µF filtering capacitor.

RM-07　RS-485 network amplifier/separator

Purpose

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

power supply	9÷30 V DC
transmission rate	1200÷115200 bps
system current	<25 mA
separation	
RS-485 (input) <-> RS-485 (output)	galvanic 1 kV
power supply <-> RS-485 (input)	resistive
power supply <-> RS-485 (output)	galvanic 1kV
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20
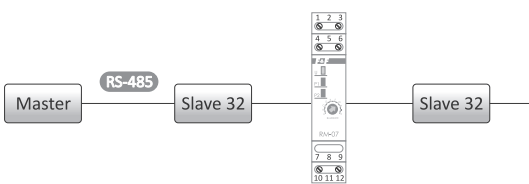
Extension
To extend the bus by another group of 32 receivers.
Extendable up to 4 groups for baud speed of 9600.

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.
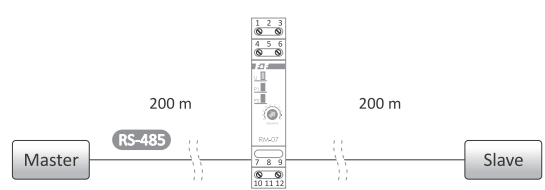
Amplification
For signal amplification in long communication networks.

LT-04 RS-485 network termination and polarization module

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.

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)
installation	for TH-35 rail
protection level	IP20
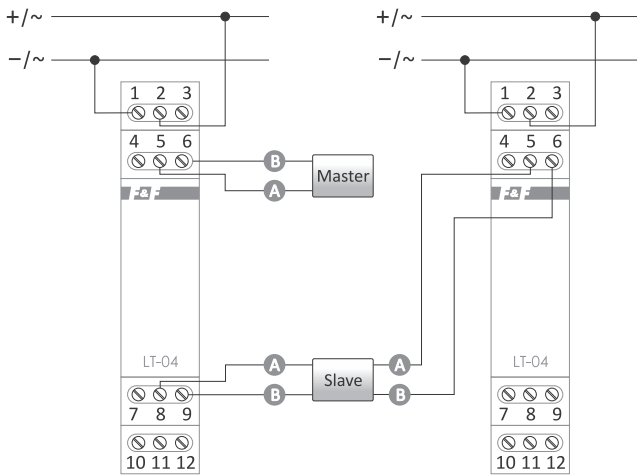
Network termination system
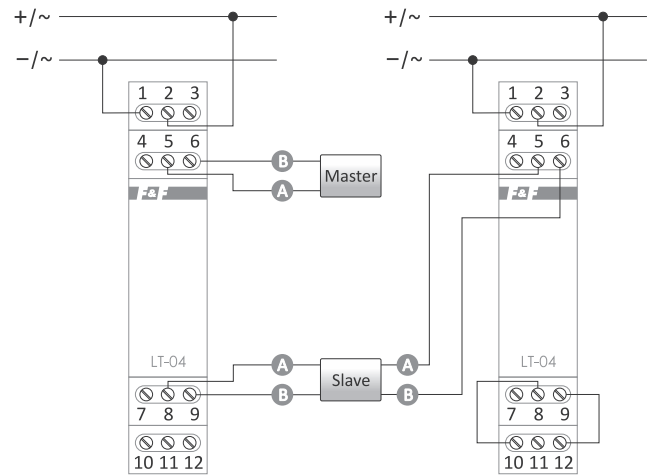
Network polarization system with termination
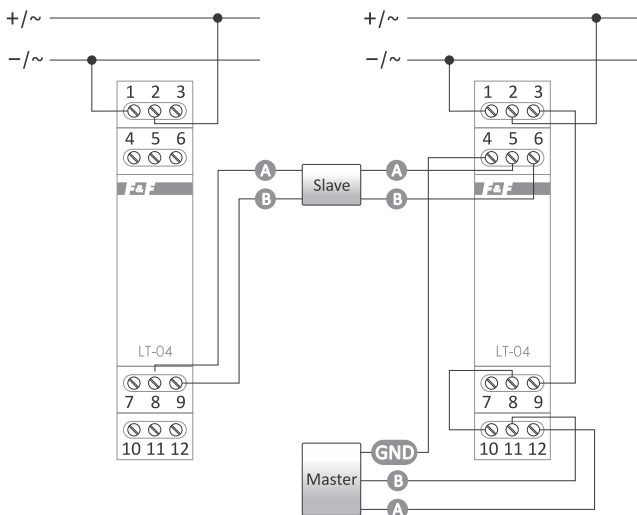
Network polarization system (with termination)
for Slave-type devices without GND

Chapter 42

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 and output signal.

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	24÷30 V DC
input impedance	
voltage mode	3 kΩ
current mode	50Ω
output current (voltage mode)	<50 mA
separation	
input <-> output	galvanic 1 kV
power supply <-> input	resistive
power supply <-> output	galvanic 1 kV
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Functions

- Galvanic separation (min. 1 kV) between analog input and output;
- High processing speed – the ability to carry signals up to 100 Hz;
- Visual validation of input and output signals;
- Signaling of cases when the output signal is out of the range of acceptable values;
- Indication of overload or short circuit on the output line.

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. 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.

Operation
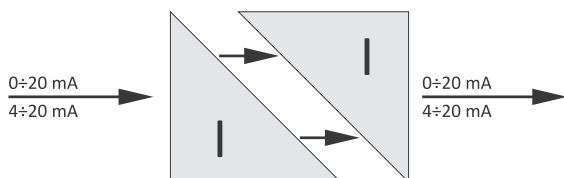
Current/current
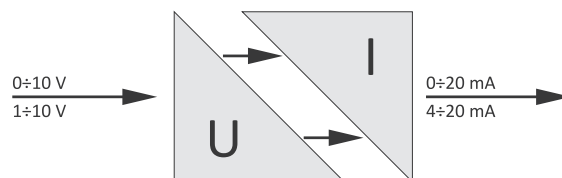
Voltage/current
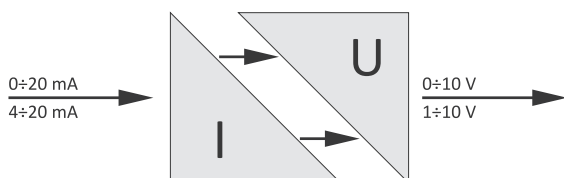
Current/voltage
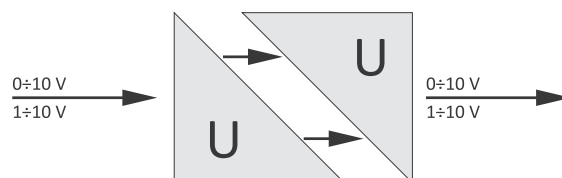
Voltage/voltage

Chapter 42

MAX-CN-USB-485 RS-485-> USB converter

Purpose

The converter enables access to the RS-485 port from any PC or other Master-type device equipped with a USB interface.
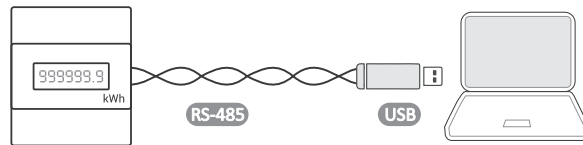
wire length	1.8 m
terminal RS-485	2×0.34 mm²

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

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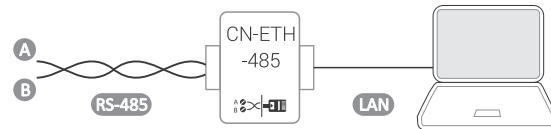
power supply	9÷24 V DC
power supply (included)	9 V DC
RS-485 connector	1.0 mm²
TCP connector	RJ-45 socket
dimensions	86×100×26 mm
installation	surface mounting

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.
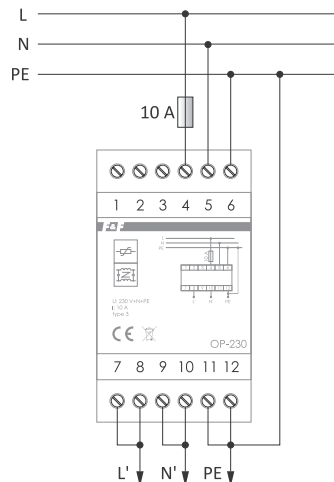
norm No.	IEC 61643-1:2001
surge arrester class	III
rated voltage	230 V AC
rated current	10 A
highest permanent operating voltage	255 V
voltage protection level L→N (measured)	<1 kV
tripping time	<25 ns
additional protection	10 A gL/gG or C10 A
system inductance	1 mH/tor
leakage current	0.5 mA
system 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)
installation	for TH-35 rail
protection level	IP20

WB-1 2-position switch with indicator light
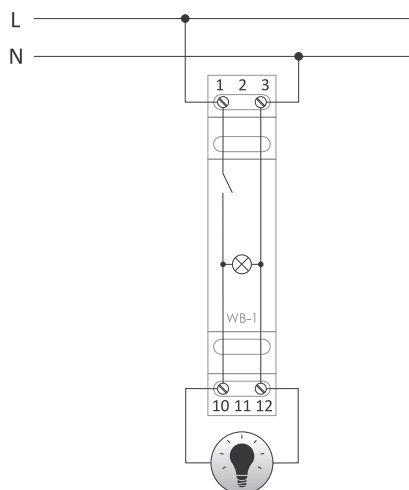
maximum load current	16 A/250 V
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

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.

Operation

The module constantly monitors the state of charge of the battery and charges it automatically when the main supply voltage is present. In case of main voltage loss or drop of its value below the voltage on the battery, the receiver is powered from the battery. When the battery voltage is about 10.5 V, the module automatically cuts off the power supply (protection against damage to the battery).
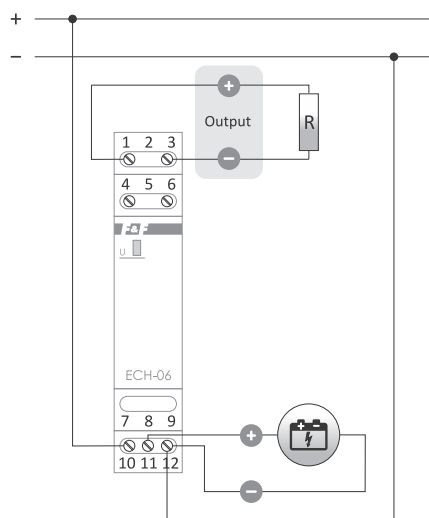
power supply Uin	18÷30 V DC
output voltage Uout	Uin -0.5 V DC
	Uacu -0.5 V DC
the maximum load current of the output Uout (AC-1)	3 A
supported battery capacity	1.3 ÷ 7.2 Ah
the maximum voltage of the battery Uacu	13.8 V DC
the maximum charging current	<0.35 A
power supply cut-off threshold	<10.5 V DC
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)
installation	for TH-35 rail
protection level	IP20

An example of 9÷30 V DC receiver power supply system

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 0÷10 V (AT-1U-DS) or 4÷20 mA (AT-1I-DS) voltage output.

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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the AT-1I-DS and AT-1U-DS transmitters can be found on page 260.

(!) 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 244.

AT-1I-KT / AT-1U-KT   for use with KTY81-210 digital temperature transducers

Temperature transducer with 0÷10 V (AT-1U-KT) or 4÷20 mA (AT-1I-KT) voltage output.

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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the AT-1I-KT and AT-1U-KT transmitters can be found on page 260.

(!) 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 244.

AT-1I-PT / AT-1U-PT   for use with PT100 3-wire temperature sensor

Temperature transducer with 0÷10 V (AT-1U-PT) or 4÷20 mA (AT-1I-PT) voltage output.

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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the AT-1I-PT and AT-1U-PT transmitters can be found on page 260.

(!) 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 244.

AT-1I / AT-1U   dfor use with KTY temperature sensor
Products available until stocks run out

Temperature transducer with 0÷10 V (AT-1I) or 4÷20 mA (AT-1U) voltage output.

power supply	9÷30 V DC
measuring range	-50÷100°C
maximum measurement error	± 1.5°C
output signal	
AT-1I	4÷20 mA
AT-1U	0÷10 V
processing error	±0.5%
signal cable	
AT-1I	300 m
AT-1U	20 m
temperature probe	RT/ RT2
power consumption	0.8 W
working temperature	-20÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the AT-1I and AT-1U transmitters can be found on page 261.

(!) 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 244.

AT-2I / AT-2U   with the internal KTY temperature sensor

Temperature transducer with 0÷10 V (AT-2I) or 4÷20 mA (AT-2U) voltage output.

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
installation	in flush mounted box ø60
protection level	IP20

(!) The connection diagrams for the AT-2I and AT-2U transmitters can be found on page 261.

(!) 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 244.

AT-3I   for use with PT-100 temperature sensor
Product available until stocks run out

Transducer with a 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 ignal 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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the AT-3I and AT-2U transducers can be found on page 261.

(!) 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 244.

Connection diagrams for temperature sensors
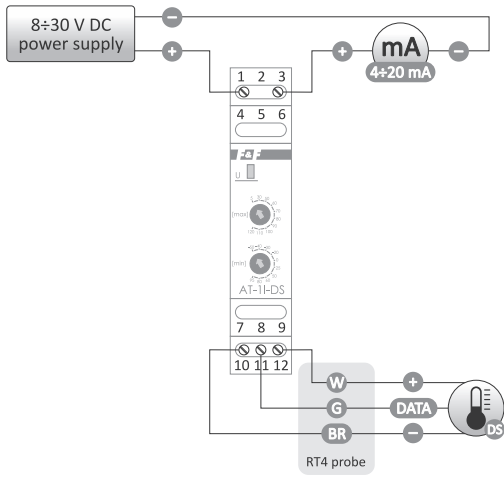
AT-1I-DS
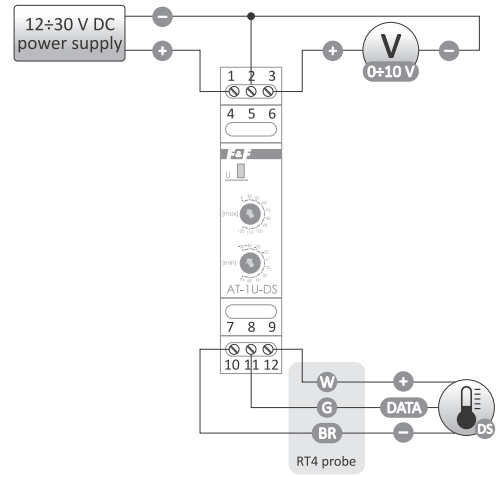
AT-1U-DS
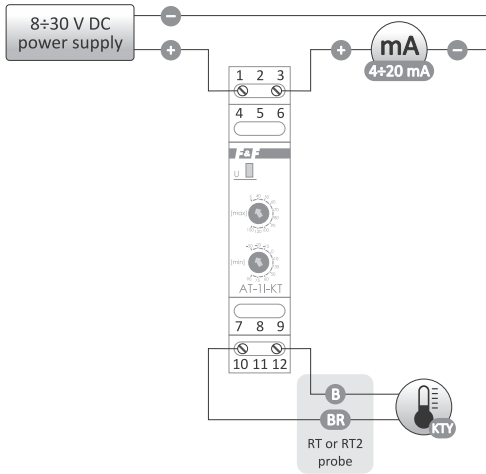
AT-1I-KT
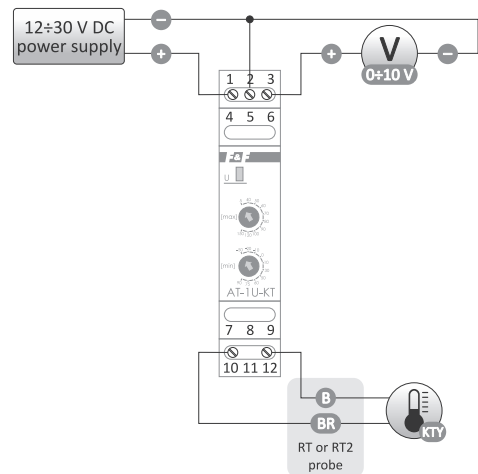
AT-1U-KT
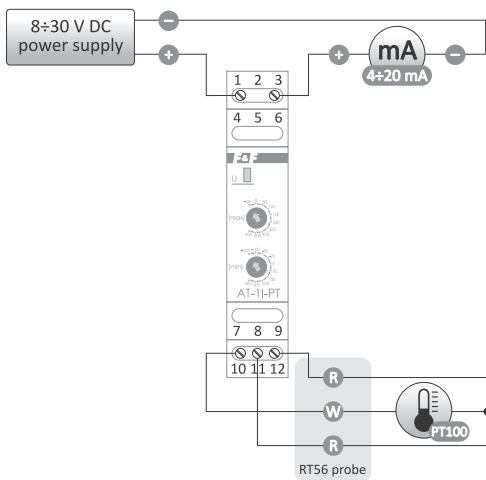
AT-1I-PT
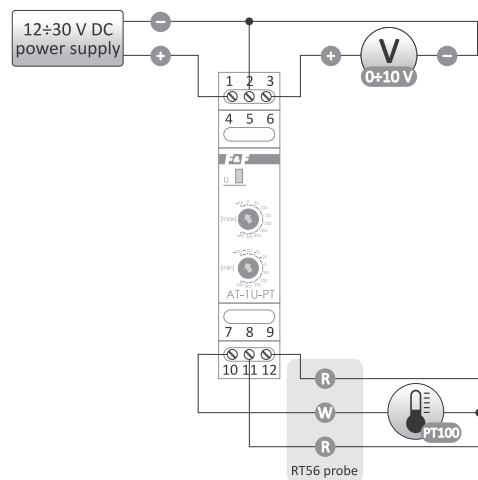
AT-1U-PT

Connection diagrams for temperature sensors cont.
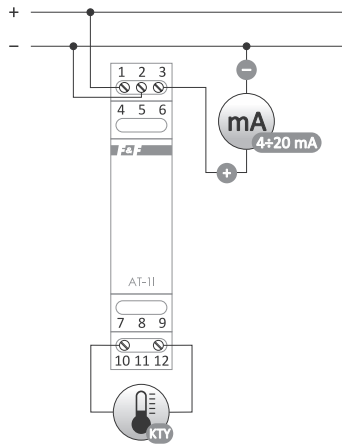
AT-1I
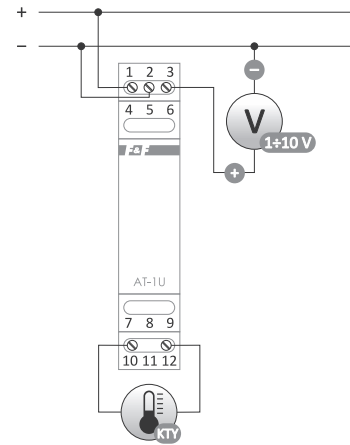
AT-1U
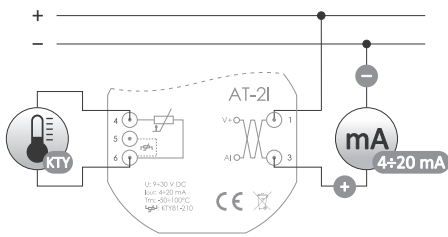
AT-2I
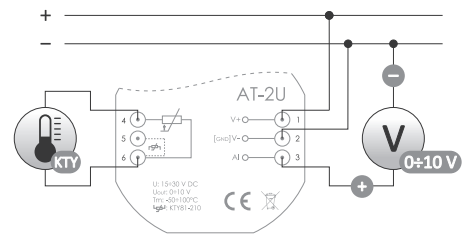
AT-2U
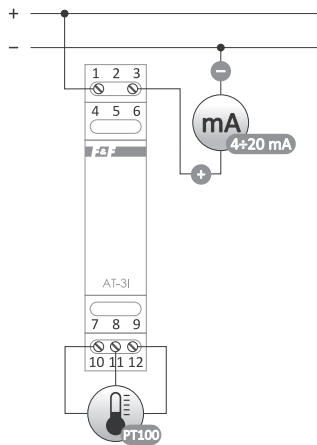
AT-3I

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.
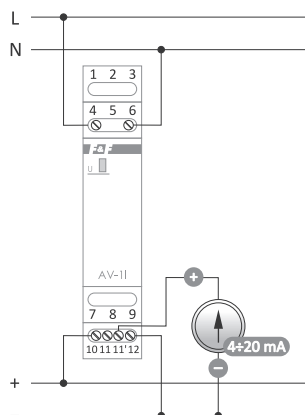
power supply	9÷30 V DC
measuring range (True RMS)	
alternating voltage AC	0÷285 V
constant voltage DC	0÷400 V
the maximum voltage at the measuring input	320 V AC
	450 V DC
maximum measurement error	±1 V
output signal	4÷20 mA
the maximum length of shielded ignal cable	300 m
overvoltage IN->OUT	3 kV
power 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)
installation	for TH-35 rail
protection level	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.
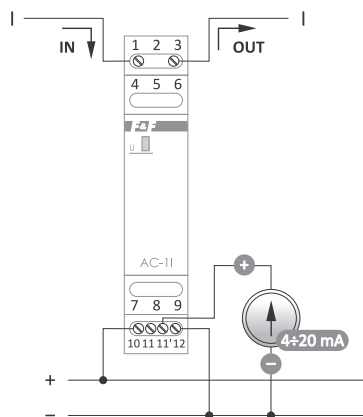
power supply	9÷30 V DC
measuring range (True RMS)/maximum voltage	
AC-1I 5A	0÷5 A/285 V AC
AC-1I 15A	0÷15 A/285 V AC
permissible overload	100 A/100 ms
maximum measurement error	±2.5%
output signal	4÷20 mA
the maximum length of shielded signal cable	300 m
overvoltage IN->OUT	2.1 kV
power consumption	0.8 W
working temperature	-20÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	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 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. 223

Relays with analog input

PA-01I analog relay with the current input

The PA-01I device is used to convert a 0÷20 mA/4÷20 mA analog signal to a relay output control signal. This allows sensors with analog output to be used in automation systems. The measurement chain is galvanically isolated from the power supply of the device.

power supply	9÷30 V DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
maximum current consumption	100 mA
range of input signals	0÷ 20 mA
hysteresis setting range	0÷5 mA
input resistance	150 Ω ±0.1 %
measurement resolution	5 µA
measurement error	1%
hysteresis in the "window" mode	200 µA
working temperature	-20÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.5 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

PA-01U analog relay with voltage input

The PA-01U device is used to convert a 0÷10 V analog signal to a relay output control signal. This allows sensors with analog output to be used in automation systems. The measurement chain is galvanically isolated from the power supply of the device.
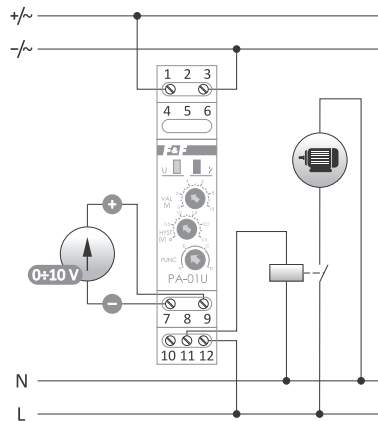
power supply	9÷30 V DC
maximum load current (AC-1)	8 A
contact	separated 1×NO/NC
maximum current consumption	100 mA
range of input signals	0÷10 V
hysteresis setting range	0÷2.5 V
input resistance	69 kΩ ±0.1 %
measurement resolution	2.5 mV
measurement error	1%
hysteresis in the "window" mode	100 mV
working temperature	-20÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.5 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20
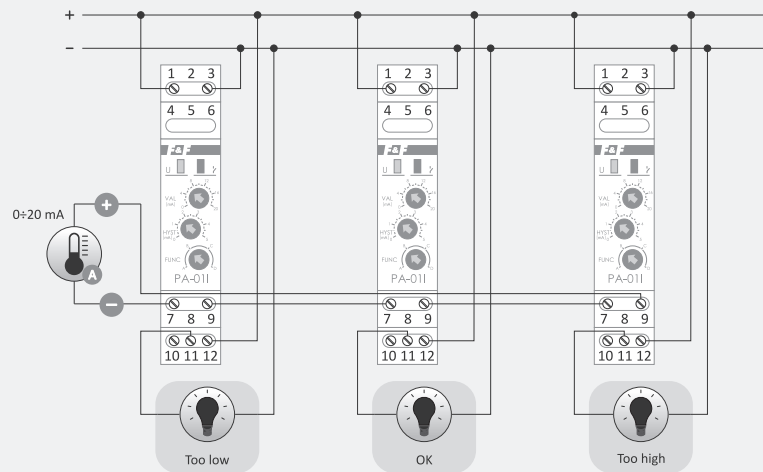
Temperature status indication

Too low   OK   Too high

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)
installation	for TH-35 rail
protection level	IP20

0÷20 mA current loop measurement
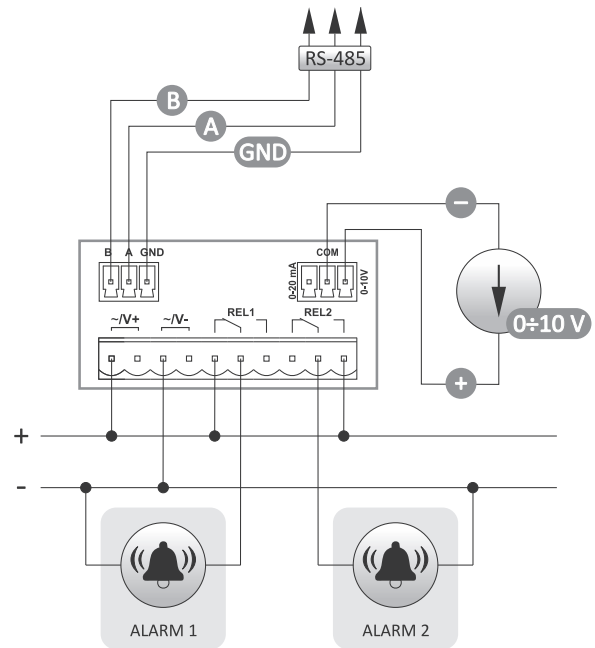
0÷10 V voltage loop measurement

Chapter 43

Transducers with Modbus RTU output

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 / MB-1I-1 15A single-phase
MB-3I-1 5A / 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	±2.5%
current reading accuracy	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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the MB-1U-1 and MB-3U-1 transmitters can be found on page 266.

Voltage transducers

MB-1U-1 single-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	±1%
reading registry precision	1 V
overvoltage IN->OUT	3 kV
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

(!) The connection diagrams for the MB-1U-1 and MB-3U-1 transmitters can be found on page 266.

Connection diagrams for measuring transducers
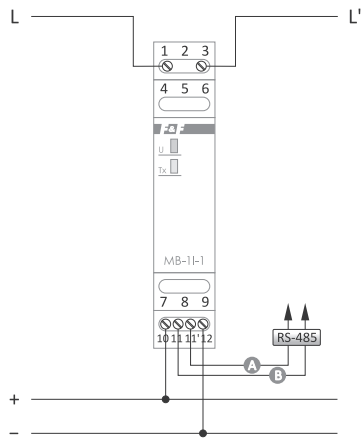
MB-1I-1 5A/MB-1I-1 15A
direct measurement
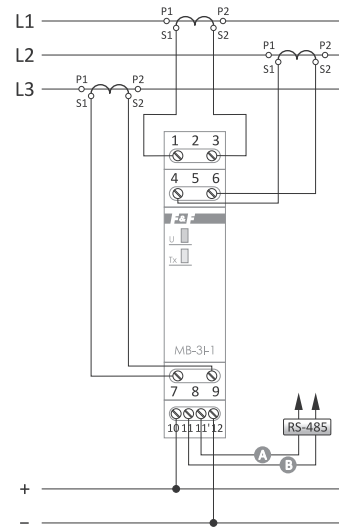
MB-3i-1 5A/MB-3i-1 15A
half indirect measurement
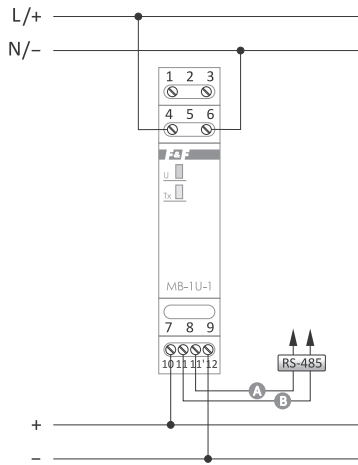
MB-1U-1
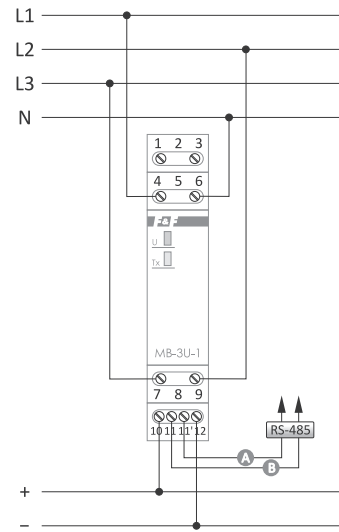
MB-3U-1

Temperature transducers

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

Temperature recording from 2 independent measuring channels in the range from -55 to 125°C. Saving the maximum and minimum recorded temperature in the non-volatile memory. A dedicated RT4 probe can be found in the table on page 244.

power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

MB-DS-10   for use with DS1820 digital temperature sensor (up to10 pcs.)

The transmitter supports up to 10 sensors on one channel (1-Wire bus). Recorded value: current temperature.

power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

MB-DS-30   for use with DS1820 digital temperature sensor (up to 30 pcs.)

The transmitter supports up to 30 sensors on one channel (1-Wire bus). Recorded value: current temperature.

power supply	9÷30 V DC
measuring range	-55÷125°C
maximum measurement error	±1°C
temperature sensor type	DS1820
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

MB-PT-100 for use with PT100 temperature sensor

Temperature recording from 2 independent measuring channels 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 244.
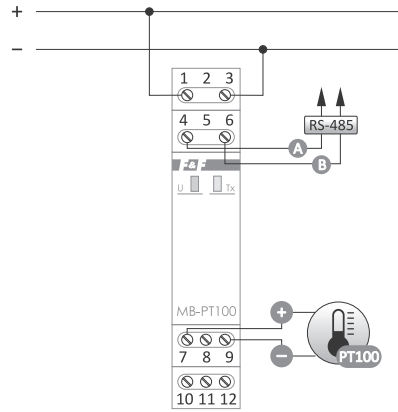
power supply	9÷30 V DC
measuring range	-100÷400°C
maximum measurement error	±1°C
overvoltage IN->OUT	2.1 kV
temperature sensor type	PT100
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
baud rate (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)
installation	for TH-35 rail
protection level	IP20

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

Recorded values: current temperature and recorded minimum and maximum temperature. Adjustable measurement parameters of the transducer: the averaging time of temperature measurement result and the standard temperature correction. The sensor type is software-set according to Modbus RTU protocol functions.
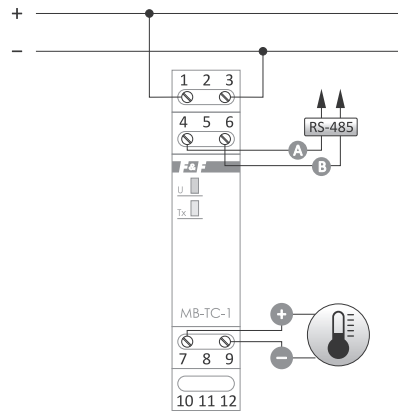
power supply	9÷30 V DC
measurement range	dependent on the type of sensor
maximum measurement error	±2°C
temperature sensor type	K, J, E, N, T, S, R, B
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
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)
installation	for TH-35 rail
protection level	IP20

Pulse meter (4-channel)

MB-LI-4 Lo   low-voltage counting inputs
MB-LI-4 Hi   high-voltage counting inputs
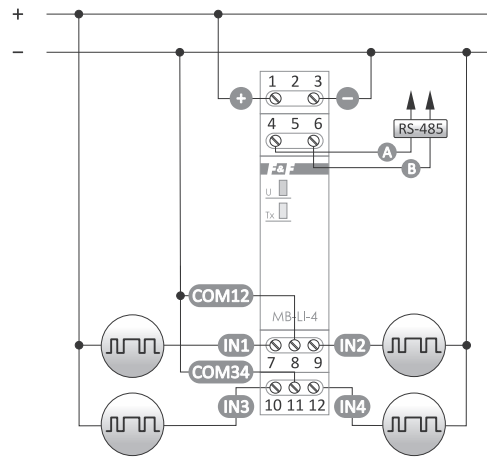
power supply	9÷30 V DC
number of counting inputs	4
counting input voltage	
MB-LI-4 Lo	6÷30 V AC/DC
MB-LI-4 Hi	160÷265 V AC/DC
maximum counting frequency	100 Hz
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication 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)
installation	for TH-35 rail
protection level	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
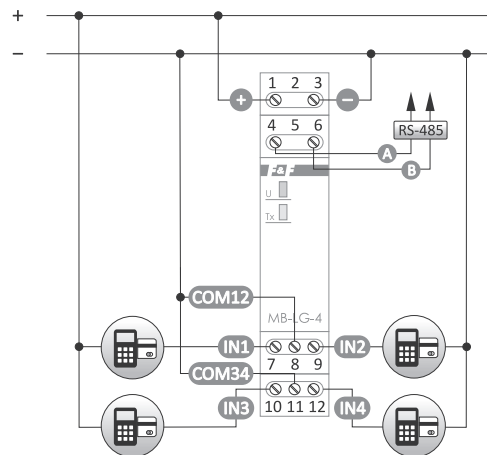
power supply	9÷30 V DC
number of counting inputs	4
counting input voltage	
MB-LG-4 Lo	6÷30 V AC/DC
MB-LG-4 Hi	160÷265 V AC/DC
maximum input signal frequency	100 Hz
the maximum measured time	>150 years
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	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

Operation

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.

63 mm
42 mm
PG7 cable gland
internal airtightening flange
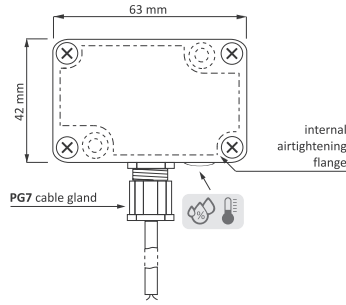
power supply	9÷30 V DC
measuring range	0÷100% RH/-40÷70°C
maximum measurement error of temperature	±1°C
maximum measurement error of humidity	±4.5% (0÷80 RH)
	±6.5% (80÷100 RH)
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
baud rate (adjustable)	1200÷115200 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	42×63×30 mm
installation	surface mounting
protection level	IP65

MB-LS-1 lighting brightness level transducer

Operation

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.

42 mm
63 mm
internal airtightening flange
PG7 cable gland
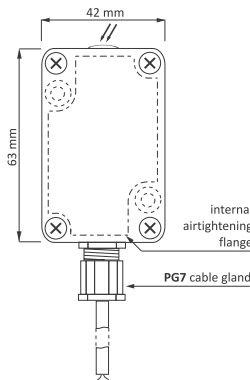
power supply	9÷30 V DC
measuring range	1÷65000 lx
maximum measurement error	±2%
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1/1.5/2
parity bit	EVEN/ODD/NONE
address	1÷247
power consumption	0.3 W
working temperature	-40÷70°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	42×63×30 mm
installation	surface mounting
protection level	IP65

MB-GPS-1 GPS location converter

Operation

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);
• absolute height (meters above sea level).

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.

60 mm
85 mm
LED
GPS
DATA
POW
9÷30 V DC
0 V DC
RS-485 –A
RS-485 –B
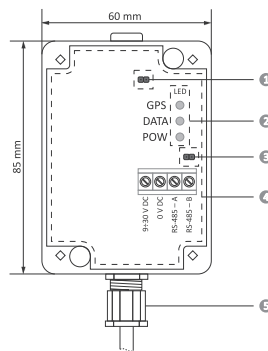
① factory reset jumper
② signal lights
③ 120 Ω terminator jumper
④ internal airtightening flange
⑤ PG7 cable gland

power supply	9÷30 V DC
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
installation	surface mounting
protection level	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

Operation

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.
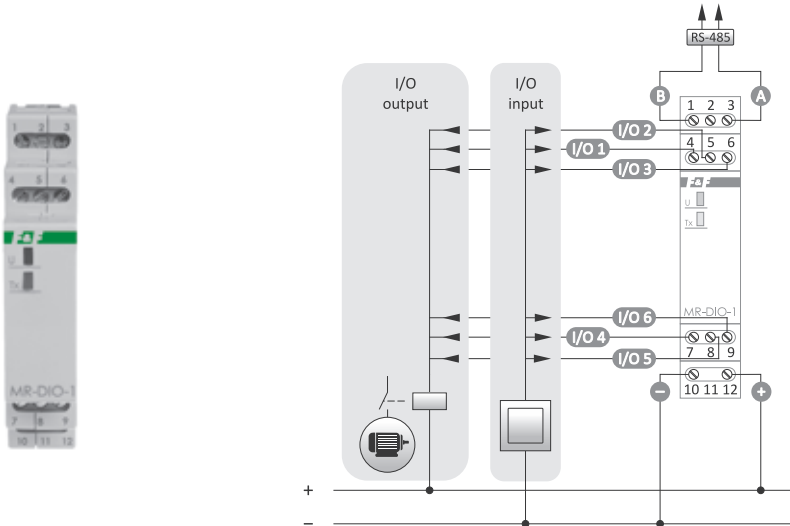
power supply	9÷30 V DC
number of I/O lines	6
maximum voltage on the I/O line	<50 V
the maximum current of the I/O line	
constant	100 mA
pulse (20%)	200 mA
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
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)
installation	for TH-35 rail
protection level	IP20

MR-DI-4Lo / MR-DI-4Hi   digital inputs (DI) modules

Operation

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.
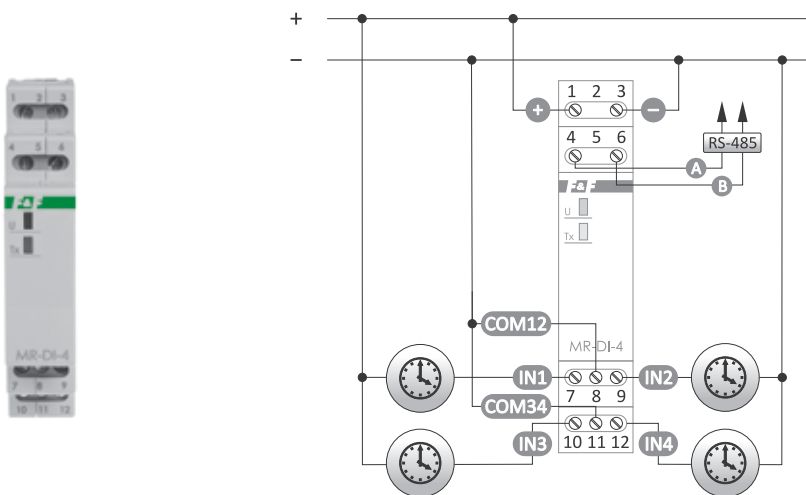
power supply	9÷30 V DC
number of digital inputs	4
voltage range for digital inputs	
MR-DI-4 Lo	6÷30 V AC/DC
MR-DI-4 Hi	160÷265 V AC/DC
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
baud rate (adjustable)	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)
installation	for TH-35 rail
protection level	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

MR-RO-1 module has a controllable relay output (separated contact 16 A).
Control via Modbus RTU protocol or standalone operation.
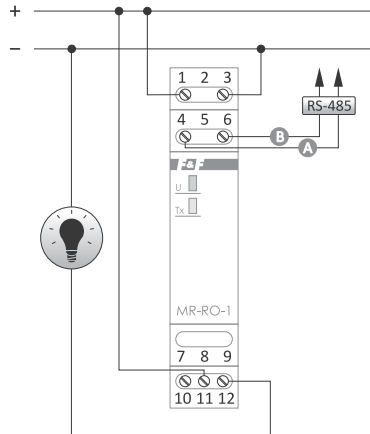
power supply	9÷30 V DC
maximum load current (AC-1)	16 A
contact	separated 1×NO/NC
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1/1.5/2
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)
installation	for TH-35 rail
protection level	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

MR-RO-4 module has a controllable relay output (separated contacts 4×16 A).
Control via Modbus RTU protocol or standalone operation.
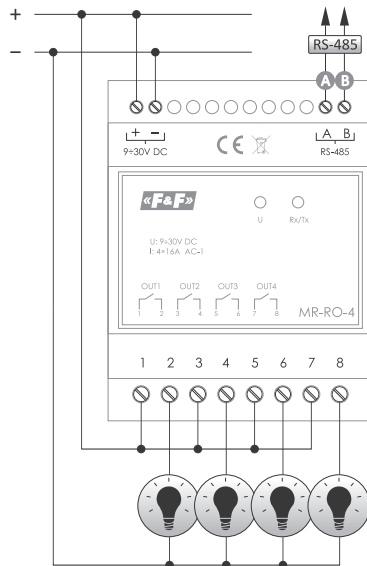
power supply	9÷30 V DC
maximum load current (AC-1)	4×16 A
contact	separated 4×NO
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1/1.5/2
parity bit	EVEN/ODD/NONE
address	1÷247
power consumption	2 W
working temperature	-20÷50°C
terminal	1.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	4 modules (70 mm)
installation	for TH-35 rail
protection level	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

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.
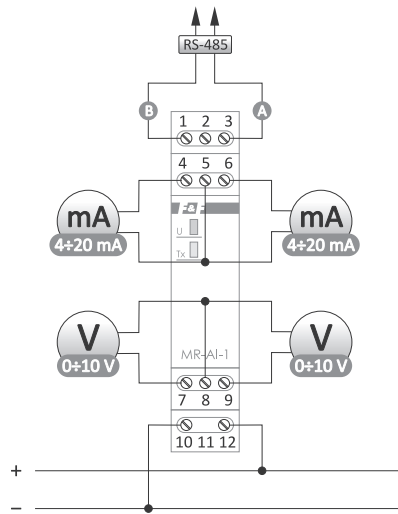
power supply	9÷30 V DC
number of analog inputs	4
current inputs	4÷20 mA
voltage inpputs	0÷10 V
current input resistance	47 Ω
voltage input resistance	110 Ω
measurement error	1%
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
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)
installation	for TH-35 rail
protection level	IP20

MR-AO-1 voltage analog outputs (AO) module

The module has 4 analog outputs compliant with the 0÷10 V standard. The current voltage value of a given output is determined by means of Modbus RTU protocol commands. Additionally, the module has a function of recording the status of inputs in the non-volatile local memory. Each time the power supply to the module is switched on, the outputs can be restored to the saved state.
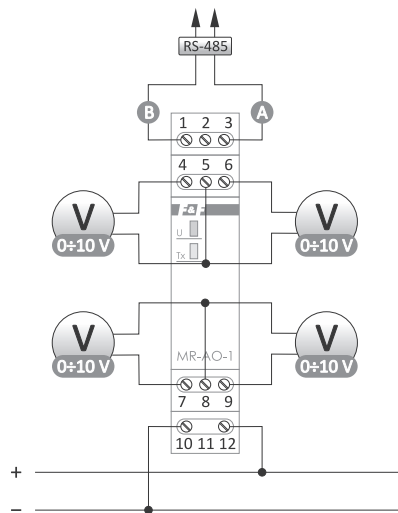
power supply	9÷30 V DC
number of analog output	4
output signal	
output voltage	0÷10 V
Output maximum load	40 mA
the accuracy of output voltage settings	0.1 V
port	RS-485
communication protocol	Modbus RTU
type of work	Slave
power indication	LED green
communication indication	LED yellow
communication parameters	
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)
installation	for TH-35 rail
protection level	IP20

Chapter 43

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.
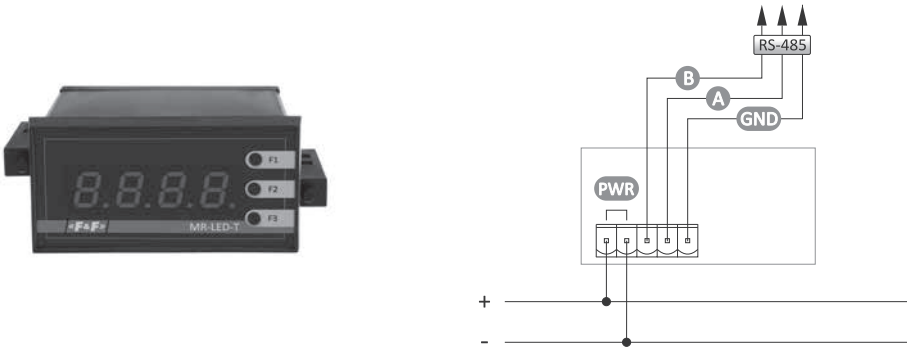
power supply	9÷30 V AC/DC
power consumption	max 100 mA
communication protocol	Modbus RTU
port	RS-485
communication parameters	
baud rate (adjustable)	1200÷115200 bit/s
data bits	8
stop bits	1 or 2
parity bit	EVEN/ODD/NONE
address	1÷247
working temperature	-10÷40°C
terminal	2.5 mm² detachable terminal
tightening torque	0.4 Nm
dimensions	72×36×72 mm
dimensions of the mounting hole	67.5×32.5 mm
installation	panel-mounted
protection level	IP20

Interesting and practical

Example of a control system for a wood drying room
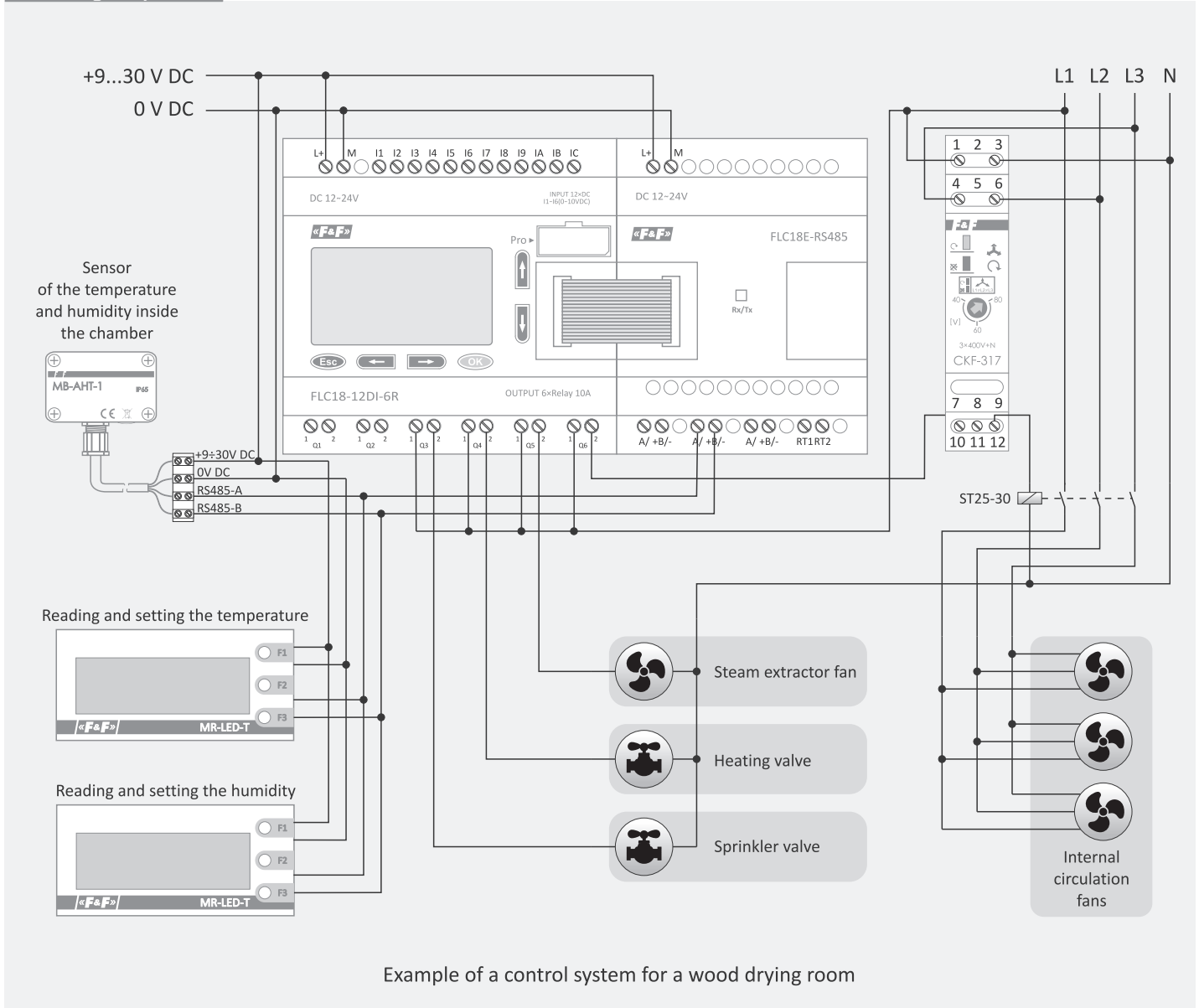
Contactors and electromagnetic relays

Modular contactors

Purpose

Electromagnetic contactors in modular enclosures for direct mounting on TH-35 mm rail.

Operation

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 24 V

NEW!

ST40

ST63

ST100

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	Consumption of power [W]	Dimensions [module]	Weight [g]	Screw terminals [mm²]
ST25-02-24 DC	2×NC	25	4	1.3	24 V DC	2.2	1	106	4
ST25-11-24 DC	1×NO+1×NC	25	4	1.3	24 V DC	2.2	1	106	4
ST25-20-24 DC	2×NO	25	4	1.3	24 V DC	2.2	1	106	4
ST25-20	2×NO	25	4	1.3	230 V AC	2.2	1	106	4
ST25-20/24	2×NO	25	4	1.3	24 V AC	2.2	1	106	4
ST25-11	1×NO+1×NC	25	4	1.3	230 V AC	2.2	1	106	4
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
ST25-04	4×NC	25	9	2.2	230 V AC	4.0	2	168	6
ST25-22	2×NO+2×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
ST40-40	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
ST40-31	3×NO+1×NC	40	16	5.5	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
ST63-31	3×NO+1×NC	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

norm No.	IEC 61095
service life of the electrical connection	1×10⁵
service life of the mechanical connection	1×10⁶
insulation voltage	4.0 kV
working temperature	-25÷50°C
installation	for TH-35 rail
protection level	IP20
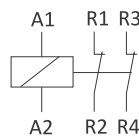
ST25-02
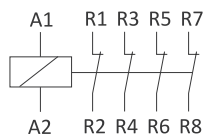
ST25-04
ST40-04
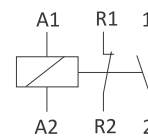
ST25-11
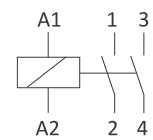
ST25-20
ST100-20
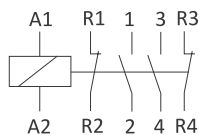
ST25-22
ST40-22
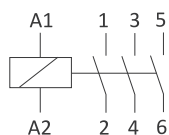
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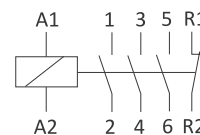
ST25-31
ST40-31
ST63-31
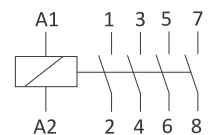
ST25-40
ST40-40
ST63-40
ST100-40

Electromagnetic relays

If the power supply voltage is applied to the coil of the relay, the contact will switch. The activation status of the relay is indicated by a green LED. After a power failure, the contact returns to their original position.

Modular for TH-35 rail

PK-1P   1 NO/NC (16 A) contact
PK-2P   2 NO/NC (8 A) contacts
PK-3P   3 NO/NC (8 A) contacts
PK-4PZ   2 NO/NC (2×8 A) contacts + 2 NO (2×8 A) contacts
PK-4PR   2 NO/NC (2×8 A) contacts + 2 NC (2×8 A) contacts

power supply	
PK-...P... 230 V	230 V AC
PK-...P... 110 V	110 V AC
PK-...P... 48 V	48 V AC
PK-...P... 24 V	24 V AC
PK-...P... 12 V	12 V AC
maximum load current (AC-1)	
PK-1P	16 A
PK-2P	2×8 A
PK-3P	3×8 A
PK-4PZ	4×8 A
PK-4PR	4×8 A
contacts	
PK-1P	1×NO/NC
PK-2P	2×NO/NC
PK-3P	3×NO/NC
PK-4PZ	2×NO/NC, 2×NO
PK-4PR	2×NO/NC, 2×NC
mechanical durability	min. 5×10⁶ cycles
power consumption	25 mA
working temperature	-25÷50°C
terminal	2.5 mm² screw terminals
tightening torque	0.4 Nm
dimensions	1 module (18 mm)
installation	for TH-35 rail
protection level	IP20

Example of marking when placing an order: PK-2P   48 V   supply voltage

PK-1P   PK-2P   PK-3P   PK-4PZ   PK-4PR
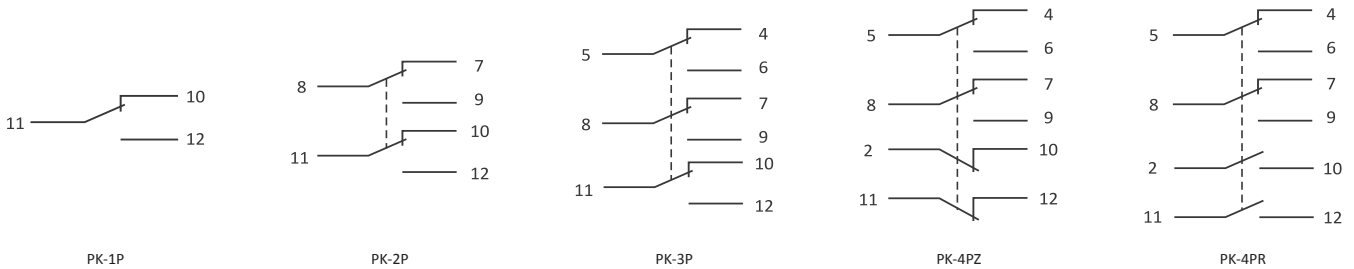
For ø60 flush-mounted box

PP-1P   1 NO/NC <16 A 250 V AC contact
PP-1Zi   1 NO <16 A (160 A/20 ms) 250 V AC contact
PP-2P   2 NO <16 A 250 V AC contacts
PP-2Zi   2 NO <16 A (160 A/20 ms) contacts

power supply	
PP-1P 24 V	7÷30 V AC/9÷40 V DC
PP-1P 230 V	100÷265 V AC
PP-1Zi 24 V	7÷30 V AC/9÷40 V DC
PP-1Zi 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-2Zi 24 V	7÷30 V AC/9÷40 V DC
PP-2Zi 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-1Zi 24 V	1×NO/<16 A (160 A/20 ms) 250 V AC
PP-1Zi 230 V	1×NO/<16 A (160 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-2Zi 24 V	2×NO/<16 A (160 A/20 ms) 250 V AC
PP-2Zi 230 V	2×NO/<16 A (160 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
installation	in flush mounted box ø60
protection level	IP20

(!) The "i" version of the relay 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-1Zi   PP-2P   PP-2Zi
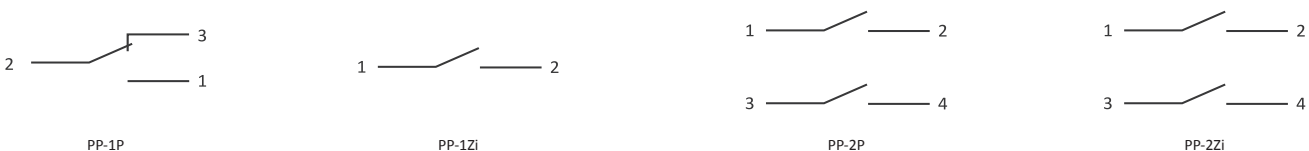
Measuring current transformers

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
Terminal S1/S2	4.0 mm² screw terminals
tightening torque	0.5 Nm
installation	board/busbar
orientation	vertical/horizontal
protection level	IP20

Type	Transformer Ip/Is	Class	Power [VA]	Dimensions of the P1/P2 [mm]	Dimensions [mm]	Weight [kg]
TI-30	30/5	0.5	1	ø22	44×67×30	0.135
TI-40	40/5	0.5	1	ø22	44×67×30	0.135
TI-50	50/5	0.5	2.5	ø22	44×67×30	0.135
TI-60	60/5	0.5	2.5	ø22	44×67×30	0.135
TI-75	75/5	0.5	2.5	ø22	44×67×30	0.135
TI-80	80/5	0.5	2.5	ø22	44×67×30	0.135

TI-100 / ... / TI-600   1-phase closed-core transformers

norm No.	IEC 60044 -1
nominal secondary current Is	5 A
rated voltage	0.66 kV AC
insulation breakdown voltage	3 kV/1 min.
frequency	50/60 Hz
security factor	FS<5
working temperature	-5÷40°C
Terminal S1/S2	4.0 mm² screw terminals
tightening torque	0.5 Nm
installation	board/busbar
orientation	vertical/horizontal
protection level	IP20

Type	Transformer Ip/Is	Class	Power [VA]	Dimensions of the P1/P2 A1/A2/A3×B; C [mm]	Dimensions [mm]	Weight [kg]
TI-100	100/5	0.5	2.5	30/25/20×10; ø22	61×80×37	0.235
TI-150	150/5	0.5	2.5	30/25/20×10; ø22	61×80×37	0.235
TI-200	200/5	0.5	5.0	30/25/20×10; ø22	61×80×37	0.235
TI-250	250/5	0.5	5.0	30/25/20×10; ø22	61×80×37	0.235
TI-300	300/5	0.5	5.0	30/25/20×10; ø22	61×80×37	0.235
TI-400	400/5	0.5	10.0	40/30/00×10; ø30	75×99×41	0.305
TI-600	600/5	0.5	10.0	40/30/00×10; ø30	75×99×41	0.305
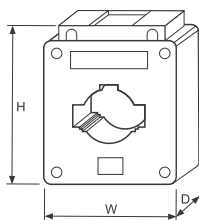
Dimensions
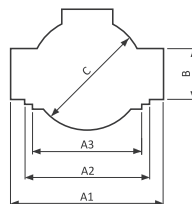
P1/P2 hole
TI-100; TI-150; TI-200; TI-250; TI-300

P1/P2 hole
TI-400; TI-600

Chapter 45

TO-100 / ... / TO-1000   1-phase open-core transformers

norm No.		IEC 60044 -1
nominal secondary current Is		5 A
rated voltage		0.66 kV AC
insulation breakdown voltage		3 kV/1 min.
frequency		50/60 Hz
security factor		FS<5
working temperature		-15÷50°C
terminal S1/S2		4.0 mm² screw terminals
tightening torque		0.5 Nm
installation		board
orientation		vertical/horizontal
protection level		IP20

Type	Transformer Ip/Is	Class	Power [VA]	Dimensions [mm]									Weight [kg]
				A	B	C	D	E	F	G	H	I	
TO-100	100/5	1.0	1.5	21	32	51	90	112	34	45	40	32	0.78
TO-150	150/5	1.0	1.5	21	32	51	90	112	34	45	40	32	0.78
TO-200	200/5	0.5	1.5	21	32	51	90	112	34	45	40	32	0.78
TO-250	250/5	0.5	1.5	21	32	51	90	112	34	45	40	32	0.78
TO-300	300/5	0.5	1.5	21	32	51	90	112	34	45	40	32	0.78
TO-400	400/5	0.5	2.5	21	32	51	90	112	34	45	40	32	0.78
TO-600	600/5	0.5	2.5	50	80	78	116	146	33	33	35	33	0.90
TO-750	750/5	0.5	5.0	50	80	78	116	146	33	33	35	33	0.90
TO-1000	1000/5	0.5	5.0	50	80	78	116	146	33	33	35	33	0.90
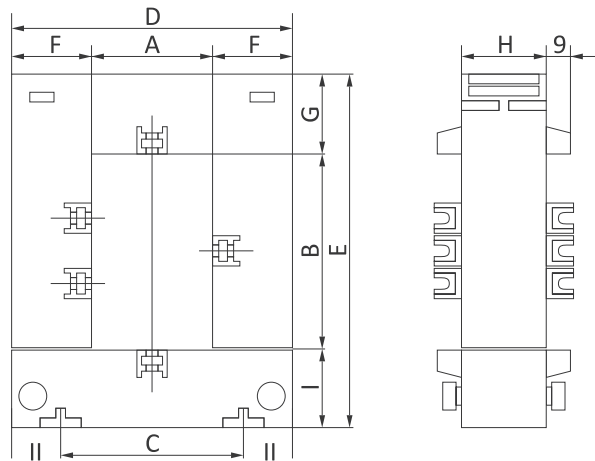
It is recommended to connect the secondary system with a wire with a diameter of at least 2.5 mm². Grounding of the S2 terminal is recommended.
Do not turn off the secondary system while the transformer is running (high voltage may cause injury to people or damage to the device).

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-150 / TP-200 / TP-400 / 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
Terminal S1/S2	4 mm² screw terminals
installation	DIN rail/board/cable
orientation	vertical/horizontal
protection level	IP20

Type	Transformer Ip/Is	Class	Power [VA]	Dimensions of the P1/P2 hole 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-400	400/5	1	3.75	31×31	142×96×51	0.570
TP-600	600/5	1	3.75	31×31	142×96×51	0.570

Section XIII

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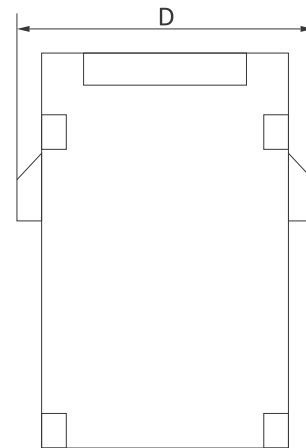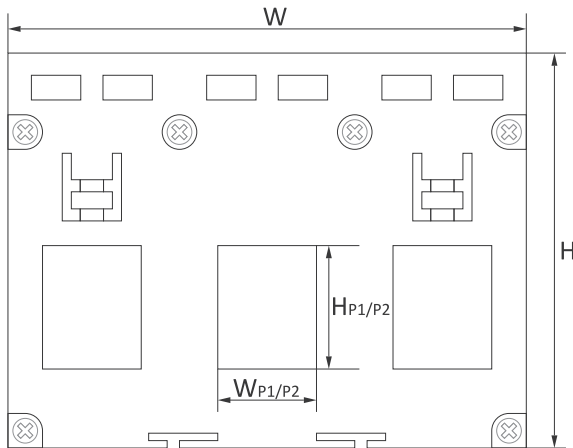
Indexes

Types and dimensions of enclosures

Dimensions in millimeters.
Tolerance ±0.5 mm.
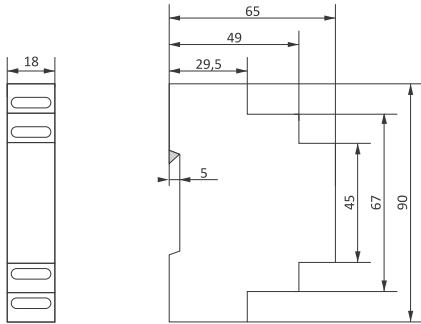
1S module
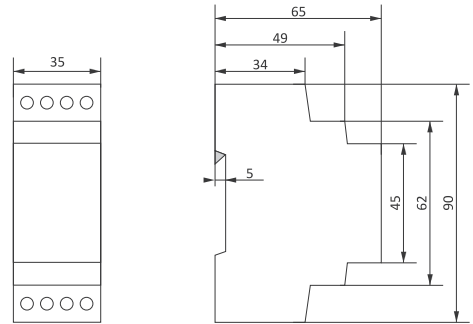
2S module
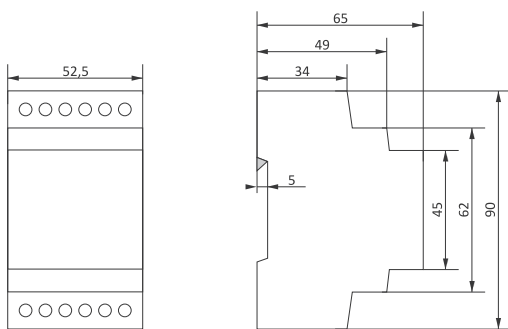
3S module
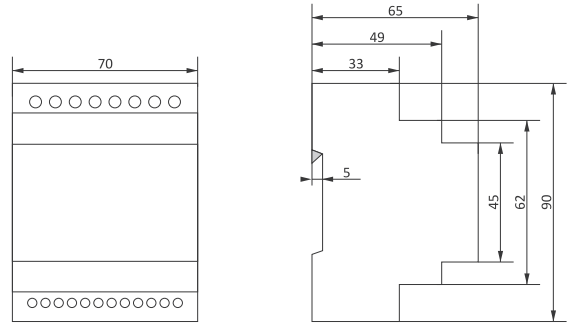
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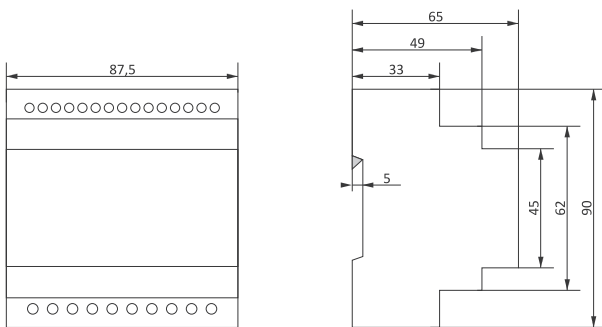
5S module
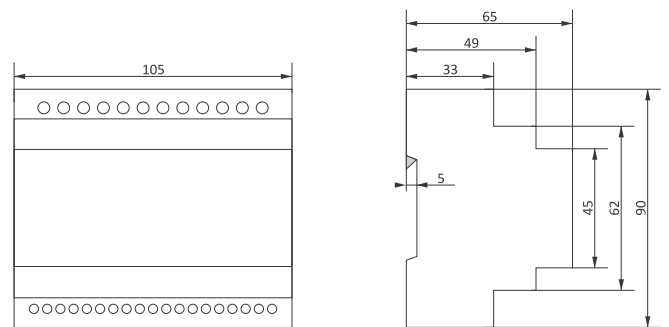
6S module
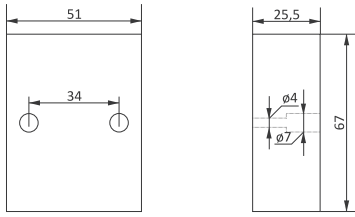
surface-mounted for: ASO, AZH, CKF, CZF, STR
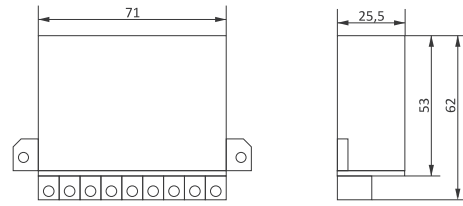
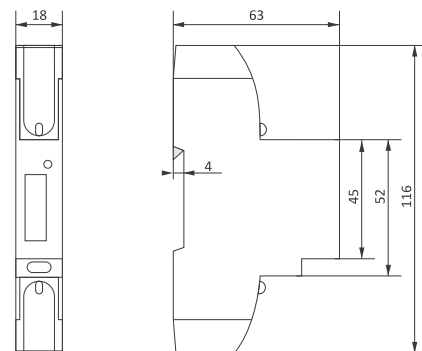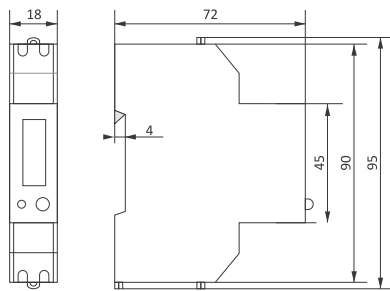surface-mounted for: CZF2
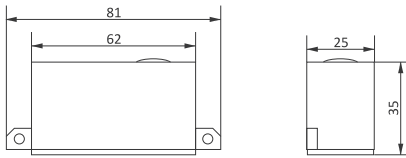
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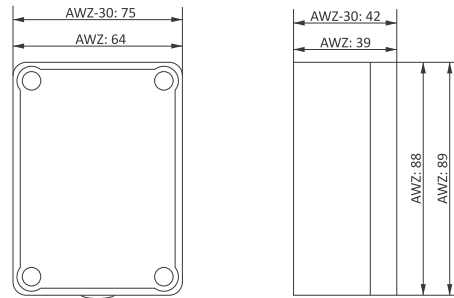
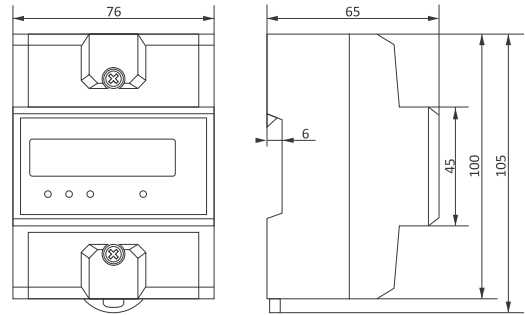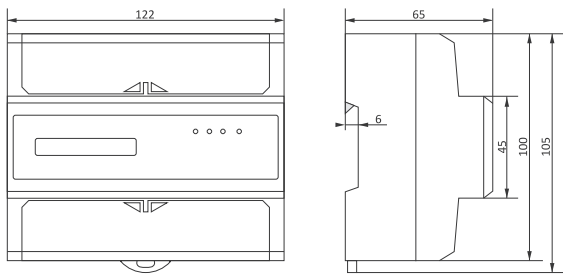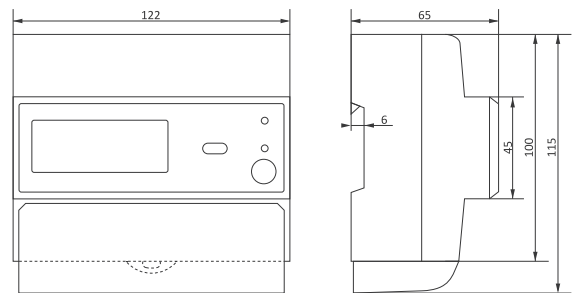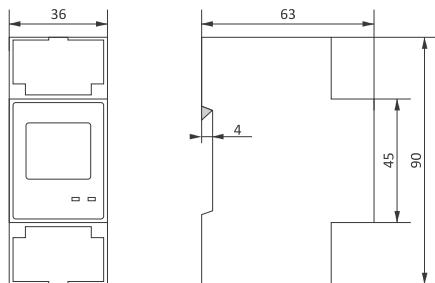surface-mounted for: AWZ, AWZ-30
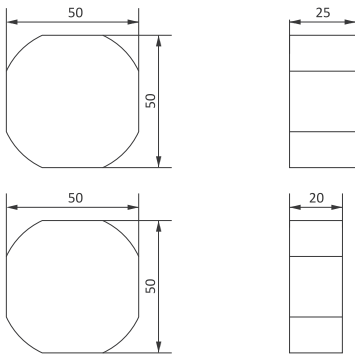
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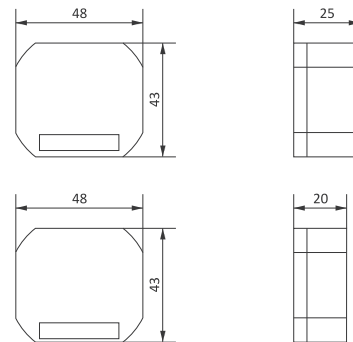
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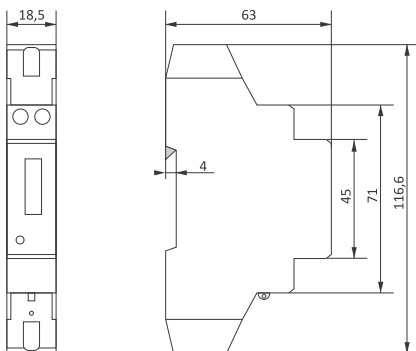
LE-01

LE-01d

LE-01MR

LE-02d/LE-02d CT

LE-03/LE-03d/LE-03d CT200/
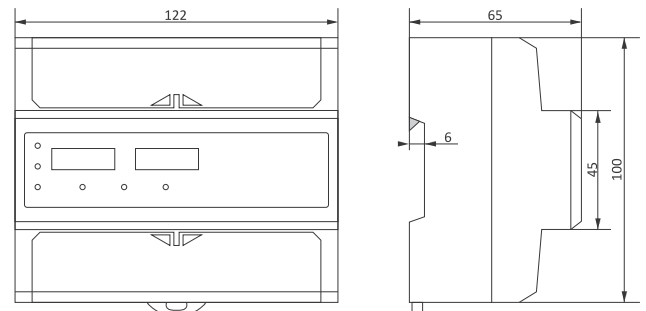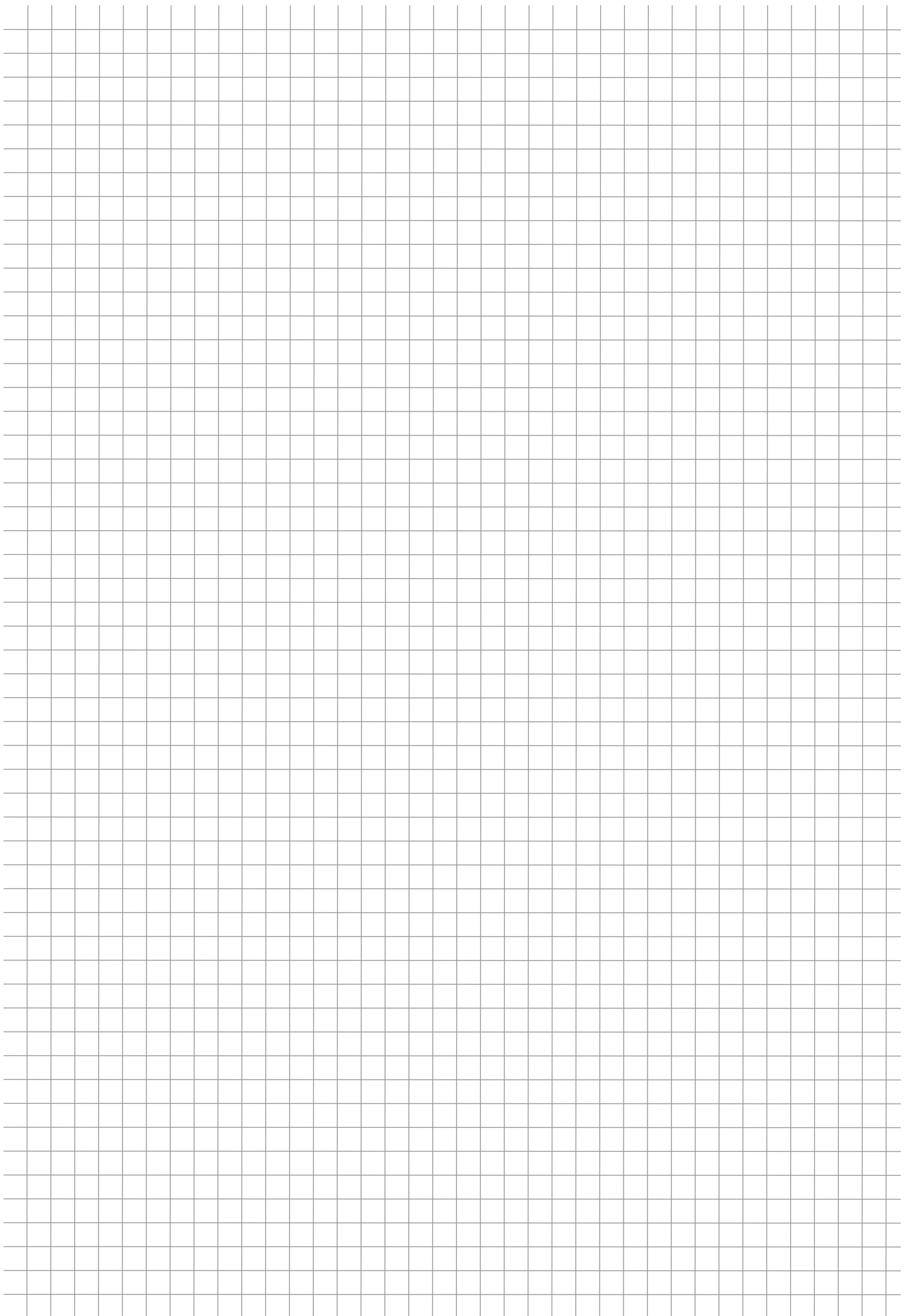LE-03d CT400/LE-03M/LE-03M CT

LE-03MP

LE-01MB/LE-01MQ
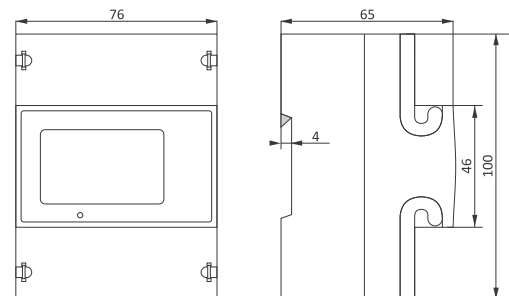
LE-03MB/LE-03MQ
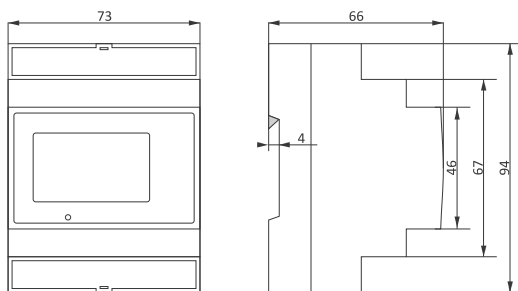
LE-03MB CT/LE-03MQ CT

LE-04d

mH-DEVELOPER

Smart Home for developers

A module designed for developers to control:

- ■ heating
- ■ lighting
- ■ the power supply of electrical outlets

The device was created based on detailed analyses of customers' needs and in cooperation with developers.

The advantage of the mH-DEVELOPER module is its simple assembly, compact design and the ability to extend the features with additional functions.